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**РЕГУЛИРУЮЩЕЕ ВОЗДЕЙСТВИЕ ГОСУДАРСТВА НА МАЛОЕ  
ПРЕДПРИНИМАТЕЛЬСТВО: СРАВНИТЕЛЬНАЯ ОЦЕНКА РОССИИ И КИТАЯ**  
REGULATORY IMPACT ON SMALL ENTREPRENEURSHIP:  
COMPARATIVE ASSESSMENT OF RUSSIA AND CHINA

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**АННОТАЦИЯ**

В статье приведена сравнительная оценка регулирующего воздействия на сектор малого бизнеса России и Китая, которая основана на данных ежегодного доклада Всемирного банка «Ведение бизнеса». Обобщены приоритетные направления государственной политики регулирования и поддержки малого предпринимательства в России и КНР. Выявлены причины изменения позиций стран в общем рейтинге Всемирного банка, и барьеры на пути развития малого предпринимательства обеих стран. Практическое применение авторских выводов возможно при формировании инструментария развития сектора малого предпринимательства.

**ABSTRACT**

The article compares the regulatory impact on the small business sector in Russia and China, which is based on the World Bank's annual Doing Business report. The priority directions of the state policy of regulation and support of small business in Russia and China are generalized. The reasons for changing the positions of countries in the general rating of the World Bank, the barriers to the development of small business of both countries are revealed. Practical application of the conclusions of the authors can be in the development of tools for the development of the small business sector.

**КЛЮЧЕВЫЕ СЛОВА**

Регулирующее воздействие на малое предпринимательство; легкость осуществления предпринимательства; барьеры развития бизнеса, государственная политика содействия развитию малого предпринимательства, малое и среднее предпринимательство.

**KEY WORDS**

Regulatory impact on small business, ease of entrepreneurship, barriers to business development, public policy to promote small business development, small and medium-sized businesses.

Особую роль в решении ряда социально-экономических проблем играет малый бизнес. Он является фундаментом большой экономики и в значительной степени определяет динамику развития страны в целом, а так же в отдельных ее областях.

Малые предприятия более мобильны. Они не требуют крупных стартовых инвестиций, имеют сравнительно высокую оборачиваемость капитала, оперативно реагируют на изменение конъюнктуры рынка, придают экономике гибкость [10].

Являясь базовой составляющей рыночного хозяйства, как в нашей стране, так и за ее пределами, малое предпринимательство оценивают как наиболее эффективную форму хозяйствования.

Основная цель, которую стремится достигнуть Правительство РФ с помощью малого предпринимательства, – создание адаптированной, конкурентоспособной и гибкой экономики, с помощью которой возможно было бы гарантировать стабильную занятость и высокую скорость технологического обновления производства. Достижение этой цели обеспечило бы рост доли среднего класса и значительное повышение качества жизни граждан в целом [11].

В последние годы существенно улучшен деловой климат. Однако, динамичного развития сектора российского малого предпринимательства не происходит. Малый бизнес представлен преимущественно микропредприятиями и индивидуальными предпринимателями, его доля в ВВП государства невелика и составляет около 20%, доля в обороте товаров и услуг – 25%, доля инвестиций в основной капитал – лишь 6% от общего объема по России. Только 6% россиян являются начинающими предпринимателями или владельцами нового бизнеса. Отсюда, нужны комплексные меры, охватывающие все субъекты малого предпринимательства, которые смогут обеспечить реальную поддержку частной деловой инициативы.

За последнее полугодие 2017 г. наблюдалось увеличение числа субъектов малого предпринимательства на 401 тыс. 517 хозяйствующих субъектов (7,3%). В едином реестре субъектов малого и среднего предпринимательства в России на 01.02.2017 года зарегистрировано 5 млн. 925 тыс. 282 субъекта МСП, из которых 5 млн. 636 тыс. 789 единиц составили микропредприятия (95%), 267 тыс. 558 единиц – малые предприятия (4,5%), 20 тыс. 935 единиц – средние предприятия (0,5%) [5].

По данным исследования Всемирного банка, по степени благоприятности условий для предпринимательской деятельности Российская Федерация за последние три года поднялась в рейтинге на 11 пунктов с 51 до 40 места. Вместе с тем, в 2017 году наблюдается падение на 4 пункта с 36 до 40 места (таблица 1) [9].

Впервые в сфере развития малого и среднего предпринимательства утвержден документ стратегического планирования на долгосрочную перспективу – Стратегия развития малого и среднего предпринимательства в Российской Федерации на период до 2030 года. Ориентиром этого документа является увеличение доли малых и средних предприятий в валовом внутреннем продукте в два раза (с 20 до 40%) [5]. Перечислим ключевые задачи стратегии развития малого и среднего предпринимательства:

1. Стимулирование спроса на продукцию малого предпринимательства, а так же стимулирование развития предпринимательской деятельности в отдельных регионах страны;
2. Повышение качества государственного регулирования;
3. Совершенствование политики в области налогообложения, а также в области неналоговых платежей;
4. Обеспечение доступности финансовых ресурсов;
5. Укрепление кадрового потенциала;
6. Повышение производительности труда [11].

Приоритетом государственной политики в области стимулирования развития малого предпринимательства в России является сокращение контрольно-надзорной нагрузки (рисунок 1).

После 2017 г. в Федеральном законе «Об основах государственного и муниципального контроля и надзора в Российской Федерации», который направлен на переход к риск-ориентированному подходу при проведении мероприятий по надзору, будут предусмотрены все мероприятия по совершенствованию контрольно-надзорной деятельности [11].

Важным фактором, который способствует развитию экономики малого предпринимательства, является повышение предпринимательской грамотности.

Поэтому, в стратегии развития малого предпринимательства РФ уделяется большое значение подготовке кадров и раскрытию их предпринимательского потенциала.

Таблица 1 – Оценка бизнес- регулирования в Российской Федерации [8]

| Направление регулирования               | DB 2017 Рейтинг | DB 2016 Рейтинг info_outline | Изменение в рейтинге | DB 2017 ПР (% пунктов) info_outline | DB 2016 ПР (% пунктов) info_outline | Изменение в показателе ПР (% пунктов) info_outline |
|---|-----------------|------------------------------|----------------------|-------------------------------------|-------------------------------------|--|
| Глобально                               | 40              | 36                           | ↓4                   | 73.19                               | 73.20                               | ↓0.01  |
| Создание предприятий                    | 26              | 37                           | ↑11                  | 93.57                               | 92.35                               | ↑1.22  |
| Получение разрешений на строительство ✓ | 115             | 117                          | ↑2                   | 65.86                               | 64.67                               | ↑1.19  |
| Подключение к системе электроснабжения  | 30              | 26                           | ↓4                   | 84.37                               | 84.22                               | ↑0.15  |
| Регистрация собственности               | 9               | 8                            | ↓1                   | 90.55                               | 90.51                               | ↑0.04  |
| Получение кредитов                      | 44              | 42                           | ↓2                   | 65.00                               | 65.00                               | -  |
| Защита миноритарных инвесторов          | 53              | 51                           | ↓2                   | 60.00                               | 60.00                               | -  |
| Налогообложение                         | 45              | 40                           | ↓5                   | 82.96                               | 83.09                               | ↓0.13  |
| Международная торговля                  | 140             | 138                          | ↓2                   | 57.96                               | 57.96                               | -  |
| Обеспечение исполнения контрактов ✗     | 12              | 8                            | ↓4                   | 74.96                               | 75.78                               | ↓0.82  |
| Разрешение неплатежеспособности         | 51              | 49                           | ↓2                   | 56.69                               | 58.39                               | ↓1.70  |

✓ = реформирование, которое содействует легкости ведения бизнеса; ✗ = изменение, которое затрудняет ведение бизнеса.



Рисунок 1 – Основные новации государственной поддержки предприятий малого бизнеса в России в 2016-2017гг.

Разрабатываются и внедряются стандарты оказания образовательной поддержки МБ, на стадии реализации находятся образовательные программы по основам предпринимательства, бухгалтерского учета, налогам и проектной деятельности, набирают популярность институты наставничества при участии предпринимательского сообщества, ВУЗов и различных организаций.

Подтверждением тому является запуск в августе 2016 года информационной системы "Бизнес-навигатор МСП", инструмента информационно-маркетинговой поддержки, позволяющего предпринимателям открывать и развивать новый бизнес.[5]

В разных странах мира государство проводит разное по степени жесткости регулирующее воздействие на сектор предпринимательства.

Интересным представляется сопоставительный анализ регулирующего воздействия государства на малый бизнес России и Китая. В отличие от России, регулирующее воздействие на бизнес в Китае следует признать более жестким (таблица 2).

Так, Китай занимает 78 место в рейтинге бизнес- регулирования в отличие от России (40 место) (Doing Business) [7].

Таблица 2 – Оценка бизнес -регулирования в Китае [7]

| Темы                                      | DB 2017<br>Рейтинг | DB 2016<br>Рейтинг<br>info_outline | Изменение<br>в рейтинге | DB 2017 ПР<br>(% пунктов)<br>info_outline | DB 2016 ПР<br>(% пунктов)<br>info_outline | Изменение в<br>показателе ПР<br>(% пунктов)<br>info_outline |
|---|--------------------|------------------------------------|-------------------------|---|---|---|
| Глобально                                 | 78                 | 80                                 | ↑2                      | 64.28                                     | 62.86                                     | ↑1.42   |
| Создание предприятий ✓                    | 127                | 134                                | ↑7                      | 81.02                                     | 77.46                                     | ↑3.56   |
| Получение разрешений на<br>строительство  | 177                | 175                                | ↓2                      | 48.52                                     | 48.29                                     | ↑0.23   |
| Подключение к системе<br>электроснабжения | 97                 | 92                                 | ↓5                      | 68.73                                     | 68.66                                     | ↑0.07   |
| Регистрация собственности                 | 42                 | 42                                 | -                       | 76.15                                     | 76.15                                     | -   |
| Получение кредитов ✓                      | 62                 | 78                                 | ↑16                     | 60.00                                     | 50.00                                     | ↑10.00  |
| Защита миноритарных<br>инвесторов         | 123                | 118                                | ↓5                      | 45.00                                     | 45.00                                     | -   |
| Налогообложение                           | 131                | 127                                | ↓4                      | 60.46                                     | 60.50                                     | ↓0.04   |
| Международная торговля                    | 96                 | 94                                 | ↓2                      | 69.13                                     | 69.13                                     | -   |
| Обеспечение исполнения<br>контрактов      | 5                  | 4                                  | ↓1                      | 77.98                                     | 77.98                                     | -   |
| Разрешение<br>неплатежеспособности        | 53                 | 53                                 | -                       | 55.82                                     | 55.43                                     | ↑0.39   |

✓ = реформирование, которое содействует легкости ведения бизнеса. ✗ = изменение, которое затрудняет ведение бизнеса.

По мнению российского востоковеда Маслова Алексея Александровича, чтобы построить успешный бизнес в Китае, нужно изучать не столько экономику, право или маркетинг, сколько этнические стереотипы предпринимательства и менталитет самих китайцев.

Специфика большинства китайских компаний, от мелких до транснациональных корпораций, состоит в следующем: практически все организации представляют интересы страны и управляются государством («этативные» корпорации). В КНР все контролирует Коммунистическая партия Китая. Однако управление компаниями осуществляется госаппаратом не напрямую, а через группы, аффилированные с госорганами и надежными внутренними инвесторами [2].

Правительство Китая оказывает серьезную поддержку своим мелким и средним компаниям, создавая старт-апам благоприятные условия для развития.

По свидетельству самих представителей СМБ Китая, наиболее привлекательные условия для бизнеса созданы не в континентальной части Китая, а в Гонконге. Например, в этом специальном административном районе налогом облагается только доход, полученный на территории острова. Даже если иностранные доходы напрямую связаны с деятельностью компании в Гонконге, но получены в другом месте, они все равно не облагаются налогом. Кроме того, здесь отсутствует налог на прирост капитала и дивиденды, не существует понятия НДС. Налог на прибыль, полученную от операций на территории Гонконга, составляет 17,5% в первые два года и 16% при ведении успешной деятельности более двух лет. Размер налога на заработную плату, включающую в себя и премии, и комиссионные, и социальные пособия, а также другие выплаты и вознаграждения, равен 15% [6].

На территории КНР реализуют свою деятельность сотни тысяч иностранных компаний. Преимущественно к таковым относят казахстанские корпорации.

Основными формами иностранного присутствия на рынке КНР являются:

1. создание предприятия со 100% иностранными инвестициями;
2. создание паевого китайско-иностранного совместного предприятия (предприятия совместного капитала);
3. создание контрактного китайско-иностранного совместного предприятия (предприятия совместной кооперации);
4. учреждение постоянного представительства иностранного предприятия [4].

Как и в Российской Федерации, поддержка малого и среднего бизнеса была и остается для Китая одной из приоритетных задач государства, поскольку малый и средний бизнес дает одну треть ВВП Китая и создает примерно такую же долю новых рабочих мест.

Сравнивая показатели рейтинга оценки бизнес - регулирования (Doing Business), отметим, что Российская Федерация обладает рядом преимуществ, нежели КНР (таблица 3).

Таблица 3 – Рейтинг России и Китая по степени легкости осуществления бизнеса (по результатам исследования Doing Business за 9 мес. 2017 г.) [1]

| Наименование индикатора                | Россия | Китай |
|--|--------|-------|
| Легкость ведения бизнеса               | 40     | 78    |
| Создание предприятий                   | 25     | 127   |
| Получение разрешений на строительство  | 115    | 177   |
| Подключение к системе электроснабжения | 30     | 97    |
| Регистрация собственности              | 9      | 42    |
| Получение кредитов                     | 44     | 62    |
| Защита миноритарных. инвесторов        | 53     | 123   |
| Налогообложение                        | 45     | 131   |
| Международная торговля                 | 140    | 96    |

Как свидетельствуют данные таблицы 3, единственным пунктом, где выигрывает Китай, является международная торговля. Усложнение процессов, лишние документы, неэффективная координация, а также отсутствие надлежащей инфраструктуры приводит к дополнительным затратам и задержкам для экспортеров и импортеров, подавляя торговый потенциал. Действующие санкции серьезно ухудшают положение России в международной торговле [1].

Несмотря на сложившуюся ситуацию, многие международные эксперты утверждают, что Китай, в ближайшее десятилетие, способен вырваться вперед по всем ключевым показателям, обогнав тем самым не только Россию, но и некоторые страны Западного зарубежья.

Правительство КНР работает над стратегией адаптации к мировым изменениям. Китай старается избежать ситуации, в которую попадают многие страны, а именно – потерять конкурентоспособность в трудоемких отраслях промышленности при одновременном лишении новых источников инноваций для стимулирования экономического роста [3].

Таким образом, отметим, что сопоставительный анализ легкости ведения бизнеса двух супердержав, приводит к выводу о наличии одинаковых барьеров на пути развития предпринимательства, к которым относятся долгие и сложные процедуры получения разрешений на строительство и присоединения к электросетям.

## REFERENCES

1. Валитова Д.Р. Россия и Китай: сравнительный анализ предпринимательства // Научное сообщество студентов XXI столетия. ЭКОНОМИЧЕСКИЕ НАУКИ: сб. ст. по мат. LIV междунар. студ. науч.-практ. конф. № 6(54). URL: [https://sibac.info/archive/economy/6\(54\).pdf](https://sibac.info/archive/economy/6(54).pdf) (дата обращения: 29.10.2017)
2. Идем на Восток: особенности ведения бизнеса в Китае [Электронный ресурс] - <http://nb.kz/2530/>

3. Ишмуратова В.Г. Борьба с бедностью в КНР: исторический опыт, проблемы и перспективы // Проблемы современной экономики. 2014. №3. С. 287 – 292.
4. Китайская народная республика/Визит делегации провинции Шаньси в Китайскую Народную Республику, 8 августа 2016г. С.-8. [Электронный ресурс] - [http://rusakcent.ru/media/spec\\_3\\_2016.pdf](http://rusakcent.ru/media/spec_3_2016.pdf)
5. Малое и среднее предпринимательство: отчет правительства за 2016 год [Электронный ресурс]: [http://corpmsp.ru/pres\\_slujba/](http://corpmsp.ru/pres_slujba/)
6. Особенности ведения бизнеса в КНР [Электронный ресурс] -<http://nb.kz/2530/>.
7. Оценка Бизнес регулирования в Китае [Электронный ресурс] - <http://russian.doingbusiness.org/data/exploreeconomies/china>
8. Оценка Бизнес регулирования в Российской Федерации [Электронный ресурс]: <http://russian.doingbusiness.org/data/exploreeconomies/russia>
9. Рейтинг стран по легкости ведения бизнеса (Doing Business) [Электронный ресурс] - <http://nonews.co/directory/lists/countries/doing-business>
10. Федорова Е.Ю., Косинова Н.А. Тенденции развития малого бизнеса/ Экономика и экономические науки/ Вестник Курской государственной сельскохозяйственной академии - 2013, [Электронный ресурс] - <https://cyberleninka.ru/article/v/tendentsii-razvitiya-malogo-biznesa-v-kurskoj-oblasti>
11. Шибилева О.В., Севостьянова Е.С., Бояркина Е.В. Стратегия развития малого предпринимательства в Российской Федерации до 2030 года/ Экономика и экономические науки / Вестник Воронежского государственного университета инженерных технологий. - 2016. С.-434-435.

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## **INTERNAL MIGRATION OF POPULATION FROM VILLAGES TO CITIES AS A RESULT OF SOCIO-ECONOMIC AND INNOVATIVE DEVELOPMENT OF CHINA**

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### **ABSTRACT**

Intensification of internal migration of population from villages to cities is the important process that accompanies the social and economic development of modern China. Active internal migration is the result of industrial and innovative development of the country, when developing provinces and large cities required a large number of labor force. The main scientific and practical problem of the research is the presence of a number of problems caused by migration of huge masses of people from villages to cities in China. The purpose of the article is actualization of trends reflecting the intensification of internal migration of population from villages to cities as a result of active socio-economic and innovative development of the country. The methodological basis of the research is the theses of modern economic and demographic theories, the concept of country's migration development. The article reveals the importance of migration processes for development of China's economy, focuses on internal migration from villages to cities. The authors describe the factors and conditions that take place in China for development of internal migration and national human potential, indicate the difficulties that the country faces with in such large population movements. The article also presents basic statistics in the field of Chinese internal migration, its composition and structure.

### **KEY WORDS**

Internal migration in China, migration from villages to cities, Chinese economy, socio-economic development, innovative development, labor potential, factors of migration development, Chinese population.

Rapid development of processes in internal migrations of population and labor force in China has generated a large number of scientific researches in the field of dynamics, regulation, and factors of development of internal migration processes. In modern economic science a special attention is paid to concepts, typology, varieties of internal migration, urbanization processes, etc., which are taken as a part of studying in the field of human capital and reproduction of labor resources. These aspects of studying reveal the fundamental features of internal migration and determine the trends of their development.

China's government has always paid a great attention to the processes of labor migration. The role of labor movement of population in geographical and economic sense, the significance of state instruments that regulate involvement and use of national labor force in the territories of Chinese provinces, increase from year to year. Obviously, in many provinces and cities of central subordination, such as Beijing, Tianjin, Shanghai, the processes of internal labor migration play a determining role in the resource provision of the economy and socio-economic development. Studying the regional aspects of internal labor migration in China, we can face the problem of a lack of detailed and structured assessment of migration potential in this country [1].

It is important to emphasize the peculiarities of internal migration flows in China over the past half of the century – their constant expansion and qualitative transformation. Chinese scientists consider migration as a part of national economy and at the same time as a part of national demography. Regional labor flows were created and formed. They take an active part in formation and development of labor markets in Chinese provinces and cities.



These facts determine the relevance of the research theme and its need for the growing Chinese economy. The study of internal migrations in many ways makes necessary to determine the nature, magnitude and degree of influence of factors forming the regional labor markets on each other, makes possible to identify the causes and proportion of social and economic parameter associated with the demographic development, the labor market, the development of human capital, etc. [2].

According to modern demographic theories, there are two main types of migration: external and internal. External migration is a type of movement in which national borders are crossed. Internal migration is a movement of population within the borders of the country. Geographically they consist of four streams: from city to city; from village to city; from city to village; between rural settlements (figure 1).

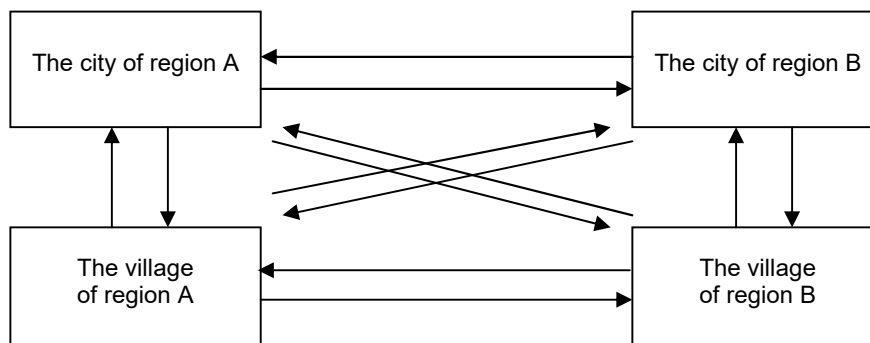


Figure 1 – The scheme of internal migration (interregional and intraregional)

Internal migration includes movements within the one country between administrative or economic-geographical populated areas. The most common modern type of internal migration is a movement from rural areas to cities and inter-district migration [3]. They take approximately 70% of all internal flows of migrants in China.

Such rapidly developing country like China, systematically and comprehensively forms conditions for innovative wave of its development that suggests accumulation and improvement of quality of the human capital. China began its reforms with a completely technocratic approach to management of human resources and migration flows, in which the large, illiterate and disenfranchised labor force was subordinated to needs of national production and was directed to way the state needs. According to experts' assessments, the existence of almost unlimited resource of labor, its migration after the capital to the points of economic growth, provided during the period 1978-1988 about a third of GDP growth [4]. In 1980 after creation of the concept of sustainable development, which China began to adhere to, Chinese society began to move toward the humanistic approach in management of population migration. The strategy of comprehensive construction of a moderately prosperous society, which was fixed at the 16th Congress of the Chinese Communist Party in 2002, clearly identified the rise of ideological, moral, scientific, cultural and physical qualities of the nation as one of the tasks that can to create a perfect modern system of public education, technical and cultural innovation, the system of nation-wide physical training, as well as medical care and public health, can to stimulate the comprehensive development of personality [5].

## RESULTS AND DISCUSSION

At present time, following their Western colleagues, Chinese scientists view their national human potential as one of the most important strategic resources that determine the complex power of the state and form the «hard» power (material resources), which with the «soft» power (culture and mentality) provide China's national competitiveness in the global economy [6]. At the same time, many researchers reflect the duality and inconsistency of

migration and demographic situation in China and connect it with the policy of birth control «One family – one child», which was started in 1979. The main negative consequence of this policy is reduction of working-age population and its aging. Many specialists connect with the policy a whole complex of social and economic problems, including internal migration problems [7].

Summarizing all that was said before, we can note the following factors and conditions in which internal migration in China has developed and continues to evolve:

1) Large number of the working-age population, not burdened with a family and children, aimed at work and earnings;

2) Reduction of growth rates of the working-age population because of the policy «One family – one child» during the 1980-2015 [8];

3) Concentration of economic and labor potential in eastern territories of the country, lag of economic development in the central and western territories of China [9];

4) Development of specific settlements and territories (provinces, districts, cities, cities of central subordination) as industrial, innovative, educational and tourist centers, which require a particularly highly skilled workforce and large number of workers;

5) Differentiation of living standards of Chinese population as a result of the difference in economic and investment development, the desire of population to move to territories that have potential for getting a good job and a high salary [10];

6) Level of education of the population continues to be low. It is easier for the less educated people to move to another place of residence than to educated people who, as a rule, have good jobs in their cities.

The volume of internal migration increases every year in China because of these socio-economic and demographic factors. The main reason for large-scale internal labor migration is the differentiation of standard of living, which pushes out a part of population in search of a better life. According to some experts' opinions, the large structural changes in China's economy led to creation of the largest migration flow of people in the history of modern civilization in peacetime. The number of people leaving the rural areas and seeking work in large industrial cities increased from 2 million in 1985 up to 250 million now [11]. Such mass of migratory people undoubtedly has a significant impact on China's economics and politics and at the same time on the neighboring countries. This fact makes labor migration one of the key and most important problems that China faces today.

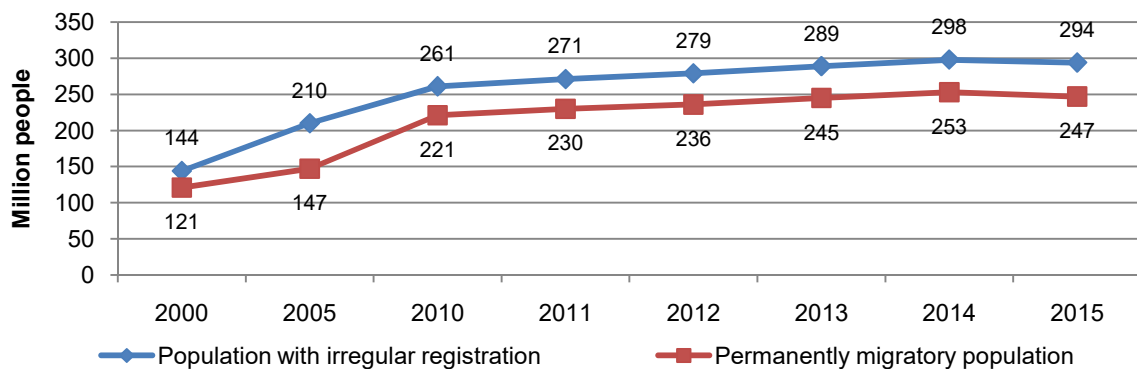


Figure 2 – Dynamics of number of migratory populations and population with irregular registration in China for 2000-2015

As in any other countries, China has different directions of internal migration: inter-regional (city-city), intraregional (village-city). The most of all internal migrations is concentrated in the framework of intraregional migrations and reflects movements from villages to cities. In the vast majority of cases, the purpose of migration is to find work, so we can say that the labor migration in China is mainly caused by economic reasons [12].

According to data of the Department of Control of the Migratory Population under the Municipal Committee for Population and Family Planning of China, in 2015 the number of

migrants in the country reached 247 million people. The trend in China's migratory population reflects a positive trend (figure 2) [11].

During the period 2000-2015 the number of migrants annually increased by 126 million people, or more than 2 times. The number of people with irregular registration increased by 150 million people, or also by 2 times. The number of residents with irregular registration is always more than the number of migrants, because it reflects those who have already arrived to a new place, but continues to live with the old residence permit. It can be assumed that the number of migrants and persons with irregular registration will increase and in 2050 will reach 350 million people [13].

The army of migrants has a significant influence on the livelihoods of cities, which are the final destination of their migration potential. The data of the National Bureau of Statistics of China indicate a permanent restructuring in number of urban residents in favor of visitors and those who live in them for less than 6 months (table 1) [11].

Table 1 – The structure of population in China on the basis of registration  
(According to results of the National sample survey 2011 and 2015 about the change in population structure. The sample's share is 1.55 ‰ in 2015 and 0.850 ‰ in 2011), millions of people

| Indicators  | 2015           | 2011         |
|---|----------------|--------------|
| The number of surveyed population   | 213,12         | 11,45        |
| Living in cities and settlements with a permanent registration (share in the total sample)  | 166,50 (78,1%) | 9,09 (79,4%) |
| Living in cities and settlements with a permanent registration in another place for more than 6 months (share in the total sample)                    | 45,46 (21,3%)  | 2,24 (19,5%) |
| Living in cities and settlements without a permanent registration (share in the total sample)   | 0,89 (0,42%)   | 0,10 (0,89%) |
| Living in Hong Kong, Macao and Taiwan, as well as abroad, with a permanent registration in Chinese cities and settlements (share in the total sample) | 0,27 (0,13%)   | 0,02 (0,77%) |

Experience of the selective statistics in China shows that over the past 5 years from 2011 to 2015 the proportion of those who do not have permanent registration and those whose registration does not coincide with their actual place of residence, has increased from 21.16% to 23.85%. The sample volume has increased significantly. This fact indicates a significant scale of internal migration of population, which is registered by statistics.

According to Chinese experts' opinion, 70% of migrants are people from 16 to 35 years old. Most of them have primary or incomplete secondary education (9 classes). Most of the migrants earn 300 to 600 yuan per month (from 36 to 72 US dollars). About a third of migrants are women. Most of migrants are hired for work, which is usually considered as dirty, dangerous or heavy and is not attractive to local residents. The average age of these migrants is 27.3 years old; 78.7% of them are peasants; the average composition of families of these people is 2.3 people; 86.8% of them graduated from high school only. Currently, the majority of migrants are engaged in construction, trade, food industry, provides various services [13]. Because of large number and specificity of their composition and structure, migrants have a very serious impact on life in cities. We can distinguish both advantages and disadvantages of the migrants' influence.

Speaking about the advantages, scientists note that internal labor migration has made a significant contribution to the growth of China's economy, providing 16% of GDP growth in China for the past 20 years. Speaking about disadvantages we can note that consideration of issues connected to internal migration makes possible to identify sectoral and geographical disparities in the country's economic development. Migration is a factor contributing to China's industrial development, to solution of the poverty problems and implementation of strategy for rural development. As in other countries in which cheap labor force is a comparatively competitive advantage, in China the border between use of labor and its exploitation is often blurred. Tens of millions of labor migrants from rural areas have become a live tool for acceleration of urbanization and industrial development of the country. But they remain second-class citizens who do not have rights, social protection and access to social life system [14].

In March 2015, Prime Minister Li Keqiang held a series of meetings and forums to promote the rapid and full adaptation of migrants in the host territories, the development of mass entrepreneurship and popular innovations among them. According to the Department of Trade and Industry of the Ministry of Economic Development of China, increasing the viability of labor market, reducing barriers to entry into the market and formation of full demand are the priority task for China. The implementation of the «Three cards in one» policy (industrialization, innovation and human capital) is a problem that Chinese economic reforms intensively solve. Currently, the country has 24 provinces in promotion of this work. Among them there are 19 provinces and municipalities in the process of implementation of the «Three cards in one» policy. The provinces participate in the program of simplification of procedure for receiving of work permits, organizing their tax services and improving the quality of life in general. The policy «Three cards in one» allows to reduce the time of registration of migrants, increases the efficiency of labor market and service market, reduces business costs, improves entrepreneurial enthusiasm among migrants, and increases the scale of investor migration [13].

Besides, the government of China is working to simplify the procedure for professional approval of qualification requirements, to improve the efficiency of allocation of the human resources. The State Council of Executive Sessions of the Communist Party of China in order to further improvement of effectiveness of the human resources' allocation and in accordance with the precondition of maintaining the acceptability of qualifications continues to work on the growth of professional qualifications and identification of migrants' licenses. In the provinces where there is no legal and institutional basis to master the various types of professional qualifications in various departments, it is necessary to create a mechanism for own licensing and certification. While the system of professional qualifications becomes strong and identification based on control and management improves, it is necessary to correct violations in implementation of job projects, to improve the standards of vocational and professional skills for all professions that are under the procedure of national classification. Professions without such standards will be excluded from the classifier of professions. With the gradual establishment of industry associations, societies and other social organizations, many Chinese provinces reevaluate the level of professional qualifications of migrants. The new migration policy reduces the threshold of entrance to the labor market in many areas of public entrepreneurship, allows the greater participation of the public in the process of entrepreneurial innovation, and promotion of employment [13].

On the other hand, although the situation of migrants in China has been ignored for many years, now the improvement of their living and working conditions has become the focus of attention for the Chinese leadership. Facing the increasing number of complex social, economic, environmental and other problems, the China's government gave priority to balanced and harmonious development of Chinese society, with a special emphasis on problems and needs of individual. This fact means that in coming years one of the central problems for China's government will be the problem of softening of negative social and economic consequences of large-scale internal migration [14].

## **CONCLUSION**

Thus, at present days we can note the intensification of internal migration of population from villages to cities in China as a result of socioeconomic and innovative development of the country. On the base on the research, the following conclusions can be drawn.

Migration of population, including labor migration, is the process of settlement of territories and their economic development, also development of productive forces of society. The current trend of migration in China is the social changes of recent decades, which have radically changed the political and social situation in the country. China is experiencing a very large migration boom now. At different periods many developing countries also experienced a high scale of migration, but unlike them, China was faced with the high degree of intensity of migration flows under conditions of beginning of innovative development.

For China – country with huge territorial differences, unevenness of socio-economic and innovative development, migration of population has always been important. The main donors of the labor force are the central, western and northern provinces. The main recipients are the eastern provinces and cities of central subordination.

Scientists identify two main factors that shape the trends of development of internal migration: demographic and economic. The study of demographic factor answers the questions «how many people», «what structure and composition migrants have». The study of economic factor shows why people move from villages to cities, which causes make them to leave their homes.

The «army» of Chinese migrants has a significant influence on economy and livelihoods of cities, which are the final destination of their migration potential. There is a permanent restructuring of number of urban residents in favor of visitors and people who live in them for less than 6 months. Proportion of those who do not have permanent registration and those whose registration does not coincide with their actual place of residence, has increased from 21.16% to 23.85%.

## REFERENCES

1. Zhocao Yu (2014). Demographic factors of China's socio-economic development // Economic Theory. No. 1. P. 85-91.
2. Yu Y. (2016). Social stratification after the formation of China // Sociology. No.1. P.87-92.
3. Migration of population: theory, policy: the textbook (2013). Edited by O.D. Vorobyeva, A.V. Topilin. Moscow: Publ. house Economic Education. – 364 p.
4. Zhujun Dean, Kovalev M.M., Novik V.V. (2014). The phenomenon of China's economic development: scientific publication. Minsk: Publ. house BSU Publishing Center. – 446 p.
5. Report of Jiang Zemin at the 16th All-China Congress of the CPC (second part) [Electronic resource] // Newspaper «People's Daily» on-line in English. URL: <http://russian.people.com.cn//zhuanti/partycongress/bao2.html>.
6. Huang Anang, Meng Hongyuan (2017). The rise of modern China. Comprehensive national power and great strategy [Electronic resource] // Almanac «East» About the Situation in Russia. No. 2 (43). URL: [http://www.situation.ru/app/j\\_art\\_1195.htm](http://www.situation.ru/app/j_art_1195.htm).
7. Internal migration continues to be one of the main problems for China [Electronic resource] // Official website of the National Television of China. URL: <http://cctv.cntv.cn/2014/05/15/VIDE1400134561794338.shtml>.
8. Andreev E. (2015) Doubling of China: What will be the reversal of the rule «One family – one child» [Electronic resource] // Information portal of RBC of Russia. URL: <http://www.rbc.ru/opinions/society/11/11/2015/>.
9. Krasova E.V., Yang X.X. (2016). Modern trends in the formation of human resources as a factor in China's sustainable economic development // Economic and Social Changes: Facts, Trends, Forecast. No. 3 (45). P. 205-220.
10. Krasova E.V., Jin Yanhong, Zhao Lihua (2016). Unevenness in the socio-economic development of the regions of China as the result of sustainable growth of Chinese economy // Vector of Science of Togliatti State University. No. 2 (25). P. 42-49.
11. Statistical Yearbook of China in 2016 [Electronic resource] // Official site of the National Bureau of Statistics of China. URL: <http://www.stats.gov.cn/tjsj/ndsj/2016/indexeh.htm>.
12. International Migration [Electronic Resource] // The World FactBook. URL: <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html>.
13. 2015 年中国劳动力市场发展报告 [Report on the development of the labor market in China in 2015. Publ. house of Beijing Pedagogical University. Beijing, 2015]. – 383 p.
14. Bao Gun (2016). Main social and economic problems of migrant workers of modern China // Research and Development of Students Collection of Materials of the International Student Scientific and Practical Conference. Cherepovets: P. 103-106.

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**АГРОПРОМЫШЛЕННАЯ ПОЛИТИКА И АГРАРНЫЙ РЫНОК В УСЛОВИЯХ  
ЕВРАЗИЙСКОГО ЭКОНОМИЧЕСКОГО СОЮЗА**  
AGRO-INDUSTRIAL POLICY AND AGRARIAN MARKET IN CONDITIONS  
OF THE EURASIAN ECONOMIC UNION

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**АННОТАЦИЯ**

В статье освещены вопросы развития интеграционных процессов на просторах Евразии. Доказано, что в ЕАЭС обеспечивается свобода движения товаров, услуг, капитала и рабочей силы, проведение скоординированной политики. Дана оценка сельского хозяйства стран-участниц Евразийского экономического союза. Выявлены предпосылки интеграции стран в аграрной сфере и формирования общего аграрного рынка, а именно наличие сильных сравнительных преимуществ АПК стран, институциональная схожесть рынков сельскохозяйственной продукции стран, исторически сложившаяся специализация стран на производстве продукции, совместное использование транспортной инфраструктуры. Осуществление согласованной политики в аграрном секторе предполагает совместное определение приоритетов развития и индикативных показателей. Обоснованы направления и механизмы реализации агропромышленной политики, а также система мер, обеспечивающих формирование общего аграрного рынка в условиях ЕАЭС.

**ABSTRACT**

The study goes into the questions of development of integration processes in Eurasia. It was proved that the EEU ensures freedom of movement of goods, services, capital and labor and adopting a coordinated policy. The estimation of agriculture in the member countries of the Eurasian Economic Union is given. Preconditions for integration of the countries in the agricultural sector and formation of a common agricultural market, namely availability of huge comparative advantages of agro-industrial complex in the countries, institutional similarity of agricultural markets of the countries, historically developed specialization of the countries in the production of some products, the joint use of transport infrastructure. Implementation of an agreed policy in the agricultural sector involves the joint identification of development priorities and performance indicators taking. The directions and mechanisms for implementation of the agricultural policy and the system of measures to ensure development of a common agricultural market under the EEU are substantiated.

**КЛЮЧЕВЫЕ СЛОВА**

Агропромышленный комплекс, сельское хозяйство, Евразийский экономический союз, продовольственная независимость, продовольственная безопасность.

**KEY WORDS**

Agro-industrial complex, Eurasian Economic Union, food sovereignty, food supply security.

Региональная интеграция является современным феноменом международных отношений. На постсоветском пространстве интеграционный процесс прошел ряд этапов: СНГ, Таможенный союз и Единое экономическое пространство Беларуси, Казахстана и России (ТС/ЕЭП), Евразийское экономическое сообщество (ЕврАзЭС). Итогом развития интеграции стало создание Евразийского экономического союза (ЕАЭС), государствами-членами которого являются Белоруссия, Казахстан, Армения, Российская Федерация, Киргизия. Кандидат к вступлению в ЕАЭС - Таджикистан. В этих условиях развитие агропромышленной интеграции является достаточно актуальной проблемой, так как вопросы разработки векторов консолидации, форм интеграционных связей в АПК, способов взаимодействия стран при усилении взаимозависимости экономик находятся только на начальном этапе разработки. Исходя из этого, целью статьи является исследование направлений развития интеграционных процессов на просторах Евразии, а также выявление предпосылок интеграции в аграрной сфере и формирования общего аграрного рынка, разработка направлений и механизмов реализации агропромышленной политики, а также системы мер, обеспечивающих формирование общего аграрного рынка в условиях ЕАЭС.

Вопросы развития АПК, а также интеграции АПК стран-участниц ЕАЭС, формирование общего аграрного рынка нашли свое отражение в трудах Р.Х. Адукова, М.С. Байгот, П.И. Буцыкина, Э.Н. Крылатых, Г.С. Прокопьева, В.Ф. Седнева, А.Ф. Серкова, В.Г. Ткаченко, И.Г. Ушачева, А.М. Югая и др [1,2]. Исследование продовольственной безопасности стран отражено в работах таких ученых как А.И. Алтухов, А.Г. Зельднер, Е.Н. Кодрат, В.В. Маслаков, И.Л. Маценович и др. Однако в условиях динамической международной среды многие проблемы продовольственной безопасности ЕАЭС остаются не решенными, а механизмы решения не апробированными на практике. Обоснованность полученных результатов основана на использовании общенаучных и специальных методов познания: абстрактно-логический, монографический, экономико-статистический, социологический (экспертные оценки), экономико-математический.

Интеграционный процесс на просторах Евразии начался с 1991 г. с подписания Соглашения о создании Содружества независимых государств На 01.01.2015 г. население интеграционной группировки ЕАЭС - 176 252 830 человек (8-е в мире), территория - 20 229 248 км<sup>2</sup> (1-я в мире), ВВП - 4077,1 млрд. долл. США (по данным МВФ), 4046,1 млрд. долл. США (по данным ВБ) (5-й в мире), промышленное производство - 1,5 трлн. долл. США (3,7 % мирового промышленного производства), сельскохозяйственное производство - 147,3 млрд. долл. США (5,5% мирового производства), оборот внешней торговли - 932,9 млрд. долл. США (2,2% от мировой доли), валовой сбор зерновых и зернобобовых культур - 93 млн. т (6 место в мире), производство молока - 44 млн. т (3 место в мире) [3]. В ЕАЭС обеспечивается свобода движения товаров, услуг, капитала и рабочей силы, проведение скоординированной политики. Цель данных интеграционных процессов - формирование общего аграрного рынка стран - членов ЕАЭС и проведение согласованной политики.

Общий аграрный рынок предполагает установление принципа абсолютной добровольности, единства экономического пространства, единства таможенного пространства, единую таможенную систему и равенство экономических условий конкуренции, установление принципа благоприятного режима для продукции стран – членов, обеспечение равенства экономических условий для деятельности участников кооперации, формирование единой системы вмешательства государств в деятельность и определение согласованной политики установления цен на сельскохозяйственную продукцию и доходы сельхозпроизводителей, создание общего финансового фонда поддержки и регулирования АПК, коллективных межгосударственных органов регулирования. Предпосылками интеграции в аграрной сфере являются наличие сильных преимуществ АПК стран на региональном и глобальном рынках, рынки сельскохозяйственной продукции данных стран являются институционально похожими, исторически сложившаяся специализация стран, совместное использование транспортной инфраструктуры. Сельское хозяйство

является стратегической отраслью экономики членов ЕАЭС. Площадь сельскохозяйственных земель государств-членов составляет порядка 300 млн га земель, общий рынок – 182,1 млн потребителей [3]. Исследования показали, что динамика производства валовой продукции сельского хозяйства стран-членов ЕАЭС за 2010 - 2014 гг. изменялась в зависимости от природно-климатических условий (табл.1).

Таблица 1 – Валовая продукция сельского хозяйства стран-участниц ЕАЭС (в % к предыдущему году, в постоянных ценах) [4-6]

| Страна     | 2010                |                     | 2011                |                     | 2012                |                     | 2013                |                     | 2014                |                     |
|------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
|            | ВП, млрд. долл. США | Индекс объема СХ, % | ВП, млрд. долл. США | Индекс объема СХ, % | ВП, млрд. долл. США | Индекс объема СХ, % | ВП, млрд. долл. США | Индекс объема СХ, % | ВП, млрд. долл. США | Индекс объема СХ, % |
| Россия     | 85,2                | 88,7                | 111,1               | 123,0               | 107,5               | 95,2                | 119,1               | 105,8               | 109,8               | 103,7               |
| Армения    | 1,7                 | 86,4                | 2,1                 | 113,9               | 2,1                 | 109,5               | 2,2                 | 107,1               | 2,4                 | 107,2               |
| Киргизия   | 2,5                 | 97,4                | 3,2                 | 102,0               | 3,6                 | 101,2               | 3,5                 | 102,7               | 3,6                 | 99,4                |
| Белоруссия | 12,1                | 102,5               | 9,9                 | 106,6               | 11,6                | 106,6               | 11,8                | 95,8                | 12,8                | 103,1               |
| Казахстан  | 9,8                 | 88,3                | 15,6                | 126,8               | 13,4                | 82,2                | 15,7                | 111,7               | 14,0                | 100,8               |

Наибольший объем производства продукции сельского хозяйства на душу сельского населения в 2011-2014 годах отмечается в Беларуси - на уровне 5,4 тыс. долл. США, в Казахстане и России - 2,1 тыс. долл. США и 3,2 тыс. долл. США соответственно. Страны союза различаются и по уровню продовольственной независимости (табл. 2).

Таблица 2 – Уровень продовольственной независимости стран ЕАЭС, % [7,8]

| Продукция               | Белоруссия |        |        | Казахстан |        |        | Россия |        |        |        |
|-------------------------|------------|--------|--------|-----------|--------|--------|--------|--------|--------|--------|
|                         | 2012г.     | 2013г. | 2015г. | 2012г.    | 2013г. | 2015г. | 2012г. | 2013г. | 2015г. | 2020г. |
| Зерно                   | 94         | 106    | 109    | 449       | 218    | 164    | 143    | 108    | 142    | 132    |
| Сахар                   | 209        | 94     | 205    | 24        | 6      | 41     | 94     | 86     | 79     | 168    |
| Растительное масло      | 91         | 74     | 106    | 82        | 84     | 90     | 132    | 209    | 160    | 239    |
| Мясо и мясопродукты     | 126        | 116    | 156    | 80        | 78     | 94     | 75     | 76     | 79     | 107    |
| Молоко и молокопродукты | 199        | 246    | 226    | 85        | 83     | 90     | 81     | 80     | 82     | 79     |
| Картофель               | 102        | 100    | 114    | 95        | 99     | 95     | 99     | 98     | 98     | 121    |
| Овощи                   | 96         | 97     | 103    | 102       | 91     | 102    | 92     | 89     | 93     | 90     |
| Фрукты и ягоды          | 63         | 50     | 72     | 44        | 20     | 39     | 33     | 30     | 37     | 39     |
| Яйца                    | 120        | 130    | 122    | 99        | 93     | 102    | 98     | 98     | 99     | 124    |

В целом можно отметить, что по ЕАЭС уровень самообеспеченности продовольствием во временном разрезе 2010-2014 гг. находится ниже 100% (рис. 1).

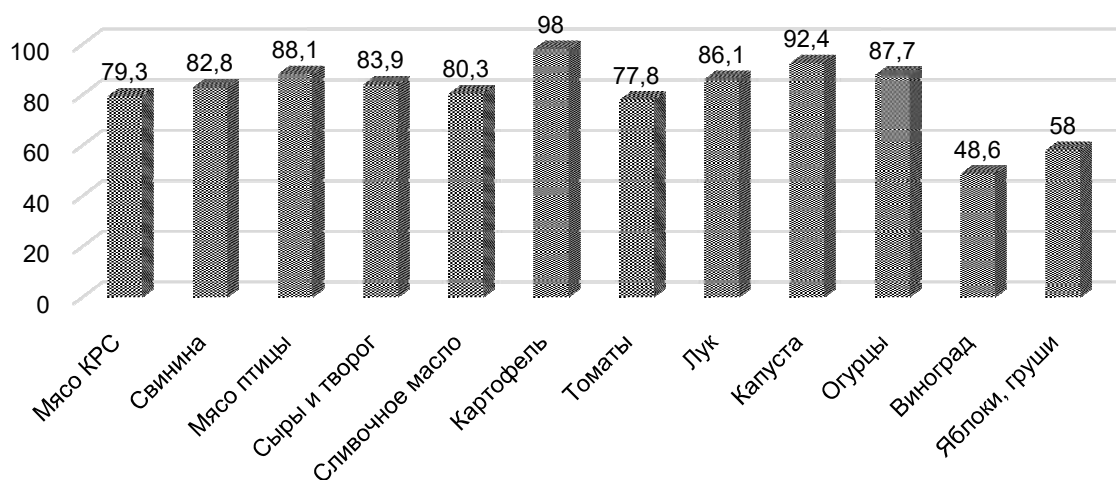


Рисунок 1 – Уровень самообеспеченности продовольствием ЕАЭС



Таким образом, интеграционная группировка ЕАЭС в целом не обеспечена на 100 % продовольствием, т.е. страны-члены ЕАЭС находятся в импортной зависимости по данным видам продовольствия от других стран.

В условиях свободного перемещения продовольствия на всей территории ЕАЭС целесообразно разработать механизмы реализации агропромышленной политики. В этом направлении Правительствами членов ЕАЭС принята Концепция согласованной (скоординированной) агропромышленной политики государств - членов, соглашение о создании общего аграрного рынка.

Решение задач согласованной агропромышленной политики предполагает использование механизмов межгосударственного взаимодействия по направлениям: прогнозирование, государственная поддержка, регулирование аграрного рынка, использование единых требований в сфере производства и обращения продукции, обеспечение санитарных, фитосанитарных и ветеринарных мер, развитие экспорта, научное и инновационное развитие АПК, интегрированное информационное обеспечение АПК.

Осуществление согласованной политики в аграрном секторе предполагает совместное определение приоритетов развития и индикативных показателей по ЕАЭС в целом, а также с учетом национальных приоритетов государств-членов. С целью формирования общего аграрного рынка между странами ЕАЭС целесообразно использовать следующие мероприятия (таблица 3).

Таблица 3 – Система мер, обеспечивающих формирование общего аграрного рынка в условиях ЕАЭС [9, 10]

| Этапы формирования               | Основные меры, обеспечивающие условия формирования ОАР  |
|----------------------------------|---|
| <i>Первый (на этапе ЗСТ)</i>     | -Отмена тарифных и нетарифных ограничений во взаимной торговле товарами.<br>-Применение согласованной системы взимания косвенных налогов во взаимной торговле по отдельным товарным группам или товарам.  |
| <i>Второй (на этапе ТС)</i>      | Формирование единой таможенной территории и единого порядка регулирования внешнеторговой деятельности:<br>- общего таможенного тарифа и единых торговых режимов в отношении третьих стран;<br>- проведение единой таможенной политики, унификация таможенного законодательства;<br>- согласованное применение механизма защиты внутренних рынков в торговле с третьими странами;<br>- гармонизация законодательства в сфере технического регулирования;<br>- синхронизация страхования экспортно-импортных операций.  |
| <i>Третий (на этапе ЕЭП)</i>     | -Устранение изъятий и барьеров из режима свободной торговли при взаимной торговле.<br>-Унификация мер нетарифного регулирования в торговле с третьими странами.<br>-Замена антидемпинговых, компенсационных и специальных защитных мер едиными правилами в области конкуренции и субсидий во взаимной торговле.<br>-Синхронизация и гармонизация осуществляемых государствами-участниками преобразований в экономике, совместных мер по проведению согласованной экономической политики.<br>-Обеспечение взаимодействия стран по участию в других региональных и международных образованиях.<br>-Создание общей статистической базы.<br>-Обоснование прогнозных параметров функционирования основных товарных рынков, разработка и реализация общей политики развития отраслей АПК.   |
| <i>Четвертый (на этапе ЕАЭС)</i> | -Устранение всех, в том числе административных, технических и налоговых барьеров на пути свободного движения товаров, лиц, услуг и капиталов («четыре свободы»);<br>-Формирование системы мер и механизмов, обеспечивающих целевое перемещение товаров и услуг между странами.<br>-Создание условий для осуществления совместных инвестиционных и инновационных проектов, принятие соответствующих нормативно-правовых документов.<br>-Формирование общественных и частных фондов содействия экспорту-импорту.<br>-Формирование единой системы оказания услуг между государствами-членами ЕАЭС, а также в отношении третьих стран.<br>-Создание согласованной системы регулирования цен, финансовой, кредитной, налоговой и страховой политики.<br>-Разработка и принятие мер, направленных на гармонизацию законодательства в системе подготовки, переподготовки и повышения квалификации кадров.<br>-Формирование общих фондов содействия социального и регионального развития.<br>-Гармонизация хозяйственного законодательства, в т. ч. в области прав интеллектуальной собственности, охраны труда, окружающей среды и некоторые другие. |

Агропромышленная интеграция стран довольно сложный процесс поэтапного сближения и слияния аграрной экономики в интересах устойчивого развития АПК и сельского хозяйства. Формирование общего аграрного рынка - процесс сложный и длительный, поэтому требуется тщательная теоретическая проработка, а также осуществление экономических, нормативно-правовых и организационных мероприятий, учитывающих как особенности АПК стран-участниц, так и внешние факторы и риски. Реализация согласованной агропромышленной политики будет способствовать повышению эффективности АПК, конкурентоспособности стран-членов на общем рынке. Как показали исследования, уровень продовольственной независимости в странах-членах ЕАЭС не всегда и не по всем продовольственным группам является достаточным, прослеживается необеспеченность стран собственным продовольствием, в результате чего возникает процесс импортозамещения и страна становится зависимой от контрагентов. Интеграция стран в аграрной сфере, формирование общего аграрного рынка, проведение согласованной аграрной политики – векторы, направленные на обеспечение продовольственной безопасности ЕАЭС, снижение импортозависимости, пролонгирование политики импортозамещения, рост технологического уровня развития АПК стран-членов группировки, а также повышение эффективности их агропромышленного производства [11].

### БИБЛИОГРАФИЯ

1. Байгот, М.С. Формирование общего аграрного рынка в условиях создания Евразийского экономического союза // Аграрная экономика, №4. - 2014. С.28-34.
2. Ткаченко, В.Г. Продовольственная безопасность Украины в условиях рыночных трансформационных процессов: монография // Луганск: 2004. – 176 с.
3. Официальный веб-сайт Евразийского экономического союза - [Электронный ресурс]. – режим доступа: <http://www.eaeunion.org>.
4. Официальный веб-сайт Федеральной службы государственной статистики РФ - [Электронный ресурс]. – режим доступа: <http://www.gks.ru>.
5. Официальный веб-сайт Национального статистического комитета Республики Беларусь - [Электронный ресурс]. – режим доступа: <http://www.belstat.gov.by>.
6. Официальный веб-сайт Агентства Республики Казахстан по статистике - [Электронный ресурс]. – режим доступа: [www.stat.gov.kz](http://www.stat.gov.kz).
7. Ушачев И.Г. Проблемы обеспечения национальной и коллективной продовольственной безопасности в условиях международной и региональной интеграции. / И.Г. Ушачев // Доклад на X Международной научно-практической конференции «АПК Беларуси: новейшие вызовы региональной и международной интеграции» (4-5 сентября 2014 г.).
8. Петрук Г.В. Современное состояние и тенденции развития молочной отрасли: региональный аспект / Г.В. Петрук, Д.В. Поляков // Международный журнал прикладных и фундаментальных исследований. 2015. № 8-4. С. 733-737.
9. Концепция согласованной (скоординированной) агропромышленной политики государств-членов ЕАЭС: утвержденная решением Высшего Евразийского экономического совета на уровне глав-государств от 29 мая 2013 № 35 // Евразийская экономическая комиссия - [Электронный ресурс]. – режим доступа: <http://www.eurasiancommission.org>.
10. Методология расчета сводных прогнозов спроса и предложения государств - членов Евразийского экономического союза по основным видам сельскохозяйственной продукции и продовольствия, утвержденная распоряжением Коллегии Евразийской экономической комиссии от 3 марта 2015 года №15// Евразийская экономическая комиссия - [Электронный ресурс]. – режим доступа: <http://www.eurasiancommission.org>.
11. Кузубов А.А. Оценка современного состояния экономических отношений субъектов региональных объединений в условиях глобализации // Вестник Астраханского государственного технического университета. 2016. № 4. С. 56-64.

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## **СТРАТЕГИЧЕСКИЕ НАПРАВЛЕНИЯ ИМПОРТОЗАМЕЩЕНИЯ НА РОССИЙСКОМ РЫНКЕ ТЕХНИКИ ДЛЯ ЗАЩИТЫ РАСТЕНИЙ И ВНЕСЕНИЯ УДОБРЕНИЙ**

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### **АННОТАЦИЯ**

В статье рассматривается проблема импортозамещения на рынке техники для агрохимических работ. Приведены данные о наличии основных видов сельскохозяйственной техники для ухода за посевами и защиты растений, соотношении количества отечественной и зарубежной техники на российском рынке техники для агрохимических работ и об основных производителях опрыскивателей и разбрасывателей минеральных удобрений, а также объемы их реализации в рамках мероприятий Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013 - 2020 годы. Рассмотрены вопросы государственной поддержки разработки, создания, испытания и внедрения новой техники, а также государственной поддержки стимулирования технической и технологической модернизации сельского хозяйства.

### **ABSTRACT**

The article deals with the problem of import substitution in the market of machinery for agrochemical works. The data on the availability of the main types of agricultural machinery for crop care and plant protection, the ratio of the number of domestic and foreign machinery on the Russian market of machinery for agrochemical works and the main producers of sprayers and spreaders of mineral fertilizers, as well as the volumes of their implementation within the framework of the State Development Program agriculture and regulation of markets for agricultural products, raw materials and food for 2013-2020. The issues of state support for the development, creation, testing and introduction of new equipment as well as state support for stimulating technical and technological modernization of agriculture are considered.

### **КЛЮЧЕВЫЕ СЛОВА**

Санкции, импортозамещение, сельскохозяйственная техника, сельское хозяйство.

### **KEY WORDS**

Sanctions, import substitution, agricultural machinery, agriculture.

В настоящее время из-за экономических санкций по отношению к России со стороны западных стран остро встал вопрос импортозамещения, в том числе полного обеспечения страны отечественной сельскохозяйственной продукцией и её продовольственной независимости от импорта из-за рубежа, а также импортозамещения на рынке сельхозтехники России. Дальнейший рост производства продукции растениеводства возможно обеспечить, применяя минеральные и органические удобрения, а также средства защиты растений на основе современных агротехнологий и современной техники для агрохимических работ. Поэтому для обеспечения продовольственной независимости России большое значение имеет импортозамещение на рынке техники для агрохимических работ.

В Стратегии развития сельскохозяйственного машиностроения на период до 2030 года, разработанной Минпромторгом России совместно с Ассоциацией «Росспецмаш» и утвержденной распоряжением правительства РФ от 7 июля 2017 г. №1455-р подчеркивается, что объем рынка машин для внесения удобрений и химической защиты растений составляет 8 млрд. руб. При этом сельскохозяйственная техника российского производства представлена в основном в низком ценовом сегменте (например, легкие опрыскиватели).

Но парк машин для механизации процессов применения агрохимикатов продолжает снижаться. Кроме того, он значительно изношен. Например, износ парка разбрасывателей минеральных удобрений составляет в настоящее время более 70%, а разбрасывателей органических удобрений – 85% [1].

По данным Росстата, наибольшее снижение сельскохозяйственной техники для ухода за посевами и защиты растений в сельскохозяйственных организациях по сравнению с 2011 г. было в 2016 г. по машинам для внесения в почву твердых органических удобрений – на 23%, машинам для внесения в почву жидких органических удобрений – на 6,3% и разбрасывателей твердых минеральных удобрений – 4,8% (табл. 1).

Таблица 1 – Наличие основных видов сельскохозяйственной техники для ухода за посевами и защиты растений в сельскохозяйственных организациях в России по годам, тыс. шт. [2]

| п/п  | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2016 в% к 2011 |
|--|------|------|------|------|------|------|----------------|
| Дождевальные и поливные машины и установки     | 5,3  | 5,2  | 5,2  | 5,7  | 5,9  | 6,0  | 113,2          |
| Разбрасыватели твердых минеральных удобрений   | 16,5 | 16,3 | 15,8 | 15,8 | 15,5 | 15,7 | 95,2           |
| Машины для внесения в почву:                   |      |      |      |      |      |      |                |
| твердых органических удобрений                 | 6,1  | 5,6  | 5,2  | 5,1  | 4,8  | 4,7  | 77,0           |
| жидких органических удобрений                  | 3,8  | 3,7  | 3,6  | 3,7  | 3,6  | 3,6  | 94,7           |
| Опрыскиватели и опыливатели тракторные - всего | 23,2 | 23,1 | 22,7 | 23,1 | 22,4 | 22,8 | 98,3           |
| Протравливатели семян                          | 7,6  | 7,5  | 7,5  | 7,6  | 7,6  | 7,6  | 100,0          |

В Национальном докладе «О ходе и результатах реализации в 2016 году Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013-2020 годы» показано, что основное количество сельскохозяйственной техники для ухода за посевами и защиты растений находится в сельскохозяйственных организациях по производству сельскохозяйственной продукции (табл. 2).

При этом количество отечественной техники для агрохимических работ на российском рынке значительно меньше количества такой техники, поступающей из зарубежных стран. За 2011-2014 гг. доля отечественных машин для внесения минеральных удобрений на российском рынке уменьшилась с 37,9% в 2011 г. до 8,7% в 2014 г., а доля импорта увеличилась соответственно с 62,1 до 91,3%. В то же время доля опрыскивателей российского производства возросла с 15,6% в 2011 г. до 25,4% в 2014 г., а доля импорта снизилась соответственно с 84,4 до 74,8% (табл. 3) [1].

Таблица 2. Наличие основных видов сельскохозяйственной техники для ухода за посевами и защиты растений в сельскохозяйственных организациях России в 2016 г., шт. [3]

| п/п  | Сельско-хозяйственные организации | В том числе:                                   |   |
|--|-----------------------------------|--|---|
|  |                                   | по производству сельскохозяйственной продукции | по предоставлению услуг в области сельского хозяйства |
| Дождевальные и поливные машины и установки   | 5983                              | 5728   | 255   |
| Разбрасыватели твердых минеральных удобрений | 15653                             | 15564  | 89  |
| Машины для внесения в почву:                 |                                   |  |   |
| твердых органических удобрений               | 4669                              | 4645   | 24  |
| жидких органических удобрений                | 3634                              | 3631   | 3   |
| Опрыскиватели и опыливатели тракторные       | 22806                             | 22674  | 132   |
| Протравливатели семян                        | 7598                              | 7553   | 45  |

Таблица 3 – Российское производство и импорт техники для агрохимических работ [1]

| Виды техники                                     | 2011 г. |      | 2012 г. |      | 2013 г. |      | 2014 г. |      | 2015 г. |      |
|--|---------|------|---------|------|---------|------|---------|------|---------|------|
|  | шт.     | %    | шт.     | %    | шт.     | %    | шт.     | %    | шт.     | %    |
| Машины для внесения минеральных удобрений, всего | 2095    | 100  | 1821    | 100  | 1456    | 100  | 2564    | 100  | 5552    | 100  |
| в том числе:                                     |         |      |         |      |         |      |         |      |         |      |
| российское производство (продажа)                | 794     | 37,9 | 657     | 36,1 | 638     | 43,8 | 222     | 8,7  | 386     | 7,0  |
| импорт   | 1301    | 62,1 | 1164    | 63,9 | 818     | 56,2 | 2342    | 91,3 | 5166    | 93,0 |
| Опрыскиватели, всего                             | 2475    | 100  | 2659    | 100  | 2462    | 100  | 3221    | 100  | 2100    | 100  |
| в том числе:                                     |         |      |         |      |         |      |         |      |         |      |
| российское производство (продажа)                | 385     | 15,6 | 608     | 22,9 | 633     | 24   | 813     | 25,2 | 509     | 24,2 |
| импорт   | 2090    | 84,4 | 2051    | 77,1 | 2009    | 76   | 2406    | 74,8 | 1591    | 75,8 |

\* составлено по данным Росагромаш.

По данным Федеральной таможенной службы России, в первом квартале 2016 г. объем импортных поставок по разбрасывателям твердых минеральных удобрений по сравнению с первым кварталом 2015 г. на 66% в натуральном выражении и на 111% в стоимостном выражении, а по опрыскивателям соответственно на 118 и 272%. При этом в первую пятерку стран, из которых эта техника поставлялась в Россию, входят Германия (32,5% поставок в стоимостном выражении), Республика Беларусь (20,3%), Польша (12,2%), Нидерланды (10,1%) и Дания (7,9%) [1].

Основные производители опрыскивателей и разбрасыватели минеральных удобрений, а также объемы их реализации в рамках мероприятий Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013 - 2020 годы, показаны в таблице 4.

Из этой таблицы видно, что основным производителем опрыскивателей и разбрасывателей минеральных удобрений является АО «Евротехника».

Наибольший рост отечественного производства опрыскивателей в первом квартале 2016 г. по сравнению с первым кварталом 2015 г. показали следующие предприятия: ООО «Комбайновый завод Ростсельмаш» (Ростовская область) – 300%, АО «Евротехника» (Самарская область) – 272%, ООО «Пегас-Агро» (Самарская область) – 131% [1].

Таблица 4. Производители и объемы реализации опрыскивателей и разбрасывателей минеральных удобрений в рамках мероприятий Госпрограммы 2013-2020 гг. в России [3]

| Производители сельскохозяйственной техники | Наименование техники  | Фактический суммарный объем субсидий, тыс. руб. |          |          | Реализовано техники, ед. |         |         |
|--|---|---|----------|----------|--------------------------|---------|---------|
|  |   | 2014 г.   | 2015 г.  | 2016 г.  | 2014 г.                  | 2015 г. | 2016 г. |
| АО «Евротехника»                           | Опрыскиватели, разбрасыватели, сеялки                       | 50314,7   | 224310,3 | 558079,8 | 122                      | 251     | 403     |
| ООО НПФ «Белагроспецмаш»                   | Опрыскиватели, сеялки, разбрасыватели минеральных удобрений | -   | -        | 16785,3  | -                        | -       | 38      |
| ООО «Пегас-Агро»                           | Опрыскиватели, разбрасыватели                               | 6044,95   | 32256,2  | 15176,0  | 14                       | 65      | 17      |
| ООО «Сальксельмаш»                         | Опрыскиватели   | -   | -        | 802,4    | -                        | -       | 13      |
| ОАО «Таоспектр»                            | Опрыскиватели   | -   | -        | -        | -                        | -       | -       |

Одними из основных условий успешного решения задачи импортозамещения на рынке сельскохозяйственной техники является государственная поддержка разработки, создания, испытания и внедрения новой техники, а также государственная поддержка стимулирования технической и технологической модернизации сельского хозяйства.

Таблица 5 – Объем инвестиций в модернизацию, разработку и освоение новых образцов производителями опрыскивателей в 2016 г. [3]

| Наименование производителя | Объем инвестиций в основное производство, тыс. руб. |         |        | Объем инвестиций в разработку и освоение новых видов сельскохозяйственной техники или модернизацию моделей сельскохозяйственной техники, тыс. руб. |         |        | Перечислено субсидий в 2016 г., тыс. руб. | % общего объема инвестиций к объему перечисленных субсидий |
|----------------------------|---|---------|--------|--|---------|--------|---|--|
|                            | план  | факт    | % исп. | план   | факт    | % исп. |   |  |
| АО «Евротехника»           | 10000   | 12717,7 | 127,18 | -  | -       | -      | 558079,8                                  | 2,28   |
| ООО НПФ «Белагроспецмаш»   | 60000   | 17192,5 | 28,65  | 30000  | 10700,4 | 35,67  | 16785,3                                   | 166,17   |
| ООО «Пегас-Агро»           | 40000   | 50968,9 | 127,42 | 500  | 852,5   | 170,51 | 15176,0                                   | 341,47   |
| ОАО «Таоспектр»            | 250   | -       | 0,00   | 50   | -       | 0,00   | -   | -  |
| ООО «Сальксельмаш»         | 20000   | -       | 0,00   | 6000   | 802,4   | 13,37  | 802,4                                     | 100,00   |

Развитие научно-технического прогресса требует периодического обновления конструкций машин в соответствии с необходимостью роста производительности труда, изменяющимися технологиями сельскохозяйственного производства, появления новых требований к качеству выполнения механизированных работ. Поэтому необходима разработка, т.е. проектирование, создание, испытание и внедрение новой техники. Разработку простой техники, например, почвообрабатывающих, посевных и других машин могут и должны осуществлять за счет собственных средств предприятия-изготовителя. Но разработка сложных машин нового поколения, например, тракторов и агрегатов к ним (двигателей, трансмиссии и др.), требует большего финансирования, и отечественные предприятия-изготовители не могут её осуществить в связи с недостаточной величиной собственных финансовых средств. Из-за этого предприятия осуществляют, в основном, модернизацию выпускаемой техники, которая по своим технико-экономическим параметрам практически не отличается от базовых моделей. В связи с этим отечественные машины по своей

конструкции отстали от западных аналогов. Поэтому необходима финансовая поддержка со стороны государства.

Объем инвестиций в модернизацию разработку и освоение новых образцов производителями опрыскивателей в 2016 г. показан в таблице 5.

Из этой таблицы видно, что только ООО «Пегас-Агро» из пяти отечественных производителей опрыскивателей в 2016 г. наращивал объем инвестиций как в основное производство, так и объем инвестиций в разработку и освоение новых видов сельскохозяйственной техники или модернизацию моделей сельскохозяйственной техники, а также имеет большой процент общего объема инвестиций к объему перечисленных субсидий. АО «Евротехника» наращивала только объем инвестиций в основное производство, инвестированием разработок и освоением новых видов сельскохозяйственной техники или модернизацией моделей сельскохозяйственной техники не занималась. ООО НПФ «Белагроспецмаш» намного недовыполнила планы как по объему инвестиций как в основное производство, так и объему инвестиций в разработку и освоение новых видов сельскохозяйственной техники или модернизацию моделей сельскохозяйственной техники; но имеет большой процент общего объема инвестиций к объему перечисленных субсидий.

Федеральные власти осуществляют финансирование разработки современной высокопроизводительной сельхозтехники. Например, в постановлении Правительства Российской Федерации от 23 сентября 2016 г. №957 « О предоставлении субсидий из федерального бюджета организациям сельскохозяйственного машиностроения в целях компенсации части затрат на транспортировку, омологацию и подтверждение соответствия продукции международным стандартам» предоставляются из федерального бюджета в 2016 г. субсидии из федерального бюджета организациям сельскохозяйственного машиностроения в целях компенсации части затрат на транспортировку, омологацию и подтверждение соответствия продукции международным стандартам в размере 1,5 млрд. руб. Под омологацией и подтверждением соответствия продукции международным стандартам понимается проведение научно-исследовательских и опытно-конструкторских работ в области сельскохозяйственного машиностроения, в том числе доработка ее конструкции, в целях обеспечения соответствия продукции международным техническим требованиям. Компенсируется до 90% затрат на проведение научно-исследовательских и опытно-конструкторских работ в области сельскохозяйственного машиностроения, доработку, адаптацию техники и до 100% расходов по ее сертификации для зарубежных рынков [4].

Постановление Правительства РФ от 30 декабря 2013 г. N 1312 «Об утверждении Правил предоставления субсидий из федерального бюджета российским организациям на компенсацию части затрат на проведение научно-исследовательских и опытно-конструкторских работ по приоритетным направлениям гражданской промышленности в рамках реализации такими организациями комплексных инвестиционных проектов» (с изменениями и дополнениями от 9 апреля 2016 г.) устанавливает порядок предоставления субсидий из федерального бюджета российским организациям на компенсацию части затрат на проведение научно-исследовательских и опытно-конструкторских работ по приоритетным направлениям гражданской промышленности в рамках реализации такими организациями комплексных инвестиционных проектов. Субсидии предоставляются организациям, прошедшим конкурсный отбор на право получения субсидии на компенсацию части затрат на выполнение научно-исследовательских, опытно-конструкторских и технологических работ, непосредственно связанных с созданием продукции в рамках реализации комплексных инвестиционных проектов по приоритетным направлениям гражданской промышленности. На совещании «Об организации проведения в 2017 году весенних полевых работ», которое состоялось в Комитете Совета Федерации по аграрно-продовольственной политике и природопользованию, заместитель Министра промышленности и торговли Российской Федерации Морозов А.Н. сообщил, что в рамках постановления №1312 и с привлечением займов Фонда развития

промышленности реализуется 14 проектов по разработке и серийному производству современной техники, в том числе тракторов, высокопроизводительных зерноуборочных и кормоуборочных комбайнов, техники для растениеводства и оборудования для животноводства.

В Стратегии развития сельскохозяйственного машиностроения на период до 2030 года, разработанной Минпромторгом России совместно с Ассоциацией «Росспецмаш» и утвержденной распоряжением правительства РФ от 7 июля 2017 г. №1455-р подчеркивается, что в рамках действия данного постановления Правительства Российской Федерации российскими производителями реализовано 7 проектов на общую сумму 566,26 млн. руб. Все разработанные машины поставлены на серийное производство. Кроме того, Фонд развития промышленности разработал механизм льготного финансирования, который позволил предприятиям реализовать инвестиционные проекты на общую сумму 760 млн. руб. Всего в 2016 году российские производители представили на рынок 278 новых моделей и модификаций сельскохозяйственной техники. Одной из основных задач Стратегии является стимулирование роста инвестиций в проведение научно-исследовательских и опытно-конструкторских работ и разработка новых видов конкурентоспособных сельскохозяйственных машин, планируется увеличение объема инвестиций в научно-исследовательские и опытно-конструкторские работы до 10 млрд. руб. Доля объема расходов на проведение научно-исследовательских и опытно-конструкторских работ в общем объеме выручки предприятий сельскохозяйственного машиностроения должна вырасти с 0,7% в 2017 г. до 3,2% в 2030 г. Для совершенствования технического уровня выпускаемой продукции сельскохозяйственного машиностроения и повышения ее привлекательности для потребителя необходимо стимулировать увеличение отраслевых расходов на проведение научно-исследовательских и опытно-конструкторских работ, а также создание условий для непосредственного взаимодействия предприятий отрасли сельскохозяйственного машиностроения с научными организациями для разработок новых технических решений, продуктов и технологий.

В России в последние годы есть небольшие подвижки в проектировании, создании, испытании и внедрении новой техники для агрономических работ. Например, Поволжской машинно-испытательной станцией проведены сравнительные испытания разбрасывателей минеральных удобрений «Туман-2» (ООО «Пегас-Агро») и ZAM-1500 (АО «Евротехника») на полях Самарской области; MDS-935 (Rauch, Германия) и МВУ-900 (ООО «АГРО-ТЕХ», Ростовская область) на полях Краснодарского края. Лучшие эксплуатационно-экономические показатели получены у нового самоходного разбрасывателя минеральных удобрений «Туман-2», который по производительности, удельному расходу топлива превосходит все сравниваемые с ним машины, в том числе зарубежный аналог [1].

Основным мероприятием в качестве меры государственной поддержки технической и технологической модернизации сельского хозяйства предусмотрены субсидии за счет средств федерального бюджета производителям сельскохозяйственной техники на возмещение затрат на производство сельскохозяйственной техники, реализуемой сельхозтоваропроизводителям со скидкой. Для сохранения субсидий на закупку отечественной сельхозтехники было принято постановление Правительства Российской Федерации от 27.12.2012 г. №1432 «Об утверждении правил предоставления субсидий производителям сельскохозяйственной техники», в реализации которой непосредственно участвует АО «Росагролизинг».

Правительство Российской Федерации определило меры помощи производителям сельскохозяйственной техники, которые применялись в 2016 году (распоряжение Правительства РФ от 25 марта 2016 г. №501-р). На реализацию соответствующей программы было выделено 9,9 млрд. руб. На субсидирование организаций, производящих тракторы, зерноуборочные комбайны и прочую технику сельскохозяйственного назначения, общий объем дополнительных субсидий составил



8 млрд. руб. Еще 500 млн. руб. было направлено на обновление учебной базы инженерных факультетов сельскохозяйственных вузов.

Спрос на отечественную технику был настолько велик, что объем субсидий составил 15 млрд. руб. В 2016 г. российские предприятия, используя этот инструмент, смогли дополнительно реализовать техники на 35 млрд. руб. За время действия программы (2013-2016 гг.) сумма предоставленной субсидии превысила 18,4 млрд. руб., что позволило дополнительно поставить сельхозпроизводителям техники на сумму 81,5 млрд. руб. [5]

В результате успешной реализации постановления Правительства Российской Федерации от 27.12.2012 г. №1432 за период 2013-2016 гг. выросло количество реализованных отечественных тракторов, а также прицепной и навесной техники, к которой относится и машины для внесения удобрений и химической защиты растений, что нашло отражение в Национальном докладе «О ходе и результатах реализации в 2016 году Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013-2020 годы» (табл. 6).

Таблица 6. Эффективность стимулирования спроса на российском рынке сельскохозяйственной техники [3]

| Показатель                                       | 2013 г. | 2014 г. | 2015 г. | 2016 г. | 2017 г. (план) |
|--|---------|---------|---------|---------|----------------|
| Реализовано сельхозтехники в рамках госпрограммы |         |         |         |         |                |
| Тракторы, шт.                                    | 37      | 191     | 979     | 1263    | 2960           |
| Прицепная и навесная техника, шт.                | 192     | 1209    | 3125    | 10767   | 12687          |

Из таблицы видно, что реализация отечественных тракторов выросла с 37 штук в 2013 г. до 1263 штук в 2016 г., или в 34 раза, а прицепной и навесной техники – соответственно с 192 штук до 10767 штук или в 56 раз. На 2017 г. запланировано увеличение реализации тракторов по сравнению с 2016 г. в 2,3 раза, а по прицепной и навесной технике – в 1,2 раза.

В Федеральном законе «О федеральном бюджете на 2017 год и на период 2018 и 2019 годов», утвержденном 19 декабря 2016 года, предусмотрено финансирование Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2017 год. На Развитие сельскохозяйственного машиностроения (субсидии российским производителям самоходной и прицепной техники на компенсацию части затрат на содержание рабочих мест, компенсацию части затрат на использование энергоресурсов энергоемкими предприятиями и части затрат, связанных с выпуском и поддержкой гарантийных обязательств в отношении высокопроизводительной самоходной и прицепной техники) выделено 9,38 млрд. руб.

Также в соответствии с Распоряжением Правительства Российской Федерации №715-р от 17.04.2017 г. в целях обеспечения дополнительного производства сельхозтехники выделяются Минсельхозу России из резервного фонда Правительства Российской Федерации в 2017 году бюджетные ассигнования в размере 13,7 млрд. руб. на предоставление субсидий производителям сельхозтехники.

В 2017 году количество производителей сельхозтехники, которые реализуют свою продукцию со скидкой, выросло до 80. Постановлением Правительства Российской Федерации от 4 марта 2017 г. №261 внесены изменения в Правила предоставления субсидий производителям сельскохозяйственной техники в рамках постановления Правительства Российской Федерации №1432. С 17.03.2017 г. снижена ставка с 30 до 20% для регионов Сибирского и Дальневосточного округов, а также Республики Крым, г. Севастополя и Калининградской области; а для остальных регионов России – с 25 до 15%. Основной причиной снижения размера субсидии и скидки являются ограниченность бюджетных средств и невозможность расширения списка участников программы – российских производителей сельхозтехники [5].

В Стратегии развития сельскохозяйственного машиностроения на период до 2030 года, разработанной Минпромторгом России совместно с Ассоциацией «Росспецмаш» и утвержденной распоряжением правительства РФ от 7 июля 2017 г. №1455-р, в рамках первого этапа (2018-2021 годы) планируется внедрение финансовых мер господдержки, направленных на ускоренное обновление парка техники, что должно привести к резкому спросу на отечественную технику. Для этого Минпромторг России предлагает продлить действия постановления Правительства Российской Федерации №1432 до 2021 г., предусмотрев постепенное снижение скидок с 15% в 2017 г. до 5% к 2021 г. На программу в 2018–2021 гг. планируется направить 45 млрд. руб. бюджетных субсидий. По итогам первого этапа (запланирована масштабная господдержка, инвестиции в НИОКР и в рост узнаваемости продукции на внешних рынках) к 2023 году отечественные производители должны занять 80% рынка. По итогам второго этапа к 2025 году экспорт должен составить 50% от отгрузок, что позволит загрузить мощности до 80–90%. По итогам третьего этапа годовое производство должно вырасти втрое, примерно до 300 млрд. руб., а доля расходов на НИОКР в выручке достичь 3%. При этом ужесточаются критерии выдачи господдержки (основная мера — субсидируемые из бюджета скидки). На третьем этапе планируется вообще убрать прямое финансовое стимулирование отрасли. Но и до этого предполагается уменьшение количества импортных компонентов и технологических операций: в 719-е постановление правительства, где прописаны операции, при выполнении которых продукция считается российской, будут вводить новые требования, в частности стимулирующие производство компонентов. В итоге к 2030 году доля импортных компонентов в себестоимости продукции снизится с 35% до 10%. Другим важным условием получения госсубсидий станут обязательства по объемам производства и экспорта.

По данным Ассоциации «Росспецмаш» от 25 июля 2017 г., в этом месяце общая сумма субсидий по заключенным контрактам превысила выделенные 13,7 млрд. руб. Поэтому заводы остановили реализацию техники по Программе №1432. Для сохранения темпов производства в текущем году на субсидии нужно еще 4,4 млрд. руб. Если объем финансирования по Программе №1432 в 2017 году не увеличится, то рост производства сельхозтехники в России сократится и к концу 2017 года составит 12%. Также субсидирование производителей сельхозтехники в 2018-2020 годах в федеральном бюджете не предусмотрено.

По нашему мнению, такое снижение скидок и недостаточное финансирование программы в 2017 г., а также отказ от её финансирования в 2018-2020 годах может уменьшить положительный эффект от реализации данного постановления, который был достигнут в 2016 г.

Стратегические направления импортозамещения на российском рынке техники для защиты растений и внесения удобрений: повышение доли российской техники на рынке, особенно в сегментах с высокой импортозависимостью, таких как техника для защиты растений и внесения удобрений; обеспечение роста объемов производства и реализации российской техники посредством повышения конкурентных преимуществ и государственной поддержки; повышение наукоёмкости машиностроения России посредством государственного стимулирования инвестирования в научные разработки; занятие новых ниш на мировом рынке сельскохозяйственной техники.

## БИБЛИОГРАФИЯ

1. Евстропов, А.С. Импортозамещение техники для агрохимических работ / А.С. Евстропов // Сельский механизатор. – 2017. – №8. С. 2, 3, 7.
2. Сайт Федеральной службы государственной статистики [Электронный ресурс]. // Бюллетени о состоянии сельского хозяйства (электронные версии). Наличие техники, энергетических мощностей в сельскохозяйственных организациях Российской Федерации. – Режим доступа: <http://www.gks.ru>
3. Сайт Минсельхоза Российской Федерации [Электронный ресурс]. // Национальный доклад «О ходе и результатах реализации в 2016 году Государственной программы

развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013-2020 годы». – Режим доступа: <http://mcx.ru/activity/state-support/programs/program-2013-2020/>

4. Кайшев, В.Г., Алексеев, К.И. Государственное стимулирование технической и технологической модернизации сельского хозяйства на федеральном уровне / В.Г. Кайшев, К.И. Алексеев // Прикладные экономические исследования. – 2017. – №3 (19). С. 4-26.
5. Сайт Ассоциации «Росагромаш» [Электронный ресурс]. // Внесены изменения в программу субсидирования производителей сельхозтехники. Пресс-релиз от 17.03.2017 г. – Режим доступа: <http://www.rosagromash.ru/32-uncategorised/1046-vneseny-izmeneniya-v-programmu-subsidirovaniya-proizvoditelej-selkhoztekhniki>
6. Полухин А.А. Траектория развития рынка сельхозтехники стран - членов ЕАЭС // АПК: Экономика, управление. 2015. №10. С. 80-84.
7. Неуймин, Д.С. Управление конкурентоспособностью сельскохозяйственного предприятия [Текст] / Д.С. Неуймин // Аграрный вестник Урала. 2011. № 1. С. 82-84.
8. Солопов, В.А. Развитие научной и инновационной деятельности МичГАУ как сокоординатора технологической платформы «Технологии пищевой и перерабатывающей промышленности АПК - продукты здорового питания» [Текст] / В.А. Солопов, Д.С. Неуймин // Вестник Мичуринского государственного аграрного университета. 2013. № 6. С. 8-12.
9. Неуймин, С.К. Сельскохозяйственная освоенность как фактор устойчивого развития сельских территорий [Текст] / С.К. Неуймин, Д.С. Неуймин // Вестник Мичуринского государственного аграрного университета. 2014. № 1. С. 121-126.
10. Неуймин, С.К. Социально-экономический каркас территории региона: расчет и анализ [Текст] / С.К. Неуймин, Д.С. Неуймин // Биотика. 2015. Т. 7. № 6. С. 226-231.
11. Неуймин, Д.С. Особенности государственной поддержки и регулирования рынков сельскохозяйственной продукции в условиях импортозамещения [Текст] / Д.С. Неуймин, А.В. Бекетов, В.А. Кувшинов, А.И. Трунов // Достижения науки и техники АПК. 2016. Т. 30. № 5. С. 12-15.

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**THE IMPACT OF GOVERNMENT POLICY IMPLEMENTATION  
ON THE LIMITATION OF IMPORT CATTLE TO COMPANY'S STRATEGY  
IN THE FRAMEWORK OF MAINTAINING COMPANY PERFORMANCE**

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**ABSTRACT**

This research aims to determine the company's strategy in order to maintain the company's performance as a result of import cattle quota restriction. The policy of import cattle restriction imposed by the Indonesian government certainly has a significant impact on cattle importing companies, especially PT Karunia Alam Sentosa Abadi (KASA), Lampung - Indonesia. PT Karunia Alam Sentosa Abadi (KASA) enforces various-new business strategies to maintain the company performance from quota import policy. The results of the study show that there are several strategies applied by the company such as Volume to Performance Strategy, Average Daily Gain (ADG) improvement, Marketing Network Evaluation, Leasing Company Facilities, and Daily Workforce Reduction.

**KEY WORDS**

Performance, policy, strategic, business.

The inability of local farmers to meet the needs of national meat market makes the government open towards imported cattle and meat. In Indonesia, the main supplier of imported cattle is its neighboring country, Australia. With the introduction of imported cattle and meat, the demand for meat can be met. The level of growth and development of imported cattle in Indonesia is positive from year to year. By that, it is no doubt that Indonesian people become very dependent towards the existence of imported cattle and meat.

The existence of imported cattle then raises the pros and cons in cattle breeding business. The development, growth, and competitiveness of local cattleman tend to be decreased both in the quality and quantity. It happened because Indonesian people rely and dependent more on imported cattle and meat. Besides the price is cheaper, they also have an assumption that imported meat and cattle have better quality than the local.

To solve that dilemma, the government has regulated a policy concerning restriction of imported cattle quota in order to regain competitiveness and development of local cattle through the national beef *swasebada* (self-sufficiency) in 2012. The policy was established not only to reduce Indonesia's dependence on imported meat but also to improve the performance and competitiveness of local farmers in order to compete with import cattle to export cattle overseas.

The restriction policy of imported cattle quota made by Indonesian government became a controversy and raised some pros and cons. Local cattle was predicted to increase and develop its production, however, it has not been able to balance the needs of the national beef market. The price of national beef is soaring due to its scarcity. In addition, problems also came from cattle importing companies which then experienced a decrease in the performance due to the quota restrictions.

Therefore, the government revised and enforced the policy to become more suitable for the business climate in Indonesia because of the complexity of the problems raised after the implementation of the quota restrictions. The policy of price stability is the next thing enacted by the Indonesian government. In that case, the government is no longer limit cattle import quotas but imposes a benchmark of price to analyze the required amount of imports. Last policy is then enforced by the Indonesian government through President Joko Widodo in which he opened the quota of imported beef up to 220 thousand/cattle per year.

These policies will greatly affect the performance and activities of imported cattle businessmen or industries. Government policy is fundamental in conducting international business activities. PT Karunia Alam Sentosa Abadi (KASA) is one of the leading companies that concentrate on imported beef business. Certainly, PT Karunia Alam Sentosa Abadi (KASA) is affected directly by the policy that is implemented by the Indonesian government.

A wide variety of business strategy will be discussed and analyzed in order to obtain the most suitable strategy in one of the policies and to survive in the midst of the trouble. Strategies in the areas of marketing, business development, human resources, up to supporting field such as finance, technology, and so on becoming the subjects of this research. These strategies are used to survive in the midst of this chaos. The impact on company's performance is the main purpose of the researcher in this manuscript which is known as *defenders Strategies*. The business strategy is aimed at curbing the company's performance and maintaining the competitiveness of PT Karunia Alam Sentosa Abadi. Market Share, Profit, Human Resources up to the assets of the company are the variable used by the company in assessing and establishing the best survival strategy for the company.

## LITERATURE REVIEW

### Marketing Performance

Performance is the success indicator of employment or work that is achieved by a person or organization for carrying out their duties properly. Marketing performance is always seen as the result of running a certain strategic role. For a salesperson, the performance generated is a result of aggressive sales approach and good serving on customers (Ferdinand Augusty, 2004 , Sapiro and Witz , 1990). Marketing itself has the definition of a social and managerial process by which the company creates value for customers and builds a strong relationship with customers in order to capture the customers' value in return (Kotler, 2008).

A good marketing performance shows a high level of sales and an increasing number of sales both in product units or in monetary units. The improved marketing performance is marked by good sales growth from the previous year and higher growth than competitors and has a wider market share compared to the previous year. On the other hand, a poor marketing performance is characterized by declining sales, a setback from the previous year or compared to the same industry competitors, and the decline in market share. Related to this, Challagalla and Sharvani (1996) in his research stated that the performance of salesman is a level where the sales force can achieve the sales target set on him.

Kotler (2008) suggested that the success of marketing management is influenced by five alternative concepts underlying an organization or company, among others:

**Production Concept.** The production concept stated that consumers will love the products that are available and have an affordable price. The management should focus on improving efficiency and its product and distribution.

**Sales Concept.** It is said that sales concept means consumers will not buy a company's product unless it is sold on a large scale of sales and has big promotional endeavors.

**Product Concept.** The product concept is a condition where consumers will love the product that offers the best quality, performance, and has innovative features. Organization or company is required to deplete the energy in achieving the goal of this concept which is making a sustainable product improvement.

**Marketing Concept.** The marketing concept points out that the achievement of an organization or company depends on the knowledge of the needs and demand of the targeted market and satisfaction that is better than the competitor. (Kotler, Marketing Strategy 2008)

**Financial Performance.** According to the Institute of Indonesia Chartered Accountants (2009), the definition of financial performance is the relationship between income and entity expenses as presented in the statement of profit and loss. Profit is often used as a

performance measure or as a basis for other measurements such as return on investment or earnings per share.

Financial management has a central role in the sustainability of a company's financial performance. James C. Van Horne (2012) indicated that financial management is related to asset acquisition, financing, and asset management based on some common objectives that are used to maintain the balance of company's financial performance.

*Human Resources Management Performance.* Human resources are one of the important components in the life of any organization or company. National Australian Bank Limited in Robbins (2009) said that the greatest strength and the drivers of a company's performance are the workers. National Australian Bank Limited (NAB) is very attentive to the lives of workers or human resources through training and development, work maintenance, and performance appreciation on each worker. It is aimed to maintain the relationship between the organization with the workers as well as to maintain the professional level of the workers. The level of employee professionalism is a general description of human resource performance. A better level of employee professionalism will support the level of company performance.

In a business organization, business management needs to support the operations of the organization in facing several challenges and in achieving the goals of the organization. One of which is by improving the competence and the role of Human Resources (HR). It is important to note that HR is the "soul" of the organization. Many companies who give the portion of duties, responsibilities, and authorities of HR function have not reached the stage of a strategic partner for companies (Swa Sembada Magazine, 2008). One of the dominant factors in this issue is the lack of understanding, both on its company management and managers who are responsible for the HR functions of HR management (HRM) role within the organization. Another factor is the lack of HR manager's understanding of the company's business activities and strategies so that there is no close connection between HR strategy and company strategy. The strategic HR planning that is not implemented properly has made the HR function to be not strategic so that the HR function cannot provide some addition of value for the organization. In this study, the role model of HRM chosen is the model developed by Ulrich (1997), namely (1) the role of HRM as a strategic partner, (2) the role of HRM as a change agent, (3) the role of HR as an employee champion, and (4) the role of HRM as an administrative expert to build strategic HRM role in accordance with PT Karunia Alam Sentosa Abadi (KASA).

*Organization Strategy.* Developing a strategy means finding a way to achieve the targeted results in accordance with the vision and mission of an organization and its prospect. A strategy is a way to achieve a specific goal or to achieve financial targets and strategic position. Basically, a strategy consists of two things. First, scalable management actions and aims (intended strategy) and secondly, a reaction to an unanticipated development of competitive pressures as government regulations, new business start-ups, and changes in competitor tactics. Management's reaction towards the ongoing development of situation is a tactic to retain the consumers and to withstand the pressures of other market participants.

Management strategy is related to how to raise a company, how to satisfy consumers, how to beat the competition, how to respond the changing market conditions, how to manage each business function, and how to achieve financial goals as well as strategic objectives. A company strategy is specified in accordance with the conditions and situations faced by the company. Companies are free to do any strategy and maneuver to strengthen their competitive position and gain financial benefits.

*Business Strategy Description.* The main business strategy in the company is how to build and improve the company's position in a long-term business competition. There are 5 principles that must be met, such as:

- Providing an answer or reaction to the ongoing changes in the fields of economy, politics, law, and so on;
- Containing steps and approaches to face the competition;
- Creating competent skills and competencies;

- Stating the strategic initiatives of each functional department;
- Placing the main strategy of the company's operations.

According to Solihin (2012, 196) business strategy is different from the strategy at the corporate level. This business-level strategy is more focused on increasing the competitive position of a company's products or services within a particular market segment. From the above explanation, it can be concluded that business strategy is a strategy to achieve goals in business management which is a guideline for a company's strategic plan to build and strengthen the competitive position of its products or services in the industry.

*Business Strategy Level.* For large companies, there is a level of management strategy or business that develops in accordance with the development of the business, namely, corporate strategy in holding company, strategy at business unit or division and functional strategy at a business unit. Each of this level can be explained as follows.

*Corporate Strategy.* Corporate strategy is a strategy run by the company that owns the shares of some other companies (subsidiaries). Such companies are commonly called holding company.

Corporate strategy illustrates the overall direction of the company towards the growth and management of a wide range of business units and product variations identified by the company.

*Business Strategy.* Business strategy is a strategy that occurs in the division or business unit. This is a strategy that emphasizes the improvement of the competitive position of products or services in specific industries or market segments. A company can have multiple divisions as separate units of strategic business which produce different products. Each division is managed as a semiautonomous unit and is authorized to develop its own strategy within the framework of corporate strategy and objective. The business strategy division may emphasize the increasing profit margins for its products or services. Business strategy should integrate various functional activities so that the goals of the division can be achieved.

*Functional Strategy.* The functional strategy focuses on maximizing the productivity of resources used in providing the best value to meet customers' needs. The strategy is often called value-based strategy. Being in the constraint of corporate strategy and business unit strategy, each functional department such as production and marketing department will develop a strategy according to the activities and objectives set forth in each department.

*Types of Business Strategy.* There are several kinds of adaptive strategies developed by Miles and Snow:

*Prospector Strategies.* This consists of risks taking, looking for opportunities, and doing innovation and development. This strategy is suitable for the dynamic business environment.

*Defensive Strategic.* Avoid change, give priority to stability, and consider reducing the size of the business, this strategy is suitable for a stable business environment and industry that is in decline.

*Reactor Strategic.* Responding to the environment without having a long-term strategy design. Companies are merely reactive and short-term oriented.

*Analyzer Strategic.* Limited in maintaining stability while doing innovation. This strategy lies in the prospector strategy and the reactor strategy. It is usually done by companies that do not become the leader in the market but the follower. In this strategy, the company will follow the leader but also make innovations that are not intensive while waiting for the development of the industry.

## **METHODS OF RESEARCH**

*Types of Research.* This study used a qualitative approach because it is made to depict or describe a phenomenon that occurs through words, pictures, tables, and so on. Moleong (2013: 6) stated that qualitative research is a research conducted to understand the phenomena experienced by the subject of the research such as perception, behavior, motivation, and action through the description approach by using words and language.

Creswell (Miles and Huberman, 1992) explained that qualitative research is a type of research where researchers are very dependent on the information of the object/participants obtained through broad scope, general questions, data collection consisted largely of words/text from participants, words explanation, and analyzation, and subjective research (Creswell, 2009).

*Research Focus.* In this case, the focus of the research is divided into several things:

Imported Cattle Policy by the Government of Indonesia: Beef self-sufficiency policy; Limitation of imported cattle quota policy; Beef Price Stability Policy; Cattle Breeders Rate Policy.

Business Strategies of PT Karunia Alam Sentosa Abadi (KASA): Defensive Strategies of PT Karunia Alam Sentosa Abadi (KASA) in facing the cattle importing policy from Indonesia Government; Reactor Strategies of PT Karunia Alam Sentosa Abadi (KASA) in facing the cattle importing policy from Indonesia Government; Analyzer Strategies of PT Karunia Alam Sentosa Abadi (KASA) in analyzing the issues arising from the Indonesian government's cattle import policy.

Performance aspects of PT Karunia Alam Sentosa Abadi: Financial Performance; Assets; Profit.

Non-Financial Performance: Market Shared; Product Quality / Average Daily Gain; Number of Employees / Employee Satisfaction; Business Relationship with the Company; Cattle Importers (Australian Companies).

*Research Location and Site.* The research was conducted on one fattening corporation of imported cattle in Central Lampung. Precisely, it was in PT Karunia Alam Sentosa Abadi (KASA) at Jalan Pagar Alam II, Kampung Rengas, Bekri Sub-district, Central Lampung.

The research site is in the management office of PT Karunia Alam Sentosa Abadi (KASA) at Jalan Pagar Alam II, Kampung Rengas, Bekri Sub-district, Central Lampung, Indonesia.

*Data Source.* This research was carried out by using primary data and secondary data obtained from the field, among others:

Primary Data. The informants that researchers use related to the fulfillment of data in this scientific work are: Chief Executive Office or president director of PT Karunia Alam Sentosa Abadi (KASA); Marketing Manager (Marketing Department) of PT Karunia Alam Sentosa Abadi (KASA); Production Director (Production Department) of PT Karunia Alam Sentosa Abadi (KASA); Accountant (Finance Department) of PT Karunia Alam Sentosa Abadi (KASA); Human Resources Manager (Human Resources Department) of PT Karunia Alam Sentosa Abadi (KASA).

Secondary Data. Secondary data in this study were obtained from the Bureau of Statistics, General Directorate of Livestock, Ministry of Agriculture and Ministry of Commerce.

*Research Instruments.* In collecting the data, research instrument is required to obtain relevant data for the research undertaken. Research instrument is a facility that can be used in collecting data so that the work or activity becomes more organized and produces better result thus it could be processed easily.

In this research, the instruments used were: Interview Guidelines, a number of basic questions that have been prepared beforehand. With this guideline, the verbal answer will be obtained concerning the desired data; Documentation Guidelines to facilitate the learning of documents in the company; Tools used for observation such as our five senses and stationery.

*Data analysis technique.* Data reduction is referred to as the selection process, focusing on simplification, abstraction, and transformation of data arising from written records in the field. Data reduction is a form of analysis that sharpens, classifies, directs, discards the unnecessary, and organizes the data in such a way that the conclusions can be drawn.

Data presentation can be done in the form of brief descriptions and relationship charts in between categories, flowcharts, and so on. The researcher presents the data in the form of



descriptive words supported by the presentation of the data table so that it can be clear enough.

Data verification in qualitative research was conducted continuously throughout the study. Since the beginning of entering the field and during the process of data collection, the researchers tried to analyze and find the meaning of the collected data such as looking for patterns, themes, equation relationships, things that often arose, and etc poured in the conclusion that is tentative.

## DISCUSSION OF RESULTS

*Business Strategy Analysis in Financial Field.* The dependence of PT Karunia Alam Sentosa Abadi (KASA) on the existence of imported cattle is, of course, experiencing such ups and downs in its performance both financially and non-financially. The decline in the financial benefits of PT Karunia Alam Sentosa Abadi (KASA) is certain to occur when the policy on quota import restrictions is applied by the Indonesian government. Limitation of beef imports is clearly depressing the sales figures as well as the rate of profit. It is also explained by the Accounting Officer of PT Karunia Alam Sentosa Abadi (KASA), Hendrik Yulianto in which he said "the restriction of cattle import quota is greatly reducing the number of cattle sales to the customer. Besides that, there will be a turmoil in which the overhead cost that has been designed will be a burden because the company's revenue is stuttering" (Statement in Bahasa Indonesia: "*Pembatasan kuota impor sapi sangat menekan angka penjualan sapi kepada para customer. Disamping itu, akan timbul gejolak dimana overhead cost yang telah dirancang akan menjadi beban dikarenakan pemasukan perusahaan yang tersendat*") (Source: Interview with Accounting Officer of PT Karunia Alam Sentosa Abadi (KASA), Hendrik Yulianto, December 20th, 2016, 09:30 in Office). From the statement, it is clear that the restriction of cattle import quota greatly affects the financial performance of PT Karunia Alam Sentosa Abadi (KASA) referenced from the increase of overhead cost and the reduction of income or profit.

In this case, PT Karunia Alam Sentosa Abadi (KASA) uses a relatively similar survival strategy when the cattle import quota policy is determined by cost efficiency. It is known that PT Karunia Alam Sentosa Abadi (KASA) endures cost efficiency in several forms, namely:

*Production cost efficiency.* Cost efficiency of production is an efficiency to the cost of feed and cattle treatment. PT Karunia Alam Sentosa Abadi (KASA) formed a team under the command of Director of Operational and Production to conduct a research. The research was intended to investigate and search for alternative feeding material by utilizing the side product of agro-industry in Lampung like palm, tapioca starch, and sugar cane. This may depress the production cost due to the cattle import restriction policy and price stability policy because companies will use the alternative feed from other industrial products. Alternative feed has a cheaper price than the concentrate feed. However, the nutrition must be assessed in depth so that the cattle could get proper food supply and boosted the Average Daily Gain (ADG) maximally. The CEO of PT Karunia Alam Sentosa Abadi (KASA), Didiek Purwanto said that "alternative feeding should continue to be followed related to its nutritional content and that the ADG is not reduced. Cows have the ability to synthesize the protein very well".

*Indirect cost efficiency.* In indirect cost efficiency, there are several strategies set by PT Karunia Alam Sentosa Abadi (KASA) in the midst of the turmoil of government policy. First, the cost-efficiency of human resources by cutting the number of casual labor or daily labor. The explanation of human resource strategy will be discussed deeply in the human resource sub-chapter. In this case, the deduction or efficiency of the number of employees is only intended to reduce the overhead cost which was escalated when the stock of imported cattle was limited. After that, the arrangement between the in and out of the cattle should be more clear and definite. By that, PT Karunia Alam Sentosa Abadi (KASA) has pressed the government concerning the exact number of import quotas given to the company. This is because if the number is unclear, it can affect the credit cooperation with the Bank. Bank as

a business partner who provides loans to PT Karunia Alam Sentosa Abadi (KASA) certainly does not want such kind of uncertainty in the business.

*Corporate Facility Strategies.* PT Karunia Alam Sentosa Abadi (KASA) also made a new strategy in the context of financial efficiency after the turmoil of government policy by leasing the production facilities owned by the company to other companies or business partners. Differences in the number of import quota between each company or business actor become the fundamental reason for forming this strategy. CEO of PT Karunia Alam Sentosa Abadi (KASA), Didiék Purwanto said that "We're going to lease our facilities to business partners or other feed lotter company. Because of the policy, this makes the company get different quotas for each company. This underlies us to lease our facilities so as not to experience a vacuum or a reduction in quality" (Statement in Bahasa Indonesia: "*Kita akan sewakan fasilitas operasional yang perusahaan miliki kepada mitra bisnis atau perusahaan feedlotter lainnya. Karena pembatasan kuota impor sapi yang dicanangkan pemerintah, membuat perusahaan mendapatkan jatah atau kuota yang berbeda – beda. Hal ini kemudian yang melandasi kami untuk menyewakan fasilitas yang kami miliki agar tidak mengalami kekosongan atau pengurangan kualitas*") (Source: Interview with the CEO of PT Karunia Alam Sentosa Abadi (KASA), Didiék Poerwanto, December 20th, 2016, 08:30 in the Office).

*Market Segmentation.* PT Karunia Alam Sentosa Abadi (KASA) categorizes the customers based on the region and slaughterhouse (*Rumah Potong Hewan*) accreditation. By region, the market of PT Karunia Alam Sentosa Abadi (KASA) consists of 2 regions such as Sumatra and Java. When the cattle import quota policy is applied, the stock or the population of imported cattle from PT Karunia Alam Sentosa Abadi (KASA) will be depleted. It will cause additional problems if there are issues outside the operational issues such as death during delivery, cow stress during delivery, and others. Therefore, PT Karunia Alam Sentosa Abadi (KASA) will also limit the delivery or sale of cattle to Java due to the distance between Sumatra and Java which is too far and risky. PT Karunia Alam Sentosa Abadi (KASA) send or sell more cattle to Sumatra with a percentage of market segmentation by 75% in Sumatra and 25% in Java. Besides to minimize the occurrence of cattle death during delivery, PT Karunia Alam Sentosa Abadi (KASA) also able to maintain the level of competition with other companies related to the quality of the meat and the weight of the cattle if competing in Sumatran market that is near the company location. This is confirmed by the CEO of the company, Didiék Purwanto. He said that "The product of this company will certainly able to win the competition if it has a good quality in accordance with the volume strategy applied to performance. Therefore, the company should be able to minimize any gap that can reduce the quality or performance of the cattle by cutting the cost or market risk arising from distance delivery. 75% of the market segmentation will be put to Sumatra, this is certainly close to our farm" (Statement in Bahasa Indonesia: "*Produk dari KASA tentu akan lebih mampu memenangkan kompetisi apabila memiliki kualitas yang baik, sesuai dengan strategi volume to peformance yang diterapkan. Maka dari itu, perusahaan harus mampu meminimalisir setiap celah yang dapat mengurangi kualitas atau peformance dari sapi tersebut dengan cara memotong biaya atau resiko pasar yang muncul akibat terlalu jauhnya jarak pengiriman sapi. Maka dari itu 75 % market segmentation dari PT KASA akan menuju ke Sumatera yang tentunya dekat dengan Farm KASA*") (Source: Interview with Purchasing CEO of PT Karunia Alam Sentosa Abadi (KASA), Didiék Poerwanto, December 27, 2016, 12:30 in the Office).

*Product Positioning.* PT Karunia Alam Sentosa Abadi uses the Average Daily Gain and the color of the beef to determine product positioning. The Production Director of PT Karunia Alam Sentosa Abadi (KASA), Gunawan said that "the Average Daily Gain and color of meat is the main thing that becomes the concern of our company when it is ready to sell to the public. Attractive color of meat and good cattle weight will support the level of sales so that customer will be interested to buy cattle from our company" (Statement in Bahasa Indonesia: "*Average Daily Gain dan warna daging adalah hal utama yang perusahaan perhatikan ketika menjualnya ke publik. Warna daging yang menarik serta berat badan sapi yang baik akan menunjang tingkat penjualan serta membuat customer akan tertarik untuk*")

*membeli sapi dari KASA.)* (Source: Interview with Production Director of PT Karunia Alam Sentosa Abadi (KASA) Gunawan, December 27, 2016, 13:30 in the Office). It is said that the higher level of Average Daily Gain (ADG), the higher the price of the cattle in the market.

*Price.* Furtherly, the marketing strategy run by PT Karunia Alam Sentosa Abadi (KASA) is the price of benefits. The price of benefits means that the company is responsible for the prices charged to the buyer with the performance level of the cattle. The price offered by PT Karunia Alam Sentosa Abadi (KASA) will always be followed by the Average Daily Gain rate, the color of the meat, and the health level of the cattle. The company uses this strategy to generate some additional values when the customers purchase the products which in turn makes the customers become the automatic promotion tool of the company.

*Promotion.* The promotion strategies carried out by PT Karunia Alam Sentosa Abadi (KASA) is to educate the customer. PT Karunia Alam Sentosa Abadi formed a campaign team containing staff marketing and Animal Warfare Officer to perform an education-related to cattle and communicate intensely with customers in order to listen to the complaints that arise. CEO of PT Karunia Alam Sentosa Abadi (KASA), Didiek Purwanto said that *"KASA gives an education to the customers and slaughterhouse related to cattle treatment and things related to Animal Warfare. This was done because we want some kind of connection in between the company and the customer. We hope that through this education, the customer will aware that we care about them and, eventually, they will become a promotional tool for our company. This education activity is intended to generate some added value for the company"* (Statement in Bahasa Indonesia: *"KASA memberikan edukasi kepada para customer dan Rumah Potong Hewan terkait perawatan sapi dan hal hal yang terkait dengan Animal Warfare. Hal ini kami lakukan dengan maksud ada keterikatan batin antar perusahaan dengan customer. Kami berharap dengan edukasi ini customer merasa diperhatikan oleh PT KASA dan pada akhirnya mereka akan menjadi alat promosi bang KASA. Edukasi ini kami lakukan untuk emnambah added value dari perusahaan"*) (Source: Interview with the CEO of Pt Karunia Alam Sentosa Abadi (KASA) Didiek Poerwanto, December 27, 2016, 12:30 in the Office).

*Production Performance.* Initially, the transfer of a business mindset of PT Karunia Alam Sentosa Abadi (KASA) was oriented on *volume* and then changed to the orientation of *performance*. This makes PT Karunia Alam Sentosa Abadi (KASA) have excellent cattle quality. The strategy issued by PT Karunia Alam Sentosa Abadi (KASA) is to increase the performance of the cattle through the increasing Average Daily Gain (ADG) program. The program to increase ADG is done because the small stock of cattle can be covered through cow maximum weight determination because the calculation of cattle prices is based on the weight of the cattle. The Director of Operations and Production of PT Karunia Alam Sentosa Abadi (KASA), Gunawan said that *"ADG is the key to maintaining the market share of PT Karunia Alam Sentosa Abadi (KASA). The growth of ADG is very concerned because the stock of imported cattle is continuously reduced by the government. Maximum ADG will make the cattle becomes expensive in the market"* (Statement in Bahasa Indonesia: *"ADG menjadi kunci PT KASA dalam mempertahankan market share. Pertumbuhan ADG sangat diperhatikan ditengah stok sapi impor yang terus menerus dikurangi oleh pemerintah. ADG yang maksimal tentu akan mebuat harga sapi menjadi mahal di pasar"*) (PT Karunia Alam Sentosa Abadi (KASA), 28 December 2016 , 08:30).

The growth rate of cattle's ADG is determined by the nutrition and feed that is regularly given and nutritious. This can be minimized very well by PT Karunia Alam Sentosa Abadi (KASA) through the utilization of waste or side-products from industries in Sumatra. Then, it is processed to produce an alternative feed source for maximum nutrition but with cheap cost.

## CONCLUSION

The existence or establishment of government policies has affected the business conditions in a country. The determination of cattle import policy that starts from imported cattle quota restriction, price stability policy, until the cattle breeding ratio policy is considered

as a major influence on the performance of cattle importing companies, one of which is PT Karunia Alam Sentosa Abadi (KASA).

Business strategies will change to follow the conditions and business environment particularly in a situation that is set by the Indonesian government. The new strategy in every division of the company such as marketing, finance, production, business relations, and human resources will be applied based on the conditions and business environment that are constantly changing. The efficiency of all company became the basis to prepare new strategy as a strategy of volume to performance, nutrition and feeding alternative strategy, market allocation strategy, and the effectiveness of human resources strategy. All of those strategies are done in order to survive the company's balance sheet so that it will not have a deficit. The defensive strategies are also implemented to maintain the value of the company and the value of competence in the eyes of the customer.

### **SUGGESTIONS**

PT Karunia Alam Sentosa Abadi (KASA) should be able to survive all business situations and environmental conditions. The company should be able to survive and keep the rhythm of the business in the midst of the turmoil of this government policy. Each element of the company such as finance, marketing, production, and human resources must be up to date and able to adapt quickly to changes that arise from the internal and external side. The relationship with the Indonesian government become the main point that must be maintained and kept beneficially. This is because any government policies will affect the continuity of PT Karunia Alam Sentosa Abadi (KASA) business.

Moreover, cattle import policy implemented by Indonesian government has a very positive impact on the cattle business continuity, especially for local cattle farmers. Self-sufficiency program of national beef is a form of government's seriousness in improving the quality of Indonesian cattle. However, the government must consider the facts that the presence of local cattle still not able to offset the need for national beef/cattle in which this resulted in scarcity and price inflation of beef. In this issue, the cattle importing company will be harmed with the implementation of this policy. The restricted stock of cattle will make the company to find a way in surviving this condition.

### **REFERENCES**

1. Aaker, D.A. 2013. *Manajemen Pemasaran Strategi*. Eight Edition. Salemba Empat. Jakarta.
2. [APFINDO] Asosiasi Pengusaha Feedlot Indonesia. 2011. *Realisasi Impor Sapi Bakalan*. Sekretariat APFINDO. Jakarta
3. Brealey, R.A., Myers, S.C., & Marcus, A.J. 2007. *Fundamental of Corporate Finance*. Sabran, Bob Jilid 1 Edisi Kelima. PT. Erlangga. Jakarta
4. Creswell, J.W. (2010). *Research design: pendekatan kualitatif, kuantitatif, dan mixed*. Yogyakarta: PT Pustaka Pelajar.
5. Dafid, F.R. (2010). *Manajemen Strategis*. Salemba Empat. Jakarta
6. Robbins, S.P. & Coulter, M. (2010). *Manajemen Edisi 10 Jilid 1*. Jakarta: Erlangga.
7. Susanto, A.B. 2014. *Manajemen Strategik Komprehensif untuk Mahasiswa dan Praktisi*. Penerbit Erlangga, Jakarta
8. Van Horne, J. 2012. *Prinsip-Prinsip Manajemen Keuangan Edisi 13*. Jakarta. Salemba Empat

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## THE ANALYSIS OF MAIZE MARKET INTEGRATION IN EAST JAVA

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### ABSTRACT

An Uncontrollable Maize price fluctuation can harm farmers when the price changes in the level of consumer price and it is not followed at the level of the producers. This study used monthly prices data during 2009-2016 in East Java province. Methods of analysis used, are in the form of price variations and market integration analysis. The results of the prices variation analysis are maize prices that gained at the level of the producers, wholesalers, and consumers are low fluctuating, but the results of the market integration show that between the producer price and consumer price, between the producer price and the wholesale price, and between wholesale prices and consumer prices are integrated in the short term and are not integrated in the long term, this indicates that the price of maize markets information systems had not been running perfectly. So, the Government needs to fix the system to make the price information of maize can be well-integrated.

### KEY WORDS

Price, maize, price integration, market.

The government tries to increase the income of maize farmers through the production. Increased of maize production since 2000 amounted to 9,677,000 tons, imported 1,264,575 tons and exports of 28,066 tons, in 2008 with production of 16,317,252 tons, imports decreased by 264,665 tons and exports increased by 107,001 tons, and production continued to increase to 19,377,030 tons, imports also increased to 3,175,362 tons and exports fell to 37,889 tons in 2014 (Central Bureau of Statistics, 2015). This shows that the export and import of maize in Indonesia which is Import activity even greater than export of maize, or in other words Indonesia is still experiencing a deficit of maize production. In an effort to increase maize production in addition to meeting the demand, aims to increase the income of maize farmers as well. The income of maize farmers is increasingly constrained by increasing production costs, and farmers continue to improve the yield of maize sells to cover production costs. The income of maize farmers is not only influenced by costs and prices, according to Magesa, et al (2014), but also an access to the market becomes necessary for the farmers as it is a strong and direct impact for farmers' income.

Maize's marketing with a long marketing channel urges the increasing of maize's price. This makes the gap between producers and consumers, because when prices are low, farmers or producers will get the disadvantaged, and if prices rise then consumers will. The longer the marketing channel exists, the higher the marketing margin. The marketing margin is the difference between the price paid by the consumer and the price that obtained by the producer, or as the price of marketing services of the demand and the provision of such services (Tomek and Kenneth, 1990). Therefore, If the seller and buyer already have accurate and continuous market information, then the price changes will be responded immediately by the market participants, and decision-making will be done quickly and appropriately. In an integrated market, the price of different markets has a positive relationship as a reflection of the smooth flow of market information (Ravalion, 1986). According to Stephens, et al. (2008) the flow of information in the market and trading networks can cause transmission prices amongst market without trade flow. The market is

also integrated by the producer's decision although there is no direct trade that occurred between the market (Srofenyoh, 2015). According to Ye and Jinggui (2015), if the price changes in the level of consumer price changes followed at the level of the producers then showed a market integration between the two. The difference in price can be equal to or less than the cost of transportation, as a strong manifestation of the Low One Price, but price movements should not be integrated (Anindita and Nur, 2017). When the market is integrated, then the flow of goods (food) between the region and the lower prices fluctuates, so the knowledge of market integration is necessary because market integration will inform the analysis of the goods security(food), an appropriate response to the crisis, the possibility of negative impact of food aid and the possibility of local procurement (Wold Food Program, 2007). Having known about the price fluctuations and marketing integration between manufacturers, wholesale markets, and the consumer, is expected to transmit market information from the manufacturer to the consumer as well as vice versa. So marketing agencies can help to create a marketing system that is efficient and effective in order to prosper, consumers, manufacturers and marketers. This research aims to analyze the Maize Market Integration in East Java province.

## MATERIALS AND METHODS

The data used is the price of maize at the level of producer, maize price at the level of wholesaler and maize price at the level of consumer from January 2009 until December 2016 in Tuban District, Kediri District, Malang District, Jember District, and Lamongan District to represent the maize center area in East Java. The following methods are used to analyze of maize price variation and analysis of market integration.

*Analysis of Maize Price Variation.* The price of maize at the level of the producers, wholesalers, and the consumer movement was analyzed from year after year, from the development of the price of each price series. The equation used to analyze maize price fluctuations which can be formulated as follows:

$$\text{Coefficient of variation (CV)} = \frac{\text{Standard deviation}}{\text{average}} \times 100\% \quad (1)$$

The coefficient of variation obtained from time series the data of pricelist that is describing the price fluctuations (average against junction) that are used to find out the stability of prices on a commodity. The smaller the value of coefficient of variation, then it can be interpreted that the price relatively more stable or low fluctuations (Abdi, 2010).

*Analysis of Market Integration.* Market integration is a measure that demonstrates how far the price changes that occur in the reference market will lead to price changes also in the market followers (Asmarantaka, 2009). The concept of market integration is different from Low One Price (LOP). Perfect market integration does not mean having a strong form of LOP. Because a strong LOP does not have to be followed by perfect market integration. This is because the price difference can be equal to or less than the transportation cost as a strong embodiment of LOP but price movement should not be integrated (Anindita and Nur, 2017).

## RESULTS AND DISCUSSION

Results of price variation Analysis. According to ministry of trade (2010), criteria of price fluctuations, that is, if the value of the coefficient of variation of the price ranges between 4 – 8% the price is said to be stable, but if the value of the coefficient of variation of more than 8% of its indicated price fluctuations is high or unstable. Analysis of Price variation of maize at the level of the manufacturers, wholesalers and consumers is as follows.

Result of producer price variation Analysis. Maize's price developments at the level of the producers during 2009 – 2016 demonstrating that the value of the coefficient of variation of prices ranged from 2.28% to 7.65% with an average value of the coefficient of variation of

4.89%. This indicates that the value of the coefficient of variation the price of maize is on the criteria of ministry of trade between 4 – 8% which means that the price of maize at the producer level low fluctuating or tend to be stable. The development of the maize price variations in the level of the producers during 2009 – 2016 can be seen in table 1.

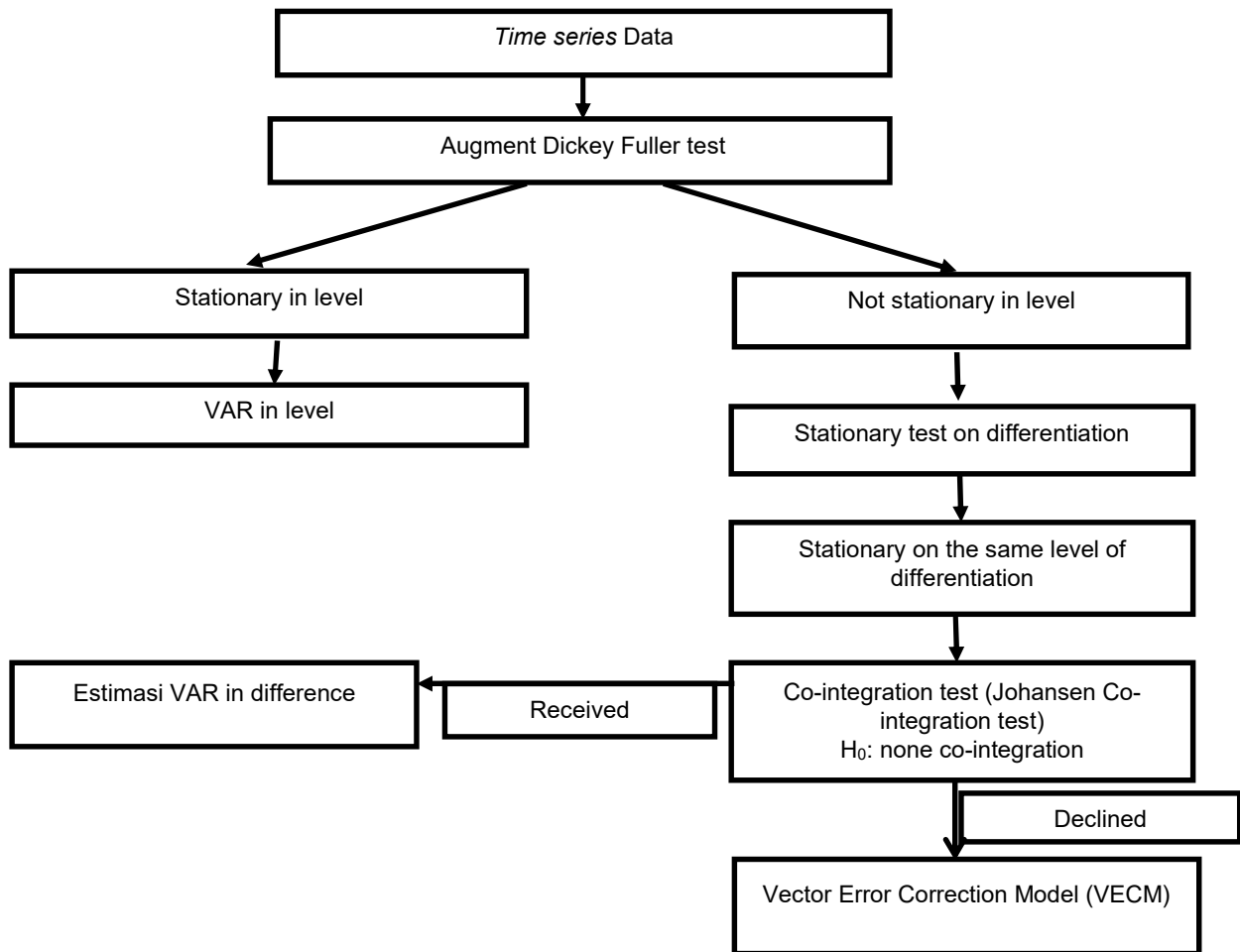


Figure 1 – Framework of VAR Model formation (Rosa, *et al*, 2014, assessed)

Table 1 – The Development of Maize Price Variation at Producer Level during 2009-2016

| Year | Average price | Standard Derivation | coefficient Variation % |
|------|---------------|---------------------|-------------------------|
| 2009 | 2591,67       | 125,18              | 4,83                    |
| 2010 | 2971,67       | 153,38              | 5,16                    |
| 2011 | 2865,83       | 186,81              | 6,52                    |
| 2012 | 2633,33       | 105,94              | 4,02                    |
| 2013 | 2926,67       | 66,79               | 2,28                    |
| 2014 | 3050,83       | 71,8                | 2,35                    |
| 2015 | 3288,33       | 207,88              | 6,32                    |
| 2016 | 3711,67       | 283,9               | 7,65                    |
| Mean | 3005          | 150,21              | 4,89                    |

Source: department of Agriculture and Food Security of east java province, 2016.

*Result of wholesaler price variation analysis.* Development of maize’s prices in the wholesaler level during 2009 – 2016 demonstrating that the value of the coefficient of variation of prices ranged from 1.6% to 6.8% with an average value of the coefficient of variation of 4.02%. This indicates that the value of the coefficient of maize’s price variation is on the criteria of ministry of trade between 4 – 8% which means that the price of maize at the wholesaler prices is low fluctuating or volatile. The development of the maize’s price variations in the wholesale level during 2009 – 2016 can be seen in table 2.

Table 2 – Development of Maize Price Variation at wholesale Level during 2009-2016

| year | Average price | Standard Deviation | Coefficient Variation% |
|------|---------------|--------------------|------------------------|
| 2009 | 2918,33       | 130,02             | 4,46                   |
| 2010 | 3270          | 164,15             | 5,02                   |
| 2011 | 3348,33       | 176,73             | 5,28                   |
| 2012 | 3070          | 62,96              | 2,05                   |
| 2013 | 3316,67       | 66,51              | 2,01                   |
| 2014 | 3518,33       | 56,22              | 1,60                   |
| 2015 | 3748,33       | 185,37             | 4,95                   |
| 2016 | 4133,33       | 280,95             | 6,80                   |
| Mean | 3415,42       | 140,36             | 4,02                   |

Source: Department of Agriculture and Food Security of East Java province, 2016.

Result of consumer price variation analysis. The development of the price of maize at the consumer level during 2009 – 2016 demonstrating that the value of the coefficient variation of prices ranged from 2.11% to 7.73% with an average value of the coefficient of variation of 4.5%. This indicates that the value of the coefficient variation the price of maize is on the criteria of ministry of trade between 4 – 8% which means that the prices of maize at the consumer levels is low fluctuating or tend to be volatile. The development of the maize price variations in the level of consumer during 2009 – 2016 can be seen in table 3.

Table 3 – Development of maize Price Variation at consumer Level during 2009-2016

| year | Average price | Standard Deviation | coefficient Variation % |
|------|---------------|--------------------|-------------------------|
| 2009 | 6375,00       | 165,83             | 2,60                    |
| 2010 | 4243,33       | 231,65             | 5,46                    |
| 2011 | 4109,17       | 260,54             | 6,34                    |
| 2012 | 3773,33       | 83,70              | 2,22                    |
| 2013 | 4058,33       | 156,43             | 3,85                    |
| 2014 | 4413,33       | 93,16              | 2,11                    |
| 2015 | 4640,83       | 264,25             | 5,69                    |
| 2016 | 5301,67       | 409,74             | 7,73                    |
| mean | 4614,37       | 208,16             | 4,50                    |

Source: Department of Agriculture and Food Security of East Java province, 2016.

Result of maize market integration analysis. The data stationary tests. A time series data needs to be tested by stationary test so that it can be known whether stationary or not stationary. If the data contains the root unit, then it can be said that data are not stationary. Stationary tests on using Augmented Dickey-Fuller (ADF) test, with the test results of stationary in level can be seen in table 4.

Table 4 – Stasionarity Test Results at Level with ADF tests

| Variable         | ADF test in level |               |         | stationary     |
|------------------|-------------------|---------------|---------|----------------|
|                  | Critical Value 5% | ADF Statistic | p-value |                |
| Producer price   | -2,892200         | -1,296921     | 0,6285  | Not stationary |
| Wholesaler price | -2,892200         | -1,121755     | 0,7046  | Not stationary |
| Consumer price   | -2,892200         | -1,365536     | 0,5960  | Not stationary |

Source: secondary data (re-make), 2017.  
Error tolerance ( $\alpha$ ) 5%

Table 4 above shows that test results of stationary test in level mind that results ADF statistic  $\leq$  ADF critical values and the value of the probability  $> \alpha$  (0.05) then concluded that the data are not stationary. The results showed that at levels, the hypothesis  $H_0$  is accepted, i.e. the data time series contain the root unit, means that the data is not stationary.

The Data that is not stationary needs to have differentiation to be used as a stationary data. This is useful to avoid spurious regression problems (pseudo) that may arise from the result of data time series regression that are not stationary (Ghozali and Dwi, 2013). Therefore, the time series data that are not stationary in level has done the Augmented



Dickey-Fuller test on the next level, i.e. at the level of the first difference. Stationary tests results at the level of the first difference are shown in table 5.

Table 5 shows that the stationary test results at level of the first difference noted that ADF statistic  $\geq$  ADF critical values and the value of the probability  $< \alpha$  (0.05) then inferred that the data is stationary. The results show that at level of the first difference, the hypothesis  $H_0$  is rejected, time series data does not contain a root unit, means that the data is stationary. Based on these results, it can be inferred that all the variables of data used are stationary in the same order of order I (1) and the data were avoided from spurious regression. So, it can be extended by performing variables regression that are used for the purposes of co-integration test.

Table 5 – The result of stationary test in level of first difference using Augmented Dicky-Fuller

| Variable        | ADF test in level |               |         |            |
|-----------------|-------------------|---------------|---------|------------|
|                 | Critical Value 5% | ADF statistic | p-value | stationary |
| Producer price  | -2,892536         | -9,638716     | 0,0000  | stationary |
| Wholesale price | -2,893230         | -6,817987     | 0,0000  | stationary |
| consumer price  | -2,892536         | -9,509322     | 0,0000  | stationary |

Source: secondary data (re-make), 2017.  
Error tolerance ( $\alpha$ ) 5%

Result of optimal lag selection. According to Kozhan (2010), the optimal lag length is used so that the residual each Vector Auto-regression (VAR) equation is free from the problem of normality and autocorrelation. In this study, the criteria which were used to determine the optimum lag length are the Acaice Information Criteria (AIC). The optimal lag test results are shown in table 6.

Table 6 – Results of Optimal Lag test

| Lag | LogL      | LR        | FPE       | AIC       | SC        | HQ        |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0   | -1698.389 | NA        | 1.25e+13  | 38.66793  | 38.75238  | 38.70195  |
| 1   | -1567.310 | 250.2409  | 7.78e+11* | 35.89342* | 36.23123* | 36.02951* |
| 2   | -1564.299 | 5.544149  | 8.92e+11  | 36.02952  | 36.62070  | 36.26769  |
| 3   | -1558.231 | 10.75616  | 9.55e+11  | 36.09616  | 36.94071  | 36.43641  |
| 4   | -1547.190 | 18.81955* | 9.15e+11  | 36.04978  | 37.14769  | 36.49210  |
| 5   | -1538.858 | 13.63545  | 9.35e+11  | 36.06494  | 37.41622  | 36.60934  |
| 6   | -1535.154 | 5.807226  | 1.06e+12  | 36.18533  | 37.78997  | 36.83180  |
| 7   | -1526.672 | 12.72416  | 1.09e+12  | 36.19708  | 38.05508  | 36.94562  |
| 8   | -1521.896 | 6.837628  | 1.22e+12  | 36.29309  | 38.40446  | 37.14371  |

Source: Secondary data (re-make), 2017.

Table 6 above shows that the optimal lag tests results using the Acaice Information criterion (AIC) is 35.89342 which are the smallest value of other criteria and at a lag of one, so the results lag of one is used as a the optimal lag length. The use of a lag as the optimal lag model means that the economy shows that all variables in the model is in the interplay, i.e. not only on this period, but the price variables mutually affected to the previous period. The value of the variable can be a lag effect on other variables. Because It takes time For a variable to be able to respond the movements of the other variables. After knowing the selection of the lag order of VAR model, then further testing is done by co-integration using Johansen model with the optimal lag length of one.

Result of Johansen co-integration test. Result of Johansen co-integration test between producer and wholesaler. Johansen Co-integration tests analysis of time series data of monthly price of maize at producer and wholesale level showed no cointegration result based on trace statistic (12,91068) <critical values 5% (15,49471) or max-eigenvalue (10,47414) <critical value 5% (14,26460) and probability value greater than 5%. That is, in the long run there is no balance between the price of maize at the producer level and the price of maize at the wholesale level. The absence of co-integration of maize prices means in the long run the producer market and wholesale markets are not integrated.. The integration of markets

that do not occur would be detrimental to the side of the producers, because price changes in wholesale level are not transmitted to the price at the level of the producers. No occurrence of transmission rates in the long term of market shows that between the producer and the wholesale market does not run efficiently or inefficiency marketing in the long run. The efficient market is the market which is its securities price quickly and fully reflects all the information that exists in the presence of its assets (Jones, 1995). Johansen Co-integration Test results for producers and wholesale market can be seen in table 7.

Table 7 – The result of Johansen Co-integration Test of maize prices variable at the level of wholesaler

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---------------------------|-----------------|---------------------|---------|---------------------|---------------------|---------|
| None                      | 12,91068        | 15,49471            | 0,1181  | 10,47414            | 14,26460            | 0,1826  |
| At most 1                 | 2,436543        | 3,841466            | 0,1185  | 2,346543            | 3,841466            | 0,1185  |

Source: secondary data (re-make), 2017.

Note: \*significance  $\alpha$  (0.05)

The next test for the maize prices variable at the producer and the wholesale level is a Vector Auto-regression first difference (VARD) test, because both of these variables are not stationary at level, but stationary are at the level of first difference and not co-integrated. VARD Test is required to see the balance of the short-run between two variables prices.

Result of Johansen co-integration test between producer and consumer Johansen Co-integration tests analysis of time series data of maize monthly price at producer and consumer level showed no co-integration result based on trace statistic (14.29980) < critical value 5% (15,49471) and max-eigenvalue (12,12511) < critical value 5% (14.26460) and probability value greater than 5%. That is, in the long run there is no balance between the price of maize at the producer level and the price of corn at the consumer level. No occurrence of maize prices co-integration indicates that in the long term producer and the consumer market would not be integrated. No occurrence of transmission rates in the long term show that between producers and consumers market do not run efficiently or inefficiency occur marketing in the long run. Result of Johansen co-integration tests for price at the producers and consumers market can be seen in table 8.

Table 8 – Johansen Co-integration Test Results for Variable of maize Price at Producer and Consumer Level

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---------------------------|-----------------|---------------------|---------|---------------------|---------------------|---------|
| None                      | 14,29980        | 15,49471            | 0,0751  | 12,12511            | 14,26460            | 0,106   |
| At most 1                 | 2,174695        | 3,841466            | 0,1403  | 2,174695            | 3,841466            | 0,1403  |

Source: secondary data (re-make), 2017.

Note: \*significance  $\alpha$  (0,05)

The next test for the variable price of maize at the producers and consumers levels is a VARD test, because both of these variables is not stationary at level, but stationary at the first difference and not co-integrated. VARD Test is required to see the balance of the short-run between those two price variables.

Result of Johansen co-integration test between wholesaler and consumer. The analysis of the Johansen co-integrated test to the data time series of maize's monthly prices on the wholesaler and consumer levels shows the results there is no co-integration were based on either trace statistics or max-eigenvalue is less than the critical value of 5% as well as the value of the probability of greater than 5%. That is, in the long term there is no balance between the price of maize at the wholesale and consumer levels. No occurrence of maize prices co-integration means that in the long run prices in the wholesale and consumer markets are not integrated. No occurrence of transmission rates in the long run shows that between wholesale and consumer market would not run efficiently or inefficiency marketing

in the long run. Johansen co-integration test results for the price in the wholesale market and consumers can be seen in table 9.

Table 9 – Johansen Co-integration Test Results for maize Price at wholesale and Consumer Level

| Hypothesized No. of CE(s) | Trace Statistic | 0.05 Critical Value | Prob.** | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---------------------------|-----------------|---------------------|---------|---------------------|---------------------|---------|
| None                      | 14,04119        | 15,49471            | 0,0818  | 11,61922            | 14,2646             | 0,1258  |
| At most 1                 | 2,421968        | 3,8414166           | 0,1196  | 2,421968            | 3,841466            | 0,1196  |

Source: secondary data (re-make), 2017.

Note: \*significance  $\alpha$  (0,05).

Based on Table 24, the value of trace statistic (14.04119) <critical values 5% (15.49471) and max-Eigen statistic value (11.611922) <critical value 5% (14.2646), means that there is no co-integration between the price in wholesale markets and consumer markets. The next test for maize price variables at the wholesale and consumer levels is the VARD test, since the two variables are not stationary at the level, but stationary at first difference and un-integrated. The VARD test is needed to see the short-run balance between the two price variables.

Result of Granger causality test. Granger Causality tests is done to see the influences between variables. Although co-integration test shows variable of prices in each market level that is not co-integrated, but need to be further analyzed using the test of Granger Causality to see relationships between the Agents of marketing. Granger Causality tests results conducted in this study are shown in Table 10.

Table 10 – The result of granger causality tests of maize price on producers, wholesalers and consumers

| Null Hypothesis:                                       | Obs | F-Statistic | Prob.   |
|--|-----|-------------|---------|
| CONSUMER_PRICE does not Granger Cause WHOLESALER_PRICE | 94  | 1.19490     | 0.3075  |
| WHOLESALER_PRICE does not Granger Cause CONSUMER_PRICE |     | 2.62404     | 0.0781* |
| PRODUCER_PRICE does not Granger Cause WHOLESALER_PRICE | 94  | 1.54138     | 0.2197  |
| WHOLESALER_PRICE does not Granger Cause PRODUCER_PRICE |     | 0.75840     | 0.4714  |
| PRODUCER_PRICE does not Granger Cause CONSUMER_PRICE   | 94  | 4.66433     | 0.0118* |
| CONSUMER_PRICE does not Granger Cause PRODUCER_PRICE   |     | 0.49885     | 0.6089  |

Source: secondary data (re-make), 2017.

Note: \*significance level of 10%.

Granger Causality tests for variable of maize price are done by comparing the value of the probability on the significance level of 10%. If the value of the probability exceeds the real level, then H0 is rejected. If the value of the probability is less than adequate for real, then H0 are received. In this study, the zero hypothesis (H0) is about a none relationship of mutual influence the two markets that are compared, and the alternative hypothesis (H1) are having none relationship between the two markets influence each other that is compared.

Granger Causality tests results show that the statistic value of F and probability on wholesaler and consumers are one way causality, i.e. the price at the level of wholesale prices is affected by the price at the consumer level ( $\alpha < 0.1$ ), but prices at the consumer level is not influenced by prices at the wholesale level. Similarly, on the results of the analysis of the relationship of prices at producers and consumers level is at the level of prices, there is a relationship of one way causality, i.e. the price at the level of producers affected prices on the consumer level ( $\alpha < 0.1$ ), but prices at the consumer level is not influenced by prices at the level of the producers. However, the relationship between price at the producer level and at wholesale level showed the results of the relationship between the two markets which are independent or does not influence each other.

Result of VARD test. VAR Tests conducted in this research using the VARD tests, for some reason the whole price data that used as the variable was not stationary at the level,

but stationary at the level of the first difference, and the entire data variables in the test results show that none co-integration between variables. Although in the long run between those markets are not integrated, but in the short-term the possibility of integration that occurs can be evaluated through Vector Auto-regression approach in the form of the first difference. So in the VAR test is done with the VARD test.

Maize price formation on the consumer level based on the estimation results of the VARD above, the increase of IDR 1.000, 00 sale price on the consumer level of the previous two months causing the increase of selling cost as much as IDR 85 at this time and causing a decrease in selling price three months earlier of IDR 369, 00 at the level of wholesale. As well as causing a decrease in selling price at the level of producers on the previous three months of IDR 81,00.

The formation of the maize price on the wholesale level based on the estimation results of the VARD above, the increase of IDR 1.000, 00 selling price at wholesale levels cause a decrease in selling price at the consumer level in previous three months IDR 11, 00 and increase the selling price at the producer level in two months earlier of IDR 5, 00 for now and previous three months amounted to IDR 33, 00.

maize price formation on the producers level based on the estimation results of VARD above, the increase of IDR 1.000, 00 selling price on the producer level led to a decrease in selling price at the consumer level on the previous three months IDR 11, 00 and led to a rise of selling price at the wholesale level two months earlier of IDR 1, 00 and prices three months earlier was as much as IDR 278, 00.

Table 11 – The estimation result of VARD models in producers, wholesaler, and consumer market during 2009-2016

|                     | Consumer Price                       | Wholesaler Price                     | Producers Price                      |
|---------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| CONSUMER PRICE(-1)  | 0.488407<br>(0.20598)<br>[ 2.37111]  | 0.099097<br>(0.14650)<br>[ 0.67645]  | 0.072582<br>(0.15752)<br>[ 0.46079]  |
| CONSUMER PRICE(-2)  | -0.080996<br>(0.21930)<br>[-0.36934] | -0.106467<br>(0.15597)<br>[-0.68262] | -0.106236<br>(0.16770)<br>[-0.63349] |
| CONSUMER PRICE(-3)  | 0.127838<br>(0.19891)<br>[ 0.64268]  | -0.010608<br>(0.14147)<br>[-0.07499] | -0.010990<br>(0.15211)<br>[-0.07225] |
| WHOLESALE PRICE(-1) | 0.337956<br>(0.32578)<br>[ 1.03739]  | 0.700708<br>(0.23169)<br>[ 3.02429]  | 0.313920*<br>(0.24912)<br>[ 1.26010] |
| WHOLESALE PRICE(-2) | 0.084941<br>(0.35676)<br>[ 0.23809]  | 0.124262<br>(0.25373)<br>[ 0.48974]  | 0.000582<br>(0.27282)<br>[ 0.00213]  |
| WHOLESALE PRICE(-3) | -0.369568<br>(0.31668)<br>[-1.16701] | -0.081378<br>(0.22522)<br>[-0.36132] | -0.277654<br>(0.24217)<br>[-1.14654] |
| PRODUCER PRICE(-1)  | 0.388443<br>(0.33973)<br>[ 1.14340]  | 0.208144<br>(0.24162)<br>[ 0.86147]  | 0.628923<br>(0.25979)<br>[ 2.42088]  |
| PRODUCER PRICE(-2)  | 0.229726<br>(0.36519)<br>[ 0.62905]  | 0.005318<br>(0.25973)<br>[ 0.02047]  | 0.109379<br>(0.27926)<br>[ 0.39167]  |
| PRODUCER PRICE(-3)  | -0.080675<br>(0.34007)<br>[-0.23723] | 0.032852<br>(0.24186)<br>[ 0.13583]  | 0.222758<br>(0.26006)<br>[ 0.85658]  |
| C                   | 201.9482<br>(185.554)<br>[ 1.08835]  | 222.2785<br>(131.967)<br>[ 1.68435]  | 189.7272<br>(141.894)<br>[ 1.33710]  |

Source: secondary data (re-make), 2017.

Note: digits inside the [] is t-table value, digits inside the () is t-statistic value.

On the relationship of long-term equilibrium of the price at the consumer level is not affected by prices at the wholesale level, as well as on the price at the consumer level is not affected by the price at the producer level. This indicates that no transmitted price changes from the consumer market to the wholesale and producer market. But on short term relationships between variables are the price of maize in the wholesale level, as well as at

producer level were affected by the price of maize at the consumer level. This indicates the presence of short-term integration between wholesale and consumer prices, with consumer prices with the producer price.

### CONCLUSION AND RECOMENDATIONS

Fluctuations in maize prices indicate producer prices, wholesale prices, and consumer prices are low fluctuating, Integration of the maize market between the prices in the producer and wholesale markets, between prices in the wholesale and consumer markets are integrated in the short-term but not in the long run. The government needs to evaluate the maize market information system so that corn market integration can be well-running and farmers / producers enjoy their maximum selling price.

### REFERENCES

1. Abdi, Herve'. 2010. Coefficient of Variation. In Neil Salkind (Ed.), Encyclopedia of Research Design. Thousand Oaks, CA: Sage.
2. Anindita, Ratya dan Nur Baladina. 2017. Pemasaran Produk Pertanian. Penerbit Andi Offset, Yogyakarta, Indonesia.
3. Asmarantaka, R.W. 2009. Pemasaran Produk-produk Pertanian. Bunga Rampai Agribisnis: Seri Pemasaran. IPB Press. Bogor.
4. Badan Pusat Statistik, 2015. Jawa Timur dalam Angka. Badan Pusat Statistik Provinsi Jawa Timur. Surabaya.
5. Dinas Perindustria dan Perdagangan Provinsi Jawa Timur. 2016. Perkembangan Harga Rata-rata Komoditas Pangan di Tingkat Grosir dan Eceran dari Sentra Produksi. Surabaya.
6. Dinas Pertanian dan Ketahanan Pangan Provinsi Jawa Timur. 2016. Perkembangan Luas Lahan, Produksi, Produktivitas, dan Harga Rata-rata Komoditas Pangan di Tingkat Produsen dari Sentra Produksi. Surabaya.
7. Engle, R. F. and Granger, C.W.J. 1987. Cointegration and Error Correction Representation, Estimation and Testing. *Econometrica* Volume 55, 251-276.
8. Jones, Charles I. 1995. R&D-Based Model of Economic Growth. *The Journal of Political Economy*. Volume 103, 759-784.
9. Kementrian Perdagangan. 2010. Rencana Strategis Kementerian Perdagangan Periode 2010-2014. Kementerian Perdagangan, Jakarta.
10. Kozhan, Roman. 2010. *Financial Econometrics with Eviews*. Ventus Publishing.
11. Magesa, Mawazo M., Kisangiri Michael, Jesuk Ko. 2014. Access to Agricultural Market Information by Rural Farmers in Tanzania. *International Journal of Information and Communication Technology Research*. Volume 4 No. 7.
12. Ravalion, M. 1986. Testing Market Integration. *American Journal of Agricultural Economics* 88 (1): 102 - 109.
13. Rosa, Franco, Michela Vasciave, robert D. Weaver. 2014. Agricultural and oil commodities: price transmission and market integration between US and Italy. *Bio-based and Applied Economics* 3(2): 93-117.
14. Srofenyoh, Francis. 2015. Maize Market Integration: A Case Study of Maize Marketing In Ghana. *International Journal of Technology and Management Research* 4: 1-11.
15. Stephens, E.C., Mabaya, E., von Cramon-Taubadel, S. and Barrett, C. B. 2008. Spatial Price Adjustment with and without Trade. Working paper series. Available.
16. Tomek, William G. dan Kenneth L. Robinson. 1990. *Agriculture Product Prices*. Cornell University Press Ithaca. London.
17. WFP. 2007. PDFP Market analysis tool: market integration. [document.wfp.org/silent/groups/public/documents/manual\\_guide\\_proced/wfp187901.pdf](http://document.wfp.org/silent/groups/public/documents/manual_guide_proced/wfp187901.pdf).
18. Ye, Zhuoying dan Jinggui Ma. 2015. Analysis of Factors on the US Soybean Pricing in China's Import Market Based on principal component analysis. *SHS Web of Conferences* 17, 01008.

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## **THE PERFORMANCE OF INDONESIA INTERMEDIATE PROCESSED COCOA IN THE WORLD MARKET**

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### **ABSTRACT**

The increasing consumption of chocolate and processed foods made from intermediate processed cocoa in the world community, makes Indonesia more able to increase its role as one of the largest exporters of intermediate processed cocoa in the world market. In order to know what factors can increase intermediate cocoa exports, the purpose of this study are to analyze the factors that influence Indonesia's intermediate processed cocoa exports and know its competitiveness in the world market. The estimation method used is OLS and using SAS 9.1.3 program with linear system procedure. It is found that cocoa butter and cocoa powder are partially influenced by cocoa beans export duty and respectively by lagged export of cocoa butter and lagged export of cocoa powder, while cocoa paste is significantly influenced by value added tax, export duty of cocoa beans and lagged export of cocoa paste. Cocoa paste, cocoa butter and cocoa powder of Indonesia has a comparative advantage that has the ability to compete in the world market.

### **KEY WORDS**

Export, cocoa paste, cocoa butter, cocoa powder, competitiveness.

The downstream industries development of chocolate and processed foods made from intermediate processed cocoa have increased over time. In the last six years, from 2010 to 2016, world exports of these commodities showed an increase, especially in 2013 and 2016 at 8.61% and 7.33% from the previous year. The increasing export of downstream industrial products implicitly indicates the increasing consumption of chocolate and processed foods made from intermediate cocoa. The increasing production of downstream industries is an opportunity for Indonesia to be able more role as a supplier of raw materials of downstream industry production in the world market.

Indonesia has an advantage on the endowment, namely cocoa beans. Cocoa plants are well suited to grow in areas with tropical climates as Indonesia has. This wealth is Indonesia's capital to become one of the world's largest intermediate processed cocoa exporters in the world besides Germany, Belgium, Netherlands, Canada and the United States. This condition is in accordance with Heckscher-Ohlin theory which states that a country with abundant availability of production factor can make the country's processed cocoa price able to compete in the world market (Salvatore D, 2014). The policy in 2010 restricting the export of cocoa beans to fulfill the demand of domestic processed cocoa industry further strengthens Indonesia to compete with exporters of intermediate processed cocoa in the world market. (Ministry of Finance, 2012)

Exports of Indonesia intermediate processed cocoa are cocoa pasta, cocoa butter and cocoa powder which show the increasing year by year. In 2009, a year before enactment the export restriction on cocoa beans, cocoa pasta, cocoa butter and cocoa powder were 13,393 tons, 41,606 tons and 27,540 tons respectively. There were a significant increase for these products to 20,014 tons, 46,687 tons and 36,354 tons in 2010. The increase of those products takes place every year. In 2015, it was 113,705 tons, 75,000 tons and 58,941 tons respectively. Indonesia can be a strong competitor of Netherlands which is an exporting

country of intermediate processed cocoa although Netherlands does not have the resources to be able to cultivate cocoa crops. Netherlands must import to be able to produce intermediate processed cocoa. The increase of Indonesia intermediate processed cocoa exports should be improved even more so that Indonesia can become the main exporter of intermediate processed cocoa in the world. Therefore, it is necessary to study the factors affecting intermediate cocoa exports and their competitiveness in the world market.

There are variations of independent variables that affect the export of a commodity in a study previous. Chileshe (2005) stated that input costs, the lagged price of coffee, real exchange rate, the lagged price of cotton had a significant effect on coffee exports per capita. A positive rise in the lagged price of coffee would lead to a slight increase the volume of coffee exports. The decline in input prices and the price of cotton causes the export volume of coffee was increasing. Depreciation of exchange rate would increase the competitiveness of Zambian coffee.

According to Hameed Abdel A. A. et al (2009) in his research, the factors affecting Malaysian cocoa exports were determined significantly by real effective exchange rates, while industrial indices of developed countries and world cocoa prices were insignificant. It was different for Malaysian black pepper commodity; the research results of Kiong W.S. et al (2010) stated that commodity exports were mainly influenced by international black pepper price, domestic black pepper production, black pepper stock, steam sterilization plant in MPB, changes in tastes and preferences of consumers in pepper importing countries.

The determinants of cocoa exports in Nigeria, according to research of Nwachukwu I.N. et al in 2010 was the world export volume, exchange rate and the production of Nigerian cocoa. Nwachukwu recommends that priority should be given to the rehabilitation of old cocoa gardens and create new plantations in order to maintain the level of output. Verter N. (2016) in his research showed that cocoa beans production, world cocoa price, trade openness and exchange rate had a positive effect on export performance of cocoa beans in Cote D'Ivoire.

Faustino B. (2011) stated that the real effective exchange rate was negatively correlated with the export volume of coffee with the elasticity of -2.164. International coffee prices had a positive and significant effect on the export volume of coffee with a price elasticity of 0.789, however, the real interest rate, gross domestic product and gross capital formation were statistically insignificant in the short term. The increase in international coffee prices and gross domestic product increasing coffee export volume while the depreciation of the real effective exchange rate and the rise in real interest rates decreased the volume of coffee exports.

Based on the problems that have been stated, the purpose of this study is to analyze the factors that affect the export of Indonesia intermediate processed cocoa and know its competitiveness in the world market.

## METHODS OF RESEARCH

This study uses secondary data in time series from 1992 to 2015 consisting of data related to export and intermediate processed cocoa competitiveness, namely cocoa butter, cocoa pasta and cocoa powder. Data sources are from Trademap, FAO, UN Comtrade, World Bank, BPS, Ministry of Finance, Directorate General of Plantation, and Coffee and Cocoa Research Center.

The measurement of the competitiveness of Indonesian intermediate processed cocoa uses Balassa Index which emphasizes measurement on the actual export value. The actual export flow represents a strong sector of a country known as the Revealed Comparative Advantage:

$$RCA_{ij} = \frac{X_{ij} / \sum_i X_{ij}}{\sum_j X_{ij} / \sum_i \sum_j X_{ij}}$$

If the RCA index is greater than one ( $RCA > 1$ ), then intermediate processed cocoa has a comparative advantage or export competitiveness. The opposite happen, if RCA is smaller than one ( $RCA < 1$ ). If the RCA index is equal to one ( $RCA = 1$ ), the Indonesian intermediate processed cocoa can be exported and may not be exported. The greater the value of the RCA index, the higher the level of comparative advantage. (Kagochi, 2007)

SAS version 9.1.3 is used to analyze the factors that affect the exports of cocoa butter, cocoa paste and cocoa powder arranged in equations 1, 2 and 3. The equations are expected respectively to be influenced by world prices, production and demand of each processed cocoa, processed cocoa export from competing countries, rupiah exchange rate against US dollar, dummy of cocoa policy (ppn and export duty) and processed cocoa export the previous year. The exporting countries of cocoa pasta (cp) and cocoa butter (cb) are Netherlands and Ivory Coast, while for cocoa powder (cpd) is Netherlands and Malaysia.

$$X_{cp_{Ina}} = a_0 + a_1 P_{cp_W} + a_2 Q_{cp_{Ina}} + a_3 D_{cp_{Ina}} + a_4 X_{cp_{Bld}} + a_5 X_{cp_{PG}} + a_6 Er_{Ina} + a_7 D_{ppn} + a_8 D_{bk} + a_9 X_{cp_{Inat-1}} + U_5 \quad (1)$$

$$X_{cb_{Ina}} = b_0 + b_1 P_{cb_W} + b_2 Q_{cb_{Ina}} + b_3 D_{cb_{Ina}} + b_4 X_{cb_{Bld}} + b_5 X_{cb_{PG}} + b_6 Er_{Ina} + b_7 D_{ppn} + b_8 D_{bk} + b_9 X_{cb_{Inat-1}} + U_4 \quad (2)$$

$$X_{cpd_{Ina}} = c_0 + c_1 P_{cpd_W} + c_2 Q_{cpd_{Ina}} + c_3 D_{cpd_{Ina}} + c_4 X_{cpd_{Bld}} + c_5 X_{cpd_{Mly}} + c_6 Er_{Ina} + c_7 D_{ppn} + c_8 D_{bk} + c_9 X_{cpd_{Inat-1}} + U_6 \quad (3)$$

Where:

- $X_{cp_{Ina}}$  is Indonesia export of cocoa paste;
- $P_{cp_W}$  is world price of cocoa paste;
- $Q_{cp_{Ina}}$  is production of Indonesia cocoa paste;
- $D_{cp_{Ina}}$  is Demand of Indonesia cocoa paste;
- $X_{cp_{Bld}}$  is Nederland export of cocoa paste;
- $X_{cp_{PG}}$  is Ivory Coast export of cocoa paste;
- $Er_{Ina}$  is exchange rate of Indonesia;
- $D_{ppn}$  is dummy of value added tax;
- $D_{bk}$  is Dummy of Cocoa Beans Export Duty;
- $X_{cb_{Inat-1}}$  is the lagged export of cocoa paste;
- $X_{cb_{Ina}}$  is Indonesia export of cocoa butter;
- $P_{cb_W}$  is world price of cocoa butter;
- $Q_{cb_{Ina}}$  is production of Indonesia cocoa butter;
- $D_{cb_{Ina}}$  is Demand of Indonesia cocoa butter;
- $X_{cb_{Bld}}$  is Nederland export of cocoa butter;
- $X_{cb_{PG}}$  is Ivory Coast export of cocoa butter;
- $Er_{Ina}$  is exchange rate of Indonesia;
- $X_{cb_{Inat-1}}$  is the lagged export of cocoa butter;
- $X_{cpd_{Ina}}$  is Indonesia export of cocoa powder;
- $P_{cpd_W}$  is world price of cocoa powder;
- $Q_{cpd_{Ina}}$  is production of Indonesia cocoa powder;
- $D_{cb_{Ina}}$  is Demand of Indonesia cocoa powder;
- $X_{cb_{Bld}}$  is Nederland export of cocoa powder;
- $X_{cb_{Mly}}$  is Malaysia export of cocoa powder;
- $Er_{Ina}$  is exchange rate of Indonesia;
- $X_{cpd_{Inat-1}}$  is the lagged export of cocoa powder.

## RESULTS AND DISCUSSION

Exports of cocoa butter, cocoa paste and cocoa powder show an improvement as can be seen in Figure 1, especially after 2010, after the enactment the regulation of Finance Minister. Regulation of the Minister of Finance No. 67 / PMK.011 / 2010 limits the export of cocoa beans to fulfill the needs of cocoa beans in the domestic intermediate processed cocoa industry. It indicates that Indonesia intermediate processed cocoa has an opportunity to improve the performance of cocoa market in the world.



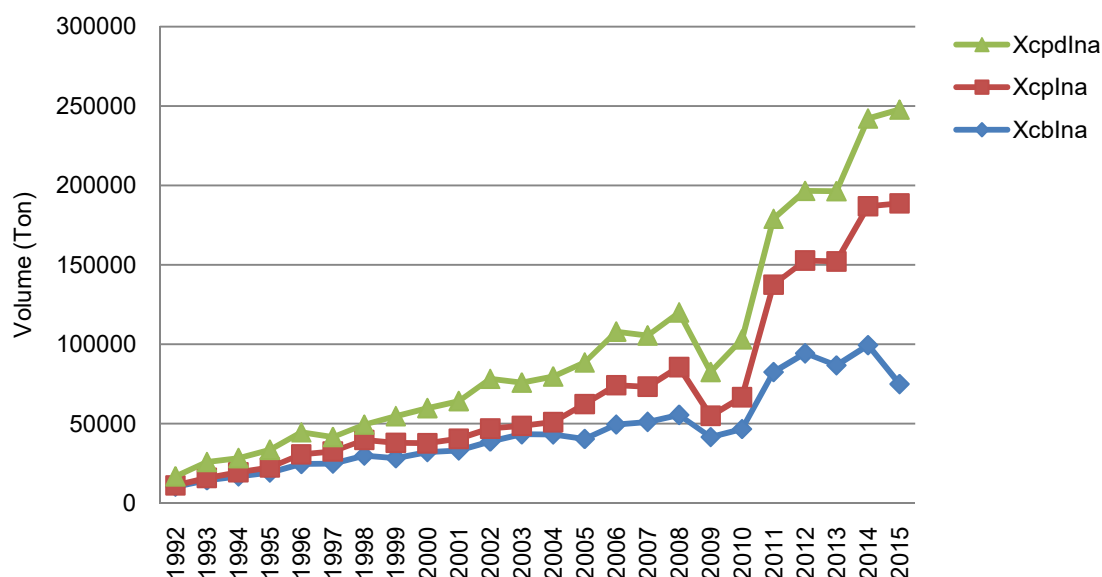


Figure 1 – Export of Cocoa Butter, Cocoa Pasta &amp; Cocoa Powder

The result of statistic test with linear system procedure can be seen in tables 1, 2 and 3. Cocoa paste exports have  $R^2$  as big as 95.19%. It means that exogenous variables used in the model have the opportunity to explain the variation of endogenous variables (Indonesian cocoa paste exports) as big as 95.19% and the rest of 4.81% influenced by other variables which is not included in the model.

Table 1 – Parameter Estimates of Cocoa Paste Export

| Variable                         | Coefficient | t-Value | Significant |
|----------------------------------|-------------|---------|-------------|
| Intercept                        | -6315.53    | -0.57   | 0.5778      |
| World cocoa-paste price          | 3.561258    | 0.97    | 0.3507      |
| Indonesia cocoa-paste price      | -0.90405    | -0.24   | 0.8129      |
| Netherland cocoa-paste export    | -0.12595    | -0.83   | 0.4219      |
| Cote d'Ivoire cocoa-paste export | 0.127951    | 1.22    | 0.2441      |
| Dummy of value added tax         | -22298.1    | -2.06   | 0.0588      |
| Dummy of Cocoa Beans Export Duty | 34108.29    | 2.91    | 0.0115      |
| The lagged export of cocoa-paste | 0.917234    | 6.06    | <.0001      |
| F Value = 39.57 (Sig. <0.0001)   |             |         |             |
| R square = 0.95189               |             |         |             |

It is obtained F-value as big as 39.57 and the error rate less than 0.01%. This shows that Indonesia cocoa paste export simultaneously with confidence level near 100% influenced by world cocoa-paste price, Indonesia cocoa-paste price, Netherland cocoa-paste export, Cote d'Ivoire cocoa-paste export, rupiah exchange rate against US dollar, value added tax and the lagged export of cocoa paste.

Partially, cocoa paste is significantly influenced by cocoa beans export duty, and the lagged export of cocoa paste and value added tax. This is because cocoa paste is the first intermediate processed cocoa product produced from cocoa beans. The next process is to process cocoa paste into cocoa butter and cocoa powder, so cocoa paste is subjected value added tax. The coefficient of the lagged export of cocoa paste has a positive sign and this sign corresponds to the theory, meaning that the presence of the lagged export of cocoa paste is used as a consideration to decide the volume of cocoa paste export on the current year.

The export duty of cocoa beans has a significant effect on the cocoa paste export. The availability of cocoa beans as a raw material is very important for intermediate processed cocoa industry. The positive sign on the coefficient means that the export duty of cocoa beans is made to support the development of domestic processed cocoa industry and the

increasing acceptance of added value from cocoa beans. The quantity volume of the lagged export of cocoa paste as a form of caution and consideration to decide the current volume of cocoa paste export.

The result of statistical test analysis with linear system procedure in table 2 illustrates that cocoa butter exports have  $R^2$  of 90.26%. It means that exogenous variables used in the model have the opportunity to explain the variation of endogenous variables (cocoa butter export) of 90.26% and the remaining 4.81% is influenced by other variables not included in the model.

The model has a F-value as big as 16.22 with an error rate of less than 0.01%. This indicates that Indonesian cocoa butter export simultaneously with near confidence level as 100% influenced by cocoa butter price of the world, domestic cocoa butter (and cocoa powder) price, cocoa butter export of countries competitors, rupiah exchange rate against US dollar, value added tax and export volume of lagged export of cocoa paste.

Table 2 – Parameter Estimates of Cocoa Butter Export

| Variable                          | Coefficient | t-Value | Significant |
|-----------------------------------|-------------|---------|-------------|
| Intercept                         | -10247.6    | -0.48   | 0.6375      |
| World cocoa-butter price          | 3.561390    | 0.34    | 0.7355      |
| Indonesia cocoa-butter price      | -4.90976    | -0.56   | 0.5840      |
| Netherland cocoa-butter export    | 0.140739    | 0.84    | 0.4140      |
| Cote d'Ivoire cocoa-butter export | 0.165908    | 0.54    | 0.6006      |
| Exchange Rate Indonesia           | 0.132282    | 0.11    | 0.9132      |
| Dummy of value added tax          | -7161.55    | -0.58   | 0.5680      |
| Dummy of Cocoa Beans Export Duty  | 22786.66    | 1.82    | 0.0898      |
| The lagged export of cocoa butter | 0.474043    | 2.06    | 0.0586      |
| F Value = 16.22 (Sig. <0.0001)    |             |         |             |
| R square = 0.90264                |             |         |             |

Partially cocoa butter export is influenced by cocoa beans export duty and the lagged export of cocoa butter. The export duty of cocoa beans has a significant effect on the cocoa butter export. It is like in cacao paste industry, the availability of cocoa beans as raw material is very important for the cocoa butter industry. The positive sign on the coefficient means that the export duty of cocoa beans strongly supports the development of cacao butter industry.

The volume of the lagged export of cocoa butter affects the cocoa powder export of the year. This is an evaluation from the result of the lagged export of cocoa butter and used as a consideration to decide the export volume of cocoa butter in this year.

Table 3 – Parameter Estimates of Cocoa Powder Export

| Variable  | Coefficient | t-Value | Significant |
|---|-------------|---------|-------------|
| Intercept   | -7406.49    | -1.12   | 0.2820      |
| Ratio World cocoa-powder price and the lagged price of cocoa powder | 2525.721    | 0.76    | 0.4604      |
| Indonesia cocoa-powder price  | -2.36111    | -1.44   | 0.1741      |
| Netherland cocoa-powder export                                      | 0.056616    | 1.57    | 0.1405      |
| Malaysia cocoa-butter export  | 0.002398    | 0.06    | 0.9543      |
| Exchange Rate Indonesia   | 0.400682    | 1.01    | 0.3328      |
| Dummy of value added tax  | -5880.46    | -1.55   | 0.1445      |
| Dummy of cocoa beans export duty                                    | 15972.39    | 3.97    | 0.0016      |
| The lagged export of cocoa powder                                   | 0.737421    | 5.35    | 0.0001      |
| F Value = 46.22 (Sig. <0.0001)                                      |             |         |             |
| R square = 0.96604  |             |         |             |

The result of statistical test analysis with linear system procedure in table 3 illustrates that cocoa powder export have  $R^2$  of 96.60%. It means that the exogenous variables used in the model have the opportunity to explain the variation of Indonesian cocoa powder variable of 96.60% and the rest of 3.40% is influenced by other variables not included in the model.

The cocoa powder export model has F-value of 46.22 with an error rate of less than 0.01%. This indicates that Indonesian cocoa powder export simultaneously with 100% confidence level influenced by cocoa butter price of the world, domestic cocoa butter price,

cocoa butter export of competitor countries, rupiah exchange rate against US dollar, value added tax and the lagged export of cocoa powder.

There are several exogenous variables similar in the model with some previous research ie world prices and exchange rates, but the results obtained are different. The results of Kiong W.S. et al (2010), Faustino B. (2011) and Verter N. (2016) stated that world black pepper price, world cocoa beans price and world coffee price affect export volume, while Abdel A. A. et al (2009), Nwachukwu I.N. et al (2010), Verter N. (2016) and Faustino B. (2011) in their research stated that the exchange rate affects the volume of export. The results of this study indicate that the world price of cocoa paste, cocoa butter and cocoa powder and exchange rate have no effect on export volume, but the tax policy in the form of value added tax and cocoa beans export duty and The lagged export of processed cocoa have significant effect on intermediate processed cocoa export. Arsyad M. (2007) in his study advised not to give export duty on cocoa beans because harming cocoa farmers. Arsyad M. et al in his research in 2011 stated that the export tax policy negatively impacted the decline of cocoa beans export.

Arsyad's research is different from this research. The results of this study provide a positive sign of coefficient on cocoa beans export duty. It means that the export duty of cocoa beans is significant for the sustainability of intermediate processed cocoa production. The negative sign on the dummy coefficient of value added tax means that without it, cacao paste export will increase, due to a decrease in operational costs of the production process. Value added tax is charged to cocoa paste because it is the first intermediate processed cocoa product produced from cocoa bean processing.

Table 4 – RCA of Cocoa Paste, Cocoa Butter and Cocoa Powder

| Tahun | RCA Cocoa Paste | RCA Cocoa Butter | RCA Cocoa Powder |
|-------|-----------------|------------------|------------------|
| 2005  | 1.319           | 90.835           | 3.596            |
| 2006  | 1.306           | 96.952           | 3.745            |
| 2007  | 1.393           | 105.792          | 3.442            |
| 2008  | 1.828           | 102.903          | 3.392            |
| 2009  | 1.279           | 93.570           | 3.227            |
| 2010  | 3.204           | 102.289          | 3.559            |
| 2011  | 6.097           | 95.568           | 3.891            |
| 2012  | 7.838           | 121.474          | 4.733            |
| 2013  | 7.134           | 108.364          | 4.273            |
| 2014  | 8.012           | 115.330          | 5.259            |
| 2015  | 9.869           | 125.305          | 6.907            |

Source: Secondary data analysis from Trademap.

The quantity of Indonesian intermediate processed cocoa competitiveness can be measured using Balassa Index which emphasizes measurement on actual export value. The actual export flow represents a strong sector of a country known as the Revealed Comparative Advantage. Using Balassa index, its obtained the competitiveness value of cocoa paste, cocoa butter and cocoa powder as can be seen in table 4.

Based on table 4, Cocoa Paste, Cocoa Butter and Cocoa Powder has an index value greater than one. It means that these products have a comparative advantage and can compete in the world market. Cocoa butter has a comparative advantage or greater competitiveness than cocoa paste and powder. It's because the price of cocoa butter is higher than the price of the other processed cocoa. As well as cocoa paste export, cocoa butter and cocoa powder, after the enactment of cocoa beans export duty policy in 2010, the competitiveness value of these intermediate processed cocoa products showed an increase. Thus, in order to increase cocoa paste, cocoa butter and cocoa powder competitiveness in the world market, it is necessary to increase the export of these products. With the increasing competitiveness of these intermediate processed cocoa products in Indonesia, Indonesia's opportunity to be an important country in the intermediate processed cocoa market is getting bigger.

## CONCLUSION

Based on results and discussion, it is concluded that cocoa butter and cocoa powder exports are significantly influenced respectively by cocoa beans export duty and the lagged export of its cocoa, while cocoa paste is significantly influenced by value added tax, cocoa beans export duty and the lagged export of cocoa paste. The policy setting by the government greatly influences the strength of intermediate processed cocoa export. The export restriction of cocoa beans is very important to increase the export volume of cocoa paste, cocoa butter and cocoa powder. Similarly, the policy of value added tax that greatly affects the cost of production to produce cocoa paste. The elimination of value added tax will further increase the export volume of cocoa paste. The increased export of the cocoa paste, cocoa butter and cocoa powder make cocoa Paste, cocoa butter and cocoa powder have a comparative advantage which is better in the world market.

## REFERENCES

1. Akbar Faisal, 2015. Trade Policy Analysis of Indonesia Cocoa Industry, National Chung Hsing University, Department of Applied Economics, <https://www.researchgate.net>.
2. Chileshe Moses, 2005. Factors Affecting Coffee Exports in Zambia, University of Zambia.
3. Coffee and Cocoa Research Center, 2016. Jember, Indonesia
4. Directorate General of Plantation, 2014. Statistik Perkebunan Indonesia, Kakao 2013-2015, [ditjenbun.pertanian.go.id](http://ditjenbun.pertanian.go.id).
5. FAO, Food and Agriculture Organization of the United Nations, [www.fao.org](http://www.fao.org).
6. Hameed Abdel Amna Awad, Hasanov Akram et al (2009), Supply and Demand Model for the Malaysian Cocoa Market, MPRA Paper No. 19568, posted 25, <http://mpra.ub.uni-muenchen.de>
7. Kagochi J.M, 2007. Evaluating the Competitiveness of US Agricultural Market Commodities, Auburn University, Alabama.
8. Kiong Wong Swee, Khalid Abdul Rahim, Mad Nasir Shamsudin. (2010). Global Economy and Finance Journal Vol. 3 No. 1 March 2010, Pp. 78-87 Long-run Determinants of Export Supply of Sarawak Black and White Pepper: An ARDL Approach, <http://www.wbiaus.org>.
9. Ministry of Finance, 2012. Kajian Perkembangan Perekonomian Kakao Indonesia Pasca Pengenaan Bea Keluar Biji Kakao, <http://www.fiskal.depkeu.go.id>
10. Nwachukwu Ifeanyi Ndubuto, Nnanna Agwu , Jude Nwaru and George Imonikhe, 2010. Competitiveness and Determinants of Cocoa Export from Nigeria, Report and Opinion ISSN: 1553-9873,2(7): 51-54, <http://www.sciencepub.net>
11. Nwachukwu Ifeanyi Ndubuto et al, 2014. Competitiveness in The Export Demand for Nigerian Rubber. The Journal of Agricultural Sciences, 2014, vol.9, no 1: 1-12 <https://www.researchgate.net>
12. Salvatore, Dominick. 2014. Ekonomi Internasional. Jakarta Selatan: Salemba Empat
13. Trademap. Trade Statistics for International Business Development, <http://www.trademap.org>.
14. UNComtrade. United Nations Comtrade Database - International Trade Statistics <https://comtrade.un.org/>
15. Verter Nahanga, 2016. Cocoa export performance in the world's largest producer. Bulg. J. Agric. Sci, 22: 713–721

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## **FOREIGN EXPERIENCE OF PUBLIC-PRIVATE PARTNERSHIP'S PROJECTS IMPLEMENTATION: PROSPECTS FOR RUSSIA**

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### **ABSTRACT**

In the article the author analyzes the foreign experience of implementing projects within the public-private partnership framework and considers the possibilities of its application in Russia. In the modern understanding, public-private partnership is understood as an institutional and organizational alliance between the state and business in order to implement national and international, large-scale and local, but always socially significant projects in a wide range of activities: from the development of strategically important industries and science research and development to the provision of public services. As a rule, such alliance is temporary, as it is created for a certain period of time in order to implement a particular project and ceases to exist after its implementation.

### **KEY WORDS**

Public-private partnership, models, industry, infrastructure, investments, government programs, non-governmental funding, private business, privatization, economic potential.

Today the organization of interaction between the public sector and entrepreneurial structures is one of the main ways that can ensure the growth of the investment potential of the socio-economic sphere of management. That is why the question of financing infrastructure development projects in conditions of limited possibilities of state budgets and unused resources of private business remains one of the topical areas of research.

Interest in public-private partnership as a form of cooperation between state and business structures for the development, planning, financing, construction and operation of infrastructure is due to the fact that the purpose of this cooperation is the implementation of national and international socially significant projects in various fields of activity on a long-term basis, the pooling of resources and the sharing of risks among participants [1].

The prerequisite for creating a PPP was the belief that private business is more mobile, and therefore operates more efficiently than state structures. The main areas of application of partnerships were, first of all, those that traditionally belonged to the jurisdiction of the state. For example, public goods, such as transportation, communal, social infrastructure, cultural facilities, public services - the maintenance of public facilities, utilities, environmental facilities, law enforcement services, social facilities - education, health, social protection [2]. Analyzing the experience of developed and actively developing countries in the sphere of construction, maintenance and operation of infrastructure facilities, it is possible to follow changes in such sectors as road and municipal services, railway and pipeline transport, electric power industry, seaports, and airports formerly owned by the state. The reason for these changes was, on the one hand, the lack of funds in state budgets, not only for further development, but also for the simple maintenance of these industries, and on the other, the inability to privatize these sectors because of their strategic, social and socio-political significance. The emerging contradiction served as a basis for the creation and introduction into business practice of the concept of public-private partnership [3]. This system of relations between the state and private business arose as a result of many years of searching for ways to improve the quality of public services while reducing the country's budget expenditures for these purposes.

The sectors of this form partnership application vary by country, and the leading positions are taken by projects for the creation and development of energy and transport infrastructure. According to the World Bank the most frequently implemented public-private

partnership projects in the energy sector were 41% of the total number of projects, 27% in the transport and road sector, 17% in the field of communications, 15% in providing water supply and development of sewage and treatment systems in low- and middle-income countries from 1990 to 2016 [4].

The cooperation attractiveness within the framework of public-private partnership lays in the possibility each participant strengths combining. This is the legal authority, protectionist procurement policy, the balance of goals to meet public needs, labor and capital resources for the public sector, and – management effectiveness, the latest technologies, efficient production facilities, cash management experience, staff development, integrated resource use – for the private one.

Thus, the public-private partnership mechanism allows to unite the strong positions of each side [5].

At the same time, this system of relations causes many disputes among scientists and practitioners. To date, there is no specific definition, no single understanding of the essence of public-private partnership. Thus, some experts consider public-private partnership as a form of indirect privatization on the grounds that the advanced economies experience often indicates a redistribution of powers between the state and private business, with the broad powers transfer, related to the ownership, operation, construction and financing of facilities. In this case, cases of subsequent partial or complete privatization of such objects are not uncommon.

Other scientists consider PPP as a special, full-fledged form of state facilities privatization replacement, which allows, on the one hand, to realize the entrepreneurial initiative potential of private capital, on the other hand, to retain state's control functions in socially significant sectors of the economy. At the same time, the state remains the owner of the objects, attracting private capital to solve a variety of problems [6].

Contradictions in understanding the partnership essence and the indistinctness of formulations served as a prerequisite for the key principles formation on which the term PPP understanding in the world practice is based. As a rule, they are usually referred to as:

1. Public-private partnership assumes official relations or arrangements between public and private participants, which are fixed in official documents, in particular in regulatory legal acts, that is, they form special legal institutions;

2. Bodies of state and municipal management act in PPP projects not like as a regulator, but as an equal partner for a private investor, who does not seek to realize his power over him;

3. First of all, public-private partnership projects are aimed to realize public interests, which are formed on the basis of nation-wide public benefit goals;

4. The nature of joint actions is inherent for public-private partnership, when the state and the private investor jointly attract resources, make decisions in the process of financing and managing the project [7].

To decide whether to use one of the public-private partnership mechanisms for the project implementation, the state proceeds from two points of view. The first point is based on a financial approach – when the objective is to use private capital to meet infrastructure needs, the second one – on the operational approach – when the goal is to optimize time and efficient allocation of costs in the operation of the facility. This is a determining factor in the choice of the public-private partnership scheme, which differ from each other, mainly, the share of risk transferred to the private sector, the volume of each party's investment, control over various types of work and ownership of assets.

Legal public-private partnership models may be different, but the state's primary role in budget instruments using, public property, legislative regulations and other public prerogatives to manage a portion of project risks that private participants can't bear remains unchanged.

Examples of successful cooperation between the state and business structures are functioning public infrastructure facilities, both in developed and developing countries.

The largest practical experience in realizing a partnership between the state and the private sector has been accumulated in the USA, Canada and Australia, where PPP

development concepts are included in government programs [8]. One of the most famous public-private partnership successful implementation examples is the creation in the United States of the Interstate Highway System.

The project duration was 17 years (from 1956 till 1973), estimated cost - USD \$129 billion, and the total length of the constructed roads exceeded 90,000 kilometers (high-speed toll roads over 9,000 kilometers). In addition to the construction of highways, the USA is implementing projects in the field of energy, municipal economy, and IT systems.

Table 1 – The main (basic) public-private partnership models classification

| PPP Model  | The main characteristics  |
|--|---|
| Construction-operation-transfer (BOT-Build, Operate, Transfer)                             | Used mainly in concessions. Infrastructure is created due to the concessionaire, which after the completion of operation acquires the right to build facility within the period allotted for recoupment of invested funds. After the object is passed to the state.                   |
| Build-own-operate-transfer/management (BOOT-Build, Own, Operate, Transfer)                 | In this case, the private partner receives the authority to not only use, but also ownership of the object during the term of the agreement, after which it passed into the ownership of the State.   |
| Build-transfer-operate/manage (BTO-Build, Operate, Transfer)                               | This mechanism involves the transfer object state immediately upon completion. He then goes into the usage of the private partner, but without the right of ownership to it. The term of the agreement shall be sufficient to the private partner failed to recoup their investments. |
| Build-own-operate/manage (BOO-Build, Own, Operate)   | The object created by the expiration of the agreement is not transferred to the public authorities, and remain at the disposal of the private partner.  |
| Construction-operation-transfer service (BOMT-Build, Operate, Maintain, Transfer)          | The private partner is responsible for the content and maintenance of built infrastructure for them.  |
| Design-build-own-operate-transfer/management (DBOOT-Design, Build, Own, Operate, Transfer) | The peculiarity of this agreements type is the responsibility of the private partner, not only for the infrastructure construction of the object, but also for its design.  |
| Design-build-finance-operate/manage (DBFO Design, Build, Finance, Operate)                 | The works complex on designing, construction, operation and financing of the private sector totally portable (concessionaire), and the owner is the state. Source of income for the private sector, most often in this case, the fee will be the direct beneficiaries of this object. |

*Source: Compiled by the author according to the «User Guidebook on Implementing Public-Private Partnerships for Transportation Infrastructure Projects in the United States» and the Toolkit for Public-Private Partnerships in the Road Sector PPIAF.*

In Canada, public-private partnership energy sector projects are successfully and most frequently implemented. However, public-private partnership in Canada is not limited to this direction only. An example of public-private partnership in the road sector is the construction of the ring road South East Edmonton Ring Road (Anthony Henday Drive). During the project implementation, 11 kilometers of the road were built with the number of lanes from 4 to 6; 24 bridges, 5 traffic interchanges, 3 overpasses, and 3 overpasses over the highway. The project was implemented in PPFO public-private partnership contract accordance. Funds for the project construction were allocated by the Government of Canada and Alberta from the Canadian Strategic Infrastructure Fund (Canada Strategic Infrastructure Fund - CSIF). Through this Fund, the Government of Canada works with the local government, as well as with private sector enterprises involved in infrastructure projects. The Fund supports large-scale projects aimed at strategic development, improving the quality of life and ensuring economic growth.

To implement the project, a private partner contract was concluded for 30 years, and the contract value was \$ 493 million.

In Australia, it is possible to single out the construction of a desalination plant among the large public-private partnership projects currently being implemented. The project cost is 3.1 billion Australian dollars was launched in 2007 as part of the state program «Our water is our future». To implement the project, a consortium of private companies was established to provide financing, construction, operation and maintenance of the plant. Another major

project is the construction of the «East Link» highway cost of 2.5 billion Australian dollars. For the purposes of the project, a consortium with the participation of «Masquarie Bank» (project financing), «Thiess and John Holland» (TJH) (construction), «Sociedad Iberica de Construccioness Electricas, SA» (road equipment), «Transfield Services Pty Ltd» (exploitation and technical support).

In China the active area of public infrastructure construction is the environmental infrastructure expansion, which includes water channels and wastewater treatment. Cooperation examples in this area include the 6th water treatment plant in Chengdu, the Northern sewage treatment plant in Shenyang and the wastewater treatment facilities in Beijing.

Also, public-private partnership mechanisms were successfully used in the construction of infrastructure facilities for the Olympic Games in Beijing, the gas project «Izhuang», the Beijing Metro, the «Laibin B Power Plant» in Guangqi Province, which was built with the foreign investment participation.

The Government of India, setting priorities for cooperation between the state and business, pays special attention to the country's infrastructure development. The total cost of the project for the construction of the first private water pipe in Tirupur (Tamil Nadu) exceeded \$ 230 million. To implement it, the Water Investment Company (Tamil Nedu Road Development Company) was based in the form of a joint venture between the state government and IL&FS company. Also within PPP project a 95-kilometer 6-lane Mumbai-Puni highway was built cost of \$ 400 million; along with P&O Australia and Jawaharlal Neru Port Crust, a two-stage sea container terminal Nhava Sheva was built. Among the successfully implemented national projects to modernize the airport infrastructure is the construction of terminals in the international airports of Bangalore, Hyderabad, Delhi and Mumbai.

Most public-private partnership projects around the world are quite capital intensive, so they are funded not only by attracted investors private capital, but also from other sources. This can be the placement of government orders financed from budgets of different levels, budget subsidies for partial financing of the project, provision of benefits (tax, administrative) from the state, issuance of government debt obligations [9].

Special attention should be paid to studying Russian experience in implementing PPP projects. The public-private partnership projects market development in Russia has only 6-7 years of history that definitely limits the number of successful projects, which, as a rule, are provided by the local authorities' own initiative and small in scale. The main models of regional public-private partnership projects are long-term leasing with the reconstruction condition, concession agreements, agreements on the development of the special economic zones (SEZ), agreements on the use of the Investment Fund, production sharing agreements, and others.

Most of the projects, such as the «Integrated Program for Construction and Reconstruction of Water Supply and Sanitation Facilities in the City of Rostov-on-Don and the South-West of the Rostov Region», the construction of the «Western High-Speed Diameter Motorway» in St. Petersburg, the establishment of a solid waste processing plant in the village of Yanino and others is in the stage of «current» projects.

To ensure the effective public-private partnership projects implementation in Russia, attention should be paid to the number of generally applicable conditions provision: unified project management system for public-private partnerships creation, including regulatory and legal support and the relevant institutional environment; the financing mechanisms development for various options of interaction between the state and private capital, including the state guarantees provision, as well as tax incentives for private investors involved in the major projects implementation; ensuring macroeconomic stability and stimulating the market environment development; a serious anti-corruption drive in the government; state structures experience and knowledge adoption for training specialists in state structures; proper execution of government property documents transferred to private capital management; well-considered approach in the risks allocation among the public-



private partnership project participants; ensuring a serious state expertise documentation submitted by potential private partners for the correspondence of its actual situation.

Today, Russia needs to adopt the long-standing positive experience of private capital attracting, effective management and modern technologies in order to create an economic and organizational legal mechanism in the country that would ensure the interest of private investors and a fair procedure for their competitive selection, reduce total public costs and production risks.

*Conclusion.* Public-private partnership worlds experience analysis in the projects implementation shows that the development of public-private relations on the principles of PPP fully justifies itself, contributing to the development of socially significant infrastructure and the achievement of a positive social effect at the state level. On the one hand, this type of partnership provides private partners with a long-term stable business, improving the company's image and obtaining additional opportunities for business development.

The state, by attracting non-governmental funding, reduces the costs of construction, maintenance and operation of infrastructure facilities and ensures cost-effective project management by transferring management functions to a private investor has the ability to attract modern high-performance technologies, improve the investment climate and obtain additional political «points» if the object has social significance.

Along with the cooperation schemes advantages between the state and private business, there are a number of issues that require more detailed research to improve the system of these relationships. The priority areas of study include combining the commercial motivation of the private sector with the needs of public organizations, the most rational and acceptable distribution of risks, managing partnerships through agreements within 20-30 years in a rapidly changing environment, an adequate evaluation of projects over 20 years and the classification of proposals in public-private partnership in terms of their effectiveness.

In connection with above-mentioned, author can conclude that further effective functioning of developed and developing countries' economies, active use forms of public-private partnership forms is necessary, which has already become one of the main instruments of public administration in the world. The last twenty years events have definitely shown that the private entrepreneurship economic potential and the state's possibilities integration is necessary to solve the most complicated socioeconomic, structural, technological and other strategic tasks of the countries development, to realize their national interests and to ensure an enabling environment for life activity.

## REFERENCES

1. Varnavsky V.G. (2005) Partnership of the state and private business: forms, projects, risks. M., Science.
2. Hayrapetyan M.S. (2010) Foreign experience of using public-private partnership [Electronic resource] // Legal portal of the «Arkon Group» URL: <http://arkon-group.ru>
3. Nikolaeva L.A., Komissarova V.V. (2011) Leasing as a form of financing innovative projects in the road economy // Transport business of Russia. No. 1. pp. 32-37
4. Private Participation in Infrastructure (2016) [Electronic resource] // Official site of the World Bank Group URL: [http://ppi.worldbank.org/explore/ppi\\_exploreRankings.aspx](http://ppi.worldbank.org/explore/ppi_exploreRankings.aspx)
5. Norment R. (2007) Fundamentals of Public-Private Partnerships (PPPs) [Electronic resource] // Official site of the «NCPMP» URL: <http://www.ncppp.org/resources/>
6. Bondar N.N. (2010) Experience of public-private partnership in the transport sector: achievements and setbacks [Electronic resource] // Legal portal of the «Arkon Group» URL: <http://arkon-group.ru/see.php?see=53>
7. Analytical report on the results of the study (2010) «Development of public-private partnership in the regions of the Central Federal District: investment and infrastructure», Public-Private Partnership Development Center
8. Dynkin A.A. (2008) World economy: forecast to 2020 // IMEMO RAS.
9. Overview of Key Elements and Sample Provisions State PPP Enabling Legislation for Highway Projects (2010) // Official site of the «Nossaman» URL: <http://www.fhwa.dot.gov>

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**THE APPLICATION OF AIDA MODEL (ATTENTION, INTEREST, DESIRE, ACTION)  
ON CONSUMPTION BEHAVIOR OF ECO-FRIENDLY PRODUCT IN DEMAK AND  
UNGARAN OF CENTRAL JAVA**

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**ABSTRACT**

This research aims to know the most dominant factors in determining consumption behavior of eco-friendly product which is based on AIDA Model (Attention, Interest, Desire, Action) in Central Java. The populations of the research are housewives (married & aged 20 – 65 years) in Central Java, while the sample of the research are housewives (married & aged 20 – 65 years) in 2 (two) cities of Central Java include: Demak and Ungaran. The samples amount to 150 respondents which are taken 75 respondents of each city. Data analysis used in this research is factor analysis. From the result of factor analysis, it can be concluded that the most dominant factors determining consumption behavior of eco-friendly product in Ungaran are a) having positive attitude to eco-friendly products & packaging, b) using plastic bags & Styrofoam as efficiently as possible, c) recommending the eco-friendly products and packaging, in addition, factors in Demak are a) starting to like eco-friendly products & packaging, b) recommending the eco-friendly products and packaging.

**KEY WORDS**

AIDA model, consumption behavior, eco-friendly product.

Indonesian Environment Week (PLI) of 2013, entitled "Change Your Behavior and Consumption Habits to Save the Environment", was held on 30 May - 2 June. Indonesian Environment Week (PLI) is one activity carried out routinely in order to increase people's awareness to the importance of preserving the environment. The annual event organized to commemorate the World Environment Day, coincided on June 5, is an arena presenting all forms of information on eco-friendly life, products and any information on government, private and stakeholder efforts in maintaining eco-friendly life.

Environmental issues cannot be seen as stand-alone but they are closely related to human behavior, especially in meeting their needs. Changes in behavior through lifestyle will definitely change the extraction pattern of natural resources and existing energy. Humans are encouraged not to use unsustainable natural resources. It is based on the Ministry of Environment (KLH) study results, indicating that the Environmental Care Behavior Index (IPPL) is 0.57 (of absolute numbers), it indicates that our society is not yet behaving in an environmentally conscious manner to our daily lives. Current consumption behavior of the society is the fulfillment of the 49.3% needs of foodstuffs imports. This condition will certainly leave an impact on the environment such as the increase of food-transportation emissions from the country of origin to the destination.

The widespread of environmental issues requires socio-environmental awareness, shown by recognizing and consuming eco-friendly products. Back-to-nature movement, through eco-friendly products, to get a better quality of life and to care for the environment, recently found in Indonesia although on a limited scale (Naomi, 2011). It is because there is not much information easily understood by the community, so that the movement of eco-friendly products is currently limited. This research is important and required to be conducted because eco-friendly products are classified as new product which is created to anticipate and overcome the environmental damage issues. As a form of innovation, this eco-friendly product takes a long time to be socialized and adopted by the wider society (Naomi, 2011). Eco-friendly product is a form of real contribution to nature. It means that raw materials are taken sustainably and leave no damage to the nature conservation which is processed in

clean and hygienic way, so that it is always in harmony with the nature. This product contains socioeconomic aspects and yet has market value; and the target of this eco-friendly product covers all consumer groups.

In addition to the consumption of eco-friendly products, attention to the packaging used is also important. Plastics have become a growing demand for human needs. Plastic needs of Indonesian people in 2002 were amounted to 1.9 million tons and was continued to increase to 2.3 million tons in 2004. Besides, it is estimated that each person disposes 700 plastic bags per year or equal to one to five plastic bags per day. Plastic and Styrofoam are the examples of packaging that are difficult to decompose and destroy naturally. It takes 1,000 to 5,000 years to decompose the plastic naturally and it takes 50 to 1,000 years to make the Styrofoam decay naturally (Firdaus et al., 2008). If the use of plastic packaging and Styrofoam remain happening in large numbers, the balance of the ecosystem environment will be threatened. The remaining organic waste, especially food, is only 2.2% being composted and the rest is thrown away then become a burden of environmental pollution. Actually, there is a tendency to change the consumption pattern toward sustainable consumption pattern, especially in the use of packaging.

## LITERATURE REVIEW

According to the American Marketing Association (AMA) "Green Marketing" is a product marketing that is presumed to be eco-friendly safe (Sadhev, 2011). Green marketing appears as a result of the increasing group of people who are eco-friendly conscious in their daily consumption behavior (ecologically conscious consumer behavior), or known as green consumers. As the result of consumer awareness of the impact of consumption to the environment, the demand for eco-friendly products (green product) increase as well. Green or eco-friendly marketing refer to organizational efforts to develop, package, and promote the products and services in the way that works to minimize the harmful effects to the physical environment (Gingerich and Karaatli, 2015).

The term 'eco-friendly' is used to describe activities which are good for environments; it is a short form of ecologically friendly, eco-friendly or green used to describe similar activities. Eco-friendly products mean products that should ecologically have minimal impact on environment. Eco-friendly products have an impact on the environment, but the impact is greatly reduced when compared to conventionally produced products (Sehgal & Singh, 2010). Green product, or is also known as ecologically product or eco-friendly product, is safe, non-toxic and recyclable products; and it uses eco-friendly packaging to reduce the negative impact of consumption of the products to the environment (Raluca -Mihaela Sandu, 2014; Shaikh, 2011). Kumar and Anand (2013) found that consumers positive attitude toward green product is not influenced by recession. Based on different definitions of green marketing, some common characteristics of the products are generally accepted as green, including the energy efficiency, water efficiency, low emission, safe and/or healthy products, recyclable and/or recycled content, durable, biodegradable, renewable, reused products, third party certified to society or transport standard (organic, certified wood), local product (Bhatia and Jain, 2013). Some studies have concluded the inclination of consumers to pay a higher price for the product with environmental credentials (Biswas, 2015).

In the new marketing era, products are evaluated not only based on performance or price, but also based on the social responsibility of consumers. In other words, the value of a product includes the aspects of environmental friendliness of the product itself and its packaging. Consumers, who want products that have minimal impact on the environment, are called green subscriber or green customer. But in fact, the Indonesian people are not concerned about the environment. Consumers in Indonesia, especially from the upper middle class, have been increasing awareness in buying a product. Consumer behavior can be defined as the action and decision process of people who purchase goods and services for personal consumption, (Sehgal and Singh, 2010). Consumer behavior is the mental of emotional process and the observable behavior of consumers during searching, purchasing and posting consumption of product and service. Within the scope of consumer behavior, the

view or assessment of a product varies greatly; it is influenced by the uniqueness of each individual, (Sehgal and Singh, 2010). The unique combination of various factors in the individual characteristics will shape the personality of the individual (Schiffman and Kanuk 2006). Other than being influenced by personality, consumer behavior also influences consumer awareness of a product. Awareness of the product is automatically formed by the individual with the help of the surrounding conditions. Consumer awareness of a product is usually used as an indicator of product performance successfulness. It is because, after the consumer own this awareness then the consumer will try the product until finally decided to become a regular customer or not. In addition, consumers not only focus on the decision making process of purchasing but also focus on awareness of the specific dimensions and characteristics of the product (Naomi, 2011).

In exploring green purchasing behavior, many studies have reported a discrepancy or "gap" between consumers expressed favorable attitudes and actual purchasing practices, (Joshi & Rahman, 2015). (Joshi & Rahman (2015) found that while many consumers showed a positive attitude toward purchase of organic food products (67%), only a small number of consumers (4%) who are actually purchased the products. Similarly, Joshi & Rahman, (2015) found that 30% of the consumers in the UK have reported their concern to the environment, but rarely translated their concern into a green purchase. Thus, it is clear that there is a gap between consumers 'thinking and actual actions; this discrepancy or gap between consumers' favorable attitude and actual purchase behavior of green product is referred to green purchasing inconsistency or green attitude behavior gap; it signifies that consumer positive attitude toward green product does not always translate into action. Previous research conducted by Maharani (2010) states that eco-friendly consumer behavior can be analyzed not only through the reflection of buying actions, recycling and eliminating the products, but also through the mood conditions that reflects the level of green consciousness. It is also through active and positive attitude to recycle and the willingness to pay more for eco-friendly products, (Ali, 2013). Therefore, eco-friendly behavior presents different manifestations that are sometimes not in the form of final action, but in the form of eco-friendly feelings and attitudes.

The result of a research conducted by Sumarsono and Yayat G, 2012 stated that there is no positive influence from consumer knowledge to environmental information which is contained in product packaging to decision of purchasing eco-friendly detergent product, but there is a positive influence from consumer attitude toward the impact of consumption behavior to the environment to the decision in purchasing eco-friendly detergent products. Several studies have attempted to identify the characteristics of environmentally consumers related to marketing implications (Maharani, 2010). The studies try to explore environmental concerns and purchasing behavior that are environmentally-based insight. Research findings indicate that there is a strong environmental concern trend; and consumers prefer to choose eco-friendly products. Consumer purchasing behavior with environmentally-based insight is also examined by Maharani (2010) by using disposable baby diaper products that are not eco-friendly compared to traditional cloth diapers that are more eco-friendly. Her research aims to develop models that can predict the purchase of a specific type of eco-friendly product. Shaikh (2011) had a view that there is a direct relationship between eco-awareness and eco-oriented attitude. On the contrary, many studies show that environmental awareness does not significantly affect the performance of ecological oriented behavior, (Shaikh, 2011). Shaikh (2011) stated that such type of conflicting findings indicates complex relationships between environmental awareness and attitude. The lack of awareness about green product and negative perception of green product can be resolved by educating customers and building better product respectively, (Kumar and Anand, 2013). Kumar and Anand (2013) have developed a model for understanding green purchase intentions between consumers by using for factors, they are green perceive value, green perceive risk, green trust and green purchase intention; and he stated that consumers who perceive that green products are better for environment will have positive purchase intention toward green product.

The AIDA model is a response model consisting of: Attention, Interest, Desire, and Action. Consumer action to consume an innovation is a series of stages that begin with

awareness then form the next attention to form interest until it finally forms an action (Kotler and Armstrong 2008).

## METHODS OF RESEARCH

*Population and Sample.* The populations of the research are housewives aged 20 - 65 years old in Ungaran and Demak of Central Java. Meanwhile, the samples of the research are housewives aged 20 - 65 years old in Ungaran District (Leyangan and Gogik Village) and Demak District (Katonsari and Jogoloyo Villages of Central Java). The minimum sample size is using the following formula:

$$n = \frac{(Z \frac{1}{2} \alpha)^2 (\delta)^2}{(\epsilon)}$$

By the error rate ( $\alpha$ ) of 10%, then  $Z \frac{1}{2} \alpha = 1.645$ ,  $(\epsilon) = 0.1$ , standard deviation  $(\delta) = 0.5$ ; so the minimum sample ( $n$ ) is 67.65 and is rounded to 75 respondents. In this research, 75 respondents are taken from each District / City.

*Sampling Technique and Data Collection Method.* Sampling technique used in this research is non-probability sampling. Type of sampling used is purposive sampling. Purposive sampling is a sampling technique based on certain considerations; the selected samples in the study are housewives aged 20 – 65 years. Method used in obtaining the data is survey method by using interview and questionnaire (question list). Data collection method to be used in this study is structured interview by using Personally Administered Questionnaires. After the data are collected, the questionnaire is analyzed through its Validity and Reliability to get feasible data for the research.

*Hypothesis Verification and Testing.* Factor Analysis is firstly used in proving and testing the hypothesis. Factor Analysis is "a series of procedures used to reduce the doubling of tests and measurements to be much simpler" (Wibisono, 2000):

| Construct   | Dimensions     | Indicators  | Measurement Scale                      |
|---|----------------|---|--|
| Consumption Behavior of Eco-Friendly Products by Using AIDA Model | Attention (A1) | <ul style="list-style-type: none"> <li>Having a positive attitude about eco-friendly products and packaging/ container</li> <li>Taking the eco-friendly products and packaging/ container as the main preference in shopping</li> <li>Starting to understand the aim of eco-friendly products and packaging/ container</li> <li>Understanding the information about eco-friendly product and packaging/ container</li> <li>Understanding the information about plastic bags and Styrofoam which are harmful to health/ environment</li> </ul> | Interval data with Likert scale of 1-5 |
|   | Interest (I)   | <ul style="list-style-type: none"> <li>Starting to like eco-friendly products and packaging/ container for daily consumption</li> <li>Starting to plan buying eco-friendly products and packaging / containers</li> </ul>   | Interval data with Likert scale of 1-5 |
|   | Desire (D)     | <ul style="list-style-type: none"> <li>Starting to try/ consume eco-friendly products</li> <li>Starting to use eco-friendly packaging/ containers</li> <li>Looking for in-depth information about eco-friendly products and packaging/ containers</li> </ul>  | Interval data with Likert scale of 1-5 |
|   | Action (A2)    | <ul style="list-style-type: none"> <li>Using plastic bags and Styrofoam as efficiently as possible</li> <li>Throwing away plastic bags and Styrofoam wisely</li> <li>Purchasing eco-friendly products</li> <li>Recommending eco-friendly products and packaging/ containers</li> <li>Willing to pay with the expensive price in consuming eco-friendly products and packaging/ containers</li> </ul>  | Interval data with Likert scale of 1-5 |

*Research Model and Hypotheses based on AIDA Model.* This research model can be described as follows:

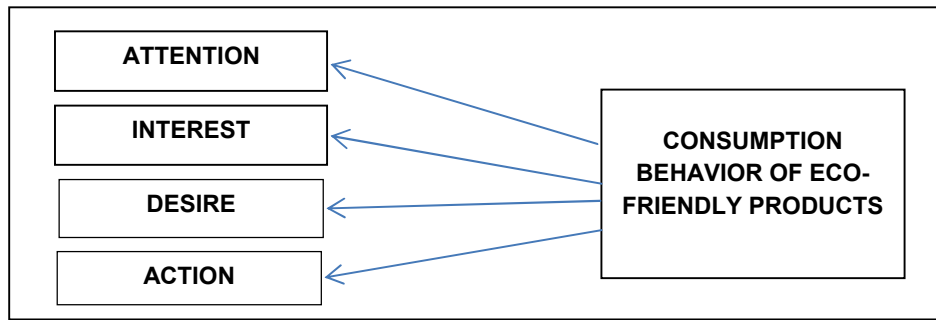


Figure 1 – Research Model

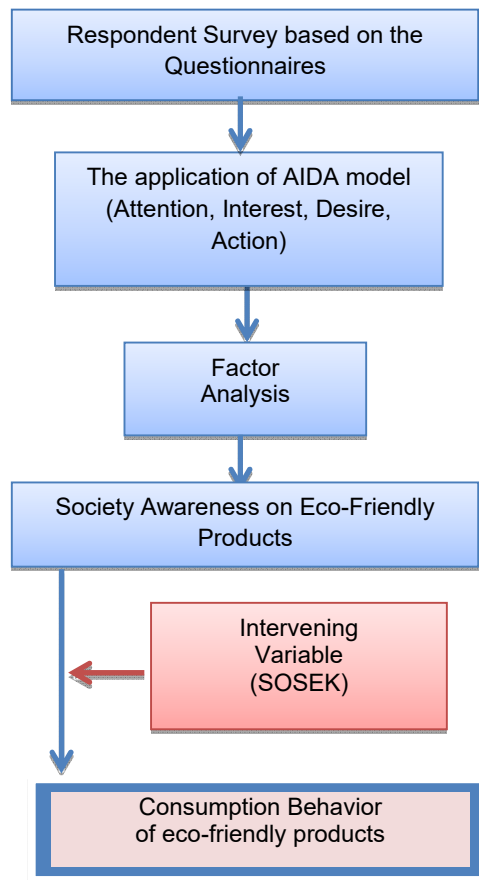


Figure 2 – Research Flowchart

Appropriate hypothesis, according to the research model, is that there are most dominant factors that form Consumption Behavior of eco-friendly products based on the application of AIDA Model to housewives in Demak and Ungaran of Central Java.

## RESULTS AND DISCUSSION

*Validity.* The r-table for the number of respondents 75,  $df = n-2$ ,  $\alpha = 0.05$  and in two sides, is 0.230.

*Ungaran District.* From the SPSS results, it shows that all the factors in dimensions 1, dimension 2, dimension 3 and dimension 4 are valid, even if the indicator of dimension 1 is invalid; it means that the questionnaire is able to measure what to be measured, except the

invalid indicator. Thus, A1.5 dimension should be removed so that the indicator validity of the dimension 1 indicates that all the factors, including dimension 1, are valid which means that the questionnaire is able to measure what to be measured.

**Demak District.** From the SPSS results, shows that all the factors both in dimensions 1, dimension 2, dimension 3 and dimension 4 are valid, meaning that all questionnaires are able to measure what to be measured.

**Reliability.** The output result of SPSS reliability in Ungaran and Demak District shows alpha cronbach value for all dimensions  $> 0.7$  which means that it is reliable; thus, it can be concluded that the questionnaire used in this research is reliable.

**KMO Method.** Kaiser Meyer Olkin (KMO) method is used to test the suitability of factor analysis. KMO is a comparative index to the amount of partial correlation coefficient. In Ungaran District, KMO from SPSS result is  $0.824 > 0.5$ ,  $\alpha = 0.05$  and significant  $0.000$ ; it means that factor analysis can be used in this research. Same thing for Demak District, KMO from SPSS result is  $0.795 > 0.5$ ,  $\alpha = 0.05$  and significant  $0.000$ ; it means that factor analysis can be used in this research.

Table 1 – Rotated Component Matrix<sup>a</sup>

|      | Component |      |      |
|------|-----------|------|------|
|      | 1         | 2    | 3    |
| A1.1 | .742      | .167 | .032 |
| A1.2 | .673      | .157 | .435 |
| A1.3 | .584      | .688 | .014 |
| A1.4 | .537      | .668 | .096 |
| I1   | .654      | .358 | .319 |
| I2   | .681      | .237 | .442 |
| D1   | .345      | .133 | .692 |
| D2   | .514      | .066 | .635 |
| D3   | .413      | .258 | .545 |
| A2.1 | .269      | .828 | .085 |
| A2.2 | .131      | .623 | .366 |
| A2.3 | .065      | .732 | .426 |
| A2.4 | .033      | .501 | .778 |
| A2.5 | .070      | .103 | .672 |

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.  
a. Rotation converged in 11 iterations

Table 2 – Rotated Component Matrix<sup>a</sup>

|      | Component |      |
|------|-----------|------|
|      | 1         | 2    |
| A1.1 | .150      | .703 |
| A1.2 | .409      | .638 |
| A1.3 | .589      | .583 |
| A1.4 | .469      | .678 |
| A1.5 | .606      | .539 |
| I1   | .158      | .862 |
| I2   | .211      | .842 |
| D1   | .577      | .579 |
| D2   | .770      | .391 |
| D3   | .717      | .214 |
| A2.1 | .535      | .459 |
| A2.2 | .580      | .453 |
| A2.3 | .794      | .197 |
| A2.4 | .839      | .321 |
| A2.5 | .704      | .083 |

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.  
a. Rotation converged in 3 iterations.

**Factor Extraction.** Principal Component Analysis (PCA) is a data reduction technique that aims to form a linear combination of the initial variables by calculating as many as

possible the achievable initial variations. In Ungaran District, out of the 14 questions/ factors (indicator A1.5 is removed out due to the invalidity), it can be grouped into 3 dimensions (eigen value > 1). From the SPSS result, dimension 1 can explain variation equal to 48.496%, dimension 2 can explain variation equal to 9.876%, dimension 3 can explain variation equal to 8.405%; or the 3 dimensions can explain variation equal to 66.777%.

Meanwhile, in Demak District, out of 15 items of questions/ factors, it can be grouped into 2 dimensions (eigen value > 1). From the above SPSS table, dimension 1 can explain variation equal to 55.172%, dimension 2 can explain variation equal to 9.031%; or both dimensions can explain variation equal to 64.203%.

*Factor Rotation.* The results of factor extraction are difficult to interpret, so that factor rotation is needed. Factor rotation can clarify and highlight every factor, making it easier to interpret; in this case, A1 (Attention), I (Interest), D (Desire), and A2 (Action).

*Demak District.* By the use of varimax rotation, SPSS output as shown in the table above shows that the factors of dimension 1, with large loading, (> 0.5) are, A1.3, A1.5, D2, D3, A2.1, A2.2, A2.3, A2.4, A2.5, the factors of dimension 2, with large loading, (> 0.5) are A1.1, A1.2, A1.4, I1, I2, D1. The factor of dimension 1 that has the high-weight dimensions can be used as a basis for determining the consumption behavior of eco-friendly products in question. In the result of varimax rotation above, dimension 1 is formed by I1 (starting to like eco-friendly products & packaging and dimensions 2 formed A2.4 (recommending eco-friendly products and packaging). They can be seen in Table 1 and Table 2.

*Ungaran District.* By using varimax rotation, SPSS output, as shown in the table above, shows that the factors of dimension 1, with large loading, (> 0.5) are A1.1, A1.2, I1, I2. The factors of dimension 2, with large loading, are A1.3, A1.4, A2.1, A2.2, A2.3, whereas the factors of dimension 3, with large loading, are D1, D2, D3, A2.4, A2.5. Factors of high-weight dimensions can be used as a basis for determining the related consumption behavior of eco-friendly products. In the result of varimax rotation above, dimension 1 is formed by A1.1 (having positive attitude about the eco-friendly product & packaging), dimension 2 is formed by A2.1 (using plastic bags & Styrofoam as efficiently as possible), and dimension 3 is formed by A2.4 (recommending eco-friendly product & packaging).

## CONCLUSION AND SUGGESTIONS

Reliability testing for all questionnaires/ indicators, for both Ungaran and Demak respondents is reliable. Validity test for all questionnaires/ indicators, for both Ungaran and Demak respondents is valid except the A2.5 indicator about the understanding of plastic bags and Styrofoam; it is not valid for Ungaran respondents. After going through the factor analysis, it can be concluded that consumption behavior of eco-friendly product in Ungaran society is formed from 1) having positive attitude about eco-friendly products & packaging, 2) using plastic bags & Styrofoam as efficiently as possible, 3) recommending eco-friendly products & packaging. Meanwhile, the consumption behavior of eco-friendly products in the Demak society is formed from 1) starting to like the eco-friendly product & packaging, 2) recommending eco-friendly products and packaging.

The most dominant efforts to increase the awareness of public consumption of eco-friendly products are attention, interest and action; therefore, environmental care information from the Ministry of Environment and incentive promotion from companies that produce eco-friendly products are necessary, in the following ways:

- a. Building attention and interest through slogans, sponsorships, advertisements.
- b. Building action by recommending to others by word of mouth.

## RECOMMENDATIONS

Recommendations in this study include a) the needs of socialization and information by having community service to the people living in villages about the knowledge of eco-friendly product and packaging; when the society do not get the information then it will endanger public health. The government may facilitate facilitation such as newspapers, magazines,



television, internet, and free hotspots, b) socio-economic factors, namely income (ability of purchasing power), is needed as an intervening variable that can improve the ability to buy, c) further research on eco-friendly lifestyles is needed to ascertain whether people has been consuming eco-friendly products.

## REFERENCES

1. Ali, S. (2013). Prediksi Perilaku Ramah Lingkungan Yang Dipengaruhi Oleh Nilai Dan Gaya Hidup Konsumen. *Jurnal Perspektif Bisnis*, Vol.1, No.1, Juni 2013, ISSN: 2338-5111
2. Bhatia, M & Jain, A. (2013). Green Marketing: A study of Consumer Perception and Preference in India. *EGJ, eScholarship University of California*, 1 (36) 2013, ISSN 1076-7975.
3. Biswas, A. (2016). A Study of Consumers' Willingness to Pay for Green Product. *Journal Of Advanced Management Science*, Vol.4, No. 3. May 2016
4. Firdaus, F., Mulyaningsih, & S., Anshor, H, (2008). Sintesis film kemasan ramah lingkungan dari kompositpati, khitosan, dan asam polilaktat dengan pemlastik gliserol. *Logika*, hal 14-18.
5. Ghozali, I. (2011). Aplikasi Analisis Multivariat dengan Program IBM SPSSv19. Semarang: Badan Penerbit UNDIP, ISBN 979.704.015.1, Cetakan V, April 2011
6. Gingerich, E & Karaatli, G. (2015). Eco-Friendly Marketing: Beyond the Label. *Journal of Applied Business and Economics*, Vol.17 (3). p.45-62.
7. Joshi, Y. & Rahman, Z, (2015). Factors Affecting Green Purchase Behavior and Future Research Directions. *International Strategic Management Review* 3, p.128-143.
8. Kotler, P., & Armstrong, G. (2008). *Prinsip-Prinsip Pemasaran*. Jilid 1. Ed ke-12. Sabran B, penerjemah. Jakarta: Erlangga.
9. Kumar, P.K & Anand, B, (2013). A Study on Consumer Behavior towards Eco-Friendly Paper. *Global Journal of Management and Business Research*, Vol. XIII, Issue XI, Version I, p. 8-14
10. Maharani, P.N. (2010). Faktor-faktor yang mempengaruhi Niat Konsumen dalam Pembelian Produk Ramah Lingkungan. *Jurnal Ekonomi dan Bisnis*, vol 4, no 1, maret 2010, hal 1-30
11. Naomi, N. (2011). Analisis Perilaku Produk Ramah Lingkungan pada Remaja: Aplikasi Model AIDA. (Skripsi). IPB Bogor. [lkk.fema.ipb.ac.id/index.php](http://lkk.fema.ipb.ac.id/index.php) (8 Februari 2011)
12. Raluca-Mihela SANDU, (2014). Green: Marketing, Product and Consumers. *Literatur Review, SEA-Practical Application of Science*, Vol. II, Issue 3 (5), p.555-561
13. Sadhev, S. (2011). Eco-Friendly Product and Consumer Perception. *Zenith International Journal of Multidisciplinary Research*, Vol.1 Issue 5, September 2011, p 279-287
14. Schiffman & Kanuk, (2006). *Consumer Behavior*. PHI-EEE, 9th Edition.
15. Sehgal, P. & Singh, N. (2010). Impact of Eco-Friendly Product on Consumer Behavior. *CBS E\_Journal, Biz n Bytes*, Vol.6, Dec, 2010.
16. Shaikh, A.S. (2011). Consumer Perception of Green Product: A Survey of Karachi. *Journal of Independent Studies and Research-MSSE*, Vol.9, Number 2, July 2011. p 15-28.
17. Sumarsono, Y.G. (2012). Analisis Sikap Dan Pengetahuan Konsumen Terhadap Ecolabelling Serta Pengaruhnya Pada Keputusan Pembelian Produk Ramah Lingkungan. *Jurnal Performance* Vol 15, No.1, Maret 2012, hal 70-85)

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**TAX KNOWLEDGE, DIMENSION OF JUSTICE, AND PERCEPTION OF TAX BENEFITS TOWARDS THE TAXPAYER COMPLIANCE IN IMPLEMENTING GOVERNMENT REGULATION NO. 46 OF 2013**

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**ABSTRACT**

The purpose of this research is to know the effect of tax knowledge towards the taxpayer compliance, the effect of dimension of justice towards the taxpayer compliance, the effect of perception of tax benefits towards the taxpayer compliance, and the effect of tax knowledge, dimension of justice, and perception of tax benefits towards the taxpayer compliance in implementing the Government Regulation No. 46 Year 2013. The research method used in this study is quantitative. The variables used consist of independent and dependent variable. There are three independent variables, i.e. tax knowledge, dimension of justice, and perception of tax benefits. The results of this study are: 1) tax knowledge significantly gives positive effect to taxpayer compliance in implementing Government Regulation No. 46 Year 2013, 2) dimension of justice does not affect significantly, and it negatively affects the taxpayer compliance in implementing Government Regulation No. 46 Year 2013, 3) perception of tax benefits significantly gives positive effect to the taxpayer compliance in implementing Government Regulation No. 46 Year 2013, 4) tax knowledge, dimension of justice, and perception of tax benefits simultaneously give positive effect and are significant towards the taxpayer compliance in implementing Government Regulation No. 46 Year 2013.

**KEY WORDS**

Tax, justice, taxpayer, government.

Tax is the dues which should be paid to the government which becomes the sources of national income, and it is useful for the national development to achieve the citizens' prosperity. Tax has two main functions, i.e. budget-air function used to finance government's expenses and regular-end function used to manage government regulations in social and economic aspects (Susmiatun, 2014). Tax is the sector giving the largest income in a country as it is stated in State Budget. Therefore, as a good citizen, paying tax is a must.

There are some ways done by the government to increase aspects of taxpayer compliance, such as facility program entitled sunset policy, tax socialization to secondary schools, tax invoice identification number socialization, and socialization of filling annual tax return. Besides, Indonesia has done some ways to increase tax revenue, such as the tax object and subject extension called extension, improvement of tax services, and taxation administration enhancement called intensification. Because the tax revenue has not met the optimum target, Directorate General of Taxes should find an alternative to the tax revenue which has not reached certain target as it is estimated.

Indonesia is one of the developing countries in which Micro, Small, and Medium Enterprises take an important role in Indonesian economy. The 2014-year-end data shows that there are 57.9 million entrepreneurs of Micro, Small, and Medium Enterprises contribute 58.92% to Gross Domestic Product (GDP) and 97.3% to employment; therefore, it can decrease the level of unemployment and poverty in Indonesia (Merdeka (25/9)). Moreover, the data of Ministry of Cooperatives Small and Medium Enterprises show that in the end of 2014, there are 209.488 units of cooperative in Indonesia (Inspeksianews (5/6)). According to Braman, Deputy of Business Development and Restructuration of the ministry of Cooperatives and Small and Medium Enterprises, Micro, Small, and Medium Enterprises should be guaranteed to access the capital since Asian Economic Community (EAC) is coming; therefore, Braman encourages three government banks - BRI, Mandiri, and BNI - to

do the distribution of Business Credit. As it is informed, 30 trillion rupiah has been disbursed by the government for Business Credit program (Tobing, 2015).

The existence of Micro, Small, and Medium Enterprises might increase taxpayers in Indonesia, but it should be supported by the significant of tax revenue as well. In fact, it does not in line with the tax revenue because there are many Micro, Small, and Medium Enterprise taxpayers get problem in the tax compliance. The Directory General of Taxes, Fuad Rahmany, reveals that the potential of tax revenue from Micro, Small, and Medium Enterprises is considered to be low from the total of tax revenue; thus entrepreneurs of Micro, Small, and Medium Enterprises are supposed to pay the tax. Ironically, there are a lot of Micro, Small, and Medium Enterprises in Indonesia, but they do not report and even pay the tax. The Director of Tax Service Counseling and Public Relation, Krismanto Petrus, details the total number of Micro, Small, and Medium Enterprises which following the tax regulations are only 20 million (Daud, 2013).

If it is left unchecked, compliance aspects will disappear gradually. Moreover, the target of tax revenue cannot be achieved, and the taxpayer compliance awareness will be very low. Therefore, because the tax should be dynamic, keeping up with developments, the next target of the tax is Micro, Small, and Medium Enterprises which should begin knowing tax and contributing to taxpayer compliance. Compliance means willingness to do everything based on either self-awareness or coercion which encourages someone does something as expected (Berutu and Hartono, 2013).

Tax compliance can be influenced by two factors, i.e. internal and external factor. The internal factor is on the willingness of taxpayers themselves to follow the tax regulations. On the other hand, the external factor is from the taxpayer external situation, such as situation and taxpayer environment (Yusro and Kiswanto, 2014).

Regarding to those problems, the government released the Government Regulation No.46 Year 2013 about Income Tax for Taxpayers of Certain Gross Earnings on Business Income Received and Generated. This regulation begins since July 1, 2013. It was released to educate people to be more aware of tax administration and to encourage people's contribution to the state.

The benefits of paying tax can directly and indirectly encourage taxpayers to willingly fulfill the taxpayer compliance, thinking that they will get benefits through facilities provided by the government. Automatically, the willing to violate the tax compliance will decrease (Probondari, 2013). However, only some of Micro, Small, and Medium Enterprises who think that they get the benefits of paying tax; thus they might make the sales below 4.8 billion.

In this case, the research problems proposed are: 1) the effect of tax knowledge towards taxpayer compliance in implementing Government Regulation No.46 Year 2013, 2) the effect of dimension of justice towards taxpayer compliance in implementing Government Regulation No.46 Year 2013, 3) the effect of perception of tax benefits towards taxpayer compliance in implementing Government Regulation No.46 Year 2013, 4) the effect of tax knowledge, dimension of justice, and perception of tax benefits towards taxpayer compliance in implementing Government Regulation No.46 Year 2013.

The purpose of this study is to know the effect of tax knowledge towards taxpayer compliance in implementing Government Regulation No.46 Year 2013, the effect of dimension of justice towards taxpayer compliance in implementing Government Regulation No.46 Year 2013, the effect of perception of tax benefits towards taxpayer compliance in implementing Government Regulation No.46 Year 2013, and the effect of tax knowledge, dimension of justice, and perception of tax benefits towards taxpayer compliance in implementing Government Regulation No.46 Year 2013.

## **METHODS OF RESEARCH**

The research method used in this study is quantitative. The variables used are independent and dependent variables. There are three kinds of independent variables, i.e. tax knowledge, dimension of justice, and perception of tax benefit. The dependent variable is taxpayer compliance in implementing Government Regulation No.46 Year 2013. The data

used in this study is primary data obtained from questionnaire distribution and data collection in LTC Glodok and Puri Indah Market. The sampling method in this study is purposive sampling based on Personal Taxpayer, ownership of Taxpayer Identification Number, and turnover  $\leq$  4.8 billion. The questionnaire distribution was distributed on November 23, 2015, and it returned on November 28, 2015. The samples taken were 100 Personal Taxpayers. The technique used to analyze the data is descriptive statistic, data quality testing (validity, reliability, data transformation testing), classical assumption testing (normality, multicollinearity, heteroscedasticity testing), and hypothesis testing (determination coefficient, t-test).

## RESULTS AND DISCUSSION

*Analysis of Descriptive Statistics.* Population in this study is taxpayers of Micro, Small, and Medium Enterprises in LTC Glodok and Puri Indah Market. The sampling technique is purposive sampling with Personal Taxpayers having turnover  $\leq$  4.8 billion and having Taxpayer Identification Number as the criteria. The questionnaire distribution was given to 125 Personal Taxpayers in LTC Glodok and Puri Indah Market. The questionnaire consists of respondent personal identity and 24 statements. Each of the statements represents variables which are observed. While analyzing the data, selection towards the respondents were done. The respondents who did not meet the criteria were replaced by other respondents fulfilling the criteria which finally 100 respondents were obtained. From the fulfilled and returned questionnaire, the data were analyzed using SPSS (Statistical Product and Service Solution) for Windows version 21.0.

In this study, there were 125 questionnaires were distributed in LTC Glodok and Puri Indah Market. From the distributed questionnaires, there were 111 questionnaires which were filled and returned. After the selection process, 100 questionnaires were used. The 89% of the returned questionnaires were then used as the research samples. The number of samples and the rate of returned questionnaire can be seen in this following table.

Table 1 – Number of Samples and the Rate of Returned Questionnaire

| Research Location | The Number of Questionnaire |          |     |              |       |       |       |
|-------------------|-----------------------------|----------|-----|--------------|-------|-------|-------|
|                   | Distributed                 | Returned |     | Not Returned |       | Used  |       |
|                   |                             | Total    | %   | Total        | %     | Total | %     |
| LTC Glodok        | 90                          | 80       | 64% | 10           | 8%    | 72    | 57,6% |
| Puri Indah Market | 35                          | 31       | 25% | 4            | 3,2%  | 28    | 22,4% |
| Total             | 125                         | 111      | 89% | 14           | 11,2% | 100   | 80%   |

Table 2 – The Result of Descriptive Statistics of Tax Knowledge

| Descriptive Statistics |     |         |         |        |                |
|------------------------|-----|---------|---------|--------|----------------|
| -                      | N   | Minimum | Maximum | Mean   | Std. Deviation |
| X1_1                   | 100 | 1,00    | 5,00    | 3,8500 | ,93609         |
| X1_2                   | 100 | 1,00    | 5,00    | 3,2900 | ,84441         |
| X1_3                   | 100 | 1,00    | 5,00    | 3,5300 | ,85818         |
| X1_4                   | 100 | 1,00    | 5,00    | 3,3100 | ,99184         |
| X1_5                   | 100 | 2,00    | 5,00    | 3,6600 | ,81921         |
| X1_6                   | 100 | 1,00    | 5,00    | 3,3900 | ,87496         |
| X1_7                   | 100 | 1,00    | 5,00    | 3,5900 | ,80522         |
| X1_8                   | 100 | 2,00    | 5,00    | 3,6300 | ,76085         |
| X1_9                   | 100 | 1,00    | 5,00    | 3,4600 | ,95790         |
| Valid N (list-wise)    | 100 |         |         |        |                |

Based on the table, the descriptive statistics of statements about personal tax knowledge, 1 is the minimum score meaning that the respondents strongly disagree and 5 is the maximum score meaning that the respondents strongly agree. The mean score 3 which heads to 4 shows that the respondents tend to agree with the statements relating to the personal tax knowledge. The standard deviation shows how much deviation occurs in the

data towards its mean score. The low standard deviation tends to identify data which tends to be close to its mean score.

Table 3 – The Result of Descriptive Statistics of Dimension of Justice

| Descriptive Statistics |     |         |         |        |                |
|------------------------|-----|---------|---------|--------|----------------|
| -                      | N   | Minimum | Maximum | Mean   | Std. Deviation |
| X2_1                   | 100 | 1,00    | 5,00    | 2,6700 | 1,22314        |
| X2_2                   | 100 | 1,00    | 5,00    | 2,6900 | 1,16076        |
| X2_3                   | 100 | 1,00    | 5,00    | 2,6000 | 1,14592        |
| X2_4                   | 100 | 1,00    | 5,00    | 2,6900 | 1,23660        |
| X2_5                   | 100 | 1,00    | 5,00    | 2,9700 | 1,16736        |
| Valid N (list-wise)    | 100 |         |         |        |                |

Based on the table above, the descriptive statistics of personal dimension of justice, 1 is the minimum score meaning that the respondents strongly disagree and 5 is the maximum score meaning that the respondents strongly agree. The mean score which heads to 2 shows that the respondents tend to disagree with the statements relating to the personal dimension of justice. The standard deviation shows how much deviation occurs in the data towards its mean score. The low standard deviation tends to identify data which tends to be close to its mean score.

Table 4 – The Result of Descriptive Statistics of Perception of Tax Benefits

| Descriptive Statistics |     |         |         |        |                |
|------------------------|-----|---------|---------|--------|----------------|
|                        | N   | Minimum | Maximum | Mean   | Std. Deviation |
| X3_1                   | 100 | 1,00    | 5,00    | 3,9300 | 1,05653        |
| X3_2                   | 100 | 1,00    | 5,00    | 3,2700 | 1,33223        |
| X3_3                   | 100 | 1,00    | 5,00    | 3,3300 | 1,23137        |
| X3_4                   | 100 | 1,00    | 5,00    | 2,9500 | 1,20080        |
| Valid N (listwise)     | 100 |         |         |        |                |

Based on the table above, the descriptive statistics of personal perception of tax benefits, 1 is the minimum score meaning that the respondents strongly disagree and 5 is the maximum score meaning that the respondents strongly agree. With the mean score which heads to 3, the respondents tend to be neutral about the statements relating to the individual perception of tax benefits. The standard deviation shows how much deviation occurs in the data towards its mean score. The low standard deviation tends to identify data which tends to be close to its mean score.

Table 5 – The Result of Descriptive Statistics of Taxpayer Compliance in Implementing Government Regulation No.46 Year 2013

| Descriptive Statistics |     |         |         |        |                |
|------------------------|-----|---------|---------|--------|----------------|
|                        | N   | Minimum | Maximum | Mean   | Std. Deviation |
| Y_1                    | 100 | 1,00    | 5,00    | 3,5500 | ,72995         |
| Y_2                    | 100 | 1,00    | 5,00    | 3,5500 | ,71598         |
| Y_3                    | 100 | 1,00    | 5,00    | 3,3800 | ,78855         |
| Y_4                    | 100 | 1,00    | 5,00    | 3,5400 | ,78393         |
| Y_5                    | 100 | 1,00    | 5,00    | 3,4700 | ,78438         |
| Y_6                    | 100 | 1,00    | 5,00    | 3,5000 | ,83485         |
| Valid N (listwise)     | 100 |         |         |        |                |

Based on the table above, the descriptive statistics of taxpayer compliance in implementing Government Regulation No.46 Year 2013, 1 is the minimum score meaning that the respondents strongly disagree and 5 is the maximum score meaning that the respondents strongly agree. With the mean score heading to 3, the respondents tend to be neutral about the statements relating to taxpayer compliance in implementing Government Regulation No.46 Year 2013. The standard deviation shows how much deviation occurs in

the data towards its mean score. The low standard deviation tends to identify data which tend to be close to its mean score.

**Validity Testing.** Validity test is used to measure the accuracy of a questionnaire item. The technique of testing used in validity testing is corrected item — total correlation (Ghozali, 2013). To know whether the data is valid, validity testing is done using SPSS. In this case, there are nine statements relating to tax knowledge which were distributed in LTC Glodok and Puri Indah Market. From the validity testing, it is found that the calculation value of each statement ( $r$  calculation) is greater than  $r$  table (.1946). Therefore, it can be concluded that each statement is valid to be used in the process of hypothesis testing.

**Reliability Testing.** Reliability testing is used to measure the consistency of measuring devices used. The reliability testing of each variable can be seen from Cronbach's Coefficient Alpha as the reliability coefficient. According to Sekaran in Priyatno (2013: 30), the reliability which is below .6 is bad, .6-.79 can be accepted, and more than .8 is good.

- The cronbach alpha of tax knowledge variable is .772.
- The cronbach alpha of dimension of justice variable is .76.
- The cronbach alpha of perception of tax benefits variable is .696.
- The taxpayer compliance variable in implementing Government Regulation No.46 Year 13 shows that it has passed the reliability testing. The cronbach alpha of the taxpayer compliance variable in implementing Government Regulation No.46 is .875.

**Normality Testing.** Normality testing using Normal Probability Plot graphic is done by looking at the dots distribution of the data. If the points are within the diagonal line, it means that a regression model has fulfilled the normality assumption. This is the graphic of Normal Probability Plot.

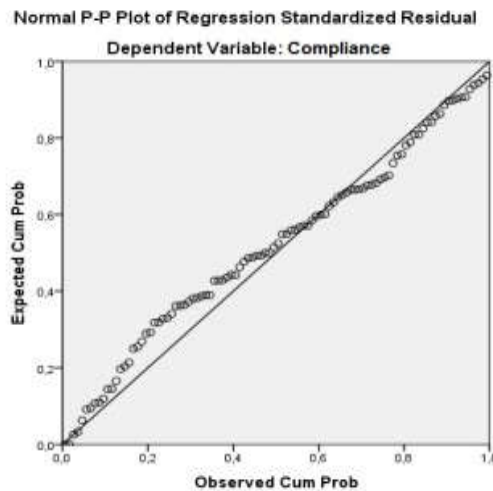


Figure 1 – The Result of Normality Testing Using Normal Probability Plot Graphic

Based on the Normal Probability Plot graphic, it can be concluded that the observed data is normal. It can be seen by the dots distribution around the diagonal line that following the diagonal line direction; thus it means that the regression model has fulfilled the normality assumption.

**Multicollinearity Testing.** Multicollinearity testing is to test whether there is a correlation among independent variables in the regression model. This testing is done calculating the variance inflation factor (VIF) of each independent variable. If the tolerance value is  $\geq .10$  and VIF is  $\leq 10$ , the correlation among independent variables can be tolerated (Ghozali, 2013). The result of Multicollinearity testing can be seen in table 6.

Based on the table, it can be seen that the value of VIF for tax knowledge variable is 1.266, dimension of justice variable is 1.472, and the perception of tax benefits variable is 1.368. The VIF value of each variable is less than 10. Therefore, it can be concluded that there is no multicollinearity problem in this regression model.

Table 6 – The Result of Multicollinearity Testing

| Coefficients <sup>a</sup> |                            |                             |            |                           |       |      |                         |       |
|---------------------------|----------------------------|-----------------------------|------------|---------------------------|-------|------|-------------------------|-------|
| Model                     |                            | Unstandardized Coefficients |            | Standardized Coefficients | T     | Sig. | Collinearity Statistics |       |
|                           |                            | B                           | Std. Error | Beta                      |       |      | Tolerance               | VIF   |
| 1                         | (Constant)                 | 14,089                      | 6,629      |                           | 2,125 | ,036 |                         |       |
|                           | Tax knowledge              | ,584                        | ,128       | ,446                      | 4,550 | ,000 | ,790                    | 1,266 |
|                           | Dimenson of justice        | -,116                       | ,116       | -,106                     | -,999 | ,320 | ,679                    | 1,472 |
|                           | Perception of tax benefits | ,250                        | ,111       | ,229                      | 2,250 | ,027 | ,731                    | 1,368 |

a. Predictors: (Constant), tax knowledge, dimension of justice, perception of tax benefits  
 b. Dependent Variable: compliance

**Heteroscedasticity Testing.** Heteroscedasticity is a condition in which there is variance inequality from the residual in the regression model. A good regression is when there is no heteroscedasticity problem. Heteroscedasticity causes inefficient estimator and very high determination coefficient. A common way used to determine whether a model is free from heteroscedasticity problem is using scatter plot and seeing whether the residual has certain pattern. If the dots in the scatter plot spread with unclear pattern above and below 0 in Y axis, there is no heteroscedasticity problem. The result of scatter plot can be seen in this figure.

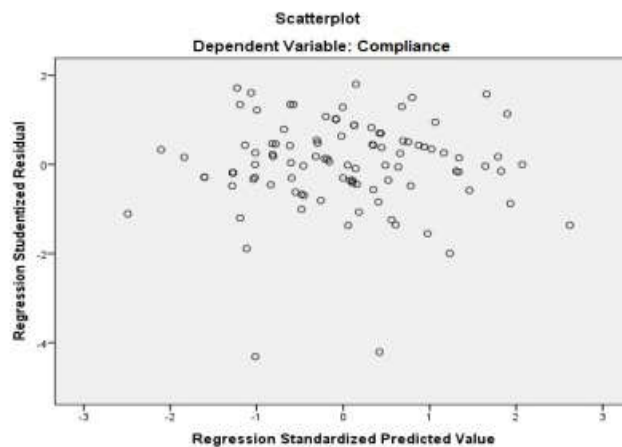


Figure 2 – The Result of Heteroscedasticity with Scatter Plot

Based on the figure above, it can be concluded that the dots forms spreading pattern and unclear pattern above and below 0 in Y axis. Therefore, there is no heteroscedasticity problem.

**HYPOTHESIS TESTING**

**The Result of Determination Coefficient (R<sup>2</sup>).** The main point of having determination coefficient testing (R<sup>2</sup>) is to measure how far the model’s ability in showing the variance of dependent variables. The value of determination coefficient is between 0 and 1. If the result is > .5, the used model is considered to be quite reliable in making estimation. The result of determination coefficient is as the following.

Table 7 – The Result of Determination Coefficient testing (R<sup>2</sup>)

| Model Summary <sup>b</sup> |                   |          |                   |                            |
|----------------------------|-------------------|----------|-------------------|----------------------------|
| Model                      | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1                          | ,520 <sup>a</sup> | ,270     | ,247              | 6,83306                    |

a. Predictors: (Constant), tax knowledge, dimension of justice, perception of tax benefits  
 b. Dependent Variable: compliance

From the table, the test shows the magnitude of the coefficient of multiple determination (R), determination coefficient (R Square), and adjusted determination coefficient (Adjusted R Square). Based on the table of Model Summary<sup>b</sup>, the value of the coefficient of multiple determinations (R) is .520. It shows that the variable of tax knowledge, dimension of justice, and perception of tax benefits towards the taxpayer compliance in implementing Government Regulation No.46 of 2013 have a very strong correlation. The result shows that the value of determination coefficient (R Square) is .270 and the value of adjusted determination coefficient (Adjusted R Square) is .247. It means that 24.7% variations of compliance in implementing Government Regulation No.46 Year 2013 can be explained by the independent variables (tax knowledge, dimension of justice, and perception of tax benefits). On the other hand, the rests (100% - 24% = 75.3%) are explained by other variables which does not exist in this research, such as tax regulations, tax administration service, tax sanction, and taxpayer awareness.

**T-Test.** T-test is used to know the effect of independent variables partially towards the dependent variable, whether it is significant or not. The basic of decision making is using significant probability level:

If the level of significance is  $< .05$ ,  $H_0$  is rejected and  $H_a$  is accepted;

If the level of the significance is  $> .05$ ,  $H_0$  is accepted and  $H_a$  is rejected.

Table 8 – The Result of T-Test

| Coefficients <sup>a</sup>  |                            |                             |            |                           |       |      |
|--|----------------------------|-----------------------------|------------|---------------------------|-------|------|
| Model  |                            | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig. |
|  |                            | B                           | Std. Error | Beta                      |       |      |
| 1  | (Constant)                 | 14,089                      | 6,629      |                           | 2,125 | ,036 |
|  | Tax knowledge              | ,584                        | ,128       | ,446                      | 4,550 | ,000 |
|  | Dimension of justice       | -,116                       | ,116       | -,106                     | -,999 | ,320 |
|  | Perception of tax benefits | ,250                        | ,111       | ,229                      | 2,250 | ,027 |
| a. Predictors: (Constant), tax knowledge, dimension of justice, perception of tax benefits |                            |                             |            |                           |       |      |
| b. Dependent Variable: compliance  |                            |                             |            |                           |       |      |

Table 9 – Conclusion of Statistical T-Test

| -                          | Sig. (T-Test result) | Requirement Sig. (<0,05) | Conclusion      |
|----------------------------|----------------------|--------------------------|-----------------|
| Tax Knowledge              | 0,000                | < 0,05                   | Significant     |
| Dimension of Justice       | 0,320                | > 0,05                   | Not Significant |
| Perception of Tax Benefits | 0,027                | < 0,05                   | Significant     |

**H1: Tax knowledge affects significantly towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013.** Based on Figure 4.9, the level of significance of the tax knowledge is .000 which is lower than .05 (.000<.05). Therefore, the conclusion based on the first hypothesis testing is that  $H_{a1}$  is accepted or  $H_{01}$  is rejected. In other words, tax knowledge affects significantly towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

**H2: Dimension of justice affects significantly towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013.** Based on Figure 4.10, the significant of dimension of justice is .320 which is higher than .05 (.320<.05). Therefore, the conclusion based on the second hypothesis testing is that  $H_{a2}$  is rejected or  $H_{02}$  is accepted. In other words, dimension of justice does not affect significantly towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

**H3: Perception of tax benefits affects significantly towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013.** Based on Figure 4.11, perception of tax benefits has significant value .027 which is lower than .05 (.027<.05). Therefore, the conclusion based on the third hypothesis testing is that  $H_{a3}$  is accepted or  $H_{03}$  is rejected. In other words, perception of tax benefits affects significantly towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

**Simultaneous Significant Testing (F Testing).** Simultaneous significant testing F is basically to show whether all independent variables included in the model give impact



simultaneously towards the dependent variable. The reliable degree used is .05. If it is lower than .05, it means that all independent variables simultaneously affect the dependent variable. The Result of Simultaneous Significant Testing (F Testing) can be seen in table 10.

Table 10 – The Result of Simultaneous Significant Testing (F Testing)

| ANOVA <sup>a</sup>   |            |                |    |             |        |                   |
|--|------------|----------------|----|-------------|--------|-------------------|
|  | Model      | Sum of Squares | Df | Mean Square | F      | Sig.              |
| 1  | Regression | 1660,108       | 3  | 553,369     | 11,852 | .000 <sup>b</sup> |
|  | Residual   | 4482,303       | 96 | 46,691      |        |                   |
|  | Total      | 6142,411       | 99 |             |        |                   |
| a. Predictors: (Constant), tax knowledge, dimension of justice, perception of tax benefits |            |                |    |             |        |                   |
| b. Dependent Variable: compliance  |            |                |    |             |        |                   |

Based on the result of F testing, the value of F is 11.852 with level of significance .000. It shows that  $H_{a4}$  is accepted or  $H_{04}$  is rejected because the level of significance is lower than .05; thus it can be concluded that tax knowledge, dimension of justice, and perception of tax benefits simultaneously and significantly affect the taxpayer compliance in implementing Government Regulation No.46 Year 2013. From the linear equation of the regression model, it is found that the coefficient of tax knowledge variable ( $\beta_1$ ) is .584. It shows that every time tax knowledge variable raises 1-point, the compliance in implementing Government Regulation No.46 Year 2013 will raise 58.4% with other independent variable assumptions remain the same. The amount of dimension of justice variable ( $\beta_2$ ) is -.116 showing that every time dimension of justice variable raises 1-point, the taxpayer compliance in implementing Government Regulation No.46 Year 2013 will decrease 11.6% with other independent variable assumptions remains the same. On the other hand, if the coefficient of perception of tax benefits variable ( $\beta_3$ ) is .250, every time perception of tax benefits variable raises 1 point, taxpayer compliance in implementing Government Regulation No.46 Year 2013 will raise 25% with other independent variable assumptions remain the same.

*Multiple Regression Testing Analysis.* The first hypothesis in this study is whether tax knowledge significantly affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013. This hypothesis is accepted because the level of significance is .000. If the level of significance is <.05,  $H_{01}$  is rejected and  $H_{a1}$  is accepted. The rejected  $H_0$  means that partially the independent variable significantly affects the dependent variable. Moreover, the coefficient value is .584 showing that tax knowledge variable and taxpayer compliance in implementing Government Regulation No.46 Year 2013 have positive correlation. This result is in line with the result of the previous studies conducted by Palil and Ahmad Fariq Mustapha (2011) entitled *Factors Affecting Tax Compliance Behavior in Self-Assessment System*. The result of the study states that tax knowledge affects positively and significantly to the behavior towards the tax compliance. Tax knowledge variable in this study was measured by taxpayers' knowledge about tax regulations, tax sanctions, self-assessment system, taxpayers' knowledge towards taxpayer registration, the differences between cutting rates tariff, tax calculation which is reported and paid, periodic and annual tax return report, and deferred request. The more taxpayers know about tax regulations relating to general information and sanction the higher awareness that the taxpayers have in paying tax. When taxpayers aware of having Taxpayer Identification Number, it means that they have done the first step of taxpayer compliance; thus, it can affect the national income. Through the mechanism of tax payment, such as payment and report, taxpayers will know what date they should pay the tax. Moreover, when they know about tax knowledge, it will increase the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

The second hypothesis in this study is whether the dimension of justice affects significantly to taxpayer compliance in implementing Government Regulation No.46 Year 2013. This hypothesis is rejected because the level of significance is .320. If the level of significance is >.05,  $H_{02}$  is accepted and  $H_{a2}$  is rejected. When  $H_0$  is accepted, it means that partially the independent variable does not significantly affect the dependent variable. Besides, the coefficient value is -.116 showing that the dimension of justice variable and

taxpayer compliance in implementing Government Regulation No.46 Year 2013 have negative correlation. This result is in line with the study conducted by Syahdan (2014) entitled *Dimensi Keadilan atas Pemberlakuan PP No.46 Tahun 2013 dan Peningkatan Kepatuhan Wajib Pajak*. The result of the study states that whether the taxation system is fair or not, it does not affect the degree of tax compliance. The degree of tax compliance is more influenced by the strict of applied taxation system than by their perception of the tax fairness. The dimension of justice in this study is measured by general fairness and tax charging system, tax charging, tax collection, and consideration of the element of justice. There are many taxpayers think that 1% of the turnover is high and not fair. It might be simple, but it is difficult for the enterprises because the profit of each year is hardly predicted. Therefore, it can be concluded that the dimension of justice does not affect the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

The third hypothesis is whether the perception of tax benefits significantly affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013. This hypothesis is accepted because the level of significance is .027. If the level of significance is  $<.05$ ,  $H_{03}$  is rejected and  $H_{a3}$  is accepted. When  $H_0$  is rejected, partially the independent variable affects the dependent variable. Moreover, the coefficient is .250 showing that the perception of tax benefits variable and taxpayer compliance in implementing Government Regulation No.46 Year 2013 have positive correlation. The result of this study is in line with the study conducted by Reraton (2014) about the effect of perception of regulation, knowledge, and tax benefits towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013 in Klewer Solo Market. From the study, it is stated that every benefit which is directly and indirectly accepted can affect the perception of the taxpayers. The perception of tax benefits variable in this study is measured from the tax revenue, the provision of public facilities, tax benefits for Micro, Small, and Medium Enterprises, and the use of the tax itself. The benefits obtained by the taxpayers are subvention, bridge, hospitals, and road constructions which encourage the taxpayers to obey. Therefore, the perception of tax benefits significantly affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

The fourth hypothesis is whether the tax knowledge, dimension of justice, and perception of tax benefits simultaneously affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013. It is found that  $F_{\text{calculation}}$  is 11.852 and the level of significance is .000. It shows that if the three independent variables are tested at the same time, they will significantly affect the taxpayer compliance in implementing Government Regulation No.46 Year 2013. The more taxpayers know about tax regulations and tax sanction the wider tax knowledge they have. The tax knowledge makes the taxpayers aware of their obligation in paying the tax. However, 1% which is not fair for some parties can decrease their spirit and passion to pay the tax. The tax benefits which are directly or indirectly obtained by them affect the taxpayers' awareness in paying the tax. Finally, based on those explanations, it can be concluded that the three independent variables in this study can affect the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

## CONCLUSION

Regarding to the hypothesis testing towards the results of the effect of tax knowledge, dimension of justice and the perception of tax benefits towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013 using classical assumption testing and multiple linier regression, it can be concluded that:

Tax knowledge significantly gives positive effect towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013 in LTC Glodok and Puri Indah Market. The evidence of this result is proved by the result of t-test with level of significance .000 which is less than .05.  $\beta$  obtained is .584 meaning that the better understanding towards tax knowledge the higher level of taxpayer compliance in implementing Government Regulation No.46 Year 2013. This result is in line with the previous hypothesis stating that

tax knowledge significantly affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

Dimension of justice does not give significant effect, but it negatively affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013 in LTC Glodok and Puri Indah Market. The evidence of this result can be seen from the result of t-test with level of significance .320 which is higher than .05.  $\beta$  obtained is -.116 meaning that the higher dimension of justice is the lower the compliance in implementing Government Regulation No.46 Year 2013. This result does not support the hypothesis stating that the dimension of justice significantly affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

The perception of tax benefits significantly gives positive effects towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013 in LTC Glodok and Puri Indah Market. The evidence of this result can be seen from the result of t-test with level of significance .027 which is less than .05.  $\beta$  obtained is .250 meaning that the better perception of tax benefits is the higher level of taxpayer compliance is in implementing Government Regulation No.46 Year 2013. This result is in line with the hypothesis stating that the perception of tax benefits significantly affects the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

Tax knowledge, dimension of justice, and perception of tax benefits simultaneously give positive and significant effect towards the taxpayer compliance in implementing Government Regulation No.46 Year 2013. It can be seen from the result of F-Test with the level of significance .000 which is less than .05. Therefore, it shows that taxpayers having tax knowledge, dimension of justice, and perception of tax benefits affect the taxpayer compliance in implementing Government Regulation No.46 Year 2013.

## REFERENCES

1. Berutu, D. A., & Harto, P. (2013). Persepsi Keadilan Pajak terhadap Perilaku Kepatuhan Wajib Pajak Orang Pribadi (WP OP)(Doctoral dissertation, Fakultas Ekonomika dan Bisnis).
2. Daud, A. (2013). "Hanya 20 juta UKM yang patuh bayar pajak". <http://ekbis.sindonews.com/read/755209/33/hanya-20-juta-ukmyangpatuh-bayarpajak-1372416213>, diakses pada tanggal 17 September 2015.
3. Ghozali, I. (2013). Aplikasi Analisis Multivariate Dengan Program IBM SPSS 21 (edisi ketujuh). Semarang: Universitas Diponegoro.
4. Peraturan Pemerintah Nomor 46 Tahun 2013 tentang Pajak Penghasilan atas Penghasilan dari Usaha yang Diterima atau Diperoleh Wajib Pajak yang Memiliki Peredaran Bruto Tertentu.
5. Probondari, R. (2013). "Faktor-Faktor yang Mempengaruhi Kemauan Membayar Pajak Oleh Wajib Pajak Orang Pribadi yang Terdaftar di Kantor Pelayanan Pajak Pratama Bintan". Hal 1-16.
6. Susmiatun. (2014). "Pengaruh Pengetahuan Perpajakan, Ketegasan Sanksi Perpajakan Dan Keadilan Perpajakan Terhadap Kepatuhan Wajib Pajak UMKM". Jurnal Akuntansi.Vol.3(3), hal 378-386.
7. Tobing, Mona. (2015)."Pemerintah jamin akses modal UMKM". <http://keuangan.kontan.co.id/news/pemerintah-jamin-akses-modal-umkm>, diakses pada tanggal 6 Oktober 2015
8. Yusro dan Kiswanto. (2014)." Pengaruh Tarif Pajak, Mekanisme Pembayaran Pajak dan Kesadaran Membayar Pajak terhadap Kepatuhan Wajib Pajak UMKM di Kabupaten Jepara". Jurnal Akuntansi Universitas Negeri Semarang, Vol.3(44).

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## UNDERSTANDING AND CRITICIZING DYNAMIC CAPABILITIES MODELS

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### ABSTRACT

There are at least four researchers who discussed the dynamic capabilities creation model, including Zollo & Winter (2002), Helfat (2007), Teece (2007) and Mc Carthy & Gordon (2010). This paper aims to understand and criticize the models proposed by the four researchers mentioned above. The method used is literature study. Therefore this study can be used as a reference in formulating dynamic capabilities creation model capable of enduring organization environment dynamics. The resulting model understanding and criticism exhibits several important discussion that could be used as guidelines in designing a more comprehensive dynamic creation model.

### KEY WORDS

Dynamic Capabilities Models, creation models, organization, management.

A company's success or failure to build a sustainable competitive advantage could be observed from two perspectives through market-based and resource-based view. The market-based view is based on the idea that the company is an open system. As an attempt to defend its existence, the company was required to establish interaction with the environment, to be able to adapt well to the environment dynamics. Interaction and adaptation to the environment must be interpreted as the company's ability to understand the business ecosystem, by making the change as an integral part of strategic management process (Porter, 1981; Davenport et.al, 2006). On the other hand, resource-based view explains the success or failure of a company with differences in companies' resources. Armed with its own resources, a company would use its capability which generally shaped as its operational capability to perform company's daily activities in order to build a sustainable competitive advantage (Barney, 1991; Grant, 1991; Peteraf, 1993; Teece, et.al, 1997; Simon, 2010; Parayitam & Teachers., 2010; Ahenkora & Aedji, 2012; Tseng & Lee, 2012).

Environments dynamic changes have brought consequences, that the success of the company, is more due to the company's ability to create dynamic capability. It is characterized by the ability to maintain company's capabilities according to the environment dynamics through a systematic and sustainable learning process (Winter, 2003). Dynamic capability is a concept derived from the resource-based view. It is an approach that could explain a company's success in building a competitive advantage in rapidly changing environments. (Esterby et.al, 2009; Ahenkora & Aedji, 2012; Tsheng & Lee, 2012). Instead, failure to create a sustainable competitive advantage, in the midst of rapidly changing dynamic environment and hypercompetitive competition, mostly due to the companies inability to create a competitive strategy based on resources which are not only merely routine but also a dynamic capability to exploit available opportunities. In other words, the company only focused on activities that patterned and repetitive, without innovation. Therefore market forces become weaker (Leonard & Barton, 1992; Winter, 2003).

*Understanding Dynamic Capabilities Model Creation Process.* Discussion of dynamic capabilities model creation have been conducted by several researchers, including Zollo & Winter (2002), Helfat (2007), Teece (2007) and Mc Carthy & Gordon (2010). Zollo & Winter (2002) developed a dynamic capabilities creation model which derived from learning

mechanisms through and organizational routine and accumulation experience, as well as knowledge articulation and codification (See Figure 1). It is in line with the definition developed by formentioned researchers, that the dynamic capability is learned and possess stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.

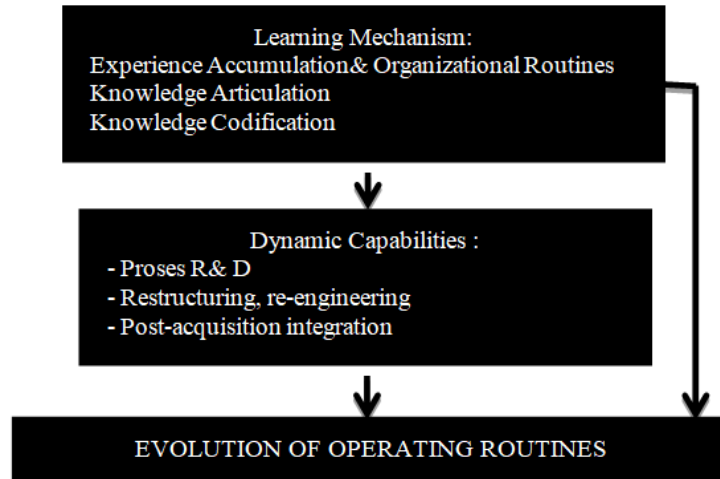


Figure 1 – Learning, Dynamic Capabilities, and Operating Routines (Source: Zollo & Winter, 2002)

Experience Accumulation and Organizational routines are generally a stable behavior pattern and shaping organizational characteristics, as well as a response to the environment dynamics. In connection with the activities, Zollo & Winter (2002) explain there are two types of operational routine. Routine operations which is underway, in familiar company, and learning/search routine, which routines is to identify any necessary changes to the operational routine. Furthermore, knowledge articulation/articulation is a collective learning, where people express their opinions and beliefs in a constructive confrontation and challenge each viewpoint by sharing and comparing their respective experiences. The next step is knowledge Codification, namely cognitive effort on a higher level, where individuals construct their own understanding of the internal routines performance implications in written form, user manual, blueprint, and others.

In other perspective, Teece, et.al (1997) argue that dynamic capabilities also require knowledge creation to be able to maintain the continuity of organization regular operation, either through sustainable modification, recycle reconfiguration and redeployment, therefore a company can avoid zero-profit condition. Furthermore, Teece (2007) also confirmed that the dynamic capabilities make a company capable to create, distribute and protect its resources in endeavor to support the organization's competitive advantage in the long term.

Teece (2007) explains that micro-foundations of dynamic capabilities include unique and different skills, organizational processes, procedures, structure, discipline, decision rule, and some micro foundations have more important roles on organizations while conducting three stages of the dynamic capabilities creation. Teece (2007) stressed that the process of creating the dynamic capabilities have to go through three stages of creation in order: (i). Sensing, i.e. activities related to scanning an opportunity arising from the environment dynamics which is a small part of the business ecosystem dynamics; (ii). Seizing, this second step focuses more on organizational activity that seeks to optimize and mobilize the company's resources to snatch the market; (iii). Managing threats/transforming is a process of continuous renewal activity which must be operated at the organizations, individuals, and networks level to coordinate/integrate, learn, and make constant changes to the company's assets, both intangible and tangible (see Figure 2).

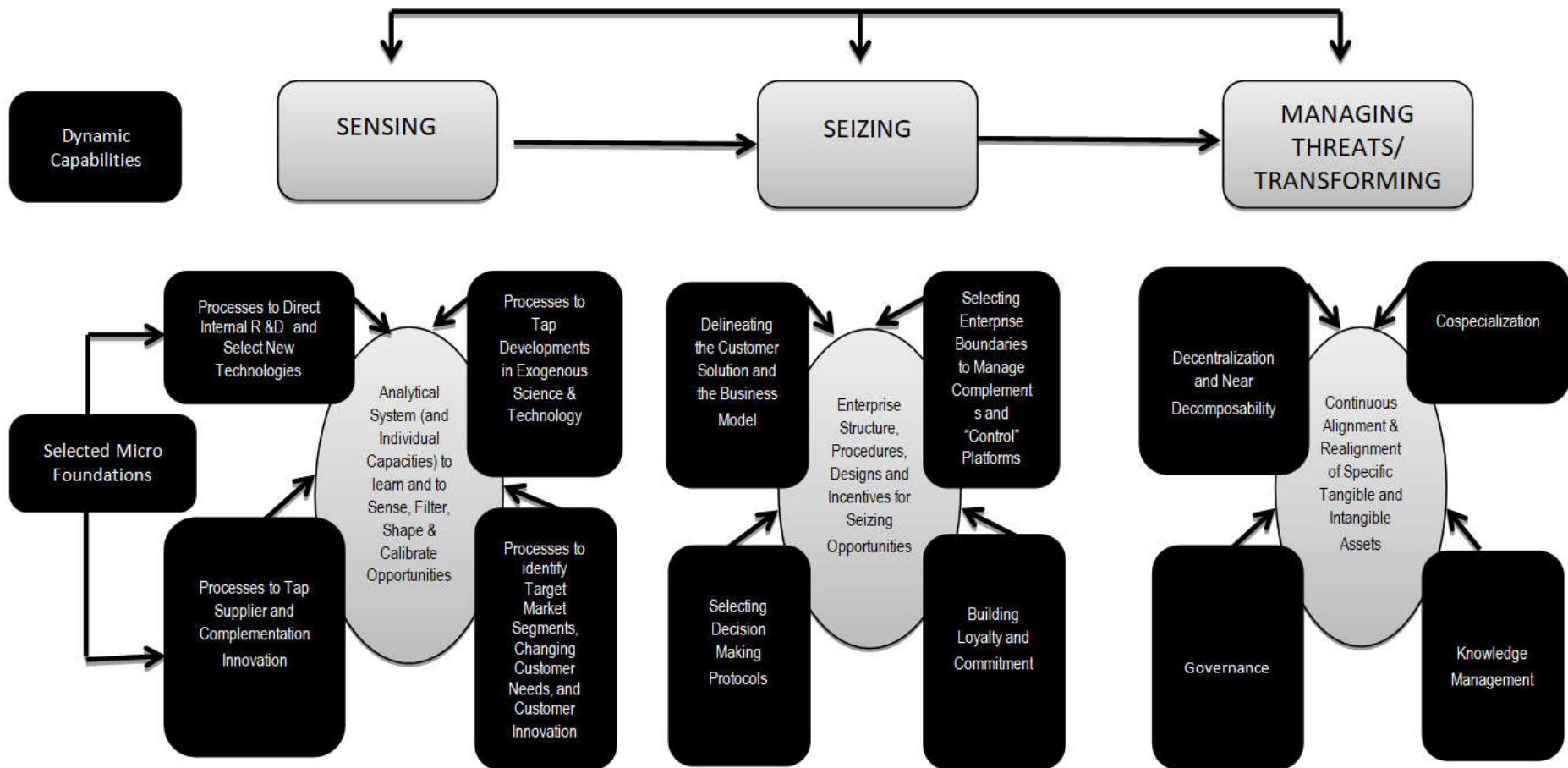


Figure 2 – Foundation of dynamic capabilities and business performance (Source: Teece, 2007)

Furthermore, a simpler dynamic capability creation model developed by Helfat et.al (2007) explained that the dynamic capabilities was formed in two main stages. These stages are managerial and organizational process performance measured in stage/performance yardstick. Helfat focused on the output of dynamic capabilities itself and less about the process of creating the dynamic capabilities in detail. Therefore, Helfat stressed that one important indicator for assessing the technical performance is measured fitness and evolutionary fitness. These aspects describe how well the dynamic capabilities of a company to be creative, expand, or modify its resources. The evolutionary fitness creation supporting factors consists of market demand, competition, and technical aspects (Figure 3).

In line with Helfat, Peteraf (2007) also believes that the process of dynamic capabilities better reflect the "investment processes" that its continuity will depend on the managerial and organizational processes. Finkelstain (2007) also corroborate what was Helfat stated by adding the importance of senior executive behavior. In other words, the process of dynamic capabilities will not run without the commitment of the senior executive in a company.

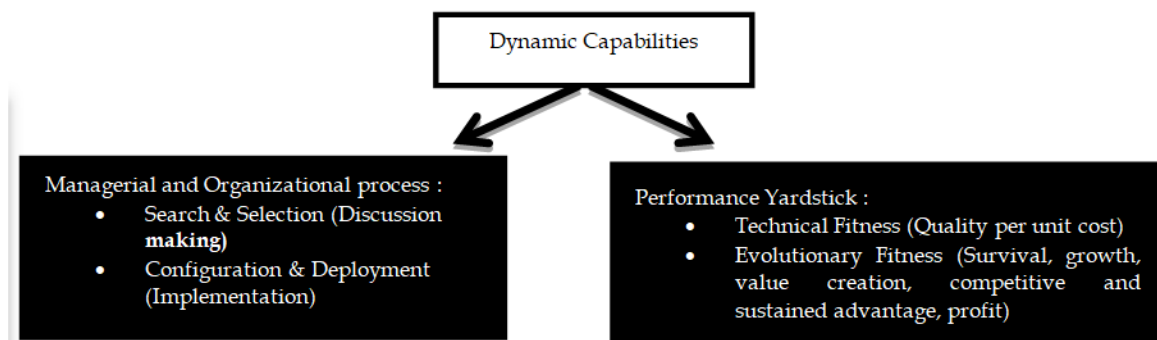


Figure 3 – DC: Process and Performance Yardstick (Source: Helfat, et.al, 2007)

Other researchers who discussed the creation of dynamic capabilities were McCarthy & Gordon (2010). They associate the process of creating dynamic capabilities with dynamic/speed control environment and management on contingent approach base (one approach to modern approach in organizational theory). Regardless, the control mechanism in various variants is able to take part in creating dynamic capabilities in many situations especially in high velocity because they wanted to prove that dynamic capability not only works at high-velocity conditions (environmental dynamics at high speed) but also can be used when an organization is at a low velocity (dynamic environments running at low speed). Although dynamic capabilities can be used in two conditions (low and high velocity), this model puts learning activities remains a key activity in integrating, coordinating, and reconfiguring resources in order to create dynamic capabilities. In turn it would create competencies that deliver a good performing company (see Figure 4).

*Criticizing Dynamic Capabilities Model.* Four models of the dynamic capabilities creation developed by fore-mentioned researchers above still leave some things that need to be discussed. The four issues are described as follows: (i). A discussion on organization/business environment that still uses the traditional paradigm within the system framework; (ii). The model is generalized. On the other hand, companies require dynamic positioning capabilities. Making it is a difficult aspect for the existing model's implementation (lii). The existence and clarity of feedback mechanisms within the framework of the system and (iv). Matters associated with learning has not been discussed in detail.

Among the four researchers above, only Teece (2007) and Mc Charty & Gordon (2010) pertaining to the business ecosystem dynamics. However, Teece merely focuses on the strength of the business ecosystem dynamics derived from the market and technological change. Four years later, Teece (2011) discussed the existence of the business ecosystem into something that is strategically important to consider when someone want to create dynamic capabilities. However, the topic has not been confirmed in a dynamic capabilities creation model. In fact, the business ecosystem strength is not only derived from two

components but can come from other components (Teece, 2011). In general, the dynamic capabilities creation process are still putting the traditional paradigm in discussing the system. It uses perspective which adopts reductionism. One proof of the reductionism dominance is the development of two environment dynamics polarization only in two patterns, which is the high velocity and low velocity on one of the models above (McCarthy & Gordon, 2010). A polarization emerges due to a mindset based on a structuralist determinism while understanding the environment.

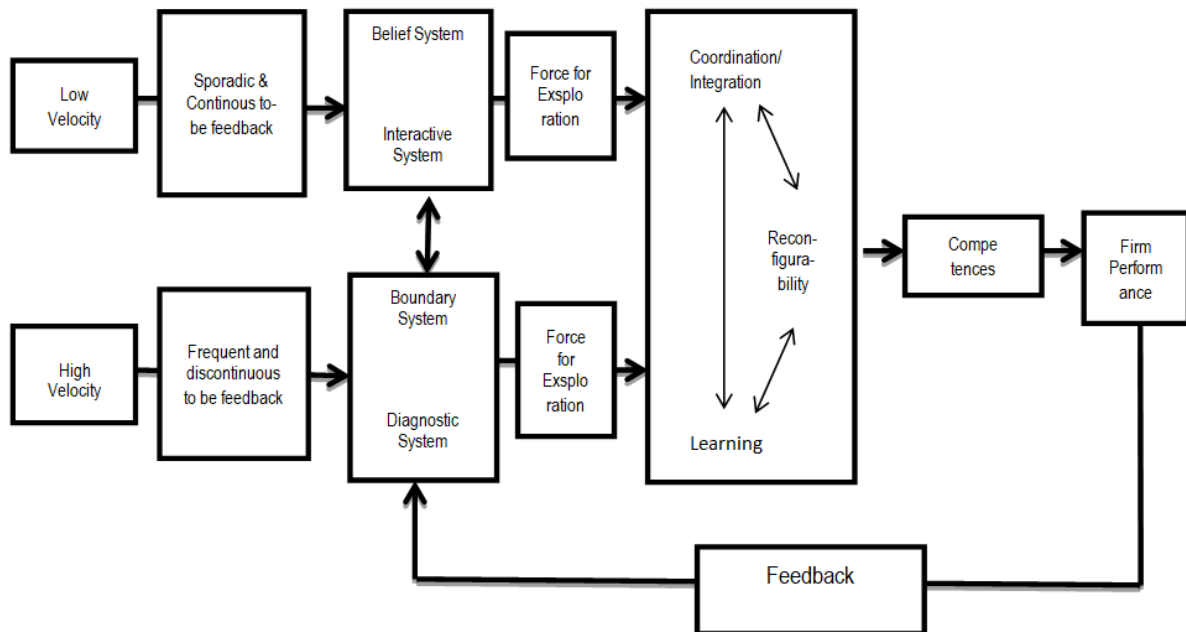


Figure 4 – Dynamic Capabilities Process (Source: Mc Carthy & Gordon, 2010)

A dynamic capabilities model creation discussed above is relatively therefore there will be many disadvantages when this model is implemented. Creating a general model of dynamic capabilities will obscure the position/unit analysis and the role of dynamic capabilities itself which is located in a firm position (Powell, et al, 2004; Madhani, 2010). On the one hand, any firm/organization possessing vision, mission, values, strategies and different stages of development, according firm characteristics and circumstances. Based on Madsen research (2010), the dynamic properties of very distinctive capabilities is in accordance with the objectives, situation, and characteristics of the organization. Therefore in creating dynamic capabilities requires the need for dynamic creation model in relatively diverse capabilities. This further reinforces their condition demands the creation of dynamic capabilities are based on a contingency approach.

Dynamic capabilities are part of strategic management which is part of a larger system. In this case is the organization. Therefore, dynamic capabilities is similar to basic idea of all-round system and concept which is not as a pile / whole but rather the overall adaptive/adaptive wholes are characterized by emergent properties. It is the capacity to achieve the overall goal, intercorrelations, monitoring and control (Sudarsono, 2012). As a part of the system, dynamic capabilities must have a feedback mechanism since the feedback is very fundamental. Without feedback, there is no system (O'Connor & Dermot, 1997). The importance of feedback as a consequence of an open system, which continuously receives information from the environment. This helps the system to adjust and provide an opportunity for the system to take corrective action to correct deviations from the specified direction (Robbins, 1990). Therefore, the feedback is needed in emergent properties. In this case is dynamic capabilities. Among the four models of the dynamic capabilities creation, only McCarthy & Gordon (2010), featured the feedback mechanism. Nevertheless, feedback type has not been discussed in detail.



Learning mechanism is a key activity in the creation of dynamic capabilities. (Lewin and Massini, 2004; Soo, et al, 2004; Gourlay, 2004; Haefliger & Krogh, 2004; Chen and Huang, 2012). However, among four researchers mentioned only Zollo & Winter (2002) and Mc Carthy & Gordon, (2010) mentioned learning as one of the key activities in the dynamic capabilities creation process. Nevertheless, it has not been discussed comprehensively. Regarding learning mechanism and knowledge creation as an integral part of learning mechanism itself. Understanding the dynamic capabilities of a knowledge-based perspective becomes important. The conclusion, in line with what was presented by Kianto & Ritala (2010), viewed from the perspective of the study of dynamic capabilities, knowledge can also be conceptualized as an effort to make organizational knowledge serving as something to enlarge, develop and update. Within this framework, knowledge is an important resource for the organization through learning mechanisms.

Furthermore, Kianto & Ritala (2010) stated that knowledge perspective in relation to the dynamic capabilities are able to bring the organization to the higher order capacity. Soo, et.al (2004) research result exhibited the ability of knowledge creation and transfer is the basis to innovate as an endeavor to achieve competitive advantage for the organization. There are three fundamental reasons why knowledge can be used as the basis for a company in the creation of dynamic capabilities. First, connectivity. It is intended that the process of knowledge takes place in the context of social relations and constellation. It would significantly affect the chance and potential for knowledge development (Cohen & Levinthal, 1990; Brown and Duguid, 1991; Nonaka & Takeuchi, 1995). Second, learning is an essential mechanism that makes existing organization capable to develop and update capabilities. Therefore, the learning culture can be defined as the capacity of organizations to work in developing a more flexible and adaptable form. It is one form of another dynamic capability (March 1991; Zollo & Winter, 2002; Ferdinand et al, 2004). Third, although knowledge cannot be fully in managed, the possibility of development and exploitation can be enhanced through the provision of a variety of facilities communication technology and various forms of information storage to support, enhance, and provide insight knowledge to the development of knowledge itself (Sher & Lee, 2004; Nielsen, 2006; Capeda & Vera, 2007).

## **CONCLUSION**

Existing model creation of dynamic capabilities needs some improvement. Convergence approach in developing certain existing models so far found four important issues. These were related to the understanding of business ecosystem, generalized model, the existence of a feedback mechanism and learning mechanism. The fourth case was discussed completely with its theoretical foundation. However it is still in theoretical form as discussed above. Therefore, an empirical study is required by making the process of creating dynamic capabilities as a research focus. Therefore so it will awaken a model of dynamic capabilities creation more than capable to capture the environment dynamics.

## **REFERENCES**

1. Ahenkora, Kwaku & Adjei Esther, 2012. A Dynamic Capabilities Perspective on the Strategic Management of an Industry Organization. *Journal Of Management and Strategy*. Vol.3. No.3.
2. Barney, Jay. B, 1991. Firm Resources and Sustained Competitive Advantage. *Journal of Management*.(17)1. P.99-121.
3. 1991. The Resource-Based View of Strategy: Origins, Implications, and Prospects. Editor of Special Theory Forum in *Journal of Management*,17:97-211.
4. Brown, J.S & P Duguid. 1991. Organizational Learning and Communities of Practice: Towards a unifying view of working, learning, and innovation.*Organization Science*, 2 (1).40-57.
5. Capeda, G & D Vera. 2007. Dynamic Capabilities and Operational Capabilities: A Knowledge Management Perspective. *Journal of Business Research*.60 (5).426-437.

6. Chien, Yi Shih & Ching-Han Tsai, 2012. Dynamic Capability, Knowledge learning, and firm performance. *Journal of Organizational Change Management*. Vol 25. No.3. P 434-444.
7. Cohen, W & D Levinthal, 1990. Absorptive capacity: A New perspective on learning and innovation. *Administrative Science Quarterly*, 35 (1). 128-52.
8. Davenport, Thomas H, et.al, 2006. *Strategic Management in the Innovation Economy: Strategy Approaches and tools for dynamic innovation capability*. Jhon Willey.
9. Easterby-Smith, M., Lyles, M. A., & Peteraf, M. A. 2009. Dynamic capabilities: Current debates and future directions. *British Journal of Management*, 20: S1-S8.
10. Gourlay, Stephen. 2004. Knowing as Semiosis: Step Towards a Reconceptualization of 'tacit knowledge'. In Tsoukas Haridimos dan Nikolaos Mylonopoulos.(Editor). *Organizations as Knowledge System*. Palgrave Macmillan.
11. Grant, R. M, 1991. The Resource-based Theory of Competitive Advantage: Implications for Strategy Formulation. *California Management Review*, Spring: 114-35
12. Haefliger Stefan & Georg Van Krogh 2004. Knowledge Creation in Open Source Software Development. In Tsoukas Haridimos dan Nikolaos Mylonopoulos.(Editor). *Organizations as Knowledge System*. Palgrave Macmillan.
13. Helfat, Constance. 2007. *Dynamic Capabilities: Foundations*. Blackwell Publishing.
14. Kianto Aino & Ritala Paavo. 2010. Knowledge-Based Perspective on dynamic capabilities dalam Strategic Reconfiguration & Building Dynamic Capabilities in Rapid Innovation-based Industries. Edward Elgar. UK.
15. Leonard-Barton, D. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal*: 111-125.
16. Lewin Arie Y dan Silvia Massini. 2004. Knowledge Creation and Organizational Capabilities of Innovating and Imitating Firms. In Tsoukas Haridimos dan Nikolaos Mylonopoulos.(Editor). *Organizations as Knowledge System*. Palgrave Macmillan.
17. March, J.G. 1991. Exploration and exploitation in organization learning. *Organization Science*, 2 (1). 101-23
18. Mc Carthy, Ian & Brian Gordon, 2010. "Leveraging dynamic capabilities: a contingent management control system approach". In Stuart Wall, et.all. (ed). *Strategic Reconfiguration: Building Dynamic Capabilities in Rapid Innovation - based Industries*. P.13-32. Edward & Elgar.
19. Nielsen, A. 2006. Understanding dynamic capabilities through knowledge management. *Journal of Knowledge Management*, 10 (4). 59-71.
20. Nonaka I & Takeuchi, H, 1995. *The Knowledge Creating Company*. Oxford University Press. New York.
21. O'Conner, J & Ian Mc. Dermot, 1997. *The Art of System Thinking: Essential Skill for Creativity and Problem Solving*. Thorson. UK.
22. Parayitam Satyanarayana & Kishor Guru, 2010. Economic of Resource Based and Dynamic Capabilities view: A Contemporary Framework. *Academy of Strategic Management Journal*. Volume 9, Number 1.
23. Peteraf, M.A, 1993. The Cornerstones of Competitive Advantage: A Resource-based View. *Strategic Management Journal*, 14: 179-91.
24. Porter, M.E, 1981. The Contribution of Industrial organization to Strategic Management. *Academy of Management Review* 6. 20-609.
25. Robbins, Stephen P. 1990. *Organization Theory: Structure, Design and Applications*. Prentice hall. New Jersey USA.
26. Sher, P & V Lee. 2004. Information technology as a facilitator for enhancing dynamic capabilities through knowledge management, *Information & Management*, 41 (8). 933-44.
27. Simon, A., 2010. Resources, Dynamic Capabilities and Australian Business Success. *Journal of Global Business and Technology*, Vol.5 No.2, 13-30.
28. Soo, et.al. 2004. The Role of Knowledge Quality in Firm Performance. Dalam Tsoukas Haridimos dan Nikolaos Mylonopoulos.(Editor). *Organizations as Knowledge System*. Palgrave Macmillan.

29. Sudarsono, Hardjosoekarto, 2012. *Soft Systems Methodology (Metode Serba Sistem Lunak)*. UI Press.
30. Teece, D. J., Pisano, G., & Shuen, A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7): 509-533.
31. Teece, D. J. 2007. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, 28: 1319-1350.
32. 2011. Dynamic Capabilities: A Guide for Managers. <http://www.iveybusinessjournal.com/topic/strategy/dynamic-capabilities-a-guide-for-managers>.
33. Tseng Mei Shu & Pei Shan Lee, 2012. The effect of Knowledge management capability and dynamic capability on organizational performance. *Journal of Enterprise Information Management*. Vol 27.No.2.P.158-179.
34. Winter, S. G. 2003. Understanding dynamic capabilities. *Strategic Management Journal*, 24: 991-995.
35. Zollo, M, & Winter, S. G. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organization Science*, 13(3): 339-351.

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## **METHODICAL APPROACH TO ASSESSMENT OF THE ENTERPRISE ECONOMIC POTENTIAL**

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### **ABSTRACT**

Carrying out the activity in equal conditions, enterprises can achieve different results, as they have different levels of economic potentials. Assessment of the economic potential allows developing a complex understanding of all aspects of the organization for increasing its investment activity, competitiveness and effective functioning. Over the years, theoretical justification of the category of economic potential has not developed a common approach and a common methodology for its evaluation. This is due to the variety of the concept, its versatility and diversity of economists' opinions. The aim of the research was the development of universal methods for the assessment of the economic potential and its testing on materials of fisheries enterprises.

### **KEY WORDS**

Economic potential, assessment of economic potential, methodology, production, innovation potential, financial potential, labor potential, marketing potential.

The economic potential of the modern organization is a complex multi-level category to which a systematic approach should be applied. Analysis of the economic potential allows to form complex assessment of the current and future state of the organization from various positions, and conduct intra-industry and inter-industry comparison of organizations.

However, the use of the category of economic potential has a number of difficulties associated with the contradictions in the rendering of given concept and the absence of a single, accepted methodology of quantitative evaluation. The aim of the study, summarized in the article, was the development of universal methods of evaluation of the economic potential and its testing on materials of fisheries organizations. Objectives of the study were: assessment of the theoretical approaches to the concept of economic potential, substantiation of its target, development of a model of formation and realization of the economic potential of the organization, validation of approaches and methods of evaluation to determine the current level and reserves for its increasing, which is especially important in modern conditions of dynamically changing external environment, the high level of competition in all spheres of economic activity.

The category of economic potential is known in Russian science for over 40 years. From A.N. Azrilian and O.A. Zhigunova [14, p. 23], O.Y. Vorozhbit [13, p. 54; 11, p. 11] to T.V. Krashennikova [5, p. 10] and Kovaleva V. V. [4, p. 98]. From the point of view of targets, the economic potential of the enterprise is rendered as related to resource or effective potential. According to the resource approach, the economic potential represents a volume of already accumulated resources. According to effective approach economic potential is the ability of the economic system of any level to achieve a certain result, which is based on available opportunities.

Number of modern scientists (I.E., Gvarliani, S.V. Klimchuk, G.G. Nadvornaya, M.S. Oborin) give a generalized definition of economic potential as "a certain set of economic resources, generated by the economic entity, with the goal of creating the targeted, economically effective results of activity" [7, p. 75].

The types distinguish the following potentials: innovative, productive, intellectual, human, financial, organizational, managerial, marketing, socio-economic, environmental and others [10, p. 52].

In our opinion, the economic potential of the organization is formed on the basis of its productive and innovative potential as well as on labor, financial and marketing ones, as, in our opinion, they characterized all aspects of the enterprise and take into account the relationship with the external environment. The realization of the economic potential of the organization contributes to its quality upgrading, the formation of a new vector of development and the achieving the target indicators [1, 12]. For effective implementation of the economic potential of the organization its assessment is required. It allows to identify the current (reached) level of economic potential and the reserves for increasing. It is especially important in modern conditions of dynamically changing external environment, the high level of competition in all spheres of economic activity. The above mentioned determined the development of methods of estimation of economic potential and their regular upgrading is also necessary. Such sciences-economists as O.A. Zhigunova [14], Yu.G. Kanyuka [2], V.V. Kovalev [4], A.P. Latkin [6], M.K. Starovoitov, P.A. Fomin [8], Yu.V. Timofeeva [9], T.G. Sheshukova, E.V. Colesen [10] and others, contributed to the development of methods for assessing of economic potential of the organization. The technique, proposed by them, is based, mainly, on the using of financial indicators to measure its various components, which are compared with the criterial values. Financial indicators are easy to calculate using accounting forms, which greatly simplifies the evaluation process.

However, the following shortcomings of the existing methods of evaluating the economic potential of the organization might be marked: insufficient using of internal data of organization, which are not reflected in the forms of accounting (financial) reports of organization; the lack of a system of indicators for assessment of the economic potential of the organization and the indicators, characterizing marketing activity and its effectiveness; the inability to account the peculiarities of the activities of organizations, which are members of integration associations, for example, clusters.

These shortcomings indicate the need for improvement of previously developed methods. In our opinion, the most appropriate assessment of the economic potential of the organization should be in four areas: productive and innovative, financial, labor and marketing.

#### *1. Evaluation of the productive and innovative potential of the organization.*

The sources of productive and innovative potential are multiple relationships and interactions between the elements of the organization as a productive system. In this regard, it is appropriate to include the following indicators in block for assessment of productive potential: the level of depreciation of fixed assets ( $P_1$ ), returns on assets ( $P_2$ ), capital-labor ratio ( $P_3$ ), the proportion of costs for Research and Advanced Development (RAD) in the total amount of expenses for production and its realization ( $P_4$ ), the ratio of fundamentally new products in the total volume of sold products ( $P_5$ ), the ratio of improved production in total sales ( $P_6$ ).

#### *2. Evaluation of the financial potential of the organization.*

The economic potential of the organization is formed by effectively combining different types of resources, including financial ones [3]. The financial potential is based on the use of both own and borrowed funds. For the selection of indicators, characterizing the level of financial potential, it is necessary to evaluate the relationship of the final financial results of the organization and the factors of efficiency and intensity of using its resources.

Our calculations suggest that there is a strong positively directed connection between the amount of the net profit of the company and the following ratios: equity ratio ( $F_1$ ), return on equity ( $F_2$ ), return on assets ( $F_3$ ) the ratio of economic security of company's own assets ( $F_4$ ), the equity ratio ( $F_5$ ) the ratio of current liquidity ( $F_6$ ), the ratio of quick liquidity ( $F_7$ ). These ratios should be used to assess the financial potential of the organization. Each of these indicators can have both positive and negative effects on the value of financial potential and, through it, on the magnitude of the economic potential of the organization.

#### *3. Assessment of personnel potential of the organization.*

Effective selection of personnel is indispensable prerequisite and prime cause of the high competitiveness of any organization. Qualitative characteristics of the personnel determine the completeness of using the resource potential, high level of profitability, the

positive dynamics of the production processes, and hence, the level of economic potential of the organization.

We propose a set of indicators to assess human resource potential, including the following indicators: average age of employees ( $K_1$ ), the coefficient of constant personnel composition ( $K_2$ ), ratio of employees' turnover ( $K_3$ ), return on labor ( $K_4$ ), labor efficiency ( $K_5$ ), and the ratio of average wage to minimum subsistence income in the region ( $K_6$ ).

#### 4. Assessment of the marketing potential of the organization.

Forming a high level of economic potential is associated with a systemic approach to the marketing complex, integration of the parts of marketing system in the company, as well as modern and reliable information support of marketing decisions. The obtaining a positive effect increases the efficiency of business activity in general.

The following unit of marketing indicators is proposed for assessment of marketing potential: the degree of market coverage ( $M_1$ ), the degree of potential using ( $M_2$ ), ROI ( $M_3$ ).

According to the authors, the evaluation of the magnitude of the economic potential, provides the calculation of the integral indicator by the formula (1):

$$EP = \sum_{i=1}^4 q_i \sum_{a=1}^t k_a \cdot p_a \quad (1)$$

Where: EP – the economic potential of the organization;  $q_i$  – coefficient of significance in the block of indicators ( used to assess the economic potential of industrial enterprise);  $k_a$  – is a coefficient, indicating the direction of influence of the specific indicator from a particular block on the economic potential of industrial enterprise (can take values 1 or -1 depending on whether a particular indicator is within the standard (recommended) or dynamics values);  $p_a$  – the coefficient of significance of individual indicator from determined block;  $t$  – the number of indicators in the block.

Table 1 – Calculation of the Economic Potential of PJSC "Dalryba"

| Indicator | Value   | Recommended value | $k_a \cdot p_a$ |
|-----------|---------|-------------------|-----------------|
| $P_1$     | 0,53    | <0,5              | +0,17           |
| $P_2$     | 12,02   | Positive dynamics | -0,17           |
| $P_3$     | 407,55  | Positive dynamics | +0,17           |
| $P_4$     | 0,0     | Positive dynamics | -0,17           |
| $P_5$     | 0,0     | 0,06              | +0,17           |
| $P_6$     | 0,10    | 0,10              | +0,17           |
| $F_1$     | 0,82    | $\geq 0,5$        | +0,14           |
| $F_2$     | 0,57    | $\geq 0,1$        | +0,14           |
| $F_3$     | 0,46    | $\geq 0,03$       | +0,14           |
| $F_4$     | 0,76    | $\geq 0,2$        | +0,14           |
| $F_5$     | 0,72    | $\geq 0,2$        | +0,14           |
| $F_6$     | 4,18    | $\geq 1,5$        | +0,14           |
| $F_7$     | 3,11    | $\geq 1$          | +0,14           |
| $K_1$     | 45      | 35-45             | +0,17           |
| $K_2$     | 0,50    | >0,9              | -0,17           |
| $K_3$     | 0,49    | <0,05             | -0,17           |
| $K_4$     | 1063,79 | Positive dynamics | +0,17           |
| $K_5$     | 4897,95 | Positive dynamics | +0,17           |
| $K_6$     | 6,06    | >3,8              | +0,17           |
| $M_1$     | 634,50  | Positive dynamics | +0,33           |
| $M_2$     | 0,01    | Positive dynamics | +0,33           |
| $M_3$     | 5,35    | Positive dynamics | +0,33           |

Source: compiled by the authors.

The coefficients of significance in the blocks of indicators, used to assess the economic potential of the organization, are taken by the calculation of the component - priorities for the matrix of paired comparisons. Based on selected number of indicators, they are: for

productive-innovative block – 0,27; for financial block – 0,32; for labor block – 0,27; for marketing block – 0,14.

If the calculation is performed by external users without access to all necessary information, the values of coefficients of significance in blocks of indicators can be changed. Hence, the transformation methods, depending on evaluated subject, are possible.

It is proposed to use the following scale for the resultant assessment of the economic potential of the organization: if  $EP \geq 0,75$ , the economic potential of the organization is high; if of  $0.50 \leq EP \leq 0,74$ , the economic potential of is medium; if  $EP < 0,50$ , the economic potential is low.

The described method was tested on the example of PJSC "Dalryba" according to the financial accounts for 2016 (table 1).

The calculations have allowed to conclude that the level of economic potential of JSC "Dalryba" in 2016 was high ( $EP = 0,816$ ).

Taking into account the results of the conducted research we can make the following conclusions:

1. The economic potential of the organization is a multiway category, that can be determined by combining the resource and resultative approaches (the most frequently used in modern science)

2. For effective implementation of the economic potential of the organization it is necessary to evaluate the already reached level and to reveal reserves for its increase.

3. Assessment of the economic potential of the organization should be based on a system-based approach and include evaluation of productive- innovative, financial, labor and marketing potentials of the organization. It is recommended to carry out calculation of integral index, that allows to take into account the recommended values, included in the formula of indicators and taking into consideration the industry features of the activities of a particular organization. The conducted testing (on the basis of accounting data of JSC "Dalryba") proves the viability of the proposed methodology.

## REFERENCES

1. Chipovskaya I.S., Levchenko T.A. The formation of synergies in the operation of the fishery cluster. *Ekonomika i predprinimatelstvo*. 2015. No. 4-2 (57-2). Pp. 291-296.
2. Kanyuka Yu.G. Perfection of approaches to formation, development and use of marketing potential of the company in the new markets: the author's abstract of the dissertation of the candidate of economic sciences: 08.00.05. St. Petersburg, 2017. 20 p.
3. Konvisarova E.V., Neprokin A.V., Konvisarov A.G. The ways of improvement of financial state of small construction company. *Vektor nauki Toliattinskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravleniye*. 2016. No. 2 (25). Pp. 22-27.
4. Kovalev V.V. Corporate finance and accounting. Moscow: Prospekt, 2015. 916 p.
5. Krashennikova T.V. Management of the potential of the socio-economic system as a determinant of its sustainable development: the author's abstract of the dissertation of the candidate of economic sciences: 08.00.05. Rostov-na-Donu, 2016. 30 p.
6. Latkin A.P., Kravets A.V. The main problems of preservation and development of the labor potential of the Russian Primorye. *Vektor nauki Toliattinskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravleniye*. 2017. No 1 (28). Pp. 23-30.
7. Nadvornaya G.G., Klimchuk S.V., Oborin M.S., Gvarliani T.E. Theory and methodology for assessing the economic potential of enterprises. *Ekonomicheskie i socialnye peremeny: fakty, tendentsii, prognoz*. 2016. No 6. Pp. 70-90.
8. Starovoytov M.K., Fomin P.A. Features of the assessment of the potential of industrial enterprises. *Antikrizisnoe i vneshnee upravlenie*. 2006. No 2. Pp. 27-41.
9. Timofeeva Yu.V. Assessment of the economic potential of the organization: financial and investment potential. *Ekonomicheskiy analiz: teoriya i praktika*. 2009. No 1 (130). Pp. 43-53.
10. Sheshukova T.G., Kolesen E.V. Improvement of the methodology for assessing the economic potential of an economic entity. Perm: Permskiy gosudarstvennyy nacionalnyy

issledovatelskiy universitet, 2013. 196 p.

11. Vorozhbit O.Yu. Theoretical and methodological bases of management of competitiveness of entrepreneurial structures in the fishing industry: the author's abstract of the dissertation of the Doctor of Economic Sciences: 08.00.05. Vladivostok, 2009. 34 p.
  12. Vorozhbit O.Yu., Shashlo N.V. Integration process and common agricultural market under the conditions of the Eurasian Economic Union // International Business Management. 2016. T. 10. №19. С. 4635-4643.
  13. Vorozhbit O.Yu., Terenteva T.V., Titova N.Yu. Sustainable development of fishing complex in Primorsky krai via formation of territorial-sectoral industrial cluster. Azimut nauchnykh issledovaniy: ekonomika i upravleniye. 2016. T. 5. No. 2 (15). Pp. 53-57.
- Zhigunova O.A. Methodology of analysis and forecasting of the economic potential of the enterprise: the dissertation of the Doctor of Economics: 08.00.12. Ekaterinburg, 2010. 339 p.



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## **CRITERIA FOR ASYMMETRIC PRICE TRANSMISSION MODEL SELECTION BASED ON KULLBACK'S SYMMETRIC DIVERGENCE**

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### **ABSTRACT**

In econometric modelling of asymmetric price transmission, selection of an optimal model among a collection of candidate models is a critical issue. In order to address the problem, criteria that targets Kullback's Direct Divergence has been extensively used in asymmetric price transmission model selection. An alternative criteria recently introduced by Cavanaugh that targets Kullback's Symmetric Divergence (KIC and KICc) remains unexplored in asymmetric price transmission model selection. In this paper, a Monte Carlo study is conducted to evaluate the relative performance of the recently developed selection criteria based on Kullback's Symmetric Divergence (KIC and KICc) against commonly used alternatives based on Kullback's Direct Divergence (AIC and AICc) in terms of their ability to recover the true asymmetric data generating process. Monte Carlo simulation results indicate that the performance of the model selection methods is influenced by the sample size, the level of asymmetry and the amount of noise in the model used in the application. KICc is comparable to KIC and both outperform AIC and AICc in both small and large samples. At lower noise levels, KICc is comparable to KIC and both outperform AIC and AICc. As difference in asymmetric adjustment parameters or speeds increases KICc is comparable to KIC and both outperform AIC and AICc. These results suggest that criteria based on Kullback's Symmetric Divergence (KICc and KIC), is a very reliable and useful criterion in asymmetric price transmission model selection.

### **KEY WORDS**

Price asymmetry, Akaike's Information Criteria, Kullback Information Criteria, model selection.

Researchers in asymmetric price transmission modelling have developed competing models for detecting price asymmetry. Model selection criteria provide useful tools for choosing an appropriate model from a set of competing models. In asymmetric price transmission model selection, criteria that target directed divergence such as Akaike Information Criteria (AIC), and its corrected versions, Corrected Akaike Information Criteria (AICc) have been employed. For example, Acquah (2013) addresses asymmetric price transmission model selection problem using AIC and its corrected version. The directed divergence, also known as the I-divergence, is an asymmetric measure of separation between two statistical models, meaning that an alternate directed divergence may be obtained by reversing the roles of the two models in the definition of the measure. As an alternative to estimating the directed divergence, model selection criteria that targets symmetric divergence between the generating model and a fitted candidate model has been developed. The symmetric divergence, also known as the J-divergence, is the sum of the two directed divergences. Kullback Information Criteria (KIC) and the Corrected Kullback Information Criteria (KICc) were proposed as asymptotically unbiased estimators of the J-divergence (Cavanaugh 1999). Cavanaugh 2004 asserts that the symmetric divergence is arguably more sensitive than the directed divergence towards detecting improperly specified models when used to evaluate fitted candidate models. There is, therefore the need to extend previous literature on comparison of model selection methods in asymmetric price transmission modelling to include new criteria based on symmetric divergence (KICc and

KIC) which has been successfully applied to a number of applications such as linear regression, longitudinal data and overdispersed data.

Previous studies addressing issues of asymmetric price transmission model selection did not consider the use of criteria based on symmetric divergence such as KIC and corrected KIC. In effect, little is understood about the performance of criteria based on symmetric divergence in selecting the correct asymmetric price transmission model. A fundamental question in asymmetric price transmission model selection is, will criterion based on symmetric divergence outperform criterion based on directed divergence in identifying the true asymmetric price transmission model. In effect, will symmetric divergence serve as a more sensitive discrepancy measure than the direct divergence in asymmetric price transmission modelling context?

In order to address these issues, the study compares the relative performance of model selection criteria based on directed divergence (AIC, AICc) with the criterion based on symmetric divergence (KIC, KICc) in terms of their ability to recover the true asymmetric data generating process (DGP). In effect, the paper evaluates the ability of AIC, AICc, KIC, and KICc to choose between alternative methods of testing for price asymmetry.

## METHODS OF RESEARCH

*Model Selection Methods.* Model selection criteria are statistical instruments that serve the purpose of choosing a suitable statistical model from a set of candidate models. Researchers studying a price asymmetry often postulates different theories that could explain the phenomenon. The different theories hypothesized usually generate a group of candidate models that could viably characterize the data. Model selection criteria are used to assign scores to each of the fitted candidate models in order to assist the researcher in selecting a good model. Different model selection criteria have been developed. Akaike pioneered the work in this area and developed the Akaike information criterion (AIC) (Akaike, 1973). AIC remains the most widely known and used model selection criterion. Subsequently, extensions of AIC have been developed. AIC and related measures were developed based on the notion of the Kullback Directed Divergence (KDD). Cavanaugh, (1999, 2004) developed KIC and extensions based on the notion of Kullback Symmetric Divergence (KSD) as an alternative measure of the Kullback's discrepancy. Models that minimizes the information criteria are declared as the best model among the set of candidate models under consideration. In this section commonly used information criteria such as Akaike Information Criteria (AIC and AICc) and recently developed Kullback Information Criteria (KIC and KICc) are discussed.

*Akaike Information Criteria (AIC).* Akaike (1973, 1974), proposed AIC as an estimate of Kullback's directed divergence. AIC is an asymptotically unbiased estimate of the Kullback's directed divergence. With this motivation, AIC is defined as:

$$AIC = -2 \log(L) + 2k \quad (1)$$

Where: (L) denotes the maximum likelihood function of the model with k covariates. The  $-2 \log(L)$  is the goodness of fit term and  $2k$  is the penalty for model complexity. The difference between the expected value of AIC and the expected Kullback's directed divergence should tend to zero as sample size increases. AIC chooses the best-approximating model to the data generating process and models with minimum AIC values are preferred.

*Corrected Akaike Information Criteria (AICc).* AIC severely underestimates Kullback's directed divergence for high dimensional fitted models in the competing models. Hurvich and Tsai (1989) proposed another information criteria, corrected AIC as an estimate of the Kullback's directed divergence which corrects the overfitting nature of AIC. AICc can be defined as:

$$AICc = -2 \log(L) + \frac{2nk}{(n-k-1)} \quad (2)$$

Where: (L) denotes the maximum likelihood function of the model with k covariates and n is the sample size. The first term represents the log-likelihood of the model and the second term penalizes the model for complexity. Models with minimum AICc values are preferred.

*Kullback Information Criteria (KIC).* Cavanaugh (1999) proposes KIC as an analogue of AIC that targets the symmetric as opposed to the directed divergence. KIC is asymptotically unbiased estimate of the J-divergence.

KIC is defined as:

$$KIC = -2 \log(L) + 3k \quad (3)$$

As sample size increases, the difference between the expected value of KIC and the expected value of Kullback's symmetric divergence should tend to zero. Where (L) denotes the maximum likelihood function of the model with k covariates. The -2 log (L) is the goodness of fit term and 3k is the penalty for complexity. Models with minimum KIC values are preferred.

*Corrected Kullback Information Criteria (KICc).* Cavanaugh (2004) proposed an analogue of the corrected AIC (AICc) for the normal linear regression model based on estimating Kullback's symmetric divergence. The criteria is defined as:

$$KICc = -2 \log(L) + n \ln \left( \frac{n}{n-k-1} \right) + \frac{n \{ (n-k+1)(2k+1) - 2 \}}{(n-k-1)(n-k-1)} \quad (4)$$

KICc is exactly unbiased estimator of symmetric divergence in the normal linear regression framework, (Kim and Cavanaugh, 2005). Where (L) denotes the maximum likelihood function of the model with k covariates and n denotes the sample size. The -2 log (L) is the goodness of fit term and the remaining terms denote the penalty for complexity. Models with minimum KICc values are preferred.

*Asymmetric Price Transmission Models.* A simple Houck (1977) model based on Wolfram (1971) price variable segmentation approach can be employed to model price asymmetry as follows:

$$\Delta y_t = \beta_1^+ \Delta x_t^+ + \beta_1^- \Delta x_t^- + \varepsilon_t \quad \varepsilon_t \sim N(0, \sigma^2) \quad (5)$$

Where: the increases and decreases in the price series  $x_t$  are denoted by  $\Delta x_t^+$  and  $\Delta x_t^-$  respectively. Symmetry is tested using an F test of the null hypothesis  $H_0 : \beta_1^+ = \beta_1^-$ . The development of the Houck's model does not take into consideration the concept of cointegration between the price series.

Cramon-Taubadel and Loy (1996) and Cramon-Taubadel (1998) established that Houck's model is not an appropriate test for asymmetry if the price series are co-integrated. Granger and Lee (1989) proposed the Error Correction Model as an appropriate test for asymmetry if the price series x and y are co-integrated. The proposed asymmetric error correction model can be represented as follows:

$$\Delta y_t = \beta_1 \Delta x_t + \beta_2^+ ECT_{t-1}^+ + \beta_2^- ECT_{t-1}^- + \varepsilon_t \quad (6)$$

The long run equilibrium relationship between the price series x and y is denoted by the Error Correction Term (ECT) which is partitioned into positive and negative component. In

the Error Correction Model, asymmetries specified affects the positive and negative components of the error correction term. Symmetry is tested in eqn (6) using an F test of the null hypothesis  $H_0 : \beta_2^+ = \beta_2^-$ .

Granger and Lee Model is extended in Cramon-Taubadel and Loy (1996) into a complex asymmetric price transmission model in which asymmetries specified affect the direct impact of price increases and decreases, as well as positive and negative components of the error correction term.

$$\Delta y_t = \beta_1^+ \Delta x_t^+ + \beta_1^- \Delta x_t^- + \beta_2^+ ECT_{t-1}^+ + \beta_2^- ECT_{t-1}^- + \varepsilon_t \quad (7)$$

Where:  $\Delta x_t^+$  and  $\Delta x_t^-$  are the increases and decreases in  $x_t$  and  $ECT_{t-1}^+$  and  $ECT_{t-1}^-$  are the positive and negative components of the error correction term. Symmetry is tested using a joint F test of the null hypothesis  $H_0 : \beta_1^+ = \beta_1^-$  and  $\beta_2^+ = \beta_2^-$ .

## RESULTS AND DISCUSSION

*Model Recovery Rates of the Different Model Selection Criteria.* The empirical performance of recently developed model selection criteria based on Kullback Symmetric Divergence (KIC and KICc) and frequently used alternative model selection criteria based on Directed Divergence (AIC and AICc) in recovering the true asymmetric data generating process (DGP) under conditions of different sample sizes, level of asymmetry and noise levels are evaluated using Monte Carlo simulations. The data generating process is simulated from the standard error correction model in each Monte Carlo experiment as follows:

$$\Delta y_t = 0.5\Delta x_t - 0.25(y_t - x_t)_{t-1}^+ - 0.75(y_t - x_t)_{t-1}^- + \varepsilon \quad (8)$$

In the spirit of Holly et al (2003), the value of  $\beta_1$  is set to 0.7 and  $(\beta_2^+, \beta_2^-) \in (-0.25, -0.75)$  are considered for the coefficients of the true asymmetric error correction model data generating process. In the true model, y and x are generated as I (1) nonstationary variables that are co-integrated.  $\Delta y_t$  in eqn (8) is obtained by summing up  $\Delta x_t$  and the positive and negative deviations from the equilibrium relationship between y and x.

The behavior of AIC, AICc, KIC and KICc are examined in 1000 Monte Carlo simulation where each criterion is used to select the true model from among a set of competing asymmetric price transmission models. For each Monte Carlo experiment, the candidate models are fitted to the data, and the criteria evaluated in terms of their ability to recover the true asymmetric data generating process. The fitted model favored by each criterion is recorded and defined as the model recovery rates. Model recovery rates were obtained using 1000 Monte Carlo simulations. The number of times each model selection criteria selects the true model provides the basis for comparison. In effect criteria success rate, in choosing the true data generating process forms the basis for comparing the selection methods.

The empirical performance of recently developed model selection criteria based on Kullback Symmetric Divergence (KIC and KICc) and frequently used alternative model selection criteria based on Directed Divergence (AIC and AICc) are compared in terms of their ability to recover the true asymmetric data generating process (DGP) across various sample size conditions, levels of asymmetry and noise levels (i.e. Model Recovery Rates). For the sake of brevity, the standard asymmetric error correction model, the complex asymmetric error correction model and the Houck's model in first differences are denoted by SECM, CECM, and HKD respectively.

The performance of the model selection methods is evaluated in terms of their ability to select the true model among a set of competing models. Table 1 reports the success rates with which each model selection criteria selects the true model. The model selection methods studied do point to the correct model, though their ability to recover the true asymmetric data generating process (DGP) increases with increase in sample size and a decrease in stochastic variance. Similarly, previous studies (Acquah 2013; Markon & Krueger, 2004; Bozdogan, 1987; Atkinson, 1980) also noted that model selection methods empirically do point to the correct model. Generally, as sample size increases, model recovery rates of KIC, KICc, AIC, and AICc improved. In small samples (upper part of Table 1), the model selection methods recovered at most 82.6 % of the true data generating process.

In moderate samples (middle part of Table 1), the model selection methods recovered at most 92.4 % of the true data generating process. When the sample size was large (lower part of Table 1), the model selection methods recovered at most 92.8 % of the true model. Generally KICc performs similarly to KIC in small to large samples with low noise levels and both outperform AIC and AICc in small to large samples with low noise levels. In effect, at larger sample size, KICc is comparable to KIC and outperforms AIC and AICc.

Table 1 – Relative performance of the model selection methods across sample size

| Experiment criterion   | Model fitted |          |         |                |
|------------------------|--------------|----------|---------|----------------|
|                        | Methods      | CECM (%) | HKD (%) | SECM (DGP) (%) |
| $n = 50$ $\sigma = 1$  | AIC          | 16.2     | 5.1     | 78.7           |
|                        | AICc         | 11.8     | 6.7     | 81.5           |
|                        | KIC          | 7.9      | 9.5     | 82.6           |
|                        | KICc         | 5.1      | 12.3    | 82.6           |
|                        | AIC          | 15.6     | 0       | 84.4           |
| $n = 150$ $\sigma = 1$ | AICc         | 14.4     | 0       | 85.6           |
|                        | KIC          | 8.3      | 0       | 91.7           |
|                        | KICc         | 7.6      | 0       | 92.4           |
|                        | AIC          | 15       | 0       | 85             |
| $n = 500$ $\sigma = 1$ | AIC          | 14.5     | 0       | 85.5           |
|                        | KIC          | 7.6      | 0       | 92.4           |
|                        | KICc         | 7.2      | 0       | 92.8           |
|                        |              |          |         |                |

Note: Recovery rates based on 1000 replications.

Success rates of Corrected Kullback Information Criteria (KICc) strongly depended on sample size for the true data generating process (DGP). It increased from 82.6 percent to 92.8 percent when the sample size was increased from 50 to 500. Similarly, recovery rates of Kullback Information Criteria (KIC) also depended on sample size for the true data generating process (DGP). It increased from 82.6 percent to 92.4 percent when the sample size was increased from 50 to 500. This is consistent with the empirical studies which indicate that KICc or KIC is consistent (Cavanaugh, 1999; 2004).

On the other hand, recovery rates of AIC and AICc increased from 78.7 and 81.5 percent to 85.0 and 85.5 percent respectively for the true asymmetric data generating process (DGP) when the sample size was increased from 50 to 500. Though AIC and AICc performed well in the small samples, it is inconsistent and does not improve in performance as sample size increases. Notably, AICc performs better in small and large samples than AIC. Furthermore KICc and KIC outperform AIC and AICc in small and large samples. In summary, KICc performs similarly to KIC and both outperform AICc and AIC in both small and large samples.

Similarly, Cavanaugh (2004) in a traditional linear regression modeling notes that KICc outperforms AIC, AICc and KIC in both small and large sample settings when all possible combinations of covariates are considered for the class of candidate models. These results further document the advantage of using Kullback's symmetric divergence instead of Kullback's directed divergence as an oracle. Seghouane and De Lathauwer (2003) notes in bootstrap simulations that KICc outperforms KIC, AIC and AICc in small and moderate samples. Cavanaugh (1999) and Ye et al (2008) also notes that KIC outperforms AIC and

AICc. Generally, these results are confirmed in the Monte simulation results presented in Table 1.

Using three error sizes ( $\sigma$ ) ranging from small to large and corresponding to 1.0, 2.0 and 3.0, the effects of noise level on model selection are studied. The asymmetric price transmission data generating process specified in eqn (8) is simulated via 1000 Monte Carlo experimentation with the different error sizes and a sample size of 150. The competing models are compared to the true model on the basis of their data fitting abilities as the error in the data generating process was increased systematically. Table 2 shows the percentage with which each model selection criteria selects the true asymmetric data generating process (i.e. SECM) among a set of candidate models as the amount of noise in the data generating process was increased.

Table 2 – Relative performance of the selection methods across error size

| Experiment criterion       | Methods | Model fitted |         |                |
|----------------------------|---------|--------------|---------|----------------|
|                            |         | CECM (%)     | HKD (%) | SECM (DGP) (%) |
| $n = 150 \quad \sigma = 3$ | AIC     | 12.1         | 22.8    | 65.1           |
|                            | AICc    | 10.9         | 23.7    | 65.4           |
|                            | KIC     | 5.4          | 35      | 59.6           |
|                            | KICc    | 4.6          | 36.4    | 59             |
| $n = 150 \quad \sigma = 2$ | AIC     | 14.5         | 4.8     | 80.7           |
|                            | AICc    | 13.3         | 5.1     | 81.6           |
|                            | KIC     | 7.2          | 8.5     | 84.3           |
|                            | KICc    | 6.3          | 9.3     | 84.4           |
| $n = 150 \quad \sigma = 1$ | AIC     | 15.6         | 0       | 84.4           |
|                            | AICc    | 14.4         | 0       | 85.6           |
|                            | KIC     | 8.3          | 0       | 91.7           |
|                            | KICc    | 7.6          | 0       | 92.4           |

*Note: Recovery rates percentages based on 1000 replications.*

Generally, as the amount of noise in the true asymmetric price transmission data generating process increased model selection performance declined. Recovery rates of corrected Kullback Information Criteria (KICc) decreased from 92.4 percent to 59 percent when the error size was increased from 1 to 3. Similarly, recovery rates of KIC decreased from 91.7 percent to 59.6 percent for the true data generating process (DGP) when the error size was increased from 1 to 3. Recovery rates of AIC and AICc also decreased from 84.4 and 85.6 percent to 65.1 and 65.5 percent respectively for the true asymmetric data generating process (DGP) when the error size was increased from 1 to 3. In effect, at higher noise levels, AICc is comparable to AIC and both outperform KIC and KICc whilst at lower noise levels, KICc is comparable to KIC and both outperform AIC and AICc. Similarly, some previous studies (Acquah, 2013; Myung, 2000; Gheissari and Bab-Hadiashar, 2004; Yang, 2003, Hui et al 2011) found that the recovery rates of the true data generating process decreases with increasing noise levels.

The effects of sample size and stochastic variance on model selection performance was investigated concurrently. The Monte Carlo simulation results indicate that a small error and large sample improves recovery of the true asymmetric data generating process and vice versa as illustrated in Table 3. When the sample size was 50 with an error size of 2.0, the true data generating process was recovered at least 42.3 percent of the time by the model selection criteria as illustrated in the upper part of Table 3. On the other hand, when the sample size was 150 with error size of 0.5, at least 84.4 percent of the correct model was recovered across all the model selection methods as indicated in the lower part of Table 3.

In effect under stable conditions (a relatively large sample size of 150 and a small error size of 0.5), model selection performance or recovery rates improved whilst under unstable conditions ( a small sample size of 50 and large error size of 2 ) model selection performance or recovery rates decreased.

At higher noise levels and small sample size (unstable conditions), AIC is comparable to AICc and outperforms KIC and KICc. At lower noise levels and large sample size (stable conditions), KICc is comparable to KIC and outperforms AIC and AICc. Similarly, Hui et al

(2011) note that the model recovery rate of AIC decreases slowest at high noise level. Generally, these results are consistent with Monte Carlo experimentation results of previous studies (Acquah, 2010) which suggest that the recovery rates of the true data generating process decreased with increasing noise levels in asymmetric price transmission regression models.

Table 3 – Effects of sample size and stochastic variance on model recovery

| Experiment criterion         | Methods | Model fitted |         |                |
|------------------------------|---------|--------------|---------|----------------|
|                              |         | CECM (%)     | HKD (%) | SECM (DGP) (%) |
| $\sigma = 2 \quad n = 50$    | AIC     | 10.8         | 37.5    | 51.7           |
|                              | AICc    | 7            | 41.7    | 51.3           |
|                              | KIC     | 4.7          | 48.7    | 46.6           |
|                              | KICc    | 2.3          | 55.4    | 42.3           |
| $n = 150 \quad \sigma = 0.5$ | AIC     | 15.6         | 0       | 84.4           |
|                              | AICc    | 14.4         | 0       | 85.6           |
|                              | KIC     | 8.3          | 0       | 91.7           |
|                              | KICc    | 7.6          | 0       | 92.4           |

Note: Recovery rates percentages based on 1000 replications.

The effects of the increase in difference of asymmetric adjustment parameters on model selection are investigated by simulating data of sample size 150 and error size 1 from the standard error correction model and considering asymmetry values of  $(\beta_2^+, \beta_2^-) \in (-0.25, -0.50)$  or  $(-0.25, -0.75)$  for the coefficients of the asymmetric error correction terms. The effect of the level of asymmetry on model recovery is then investigated. Increasing the difference in the asymmetric adjustment parameters from 0.25 to 0.5 results in an increase in model recovery of the true asymmetric data generating process as illustrated in Table 4.

Table 4 – Effects of the level of asymmetry on model recovery

| Experiment criterion           | Methods | Model Fitted |         |                |
|--------------------------------|---------|--------------|---------|----------------|
|                                |         | CECM (%)     | HKD (%) | SECM (DGP) (%) |
| $\beta_2^+ - \beta_2^- = 0.25$ | AIC     | 15.6         | 0       | 84.4           |
|                                | AICc    | 14.4         | 0       | 85.6           |
|                                | KIC     | 8.2          | 0.4     | 91.4           |
|                                | KICc    | 7.5          | 0.4     | 92.1           |
| $\beta_2^+ - \beta_2^- = 0.50$ | AIC     | 15.5         | 0       | 84.5           |
|                                | AICc    | 14.3         | 0       | 85.7           |
|                                | KIC     | 8.3          | 0       | 91.7           |
|                                | KICc    | 7.6          | 0       | 92.4           |

Note: Recovery rates percentages based on 1000 replications.

Recovery rates of model selection criteria based on Kullback Symmetric Divergence (KIC and KICc) respond more strongly to increases in the difference between the asymmetric adjustments parameters than other criteria based on directed divergence (AIC and AICc). Without regards to the concept of information criteria, Cook et al. (1999) notes that the increases in the difference in asymmetric adjustments parameters from 0.25 to 0.50 have positive effects on the test for asymmetry. Notably, difference in asymmetric adjustment parameters or speeds is important in the performance of the model selection methods in recovering the true data generating process.

## CONCLUSION

This study investigated the ability of the recently developed selection criteria based on Kullback's Symmetric Divergence (KIC and KICc) and commonly used alternatives based on Kullback's Direct Divergence (AIC and AICc) to clearly identify the correct asymmetric price transmission model out of a set of competing models via Monte Carlo experimentation. The

Monte simulations results indicated that the sample sizes, noise levels and the level of asymmetry are essential in the selection of the true asymmetric price transmission model. Large sample sizes or low noise levels improves the ability of the model selection methods to identify the correct asymmetric price data generating process. Generally, at lower noise levels and large sample size (stable conditions), KICc is comparable to KIC and both outperform AIC and AICc. Furthermore, KICc performs similarly to KIC and both outperform AICc and AIC in both small and large samples. As difference in asymmetric adjustment parameters or speeds increases KICc is comparable to KIC and both outperform AIC and AICc. These results suggest that criteria based on Kullback's symmetric divergence (KICc and KIC), is a very reliable and useful criterion in asymmetric price transmission model selection.

Empirically, the comparison provided contributes to knowledge and understanding of the relative performance of recently developed criteria based on Kullback's symmetric divergence (KICc and KIC) against commonly used criteria based on Kullback's directed divergence (AIC and AICc) in an asymmetric price transmission modelling framework. The study also adds to the literature on asymmetric price transmission modelling by drawing the attention and interests of asymmetric price transmission researchers to adopt more recent statistical model selection criteria based on Kullback's symmetric divergence, such as KICc and KIC, in asymmetric price transmission model selection problems.

## REFERENCES

1. Acquah, H. D. (2013). On the Comparison of Akaike Information Criterion and Consistent Akaike Information Criterion in Selection of an Asymmetric Price Relationship: Bootstrap Simulation Results. *AGRIS on-line Papers in Economics and Informatics*, 5(1), 3.
2. Acquah, H. D. (2010). Comparison of Akaike information criterion and Consistent Akaike information criterion for model selection in Asymmetric Price Transmission Studies. *Asian-African Journal of Economics and Econometrics*. Vol. 9, No. 1, 49-56.
3. Akaike, H. (1973). Information Theory and an Extension of the Maximum Likelihood Principle. In: B.N. Petrov and F. Csaki (eds.) 2nd International Symposium on Information Theory. 3: 267-81 Budapest: Akademiai Kiado.
4. Akaike, H. (1974). A new look at the statistical model identification, *IEEE Transactions on Automatic Control* AC-19, 716–723.
5. Atkinson, A. C. (1980). A note on the generalized information criterion for choice of a model. *Biometrika*, 67, 413-418.
6. Bozdogan, H. (1987). Model Selection and Akaike's Information Criterion (AIC): The General Theory and Its Analytical Extensions. *Psychometrika*. 52(3):345-370.
7. Cavanaugh, J. E. (1999). A large-sample model selection criterion based on Kullback's symmetric divergence, *Statistics and Probability Letters* 44, 333–344.
8. Cavanaugh, J. E. (2004), Criteria for linear model selection based on Kullback's symmetric divergence, *Australian and New Zealand Journal of Statistics* 46.
9. Cook, S., Holly, S., & Turner, P. (1999). The Power of tests for nonlinearity: the case of Granger–Lee asymmetry, *Economics Letters*, 62, pp.155–159.
10. Cramon-Taubadel, V. S., & Loy, J. P. (1996) Price Asymmetry in the International Wheat Market: Comment. *Canadian Journal of Agricultural Economics*, 44:311-317.
11. Cramon-Taubadel, S. (1998). Estimating asymmetric Price Transmission with the Error Correction Representation: An Application to the German Pork Market", *European Review of Agricultural Economics*, 25, pp. 1-18.
12. Gheissari, N. and Bab-Hadiasher, A. (2004). Effect of Noise on Model Selection Criteria in Visual applications. *Pattern Recognition*, 2, Issue 23-26 pp. 229-232.
13. Granger, C. W. J., & Lee, T. H. (1989). Investigation of Production, Sales and Inventory Relationships using Multicointegration and non-symmetric Error Correction Models. *Journal of Applied Econometrics*, 4:135- 159.



14. Holly, S., Turner P., & Weeks, M. (2003). Asymmetric Adjustment and Bias in Estimation of an Equilibrium Relationship from a Co-integrating Regression. *Computational Economics*, 21:195-202.
15. Houck, J. P. (1977). An Approach to specifying and estimating nonreversible Functions. *American Journal of Agricultural Economics*, 59:570-572.
16. Hui M, Li J, Wen X, Yao L, Long Z (2011) An Empirical Comparison of Information-Theoretic Criteria in Estimating the Number of Independent Components of fMRI Data. *PLoS ONE* 6(12): e29274. doi:10.1371/journal.pone.0029274
17. Hurvich, C. M. and Tsai, C. L. (1989), Regression and time series model selection in small samples, *Biometrika* 76, 297–307.
18. Kim, H. J. and Cavanaugh, J. E. (2005). Model selection criteria based on Kullback information measures for nonlinear regression, *Journal of Statistical Planning and Inference* 134, 332–349.
19. Markon, K. E., & Krueger, R. F. (2004). An Empirical Comparison of Information-Theoretic Selection Criteria for Multivariate Behavior Genetic Models. *Behavior Genetics*, 34, (6), pp.593- 609
20. Myung Jae In (2000). The Importance of Complexity in Model Selection. *Journal of Mathematical Psychology*, 44, pp. 190-204.
21. Seghouane, A-K, and De Lathauwer L ( 2003): A bootstrap model selection criterion based on Kullback's symmetric Divergence. *IEEE workshop on statistical processing*. Pages 494-497
22. Wolfram, R. (1971). "Positivistic Measures of Aggregate Supply Elasticities - Some New Approaches –Some Critical Notes," *American journal of Agricultural Economics*, 53, pp. 356-356.
23. Yang, Y., (2003). Regression with multiple candidate models: Selecting or Mixing? *Statistica Sinica*, (13), 783-809.
24. Ye, M., P. D. Meyer, and S. P. Neuman (2008), On model selection criteria in multimodel analysis, *Water Resour. Res.*, 44, W03428, doi: 10.1029/2008WR006803.

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**ВОПРОСЫ ВАЛЮТНОГО КРЕДИТОВАНИЯ КОММЕРЧЕСКИМИ БАНКАМИ  
В СОВРЕМЕННЫХ УСЛОВИЯХ**  
ISSUES OF CURRENCY LENDING BY COMMERCIAL BANKS IN MODERN CONDITIONS

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**АННОТАЦИЯ**

В статье проанализированы последствия изменения курса национальной валюты на рынок валютного кредитования. Также рассмотрены основные пути выхода из кризисной ситуации и меры, принимаемые российскими банками, для урегулирования проблемы на примере АО «Россельхозбанк» за 2014-2016 год.

**ABSTRACT**

The article analyzes the consequences of exchange rate change of the national currency on the market of foreign currency lending. It is also considered the main ways to solve crisis situation and measures taken by the Russian banks on the example of JSC «Rosselkhozbank» in 2014-2016.

**КЛЮЧЕВЫЕ СЛОВА**

Валюта, валютный кредит, курс, рубль, доллар, евро, объем кредитования, кредитный портфель, просроченная задолженность.

**KEY WORDS**

Currency, foreign exchange credit, exchange rate, ruble, dollar, euro, loan volume, credit portfolio, past due accounts.

Конец 2014 г. и весь 2015 г. характеризовались существенными сдвигами в экономической и денежно-кредитной политике развитых стран, вызванных целым рядом факторов: падением цен на нефть ниже 40 дол. за баррель; замедлением роста развивающихся экономик.

Все это не могло не оказать влияние на валютные рынки – наблюдался уход инвесторов в доллар и швейцарский франк, снижение курса евро и валют развивающихся стран, рост волатильности курсов. Не исключением стала и Россия.

Но в I квартале 2017 года наметился рост объемов валютного денежного рынка России. Действительно ли наблюдается улучшение и стабилизация данной проблемы? Попробуем рассмотреть ситуацию на валютном рынке на примере валютных кредитов, выдаваемых коммерческими банками и в частности долю АО «Россельхозбанк» в этих операциях.

Для начала рассмотрим подробнее, что же такое валютные кредиты.

Валютный кредит – заем, предоставляемый в иностранных ассигнациях на покупку конкретной вещи или услуги. При этом возвращение задолженности осуществляется в этой же валюте. Кредит в зарубежных деньгах может быть оформлен в форме:

1. Целевого или нецелевого займа.
2. Суды, обеспеченной каким-либо движимым или недвижимым имуществом.

3. Кредита, оформляемого напрямую в банковском сегменте или через посредника – маркетинговую сеть.

Можно выделить основные области валютного кредитования:

- кредитование государственных нужд;
- кредитование субъектов в интересах организации ими торговых операций;
- по экспорту и импорту;
- кредитование аналогичных субъектов – совместных предприятий с учетом особенностей состава их участников;
- кредитование предпринимательских структур при осуществлении ими расчетов в процессе внешнеэкономической деятельности.

Кредитование государственных нужд имеет целью решение национальных проблем социально-экономического, оборонного, природоохранительного или иного характера.

Кредитование субъектов хозяйствования в интересах экспортно- импортных операций, именуемое также кредитованием внешней торговли, состоит в предоставлении заемных средств для оказания содействия субъектам в организации дела. В этом отношении важную роль играет сфера использования кредита, что существенно как для кредитора, так и для заемщика.

Кредиты могут быть использованы в интересах формирования или расширения основных фондов, т.е. для возрастания производственных мощностей субъекта хозяйствования, либо с целью расширения оборотных средств в сфере производства или в сфере обращения.

Кредитование характеризуется рядом признаков.

По срокам использования кредита выделяют краткосрочные, обычно до одного года и в основном для формирования оборотных фондов, среднесрочные, до 3-7 лет в зависимости от области хозяйственной деятельности, когда может потребоваться, например, заказ технологического оборудования с его изготовлением, монтажом и наладкой, и долгосрочные кредиты, на срок 5-8 лет и более, когда решается задача создания нового сложного производства или осуществления его модернизации.

Кризисные явления в экономике России сделали невыгодным и весьма рискованным такой банковский продукт, как валютные займы. Будучи сравнительно более дешевыми, они таят в себе риск увеличения регулярных платежей в несколько раз в связи с банальным изменением курсов валют.

Существуют очевидные достоинства валютных кредитов, такие как:

1. Ставка процента ниже, чем по займам в рублях.
2. Если использовать кредит планируется в долларах, то в них его лучше и привлекать.
3. Тарифы обслуживания счетов в валюте, как правило, ниже, чем в рублях.
4. Если прикрепить к счету кредитную карту, то в зарубежных поездках не возникнет необходимости их предварительного обмена средств.

Но, не смотря на все достоинства, с начала 2016 года объем выданных в валюте кредитов в России сократился на 11%, в то время как просроченная задолженность по ним напротив возросла на 39,3%.

Для наглядности представлена таблица (таблица 1), в которой отражены данные по валютному кредитованию в РФ, в Центральном Федеральном округе и в АО «Россельхозбанк».

Таблица 1 – Объем кредитов, предоставленных юридическим лицам-резидентам и индивидуальным предпринимателям в иностранной валюте в РФ, в Центральном Федеральном округе, в т.ч. в Липецкой области (в млн. руб.)

| Год   | 2014      | 2015      | 2016      |
|---|-----------|-----------|-----------|
| Объем кредитования в РФ в целом                             | 4 413 271 | 3 324 757 | 2 736 216 |
| Объем кредитования в Центральном Федеральном округе, в т.ч. | 2 660 988 | 1 757 314 | 1 040 782 |
| Липецкая область  | 2 865     | 18 371    | 338       |
| АО «Россельхозбанк» по РФ                                   | 139 248   | 206 537   | 230 789   |

Что касается АО «Россельхозбанк», то количество выданных кредитов в иностранной валюте за 2014-2016 гг. наоборот возросло на 66%. За 2016 год банком было выдано валютных кредитов юридическим лицам на общую сумму 230 789 млн. руб. Но эта, казалось бы, значительная сумма составляет всего лишь 8% от суммы всех оформленных кредитов на территории РФ (в 2014 г. было всего лишь 3%) и поэтому на ситуацию по России в целом не влияет (рис.1).

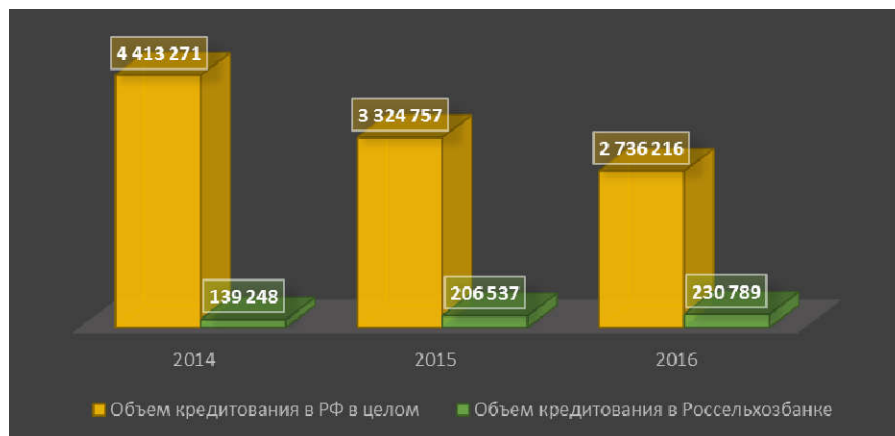


Рисунок 1 – Доля валютных кредитов юридических лиц АО «Россельхозбанк»

Если представить на диаграмме (рис. 2) динамику выданных валютных кредитов в АО «Россельхозбанк», то она будет иметь такой вид.



Рисунок 2 – Динамика показателей АО «Россельхозбанк» – кредиты юридическим лицам резидентам в иностранной валюте (в тыс.руб.)

На диаграмме виден рост, но не стабильный и с периодическими падениями. Если же рассмотреть сумму валютных кредитов не для юридических лиц, а для физических, то ситуация будет немного обратная (таблица 2).

Объем выданных в валюте кредитов для физических лиц в России в 2015 году значительно сократился, но в 2016 году снова начал расти.

Экономический кризис в начале 2015 года привел к росту общей потребительской задолженности по валютным кредитам. Продукты таких программ практически исчезли из линеек многих крупных банковских учреждений. Процент займов в портфелях небанковских финансовых организаций значительно сократился. Последствием этого стало фактическое замораживание рынка валютного кредитования. Многие граждане столкнулись с проблемой не только получения валютного кредита, а и погашения действующих ссуд, их рефинансирования и реструктуризации.

Таблица 2 – Объем кредитов, предоставленных физическим лицам-резидентам в иностранной валюте в РФ, в Центральном Федеральном округе, в т.ч. в Липецкой области (в млн. руб.)

| Год  | 2014          | 2015         | 2016         |
|--|---------------|--------------|--------------|
| Объем кредитования в РФ в целом  | 142 813       | 84 106       | 103 036      |
| Объем кредитования в Центральном Федеральном округе, в т.ч. Липецкая область | 124 623<br>94 | 72 317<br>19 | 65 714<br>86 |
| АО «Россельхозбанк» по РФ  | 606           | 488          | 369          |

А в АО «Россельхозбанк» общая сумма валютных кредитов с 2014 года по 2016 год сократилась более чем на 40%. Но опять же, доля данного банка в предоставлении валютных кредитов физическим лицам составляет всего 0,4% от всего объема кредитования по стране (рис. 3).

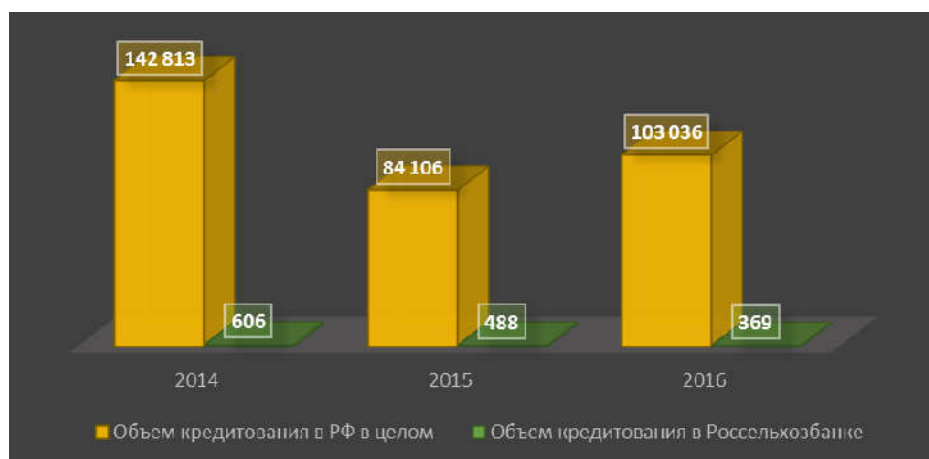


Рисунок 3 – Доля валютных кредитов для физических лиц АО «Россельхозбанк»

На диаграмме (рис. 4) отражена динамика выданных валютных кредитов физическим лицам в АО «Россельхозбанк»:



Рисунок 4 – Динамика показателей АО «Россельхозбанк» – кредиты физическим лицам в иностранной валюте (в тыс.руб)

Очевидно, что кривая на графике имеет нестабильное направление. То уходит в рост, то резко падает. Все это может говорить о том, что валютный рынок в России еще не пришел в устойчивое состояние. Объем кредитов, предоставляемых банками в валюте, пока сокращается. Причин для этого существует, как минимум, две: с одной стороны, граждане и организации опасаются пользоваться этим банковским продуктом; с другой стороны, коэффициент риска по валютным займам и процент

отчислений в фонд обязательных резервных требований с 1 мая 2016 года был увеличен ЦБ РФ, что требует от финансовых институтов закладывать на такие услуги более существенные резервы.

Стоит также добавить, что желание работать с валютными кредитами у коммерческих банков России уменьшилось в связи с процессами реструктуризации валютной ипотеки, что стало причиной непредвиденных затрат и убытков.

В кредитном портфеле крупных финансовых учреждений России валютные кредиты в 2016 году занимали совсем незначительную долю (это мы уже рассмотрели выше на примере АО «Россельхозбанк» – 0,4%). При этом совокупный объем выданных с начала года валютных кредитов в общем кредитном портфеле составил 3,1%. Предполагается, что при сохранении нестабильного курса рубля в 2017 году эта цифра составит от 0,5 до 1%.

В то же время в ЦБ РФ сообщили, что до конца года существенного сокращения объема валютного кредитования в российской экономике не произойдет. Основной причиной тому служит сложившийся круг заемщиков и кредиторов. Но и улучшения ситуации в этом сегменте рынка финансовых услуг также не прогнозируют.

Невзирая на прогнозы Банка России, риски в сегменте валютного кредитования в России остаются достаточно высокими. Основным фактором выступает ухудшение совокупного кредитного портфеля российской банковской системы, вызванное затянувшейся девальвацией рубля.

В настоящее время банки выдают валютные кредиты, а просроченная задолженность по ним только растет. Это притом, что сами кредитные институты также являются жертвой валютных рисков. В итоге вскоре мы сможем наблюдать такую ситуацию: банковские учреждения опасаются выдавать кредиты в валюте в связи с высокой вероятностью неплатежа по ним, а заемщики боятся привлекать их из-за опасности попадания в «валютную ловушку».

В данной ситуации происходит постепенное формирование двух тенденций, которые могут проявить себя уже в 2017 году: все российские банки перейдут на функционирование по принципу «рублевым займам – подавляющая часть кредитного портфеля»; кредит компании должен выдаваться в той валюте, в которой она получает прибыль, что исключит необходимость валютного обмена.

Но, не взирая на то, что многие коммерческие банки России отказались от валютного кредитования – никакого запрета на предоставление займов в долларах со стороны Центробанка РФ нет и в 2018 году не предвидится. Полностью отказаться от вливания «заемной валюты» в экономику страна, осуществляющая внешнеэкономическую деятельность, не сможет. Коммерческие банки все равно будут выдавать кредиты в валюте. Поэтому можно выделить лишь один вывод – населению и фирмам вести себя осмотрительно при использовании кредитов в валюте, а банкам – закладывать резерв на формируемые ими риски.

## БИБЛИОГРАФИЯ

1. Аврашков Л.Я. К вопросу формирования индикативного варианта размещения свободных денежных средств физических лиц // Аудитор. 2016. Т. 2. №2. С. 49-55.
2. Ларионова В.А., Сосницкий Д.П. Проблемы валютного кредитования и возможные пути решения// Научный альманах. 2015. №12-1 (14). С. 225-230.
3. Полянин А.В., Долгова С.А. Положительные и отрицательные аспекты льготного кредитования агробизнеса// Финансовый менеджмент. 2017. №4. С. 100-111.
4. Попова О.В. Рынок кредитования предпринимательских структур агробизнеса // Финансовый менеджмент. 2016. №5. С. 118-130.
5. Полянин А.В. Алгоритм стратегии развития предпринимательской деятельности организаций АПК// Экономика и предпринимательство. 2016. №3-1. С. 1156-1159.
6. Суровнева А.А., Полянин А.В. Основные концепции современного антикризисного управления // в сборнике: Результаты фундаментальных и прикладных исследований в России и за рубежом. 2017. С. 98-100.

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## ANALYSIS OF RISK DETERMINATION IN INTERNAL AUDIT PLANNING IN MICRO BANKING OF PT.BANK DANAMON

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### ABSTRACT

This research intends to examine risk assessment system at each branch of micro credit of BDI Bank, so that strategy to be conducted in this research are: 1) Internal Audit strategy in detecting risks that may affect the performance of Danamon Bank micro credit branches; 2) reviews the risk assessment system for each of Danamon Bank's micro branches. This study uses *Analytic Hierarchy Process* (AHP) method which aims to determine risk assessment and ranking of micro bank branches that will influence the decision in determining the micro branch that will be audited. The processing results show that from 100 sample data using AHP, it is obtained 10 branches that have high risk, 56 branches that have medium risk, and 34 branches that have low risk. After the risk assessment results for each branch have been determined, then the Auditor can perform the audit planning. For branches with high and medium risk, the Auditor must audit it every year. For low-risk branches, the Auditor may perform several samples to exercise control and every four years, the Auditor must audit it.

### KEY WORDS

Analytic hierarchy process, internal audit, micro banking.

Financial Institutions may be in the form of Commercial Bank, Credit Bank and Sharia Bank. Besides bank, other financial institutions may be in the form of Savings and Loans Cooperatives, Insurance and Securities. All financial institutions have their business activities which are always faced with risks, including: risk of credit, operational, market, liquidity, compliance, reputation, legal and strategic. Definition of risk is a condition that can hinder the purpose of a business (Supono, 2007). Danamon Bank is one of the commercial banks that has several kinds of credit products such as working capital loans, investments, consumptive, credit cards, etc. Micro credit is one of Danamon Bank 's business with more than 600 branches spread all over Indonesia. Given the importance of supervisory function, it is necessary to have a risk assessment system in each branch. A risk assessment system for microcredit branches will assist in the determination of future audit plans more precisely. Audit is a process of evaluation and accumulation of evidence about various information to determine and report the level of relationship between information obtained with certain criteria (Arens, 2008). Improper risk assessment may cause high risk branches not to be a priority in auditing and may cause harm to the Bank.

This research intends to examine risk assessment system in each branch of micro credit of BDI Bank, so that the strategies that will be conducted in this research are: 1) Internal Audit strategy in detecting risks that may affect the performance of Danamon Bank micro credit branch 2) reviews the risk assessment system for each of Danamon Bank's micro branches. Internal Audit of Danamon Bank needs to make strategic changes by applying a *Risk Based Audit approach* in conducting examination tasks. *Risk Based Audit* is an audit approach that has been developed since 2000 and is currently widely used by internal audit institutions in some organizations because this approach is in line with the development of Internal Audit functions to be effectively able to provide *value added*, especially for related matters with the organization's internal control (*trusted advisor*).

A risk-based audit approach should be able to provide assurance that business risks have been identified, evaluated, and monitored on an ongoing basis (Andreas et al, 2008). Internal control systems and monitoring activities by management of internal controls have

been well designed and operate effectively, efficiently, and economically in managing those risks in accordance with directives granted (or approved) by the board of directors. The role of Internal Audit in a bank is necessary to minimize the risks that exist in this industry, so the existence of Internal Audit can improve bank performance in achieving the goal. According to the Institute of Internal Auditors (IIA), internal audit is *an independent, objective assurance and consulting activity designed to add value and improve an organization's operations. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control, and governance processes* (The Institute of Internal Auditors). In Academic literature in Indonesia (Mulyadi, 2002), the meaning of Internal Audit itself is the employee who is assigned as Auditor to check whether the rules and policies determined by the bank in maintaining business assets have been implemented in accordance with the rules. The current audit activities are not just financial audits of financial audit and compliance audit, but the focus of attention is on all aspects that affect the company's performance and management control as well as the risk aspects of management and internal control (Buana, 2009).

Given that Danamon Bank micro banking operates in more than 600 branches, it is necessary to have a system that can determine the level of risk in each branch. This level of risk per branch (Macro Risk) will assist audit management in the preparation of audit plans that are generally related to the adequacy of human resources, audit time, and audit costs. Risk Based Audit System with macro risk approach for new micro credit branches was developed at Danamon Bank in 2015 and the system was then socialized and implemented to internal audit units at headquarters and region. The success of the Risk Based Audit system with the determination of risk per branch (macro risk) cannot be separated from several times of trial and verification conducted by comparing the level of risk per branch with audit results conducted by the auditor.

*Business Strategy and Segmentation.* Danamon Bank combines the ability to offer services and products that meet the needs of each segment by ensuring that every customer's needs are met well while considering all potential risks. Business strategy and business segmentation shows that Danamon Bank makes micro banking consisting of Mass Self-Employed and Mass Employed products as one of the foundations in business/commercial product strategy and consumer products.

*Corporate Risk Management.* Danamon Bank uses eight risk categories in accordance with Bank of Indonesia's regulation, eight risk categories determined by Bank of Indonesia are: credit, market, liquidity, operational, strategic, reputation, law and compliance. Danamon Bank also implements *Three Lines of Defense* in its risk management and control framework concept. *First Line of Defense* is a line of business that will identify, control, and reduce risks in its own business. *Second Line of Defense* is the risk management division. *Third Line of Defense* is the Internal Audit Unit that conducts the examination and testing of the effectiveness of the risk implementation and control management.

*Company's Performance.* The financial performances of Danamon Bank for the budget year of 2016, based on the annual consolidated financial statements that have been audited are:

1. Total bank assets as of December 2016 is IDR 174 trillion with earning assets of IDR 166 trillion (95%).
2. The loan portfolio granted as of December 31, 2016 is IDR 126 trillion with *mass market* loan composition such as micro loan, two-wheeled motor vehicle loan, *unsecured personal loan*, reaching to IDR 45 trillion.
3. Non-Performing Loan (NPL) of Danamon bank is IDR 3.7 trillion or 3.1% of the total loan provided by the bank.
4. Bank operating income during 2016 was IDR 4.9 trillion (grew 26% compared to 2015) with net profit of IDR 2.8 trillion (12% growth compared to 2015)
5. Capital Adequacy Ratio (CAR) is 20.9% and Return on Average Equity (ROAE) is at the level of 8%.

Details of Danamon Bank's financial performance and financial ratios can be seen in the table below.



Table 1 – Danamon Bank's Financial Performance in 2016

| In billions of Rupiah except share data            | 2016          |
|--|---------------|
| <b>CONSOLIDATION BALANCE</b>                       |               |
| Asset  | 174.087       |
| Productive Asset-bruto <sup>a)</sup>               | 166.651       |
| Credit Provided-bruto <sup>b)</sup>                | 122.385       |
| Loans in Problem                                   | 3.743         |
| Effects - bruto                                    | 17.446        |
| Government's Obligation                            | 9.563         |
| Savings  | 106.612       |
| Amount of Funding                                  | 113.890       |
| Amount of Liabilities                              | 137.709       |
| Equity and Controller Interest                     | 36.378        |
| Inclusion - Net                                    | 165           |
| Number of Shares Paid and Fully Paid (in unit)     | 9.584.643.365 |
| <b>REPORT OF CONSOLIDATED STATEMENTS OF INCOME</b> |               |
| Interest Income                                    | 20.665        |
| Interest Expense                                   | 6.876         |
| Interest Income and Net Underwriting               | 14.400        |
| Other Operational Income                           | 4.071         |
| General Expense and Administration                 | 3.020         |
| Manpower Expense and Allowance                     | 4.879         |
| Report of Impairment Loss                          | 4.441         |
| Operational Income - Net                           | 4.934         |
| Non-operational Expense (Income) - Net             | 541           |
| Profit Right                                       | 4.393         |
| Income Tax Expense                                 | 1.600         |
| Net Profit   | 2.793         |

Source: [www.idx.co.id](http://www.idx.co.id) - The Annual Financial Statement of Listed Company (BDMN).

Table 2 – Danamon Bank's Financial Ratios in 2016

| (In billions of Rupiah except share data)  | 2016         |
|--|--------------|
| <b>KEY FINANCIAL RATIOS (%)</b>  |              |
| <b>I. Capital</b>  |              |
| 1. Capital Adequacy Ratio (CAR) Consolidated <sup>a)</sup>   | <b>20.9</b>  |
| Tier I   | <b>20.1</b>  |
| Tier II  | <b>0.8</b>   |
| 2. Assets to Equity  | <b>4.8</b>   |
| <b>II. Earning Assets</b>  |              |
| 1. Non Performing Earning Assets and Non Productive Assets to Total Earnings and Non Productive Assets | <b>1.9</b>   |
| 2. Non Performing Earning Assets to Total Productive Assets  | <b>2.4</b>   |
| 3. Non Performing Loans (NPL) to Total Loans-Gross   | <b>3.1</b>   |
| 4. Non Performing Loan (NPL) to Total Loans-Net  | <b>1.8</b>   |
| 5. Allowance for Impairment Losses for Financial Assets to Productive Assets <sup>a)</sup>             | <b>3.0</b>   |
| 6. Loan Loss Coverage  | <b>116.9</b> |
| <b>III. Rentability</b>  |              |
| 1. Return on Average Assets (ROAA)   | <b>2.5</b>   |
| 2. Return on Average Equity (ROAE)   | <b>8.0</b>   |
| 3. Debt to Assets  | <b>0.79</b>  |
| 4. Debt to Equity  | <b>3.79</b>  |
| 5. Net Interest Margin (NIM)   | <b>8.9</b>   |
| 6. Cost to Income  | <b>48.8</b>  |
| 7. Fee Income  | <b>22.1</b>  |
| 8. Operating Expense to Operating Income   | <b>77.3</b>  |
| 9. Cost of Funds   | <b>5.1</b>   |

Source: [www.idx.co.id](http://www.idx.co.id) - The Annual Financial Statement of Listed Company (BDMN).

## METHODS OF RESEARCH

This study uses the *Analytic Hierarchy Process* (AHP) method which aims to determine risk assessment and ranking of micro bank branches that will influence the decision in determining the micro branch that will be audited, (Saaty, 2000). The end result of AHP will determine the rank or vector priority of each branch. This study uses AHP model formulation to assess the risk of Danamon Bank micro branches that generate risk ranking in each branch. The AHP model basically has three steps, namely hierarchy formation, assessment, and priority vectors, (Saaty, 2013). The stages of this research include:

*Data collection of 15 risk factors that have a level of risk.* The beginning of this research will perform the data collection needed for the calculation of 15 risk factors that already have a risk level. Data has been processed by *Analytic Internal Audit* division every month. This research will use data of August 2015 until March 29th, 2017.

*The Formation of Hierarchy.* The formation of Hierarchy in the *Analytic Hierarchy Process* (AHP) model begins with the determination of the objectives of this research problem. This research will use AHP model with 4 level hierarchies as follows:

1. Level 1 - The target of the decision that will be taken is placed at the top of the hierarchy.
2. Level 2 - Assessment criteria that can indicate the quality or level of risk factors of the alternative model used.
3. Level 3 - Assessment sub-criteria that can indicate the quality or level of risk factors of the alternative model used in level 2 criteria.
4. Level 4 - Branches assessed at risk level that may indicate quality or risk level.

*Paired Matrix Formation (Criteria, Sub-criteria, and Branches).* The formation of a pair matrix can be done by order according to the number of pairs in each group. Pair weight assessment can be incorporated into the cells above. The diagonal cell will be entered with the number 1. The other cell will be filled with the number corresponding to the division of the weight of the pair and on the opposite cell, it will be filled with the opposite number (eg, may=yam). Distribution of the weight of the spouse can be done each order and each group.

*Formation of Inter-paired Normalization (Criteria, Sub-criteria and Branches).* Formation of normalization is done after making the formation of matrix pair between data done in each group, to get normalization by counting data per cell divided by amount of data per group vertically.

$$\text{Normalization Data 1} = \frac{\text{Cell 1}}{\text{Total Number of Column 1}}$$

The above calculation may be repeated for all data and calculations are performed for the pair between criteria, sub-criteria, and branches.

*Formation of Inter-paired Priority Vector (Criteria, Sub-criteria, and Branches).* The formation of priority vectors is done after the normalization of pairs between the data functions to obtain a priority vector by calculating the total amount of data as N and multiplied by the total normalization.

$$\text{Inter Data VP 1} = 1 / N \times \text{sum (Normalization Data 1)}$$

The above calculation may be repeated for all data and calculations are performed for the pair between criteria, sub-criteria, and branches.

*Calculation of Each Branch Priority Vector Total.* Determining Total of Priority Vector is done by calculating priority vectors of criteria, sub-criteria, and branches as shown in the following equation.

$$\text{Total Branch 1} = (\text{VP Criteria 1} \times \text{VP Sub Criteria 1} \times \text{VP Branch 1}) + \dots + (\text{VP Criteria N} \times \text{VP Sub Criteria N} \times \text{VP Branch N})$$

Once the total priority vector for each branch has been calculated, the branch rank can be determined from the branch with the highest priority total vector until the branch has the lowest total vector priority. Branches that have the highest priority vector total are the highest-risk branches and the branches which have the lowest total vector total are the lowest-risk branches.

*Calculating Consistency Ratio (CR).* Consistency Ratio is calculated by dividing the Consistency Index (CI) with Random Index (RI). The Consistency Index (CI) is obtained from the average priority vector value ( $\lambda$ ) divided by the number of alternatives/types of risks used ( $n$ ).

$$CI = \frac{\lambda - n}{n - 1} \quad CR = \frac{CI}{RI}$$

Random Index (RI) for matrix with order 10 x 10 is 1.49.

*Formation of Risk Level Scoring.* Forming a risk-level scoring is by finding the maximum and minimum total vector priorities to gain distance at each risk level. In the formation of risk level scoring, it will be divided into 3 levels, namely High Risk, Medium Risk, and Low Risk.

## RESULTS AND DISCUSSION

*Branch Assessment Results Using AHP.* Analytic Hierarchy Process (AHP) used in this study aims to determine the risk assessment and ranking of Danamon Bank micro branches that will influence the decision in determining the micro branches that will be audited. The end result of AHP will determine the rank or vector priority of each branch. This study uses AHP model formulation to assess the risk of Danamon Bank micro branches that generate risk ranking in each branch. The AHP model basically has three steps, namely formation of hierarchy, assessment, and priority vectors.

*Hierarchical Formation Analysis Results.* Hierarchical formation is a conceptual approach for rating ranking models using the AHP model. The AHP model used in this study has 4 hierarchical levels:

1. Level I: The top of the hierarchy is placed for the target of the decision that will be taken. The purpose of this study is to assess risk in micro branch at Danamon Bank to obtain risk ranking for each branch.
2. Level II: The second level is used for the criteria to assess the risk on the micro-branch and to rank risk on each branch. The criteria used are: *Unsecured, Top Up, New NOA, Restructure, FID Flow Rate, Unsec OS Per Tot OS, Last OS, NPL WO 6M, Flow Rate, Unrecovery Rate.*
3. Level III: The third level is used for sub-criteria of criteria at level II that can assist in risk assessment of microcredit in more detail. Subcriteria used in the study are:
  - *Unsecured* has sub criteria *DPD 30 Unsec and OS Unsec Last 1Y*;
  - *Top Up* has sub criteria *New NOA Top Up per Tot NOA* and *DPD 30 Top Up*;
  - *New NOA* has sub criteria *New NOA 1Y and New NOA 6M*;
  - *Restructure* has sub criteria *Amt Rest Last 1Y and DPD 30Rest*;
  - *FID Flow Rate* has sub criteria *FID and Flow Rate 30+*.
4. Level IV: The fourth level is used for risk assessment on the micro banking branch to determine the risk rankings on the branch.

*Results of Score Formation/Weight of Risk Factors.* Risk factors along with their weight that have been determined by the auditor can be formed as a matrix. Matrix is formed according to each hierarchy and order group according to the number of risk factors or branches of each hierarchy group. Assessment of specified weights can be entered according to existing cells, for each cell, it can be filled in accordance with its partner in accordance with the row and column of the score (eg  $\frac{\text{row weight}}{\text{column weight}} = \frac{6}{6} = 1$ ).

*Results of Paired Matrix Inter Criteria.* Intercriteria Matrix is 10 X 10 ordered matrix formed from risk factors and matrix formation results that can be seen in the table below:

Table 3 – Paired Matrix Inter Criteria

|                     |            | UNSECURED | TOPUP   | NEW NOA | RESTRUCTURE | FID FLOWRATE | OS UNSEC PER TOT OS | LASTOS  | NPL WO 6M | FLOWRATE | UNRECOVERY RATE |
|---------------------|------------|-----------|---------|---------|-------------|--------------|---------------------|---------|-----------|----------|-----------------|
|                     | Weight     | 6         | 4       | 4       | 1           | 9            | 4                   | 3       | 6         | 3        | 2               |
| UNSECURED           | 6          | 1.0000    | 1.5000  | 1.5000  | 6.0000      | 0.6667       | 1.5000              | 2.0000  | 1.0000    | 2.0000   | 3.0000          |
| TOPUP               | 4          | 0.6667    | 1.0000  | 1.0000  | 4.0000      | 0.4444       | 1.0000              | 1.3333  | 0.6667    | 1.3333   | 2.0000          |
| NEW NOA             | 4          | 0.6667    | 1.0000  | 1.0000  | 4.0000      | 0.4444       | 1.0000              | 1.3333  | 0.6667    | 1.3333   | 2.0000          |
| RESTRUCTURE         | 1          | 0.1667    | 0.2500  | 0.2500  | 1.0000      | 0.1111       | 0.2500              | 0.3333  | 0.1667    | 0.3333   | 0.5000          |
| FID FLOWRATE        | 9          | 1.5000    | 2.2500  | 2.2500  | 9.0000      | 1.0000       | 3.0000              | 3.0000  | 1.5000    | 3.0000   | 4.5000          |
| OS UNSEC PER TOT OS | 4          | 0.6667    | 1.0000  | 1.0000  | 4.0000      | 0.3333       | 1.0000              | 1.3333  | 0.6667    | 1.3333   | 2.0000          |
| LASTOS              | 3          | 0.5000    | 0.7500  | 0.7500  | 3.0000      | 0.3333       | 0.7500              | 1.0000  | 0.5000    | 1.0000   | 1.5000          |
| NPLWO6M             | 6          | 1.0000    | 1.5000  | 1.5000  | 6.0000      | 0.6667       | 1.5000              | 2.0000  | 1.0000    | 2.0000   | 3.0000          |
| FLOWRATE            | 3          | 0.5000    | 0.7500  | 0.7500  | 3.0000      | 0.3333       | 0.7500              | 1.0000  | 0.5000    | 1.0000   | 1.5000          |
| UNRECOVERY RATE     | 2          | 0.3333    | 0.5000  | 0.5000  | 2.0000      | 0.2222       | 0.5000              | 0.6667  | 0.3333    | 0.6667   | 1.0000          |
|                     | <b>SUM</b> | 7.0000    | 10.5000 | 10.5000 | 42.0000     | 4.5556       | 11.2500             | 14.0000 | 7.0000    | 14.0000  | 21.0000         |

Source: Macro risk assessment Audit Analytic - Danamon Bank' Internal Audit Unit as of 31 March 2017.

*Results of Paired Matrix Inter Sub-criteria.* Intercity Matrix for Unsecured Matrix is 2x2 ordered matrix formed from risk factors that support the criteria factor on the criteria and the result of matrix formation can be seen in the table below:

Table 4 – Paired Matrix of Inter Unsecured Sub-criteria

|               |            | DPD30UNSEC | OSUNSECLAST1Y |
|---------------|------------|------------|---------------|
|               | Weight     | 3          | 2             |
| DPD30UNSEC    | 3          | 1.0000     | 1.5000        |
| OSUNSECLAST1Y | 2          | 0.6667     | 1.0000        |
|               | <b>SUM</b> | 1.6667     | 2.5000        |

Source: Macro risk assessment Audit Analytic – Danamon Bank Internal Audit Unit as of 31 March 2017.

*Results of Inter-branch Matrix.* Inter-branch matrix for FID is a matrix of 10 X 10 formed from the branch. The results of matrix formation can be seen in the table below:

Table 5 – Paired Matrix of FID Inter Unsecured Sub-criteria

|           |            | Branch 1 | Branch 2 | Branch 3 | Branch 4 | Branch 5 | Branch 6 | Branch 7 | Branch 8 | Branch 9 | Branch 10 |
|-----------|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
|           | Weight     | 5        | 5        | 2        | 4        | 2        | 4        | 1        | 1        | 1        | 1         |
| Branch 1  | 5          | 1.0000   | 1.0000   | 2.5000   | 1.2500   | 2.5000   | 1.2500   | 5.0000   | 5.0000   | 5.0000   | 5.0000    |
| Branch 2  | 5          | 1.0000   | 1.0000   | 2.5000   | 1.2500   | 2.5000   | 1.2500   | 5.0000   | 5.0000   | 5.0000   | 5.0000    |
| Branch 3  | 2          | 0.4000   | 0.4000   | 1.0000   | 0.5000   | 1.0000   | 0.5000   | 2.0000   | 2.0000   | 2.0000   | 2.0000    |
| Branch 4  | 4          | 0.8000   | 0.8000   | 2.0000   | 1.0000   | 2.0000   | 1.0000   | 4.0000   | 4.0000   | 4.0000   | 4.0000    |
| Branch 5  | 2          | 0.4000   | 0.4000   | 1.0000   | 0.5000   | 1.0000   | 0.5000   | 2.0000   | 2.0000   | 2.0000   | 2.0000    |
| Branch 6  | 4          | 0.8000   | 0.8000   | 2.0000   | 1.0000   | 2.0000   | 1.0000   | 4.0000   | 4.0000   | 4.0000   | 4.0000    |
| Branch 7  | 1          | 0.2000   | 0.2000   | 0.5000   | 0.2500   | 0.5000   | 0.2500   | 1.0000   | 1.0000   | 1.0000   | 1.0000    |
| Branch 8  | 1          | 0.2000   | 0.2000   | 0.5000   | 0.2500   | 0.5000   | 0.2500   | 1.0000   | 1.0000   | 1.0000   | 1.0000    |
| Branch 9  | 1          | 0.2000   | 0.2000   | 0.5000   | 0.2500   | 0.5000   | 0.2500   | 1.0000   | 1.0000   | 1.0000   | 1.0000    |
| Branch 10 | 1          | 0.2000   | 0.2000   | 0.5000   | 0.2500   | 0.5000   | 0.2500   | 1.0000   | 1.0000   | 1.0000   | 1.0000    |
|           | <b>SUM</b> | 5.2000   | 5.2000   | 13.0000  | 6.5000   | 13.0000  | 6.5000   | 26.0000  | 26.0000  | 26.0000  | 26.0000   |

Source: Macro risk assessment Audit Analytic - Bank Danamon Internal Audit Unit as of 31 March 2017.

*Weight Result of Priority Vector.* The formation of the priority vector weights on the AHP method for each factor in the matrix is intended to allow the weight of each factor that will be expressed as normalized. This normalized weight is a weight of the relative value for each factor in each column, by comparing each scaled value with the number of columns.

*Weight Result of Inter-Criteria Pair Matrix Priority Vectors.* Normalization of pair matrix between criteria is a matrix of 10x10 formed from risk factor and result of normalization formation of matrix that can be seen in table below.

Table 6 – Matrix of Paired Normalization between Risk Factors

|                     | Weight | UNSECURED | TOPUP  | NEW NOA | RESTRUCTURE | FID FLOWRATE | OS UNSEC PER TOT OS | LAST_OS | NPL WO 6M | FLOWRATE | UNRECOVERY RATE |
|---------------------|--------|-----------|--------|---------|-------------|--------------|---------------------|---------|-----------|----------|-----------------|
|                     |        | 6         | 4      | 4       | 1           | 9            | 4                   | 3       | 6         | 3        | 2               |
| UNSECURED           | 6      | 0.1429    | 0.1429 | 0.1429  | 0.1429      | 0.1463       | 0.1333              | 0.1429  | 0.1429    | 0.1429   | 0.1429          |
| TOPUP               | 4      | 0.0952    | 0.0952 | 0.0952  | 0.0952      | 0.0976       | 0.0889              | 0.0952  | 0.0952    | 0.0952   | 0.0952          |
| NEW NOA             | 4      | 0.0952    | 0.0952 | 0.0952  | 0.0952      | 0.0976       | 0.0889              | 0.0952  | 0.0952    | 0.0952   | 0.0952          |
| RESTRUCTURE         | 1      | 0.0238    | 0.0238 | 0.0238  | 0.0238      | 0.0244       | 0.0222              | 0.0238  | 0.0238    | 0.0238   | 0.0238          |
| FID FLOWRATE        | 9      | 0.2143    | 0.2143 | 0.2143  | 0.2143      | 0.2195       | 0.2667              | 0.2143  | 0.2143    | 0.2143   | 0.2143          |
| OS UNSEC PER TOT OS | 4      | 0.0952    | 0.0952 | 0.0952  | 0.0952      | 0.0732       | 0.0889              | 0.0952  | 0.0952    | 0.0952   | 0.0952          |
| LASTOS              | 3      | 0.0714    | 0.0714 | 0.0714  | 0.0714      | 0.0732       | 0.0667              | 0.0714  | 0.0714    | 0.0714   | 0.0714          |
| NPLWO6M             | 6      | 0.1429    | 0.1429 | 0.1429  | 0.1429      | 0.1463       | 0.1333              | 0.1429  | 0.1429    | 0.1429   | 0.1429          |
| FLOWRATE            | 3      | 0.0714    | 0.0714 | 0.0714  | 0.0714      | 0.0732       | 0.0667              | 0.0714  | 0.0714    | 0.0714   | 0.0714          |
| UNRECOVERY RATE     | 2      | 0.0476    | 0.0476 | 0.0476  | 0.0476      | 0.0488       | 0.0444              | 0.0476  | 0.0476    | 0.0476   | 0.0476          |
| <b>SUM</b>          |        | 1.0000    | 1.0000 | 1.0000  | 1.0000      | 1.0000       | 1.0000              | 1.0000  | 1.0000    | 1.0000   | 1.0000          |

Source: Macro risk assessment Audit Analytic - Danamon Bank Internal Audit Unit as of 31 March 2017.

Table 7 – Weight Result of Risk Factor Priority Risk

|                     | PRIORITY VECTOR |
|---------------------|-----------------|
| UNSECURED           | 0.1423          |
| TOPUP               | 0.0948          |
| NEW NOA             | 0.0948          |
| RESTRUCTURE         | 0.0237          |
| FID FLOWRATE        | 0.2200          |
| OS UNSEC PER TOT OS | 0.0924          |
| LASTOS              | 0.0711          |
| NPLWO6M             | 0.1423          |
| FLOWRATE            | 0.0711          |
| UNRECOVERY RATE     | 0.0474          |

Source: Macro risk assessment Audit Analytic - Danamon Bank Internal Audit Unit as of 31 March 2017.

Results of Sub-criteria Priority Vector. Normalization and vector priority of pair matrix between sub-criteria for Unsecured is 2x2 coordinated matrix formed from risk factor that support the criterion factor in criteria and result of normalization formation and vector of priority matrix can be seen in table below:

Table 8 – Normalization Matrix and Priority Vectors of Inter Unsecured Batches

|               | Weight | DPD30UNSEC | OSUNSECLAST1Y | PRIORITY VECTOR |
|---------------|--------|------------|---------------|-----------------|
|               |        | 3          | 2             |                 |
| DPD30 UNSEC   | 3      | 0.6000     | 0.6000        | 0.6000          |
| OSUNSECLAST1Y | 2      | 0.4000     | 0.4000        | 0.4000          |
| <b>SUM</b>    |        | 1.0000     | 1.0000        |                 |

Source: Macro risk assessment Audit Analytic - Danamon Bank's Internal Audit Unit as of 31 March 2017.

Results of Inter-branch Pair Matrix. The normalization matrix and the vector weight of the intermediate pair priority for FID are the 10x10 ordered matrix formed from the branch and the result of matrix formation can be seen in the table below.

Table 9 – Paired Normalization Matrix of FID Inter-branches

|            | Branch 1 | Branch 2 | Branch 3 | Branch 4 | Branch 5 | Branch 6 | Branch 7 | Branch 8 | Branch 9 | Branch 10 |
|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| Weight     | 5        | 5        | 2        | 4        | 2        | 4        | 1        | 1        | 1        | 1         |
| Branch 1   | 5        | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923    |
| Branch 2   | 5        | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923   | 0.1923    |
| Branch 3   | 2        | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769    |
| Branch 4   | 4        | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538    |
| Branch 5   | 2        | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769   | 0.0769    |
| Branch 6   | 4        | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538   | 0.1538    |
| Branch 7   | 1        | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385    |
| Branch 8   | 1        | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385    |
| Branch 9   | 1        | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385    |
| Branch 10  | 1        | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385   | 0.0385    |
| <b>SUM</b> |          | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000   | 1.0000    |

Source: Macro risk assessment Audit Analytic - Danamon Bank Internal Audit Unit as of 31 March 2017.

Table 10 – Matrix of Paired Priority Vector between FID Branches

|           | PRIORITY VECTOR |
|-----------|-----------------|
| Branch 1  | 0.1923          |
| Branch 2  | 0.1923          |
| Branch 3  | 0.0769          |
| Branch 4  | 0.1538          |
| Branch 5  | 0.0769          |
| Branch 6  | 0.1538          |
| Branch 7  | 0.0385          |
| Branch 8  | 0.0385          |
| Branch 9  | 0.0385          |
| Branch 10 | 0.0385          |

Source: Macro risk assessment Audit Analytic - Danamon Bank Internal Audit Unit as of 31 March 2017.

**Calculation of Consistency Ratio (CR).** The Consistency Ratio (CR) of risk factors used in this study is 0.0601%. It shows that the risk factors (elements) used have logical relationships and are ranked consistently according to logical criteria.

**Ranking Assessment Results.** Data processing yields priority weights that can determine the risk ranking of each branch. The results of AHP treatment show 2 branches that have high risk, 4 branches have medium risk, and 4 branches have low risk as shown in the table below.

Table 11 – Risk Ranking of Each Branch

|           | RANK | TOTAL OF PRIORITY VECTOR | PCNT PRIORITY VECTOR |
|-----------|------|--------------------------|----------------------|
| Branch 1  | 10   | 0.1336                   | 13.36                |
| Branch 2  | 9    | 0.1306                   | 13.06                |
| Branch 3  | 8    | 0.1119                   | 11.19                |
| Branch 4  | 7    | 0.1021                   | 10.21                |
| Branch 5  | 6    | 0.0965                   | 9.65                 |
| Branch 6  | 5    | 0.0947                   | 9.47                 |
| Branch 7  | 4    | 0.0891                   | 8.91                 |
| Branch 8  | 3    | 0.0878                   | 8.78                 |
| Branch 9  | 2    | 0.0819                   | 8.19                 |
| Branch 10 | 1    | 0.0719                   | 7.19                 |

Source: Macro risk assessment Audit Analytic - Danamon Bank Internal Audit Unit as of 31 March 2017.

The risk ranking scores used are divided or classified into 3 levels. The results of data processing show the minimum value of 7.19%, the maximum value of 13.36%. and 3 levels that have a distance scale of 2.06% can be seen in below.

Table 12 – Ranking Risk Scoring

|          |             |
|----------|-------------|
| Max :    | 13.36       |
| Min :    | 7.19        |
| Range :  | 2.06        |
| Low :    | 7.19 – 9.25 |
| Medium : | 9.26-11.30  |
| High :   | 11.31-13.36 |

Source: Macro risk assessment Audit Analytic - Danamon Bank Internal Audit Unit as of 31 March 2017.

## CONCLUSION

Risk assessment on the branch of micro banking in audit planning is very effective because the assessment process is quite short with the level of accuracy which is optimal. Risk assessment in this study is conducted by measuring risk level values based on a multi-criteria AHP method that can describe the level of risk in each branch. Risk assessment is based on the type of risk then used as the criterion of the AHP model. The processing results from 100 sample data using AHP, it is obtained 10 branches that have high risk, 56 branches that have medium risk, and 34 branches that have low risk. After the risk assessment results for each branch have been determined, then the Auditor can perform the audit planning. For branches with high and medium risk, the Auditor must audit every year. For low-risk branches, the Auditor may perform several samples to exercise control and every four years, the Auditor must audit it.

## REFERENCES

1. Arens, A. A., Elder, R. J., & Mark, B. (2012). *Auditing and assurance services: an integrated approach*. Boston: Prentice Hall.
2. Buana, A. (2009). *Analisis Pengaruh Risk Assessment Terhadap Rating Audit Studi Pada Bank "X"* (Doctoral dissertation, Program Pascasarjana Universitas Diponegoro).
3. Koutoupis, A. G., & Tsamis, A. (2009). Risk based internal auditing within Greek banks: a case study approach. *Journal of Management & Governance*, 13(1-2), 101-130.
4. Mulyadi. (2002). *Auditing, Buku Dua, Edisi Ke Enam*. Jakarta: Salemba Empat.
5. Saaty, T. L. (2013). Analytic hierarchy process. In *Encyclopedia of operations research and management science* (pp. 52-64). Springer US.
6. Saaty, T. L., (2000), *The Fundamentals of Decision Making and Priority Theory with the Analytic Hierarchy Process* Thomas L. Saaty Vol. VI of the AHP Series, , 478 pp., RWS Publ., 2000 Sawyer, 2005.
7. Stulz, R. M. (1996). Rethinking risk management. *Journal of applied corporate finance*, 9(3), 8-25.
8. Supono, A. Y. (2007). *Audit Berpeduli Risiko*, BPKP (Pusat Pendidikan dan Pelatihan, Pengawasan Badan Pengawasan Keuangan dan Pembangunan) edisi keempat.
9. The Institute of Internal Auditors. (1991). *Statement on Internal Auditing Standards (SIAS) no.9: Risk Assessment*. 249 Maitland Avenue, Altamonte Springs, Florida.

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**К ВОПРОСУ ФОРМИРОВАНИЯ НОРМАТИВНЫХ ЗНАЧЕНИЙ  
ПОКАЗАТЕЛЕЙ ФИНАНСОВО-ЭКОНОМИЧЕСКОГО АНАЛИЗА  
ПРЕДПРИНИМАТЕЛЬСКОЙ ДЕЯТЕЛЬНОСТИ**  
ON THE ISSUE OF NORMATIVE VALUES' FORMATION OF FINANCIAL AND  
ECONOMIC ANALYSIS INDICATORS OF ENTREPRENEURIAL ACTIVITY

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**АННОТАЦИЯ**

В статье сформированы позиции, отражающие более совершенные методические подходы к оценке финансово-экономического состояния. Для целей эффективного управления хозяйственной деятельностью фирмы недостаточно анализа текущей финансовой отчетности, необходимо проводить оценку по плановым расчетным показателем на ближайшую перспективу. Для объективной оценки финансово-экономического положения фирмы следует от отдельных учетных данных переходить к определенным ценностным соотношениям основных факторов – финансовым показателям или финансовым коэффициентам. Расчет и интерпретация их значений неотъемлемая и принципиально необходимая часть финансово-экономического анализа. В статье дана оценка методическим подходам анализа показателей рентабельности, деловой активности и предложена методика формирования нормативной базы данных показателей на примере фирм металлургического комплекса

**ABSTRACT**

The article contains the positions reflecting the more perfect methodological approaches to the assessment of the financial and economic situation. For the purposes of effective management of the company's business, it is not enough to analyze current financial statements, it is necessary to carry out an assessment based on the planned estimate in the short term. For an objective assessment of the financial and economic situation of the firm, it is necessary to move from certain accounting data to certain value relationships of the main factors - financial indicators or financial ratios. Calculating and interpreting their meaning is an integral and fundamentally necessary part of the financial and economic analysis. The article gives an assessment of methodological approaches to the analysis of profitability and business activity indicators and suggests a methodology for the formation of a regulatory database of indicators by the example of firms in the metallurgical complex.

**КЛЮЧЕВЫЕ СЛОВА**

финансовый анализ, баланс, рентабельность, деловая активность.

**KEY WORDS**

Financial analysis, balance sheet, profitability, business activity.

На сегодняшний день сложилась такая тенденция, что каждый экономический субъект является частью рыночных отношений, которые заинтересованные в бесперебойной работе данного субъекта. Поэтому каждая фирма должна следить и правильно организовывать свою предпринимательскую деятельность. В связи с этим необходимо контролировать ведение предпринимательской деятельности.



Предпринимательская деятельность тесно связана с экономической безопасностью фирмы. Чтобы обеспечить полную экономическую безопасность фирмы необходимо постоянно анализировать деятельность. И насколько точным и полным будет анализ, настолько и фирма обеспечит свою защищенность.

Финансово-хозяйственное состояние фирмы один из важнейших показателей устойчивости организации на рынке, как внешнем, так и внутреннем.

В общем смысле, предпринимательская деятельность фирмы отражает цель предпринимательства и показывает, насколько фирма эффективно использует собственные и привлеченные ресурсы.

Правильная организация предпринимательской деятельности играет большую роль для отлаженной работы предприятия и включает в себя следующие виды анализа: спроса на товары, ликвидности, финансовой устойчивости, дебиторской и кредиторской задолженности, имущества предприятия, собственных источников финансирования, прибыльности.

Выбранная верная стратегия ведения предпринимательской деятельности помогает рационально использовать свои ресурсы, получать прибыль, контролировать расходы и, как следствие, пережить кризисные ситуации.

Актуальность данной темы вызвана тем, что главной целью предпринимательской деятельности фирмы является оценка его экономического состояния, выявление возможных проблем и угроз и с помощью рационально организованной финансовой политики повысить предпринимательскую эффективность фирмы. В данной цели проявляется экономическая безопасность фирмы, то есть вовремя спрогнозировать и предотвратить кризисные ситуации.

Фирмы способствуют развитию региона, а регион, с помощью системы налогов и социально-общественному обеспечению, поддерживает существование государства. Предпринимательская деятельность способна организовать функционирование любого фирмы, поэтому ее роль очень велика, ее необходимо изучать и уметь правильно анализировать получаемые данные.

К сожалению, в российской экономике роль предпринимательской деятельности недооценена. Многие экономисты открыто говорят о том, что необходимо производить различного рода анализы предпринимательской деятельности для успешного функционирования и обеспечения экономической безопасности фирмы. Но большинство российских предпринимателей, в погоне за экономией денежных средств, считают не рентабельным и весьма затратным способом проводить многочисленные анализы.

При командно-административной экономике государство обязывало проводить анализ финансово-хозяйственной деятельности предприятия, но этот анализ был однообразным. До 1990-х годов в учебных изданиях практически не применялся данный термин. В настоящее время существует изобилие книг, в которых описан финансово-экономический анализ деятельности фирмы. Но мало предпринимателей пользуются данными знаниями.

В девяностых годах при переходе экономики страны на рыночные рельсы наиболее значимой представлялась оценка кредитоспособности предприятия. Для этой цели использовались показатели двух групп: – ликвидности и финансовой устойчивости, – фактические значения, которых определялись по данным агрегированного «Бухгалтерского баланса» – форма №1. Методика формирования агрегированного баланса представлена в таблице 1.

Нормативные значения коэффициентов двух групп – ликвидности и финансовой устойчивости, были ориентированы, главным образом, на зарубежные разработки, и могут быть обозначены следующими диапазонами (таблица 2).

Из представленных в таблице 2 коэффициентов наиболее широко в практике оценки ликвидности активов применяются  $K_{ТЛ}$ ,  $K_{СЛ}$  и  $K_{АЛ}$ , которые отражают возможность погашения наиболее срочных и краткосрочных обязательств за счет отдельных видов оборотных активов.

Таблица 1 – Алгоритм формирования агрегатов «Бухгалтерского баланса»

| Группы баланса   | Условное обозначение | Коды строк баланса   |
|--|----------------------|----------------------|
| <b>Активы</b>  |                      |                      |
| Наиболее ликвидные активы                                    | $A_1$                | 1240+1250            |
| Быстрореализуемые активы                                     | $A_2$                | 1230                 |
| Медленно реализуемые активы, в том числе, оборотные средства | $A_3$                | 1210+1220+1260++1170 |
|  | $A'_3$               | 1210+1220+1260       |
| Труднореализуемые активы, в том числе основные средства      | $A_4$                | 1100-1170            |
|  | OC                   | 1150                 |
| Баланс по активам  | $B_A$                | 1600                 |
| <b>Пассивы</b>   |                      |                      |
| Наиболее срочные обязательства                               | $\Pi_1$              | 1520                 |
| Краткосрочные обязательства                                  | $\Pi_2$              | 1510+1550            |
| Долгосрочные обязательства                                   | $\Pi_3$              | 1400                 |
| Постоянные пассивы   | $\Pi_4$              | 1300+1530+1540       |
| Баланс по пассивам   | $B_{\Pi}$            | 1700                 |

Таблица 2 – Алгоритм расчета и нормативные значения коэффициентов ликвидности

| Показатель   | Условное обозначение | Алгоритм расчета                                      | Нормативное значение |
|--|----------------------|---|----------------------|
| Коэффициент текущей ликвидности (общий коэффициент покрытия) | $K_{ТЛ}$             | $\frac{A_1 + A_2 + A_3}{\Pi_1 + \Pi_2}$               | 1,0-2,0              |
| Коэффициент срочной ликвидности                              | $K_{СЛ}$             | $\frac{A_1 + A_2}{\Pi_1 + \Pi_2}$                     | 0,5-1,0              |
| Коэффициент абсолютной ликвидности                           | $K_{АЛ}$             | $\frac{A_1}{\Pi_1 + \Pi_2}$                           | 0,1-0,3              |
| Коэффициент общей ликвидности                                | $K_{ОЛ}$             | $\frac{A_1 + A_2 + A_3 + A_4}{\Pi_1 + \Pi_2 + \Pi_3}$ | 2,0-3,0              |

Вместе с тем в реальной хозяйственной деятельности фирмы, особенно в случаях оценки состояния фирм, проходящих процедуру банкротства, важное значение приобретает показатель  $K_{ол}$ , характеризующей возможность покрытия как краткосрочных, так и долгосрочных (прежде всего, кредитов банка) обязательств за счет всех активов, как оборотных так и внеоборотных. Что касается нормативного диапазона этого коэффициента, то следует четко обозначить позицию, по которой в случаях банкротства рыночная стоимость имущества предприятия-банкрота практически в 2-3 раза ниже его стоимости по данным бухгалтерского баланса. Эта тенденция особенно четко проявляется при оценке стоимости основных фондов несостоятельного предприятия. Следовательно, числитель формулы расчета коэффициента общей ликвидности должен, по крайней мере, в два раза превышать численное значение знаменателя. Таким образом, нижняя граница нормативного диапазона  $K_{ол}$  может быть принято на уровне 2,0, а верхняя – 3,0.

При оценке фактической ликвидности одни коэффициенты попадают в нормативный диапазон или превышают верхнюю границу, то есть формируют положительную ликвидность, другие – имеют численное значение меньше нижней границы, что означает неудовлетворительную ликвидность.

Анализируя довольно обширный перечень показателей финансовой устойчивости, следует выделить следующие (таблица 3).

Однако, учитывая, что экономической целью любого вида предпринимательской деятельности является получение прибыли, для объективной оценки финансово-экономического состояния предприятия помимо показателей ликвидности и финансовой устойчивости следует включить показатели рентабельности (прибыльности) и деловой активности, которые характеризуют эффективность

использования производственных ресурсов и конечный экономический результат производственно-хозяйственной деятельности.

Главным источником экономической информации для расчета коэффициентов рентабельности и деловой активности является форма №2 «Отчет о финансовых результатах» (таблица 4).

Таблица 3 – Алгоритм расчета и нормативные значения коэффициентов финансовой устойчивости

| Показатель  | Условное обозначение | Алгоритм расчета                                    | Нормативное значение |
|---|----------------------|---|----------------------|
| Коэффициент соотношения заемных и собственных средств   | $K_{\text{сзсс}}$    | $\frac{\Pi_1 + \Pi_2 + \Pi_3}{\Pi_4}$               | 0,7 – 1,0            |
| Коэффициент маневренности собственных оборотных средств | $K_{\text{мос}}$     | $\frac{(A_1 + A_2 + A_3) - (\Pi_1 + \Pi_2)}{\Pi_4}$ | 0,2 - 0,5            |
| Коэффициент автономии                                   | $K_A$                | $\frac{\Pi_4}{B_A}$                                 | 0,5 – 0,7            |

Таблица 4 – Основные показатели «Отчета о финансовых результатах»

| Показатель  | Условное обозначение | Код строки |
|---|----------------------|------------|
| Выручка (НЕТТО) от продажи товаров, продукции, работ, услуг | В                    | 2110       |
| Себестоимость проданных товаров, продукции, работ, услуг    | С                    | 2120       |
| Валовая прибыль   | $\Pi_B$              | 2100       |
| Коммерческие расходы  | $P_K$                | 2210       |
| Управленческие расходы                                      | $P_Y$                | 220        |
| Прибыль (убыток) от продаж                                  | $\Pi_{\Pi}$          | 2200       |
| Прибыль (убыток) до налогообложения                         | $\Pi_H$              | 2300       |
| Чистая прибыль (убыток)                                     | $\Pi_4$              | 2400       |

В таблице 5 представлен перечень и алгоритм расчета фактических значений основных показателей рентабельности и деловой активности в соответствии с новым кодом строк «Отчета о финансовых результатах» (форма №2) и «Бухгалтерского баланса» (форма №1), а также их нормативный диапазон.

Таблица 5 – Алгоритм расчета коэффициентов рентабельности и деловой активности

| Наименование коэффициентов                             | Условное обозначение | Алгоритм расчета фактических показателей | Рекомендуемый нормативный диапазон, доли единицы |
|--|----------------------|--|--|
| Показатели рентабельности                              |                      |  |  |
| Рентабельность совокупных активов по чистой прибыли    | $R_A$                | $\frac{\Pi_4}{B_A}$                      | 0 – 0,20   |
| Рентабельность собственного капитала по чистой прибыли | $R_K$                | $\frac{\Pi_4}{\Pi_4}$                    | 0 – 0,25   |
| Рентабельность товаров, продукции, работ, услуг        | $R_n$                | $\frac{\Pi_{\Pi}}{(C + P_K + P_Y)}$      | 0 – 0,30   |
| Показатели деловой активности                          |                      |  |  |
| Коэффициент оборачиваемости оборотных активов          | $K_{\text{ооа}}$     | $\frac{B}{A_1 + A_2 + A_3}$              | 2,5 – 7,5  |
| Фондоотдача  | $\Phi$               | $B : A_4$                                | 2.0 – 6.0  |
| Коэффициент оборачиваемости собственного капитала      | $K_{\text{оск}}$     | $B : \Pi_4$                              | 1,5-4,5  |

Следует отметить, что в отличие от нормативов показателей первой группы, которые обозначены официальными разработками, нормативы третьей и четвертой групп не имеют официального статуса и трактуются в отдельных исследованиях по-разному.

Ниже предлагаются авторские подходы к оценке нормативов коэффициентов рентабельности и деловой активности в металлургической отрасли. Важность данной отрасли и вклад ее в экономику страны значителен. Россия на первом месте по экспорту никеля и алюминия, на втором – по производству алюминия, никеля и титана. Черная металлургия дает 1,4% ВВП страны, около 6% валютных поступлений. На нее приходится 15% всех железнодорожных перевозок, 5,3% потребления электроэнергии, 5,8% газа. Добавим цветную металлургию, у которой 2,3% ВВП, почти 4% объема российского производства, 3,6% экспорта. У России пятое место по производству стали после КНР, Японии, США и Индии. По экспорту – четвертое, перед нами Китай, Япония и Германия. При этом по внутреннему потреблению стали Россия на шестом месте в мире. Проблема в том, что если внутренний российский спрос на сталь будет расти нынешними темпами, к 2020 году наша страна станет четвертым в мире рынком металлов, поэтому своевременное проведение финансового анализа предпринимательской деятельности фирм металлургической отрасли крайне важно и актуально.

Нормативный диапазон коэффициентов рентабельности может быть сформирован в соответствии со следующими позициями:

– любое положительное значение коэффициентов рентабельности ( $R_A, R_K, R_n > 0$ ) следует считать позитивным вариантом в экономическом развитии предприятия, а, следовательно, нижняя граница диапазона рентабельности может быть обозначена нулевым значением;

– среднее значение коэффициентов рентабельности за период 2000-2016 г.г., который можно оценить как удовлетворительный в развитии экономики страны, по данным статистического ежегодника составляет:

$$R_A = 0,100; R_K = 0,125; R_n = 0,150.$$

То есть, диапазон удовлетворительной рентабельности:

$$R_A = 0 - 0,100; R_K = 0 - 0,125; R_n = 0 - 0,150;$$

– можно предположить, что диапазон для оценки рентабельности баллом «хорошо» будет в два раза превышать уровень удовлетворительной рентабельности и составит:

$$R_A = 0,100-0,200; R_K = 0,125-0,250; R_n = 0,150-0,300;$$

– следуя логике анализа, отличный уровень рентабельности будет превышать:

$$R_A > 0,200; R_K > 0,250; R_n > 0,300.$$

При формировании диапазона коэффициентов деловой активности, могут быть приняты следующие условия:

– нижнюю границу коэффициентов следует ориентировать на фактические значения, полученные по исходной цифровой информации статистического ежегодника, и оценивать, в долях единицы:  $K_{OOA} = 2,5$ ;  $K_{OCK} = 1,5$ ;  $\Phi = 2,0$ .

Таким образом, фактические значения коэффициентов ниже обозначенного уровня следует оценивать баллом «неудовлетворительно».

Удовлетворительное значение коэффициентов обозначается диапазоном, в долях единицы:

$$K_{OOA} = 2,5-5,0; K_{OCK} = 1,5-3,0; \Phi = 2,0-4,0.$$

Оценка коэффициентов баллом «хорошо» предполагает диапазон, в долях единицы:

$$K_{OOA} = 5,0-7,5; K_{OCK} = 3,0-4,5; \Phi = 4,0-6,0.$$

Отсюда следует: любое значение коэффициентов деловой активности свыше верхней границы диапазона «хорошо» оценивается баллом «отлично».

При формировании вывода о финансовом состоянии предприятия необходимо проведение сравнительного анализа фактических и нормативных значений основных коэффициентов ликвидности, финансовой устойчивости, рентабельности и деловой активности, что позволит подойти к объективной оценке уровня финансового состояния хозяйствующего субъекта.

Таким образом, роль финансово-экономического анализа предпринимательской деятельности очень велика. Благодаря правильному ведению финансово-хозяйственной деятельности фирмы и вовремя проведенного анализа, возможно предвидеть и спланировать кризисные ситуации, тем самым избежав банкротства, либо потери части активов, что наиболее важно для поддержания экономической безопасности фирмы. Поэтому необходимо уметь правильно и качественно организовывать финансово-хозяйственную деятельность предприятия, ведь от вовремя проведенного качественного финансово-хозяйственного анализа зависит процветание и развитие бизнеса.

### БИБЛИОГРАФИЯ

1. Аврашков Л.Я. Инновационно-инвестиционное развитие предприятий металлургического комплекса. М.: Современ. экономика и право, 2010. 151 с.
2. Бердникова Т. Б. Анализ и диагностика финансово-хозяйственной деятельности предприятия: Учебное пособие / Т. Б. Бердникова. М.: ИНФПА-М. 2001. 215 с.
3. Графов А.В. Формирование нормативов рентабельности для оценки финансово-экономического состояния предприятий // Аудитор.– М.: Русский журнал. 2011. №2.
4. Графов А.В. Методы регрессионного анализа при планировании и прогнозировании потребности в оборотных средствах// Аудитор. 2013. № 1 (215). С. 29-32.
5. Графов А.В. Критерии и показатели эффективности предпринимательской деятельности в условиях рыночной экономики // Вестник ИНЖЭКОНа. 2010. №1. С. 123-129.
6. Лебедев В.М., Полянин А.В. Методика оценки направлений формирования благоприятного климата публичного управления // В сборнике: Актуальные проблемы развития хозяйствующих субъектов, территорий и систем регионального и муниципального управления. 2015. С. 204-206.
7. Полянин А.В. Взаимовлияние уровня активности инвестиционных процессов на темпы экономического роста региона// В сборнике: Наука и инновации в сельском хозяйстве. 2011. С. 306-309.
8. Россия в цифрах. 2017: Крат. стат. сб. / Росстат- М., 2017. – 511 с.

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**ANALYSIS OF PROBLEMS AND POTENTIAL BASED ON VILLAGE DEVELOPMENT INDEX IN THE ISLAND VILLAGES OF SUMENEP REGENCY: A STUDY IN PAJENANGGER, TORJEK AND PALIAT VILLAGES**

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**ABSTRACT**

This study aims to describe village conditions based on Village Development Index (VDI) as regulated by the Regulation of the Ministry of Village Number 2 of 2016. The research was qualitative under the approach of Community Based Research. Data collection process was done by using the VDI variables and indicators. Research took place in three island villages of Sumenep Regency, i.e. in Pajenangger, Paliat, and Torjek. The results showed that Pajenangger and Paliat belong to the disadvantaged criterion; they both show a low welfare and competitiveness level. These island villages are very far away from Sumenep as the town center. The economy is not growing well due to the limited market access as well as human resources and facilities supporting trade infrastructure. The potential is the well-maintained environment and natural potential.

**KEY WORDS**

Village development index, disadvantaged village, development, potential.

Village Development Index (VDI) was developed to strengthen efforts to achieve the goals of village and rural development as defined in the National Medium-Term Development Plan. In addition, it also supports the instrument i.e. the Act Number 6 of 2014 about villages as a legal instrument to achieve community welfare and village independence. A village, in this sense refers to “*desa*” and “*desa adat*”, hereinafter referred to as a village, is a legal community that has territorial boundaries to administer government affairs as well as interests of local communities based on community initiatives, origins, rights and/or traditional rights. The community is recognized and respected in the system of the government of the Republic of Indonesia (the Act of the Village, 2014).

The explanation provides a clear understanding of village, principles, and objectives of village development that prioritizes village positions with their authority based on the existing regulations. Of the four (4) village authorities, two are the main authorities, which are based on the right of origin and on the local authority of the village. These two authorities become an important force for villages to mobilize their development and improvement of the quality of life, as well as the welfare of the village community. The study was conducted in the island villages of Sumenep Regency, considering that those villages belong to the category of very disadvantaged.

In general, the island villages in the Sumenep Regency belong to the disadvantaged and very disadvantaged ones. As many as 85 villages from 332 villages in Sumenep Regency are island villages, spread on 48 islands in 10 districts. This condition is a special concern for the local government in managing development and allocating development budget.

Awareness on the development gap between the mainland and island areas in Sumenep Regency has only been detected in the regional long term and medium term development plans in the Reform Era. In the New Order Era, the reports on the development gap were not found explicitly either in priority programs and development activities; and this indicate the need for affirmation programs for the island areas. It has also been possible that the democratic system of the New Order Era was very repressive. In the Reform Era, the quality of public services has come to question and the demands of the island area development have emerged.

Therefore, with the regional autonomy, the local government of Sumenep shows the policy alignment through the development of priority programs in each of its medium term development plans. The mission and objectives in the medium term development plans imply a major problem in the distribution of development in Sumenep Regency. The development has not been optimal; this may be due to limited budget—a general problem of governance in Indonesia - as well as the capacity of local governments, and the limited ability to reach the furthest area of the region.

Development of the village potential will be carried out on the Kangean and Sapeken Islands as the two islands are the largest in Sumenep. The two areas also possess the most numbers of disadvantaged villages (7 out of 15 villages). From the seven (7) villages, six (6) are very disadvantaged and one (1) is disadvantaged. Most of the villages are located in Sapeken District.

From the number, only 3 (three) villages were chosen as the study sites; each represents the district, namely Pajenangger in Arjasa District, Torjek in Kangean District, and Paliat in Sapeken District. Pajenangger is a coastal village having the largest coastal area in Arjasa District. Torjek has flat and coastal areas or beaches. Paliat is a one-island village. The mapping of village potentials is based on the variables that become explanatory aspects, i.e. social resilience, economic resilience, and environmental poverty. These variables are adopted from the variables in the Village Development Index (VDI); through the categorization and territorial characteristic, the selected village can become a representative of other villages in each of the three districts.

## LITERATURE REVIEW

According to the Act Number 6 of 2014 about villages, a village, in this sense refers to “*desa*” and “*desa adat*”, hereinafter referred to as a village, is a legal community that has territorial boundaries to administer government affairs as well as interests of local communities based on community initiatives, origins, rights and/or traditional rights. The community is recognized and respected in the system of the government of the Republic of Indonesia (the Act of the Village, 2014). As a representative of the country, the village is obliged to carry out the development, both physical development and human resources development, as an effort to improve the quality of life for the welfare of the village community. Sustainable village development is a village development that does not damage the environment and gives the sovereign right to govern itself (Susetiawan, 2011).

*Village Development.* According to Siagian (2005: 4), development is an activity or a series of growths and changes planned and done consciously by a nation, state, and government towards modernity in the framework of nation building. In essence, development is a deliberate activity between the government and involve the participation of the community toward modernity with a clear direction and planning.

*Development of the Village Community.* According to Indratno (2006:31), approach to rural development should be viewed from two sides. First, it deals with the development of the human (people-centered development). Second, it is a physical development (production-centered development). In other words, development must include the physical development, indicated by an increase in economic growth, and human resource development, indicated as improving health and education.

*Village Development Index.* The Regulation of the Ministry of Village Number 2 of 2016 provides a framework for village development objectives as in the document of the National Medium-Term Development Plan 2015 -2019. The preparation of the Village Development Index is intended to provide a measure of village positions and status as well as the direction of village progresses and independence. Village Development Index functions, among others, (a) to be an instrument in placing the status and position of a village and in assessing the level of progress and independence of a village; (b) to formulate village-based target sites, and (c) to be an instrument in coordination with K/L, local government and village, and other institutions. Through the Village Development Index, the progress and independence of a village is reflected with the status of independent (*sembada*), developed (*pre-sembada*),

developing (*madya*), disadvantaged (*pre-madya*), and very disadvantaged (*pratama*). This classification is needed to accommodate the diversity and depth of issue faced by each village. As we know, village issues have so far been a complex one. The challenge is to represent that complexity into a status, so the formulation of issues and targeting (focus and locus) is focused and centered. Another reason is to avoid moral hazard in achieving the target of village development goals so as not to repeat the biased development practices, which may harm the village life.

## METHODS OF RESEARCH

**Approach.** This study is a data collection for mapping of village potential. According to Nawawi and Hadari (1995), field research is an intensive and detailed research on a desired object by studying various data amplifier or supporting a case. Singarimbun (1995) explains that field research is intended for a fact finding in the field, using a description for a careful measurement of a particular social phenomenon.

**Study Site.** This study was conducted by direct observations into three villages that become the sample, i.e. Pajenangger, Torjek, and Paliat. This study used a descriptive analysis. Descriptive statistics only deal with the matter of deciphering or providing information about a data or a state. Descriptive statistics function to explain the situation, symptoms, and problems, while the conclusions in the descriptive statistics are shown only in the existing data set (Hasan, 2001).

**Focus.** The scope of data collection activities in this study includes three (3) main components. First is identification and analysis of the existing condition of the village. The information collected includes pictures of physical conditions, socio-economic conditions, monograph, development of economic sector, and infrastructure (accessibility). Second is identification of village potential. These components include regional conditions, development trends, economic potentials capable of supporting rural development, the leading commodity sectors, and constraints in the development of economic potential, in terms of both infrastructure and finance and policy.

**Data Types.** Types of data used in this study were secondary data and primary data. Secondary data is data that has been collected by other parties, such as demographic data, village areas, topography, and monograph. Primary data refers to the data obtained directly from the object of research including data used to measure the Village Development Index (IDM), which consists of social, economic, and environmental dimensions and accessibility of the region.

**Data Collection Technique.** Data collection techniques used in this study included (1) interviews, a direct communication with informants, (2) documentation, which is secondary data collection from respondents, economic and social institutions, as well as related institutions, (3) observations, a direct observation of the observed object, listening and recording the field findings, and (4) Focus Group Discussion (FGD), to discuss issues studied. Triangulation and direct confirmation between informants about the data and information obtained by the researcher is expected to occur, for the reliability of the data.

**Data Analysis.** Data analysis in this study used the method by Miles, Huberman, and Saldana (2014: 31) consisting of four steps as shown from Figure 1.

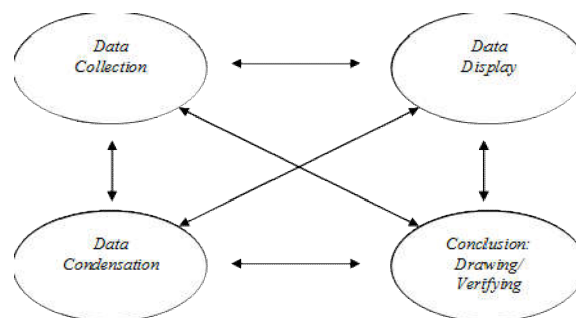


Figure 1 – Interaction Model of Data Analysis (Source: Miles, Huberman, and Saldana, 2014)



## RESULTS AND DISCUSSION

*General Overview of Pajenangger.* Pajenangger is a village located at the southern end of Arjasa District, precisely in Kangean Island. The location of Pajenangger village is strategic when reached through the waterways making the village quite populous. The total population reached approximately 10,000 people with 243.9 households. Geographically, the village is bordered by Gelaman Village in the north and is surrounded by sea in the south, east, and west. Being in the southern region of Arjasa District, Pajenangger is approximately 22 km from Arjasa Village, which is the capital city of District. Pajenangger is approximately 200 km from Sumenep Regency. To reach Sumenep from Pajenangger, we can only travel by sea or air.

Based on the typology of the area, Pajenangger is a village whose area is mostly paddy fields. Most of the people also raise livestock. They also involve in fisheries both capture and cultivation. Surrounded by the sea, the village is blessed with abundant fish resource. In addition to capture fisheries, in some areas of Pajenangger, the soil is muddy at some point during the rainy season forming a natural pond for fish cultivations. The people usually cultivate shrimp and milkfish during the rainy season.

*General Overview of Paliat.* Paliat Village is located in Sapeken District in Sumenep Regency. The total area of Paliat Village is 46 km or 23.19% of the whole area of Sapeken District. Total land area of village is 2 Ha. The population is 2,465 people, consisting of 950 households - as many as 312 people are the poor.

The people are mostly fishermen as the village is surrounded by sea. The village belongs to *swadaya* category as it is still bound by tradition because the education fee is still relatively low, production is directed to the primary needs of the family, and communication is very limited. The livelihood of the population in the primary sector is agriculture, livestock, fishermen, and from the forest.

*General Overview of Torjek.* Torjek is one of the villages in Kangayan District. The village has a total area of 54 km. Most of the area is in the form of rice fields, cultivation, plantation, and sea. Therefore, most of the inhabitants live as farmers and fishermen. The north coast and the south coast border the village. The west part is bordered by Jukong-Jukong Village, and the east is bordered by Kangayan Village. This village is approximately 5 km from Kangayan. The total population is 3,706 inhabitants, with 1,798 male and 1,908 female.

*Village Development Index of Pajenangger.* VDI focuses more on efforts to strengthen village autonomy by building three dimensions, i.e. Social, Economic Resilience, and Environmental Dimension. The three dimensions are broken into variables, indicators, and items with a total of 52 items. VDI scores are interpreted in five (5) scales, with the status of very disadvantaged, disadvantaged, developing, developed, and independent.

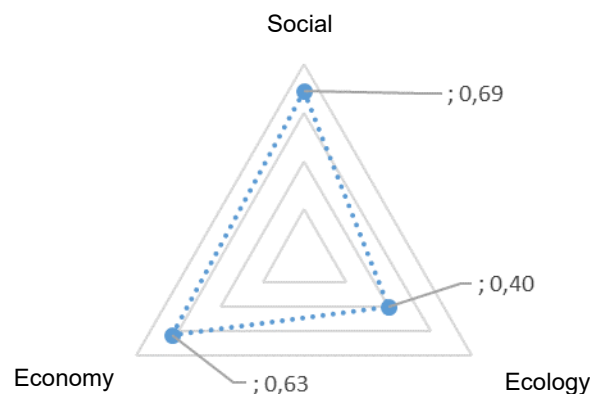


Figure 2 – Village Development Index of Pajenangger

As seen in Figure 2, the VDI score of Pajenangger Village, reached 0.57, belong to disadvantaged category. The Social Dimension Index was 0.69 and this means that the status of social development of Pajenangger is developing. Furthermore, the Environmental Dimension Index was 0.63 and this means that the status of environmental development of Pajenangger is developing. The Economic Dimension Index was 0.40 and this means that the status of economic development of Pajenangger is very disadvantaged.

Referring to the three (3) dimensions of VDI, there is an imbalance score for Pajenangger. Social and environmental development in Pajenangger Village is in developing status, but the economic development is very disadvantaged. There is a need to conduct a deeper analysis on the aspects of each dimension to help improve the status of the village form disadvantaged to developing. A deeper analysis of each dimension can be explained as follows.

The Social Dimension Index for Pajenangger is 0.69 (developing). Conceptually, Social Dimension is formed by four (4) variables covering Health, Education, Social Capital, and Settlement. Here is an index of variables forming the Social Dimension of Pajenangger Village.

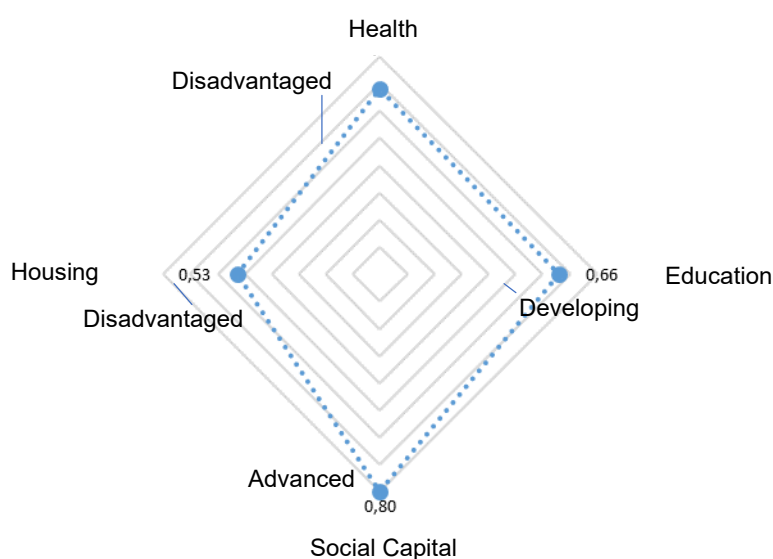


Figure 3 – Social Dimension of Pajenangger Village

Figure 3 shows the Social Dimension Index which reached 0.69 is formed by four (4) variables. Achievement Index of each variable includes Health Variable Index reached 0.68 (developing). The findings in the field from the results of observations and interviews showed that it is easy for the people to get access to health facilities. The distance from the settlement with the nearest health centers and midwives is only 15 minutes with good roads.

The second dimension is the Economic Dimension, which aims to describe the condition economic development based on the potential and accessibility to economic resources. Economic Dimension only has one (1) variable that is economic resilience. Figure 2 shows that the Economic Dimension Index score reached 0.4 (very disadvantaged). This achievement certainly illustrates that Pajenangger Village community access to economic resources is very low.

The economic resilience variable is made up of six (6) indicators covering production diversity, availability of trade service centers, access to logistic distribution, access to financial and credit institutions, economic institutions, and regional openness. In general, when referring to the quantity of village production diversity, Pajenangger Village has a variety of potential to utilize. However, the quality of production so far is still very dependent on nature. For example, for the agricultural sector, the farm areas cannot be planted all around the year. The cultivation season is heavily influenced by the rainy season because the water for irrigation is highly dependent on rainfall. During the dry season, rain intensity is very low, making poor irrigation.

Not only the agricultural sector but also the aquaculture fishery is highly dependent on the season. *Tambak* or the fishpond sector is highly dependent on the rainy season because during the prolonged drought the ponds will dry up. The next indicator is the availability of a trade service center in the village earning a score of 0.20 (very disadvantaged). The village has so much potential both agriculture, aquaculture, and capture fisheries, but it has no village market. Access to financial institutions and creditors scored 0.27 (very disadvantaged). The result of observations and interviews showed that the village has no financial institutions. Access to banking is only in the capital city of the district, which is approximately 22 km from the village.

The final dimension is the Environmental Dimension, which represents the environmental quality in the village. The Environmental Dimension Index is influenced by two forming indicators namely environmental quality and disaster prone. The following is the achievement of the Environmental Dimension Index and its constituent indicators.

The first indicator is disaster prone that describes the possibility of the disaster to occur along with the efforts of the community to anticipate the potential of the disaster. Pajenangger Village obtained a score of 0.60 (in a developing village). The record shows that the potential disasters in Pajenangger Village are the flood and strong winds. Floods occur during the rainy season due to poor irrigation, while strong winds are a season-specific disaster, especially in the middle until the end of the year.

The last indicator is the environmental quality. Pajenangger Village has an environmental quality indicator of 0.70. Pollution occurs in coastal areas and illegal sand mining is certainly destructive. Floods have high possibility to happen during the tidal time and abrasion by seawater. The village government has started efforts to reduce the problems. Here is a picture of the beach where sand mining takes place.

#### Village Development Index of Paliat

VDI focuses more on efforts to strengthen village autonomy by building three dimensions, i.e. Social, Economic Resilience, and Environmental Dimension. The three dimensions are broken into variables, indicators, and items with a total of 52 items. VDI scores are interpreted in five (5) scales, with the status of very disadvantaged, disadvantaged, developing, developed, and independent.

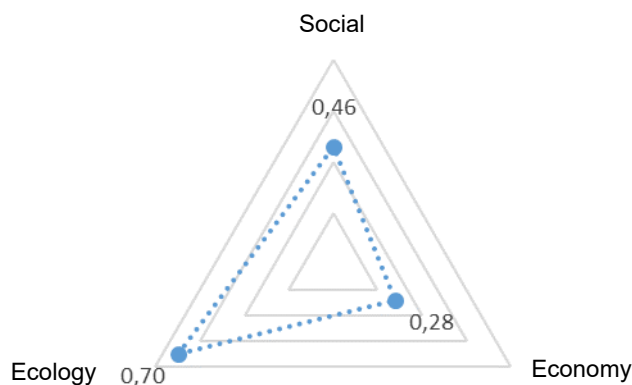


Figure 4 – Village Development Index of Paliat

As seen in Figure 4, the VDI score of Paliat Village, reached 0.4807, belong to very disadvantaged category. The Social Dimension Index was 0.46 and this means that the status of social development of Paliat is developing. Furthermore, the Environmental Dimension Index was 0.70 and this means that the status of environmental development of Paliat is developing. The Economic Dimension Index was 0.28 and this means that the status of economic development of Paliat is very disadvantaged.

Referring to the three (3) dimensions of VDI, there is an imbalance score for Paliat. Social and environmental development in Paliat Village is in developing status, but the economic development is very disadvantaged. There is a need to conduct a deeper analysis

on the aspects of each dimension to help improve the status of the village from disadvantaged to developing. A deeper analysis of each dimension can be explained as follows.

Conceptually, Social Dimension is formed by four (4) variables covering Health, Education, Social Capital, and Settlement. Here is an index of variables forming the Social Dimension of Paliat Village.

Figure 4 shows the Social Dimension Index which reached 0.32 is formed by four (4) variables. The health variables include health services, community empowerment, and health insurance. The index of each variable belongs to the category of very disadvantaged. This is due to distance of health centers, which are very far. To get to health centers, rural community needs to go to other islands by boat with an average travel time of 30 minutes. If the patients need a care in a hospital, they will have to be transferred to Sumenep with a travel time of at least 12 hours.

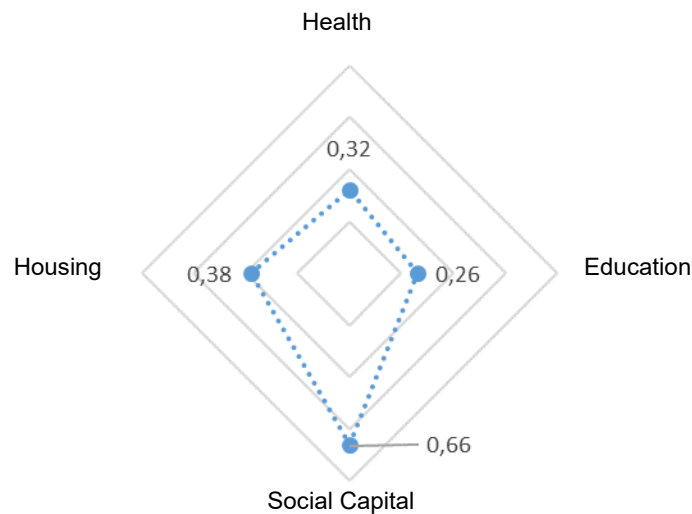


Figure 5 – Social Dimension of Paliat Village

The educational variable in Paliat Village scored 0.26 (disadvantaged). The indicators of educational variable include access to primary and secondary education, access to non-formal education, and access to knowledge. From the overall indicators, the score shows a very disadvantaged category. Education in Paliat is minimal, especially access to secondary education.

The settlement variable in Paliat Village scored 0.38 (very disadvantaged). The indicators include access to clean water and drinking water, access to sanitation, access to electricity as well as access to information and communication. Two indicators, clean water and drinking water, are good and access to electricity is categorized as developing. Meanwhile, access to sanitation and access to information and communications is very disadvantaged.

The Economic Dimension describes the economy of society and it scored only 0.28 (very disadvantaged). The Economic Dimension of Paliat shows the lowest given the weak economic resilience. The diversity of production is classified as independent (score 1) as people work only in the primary sector such as agriculture, fishermen, and breeders. However, the community has not managed the potential optimally—they do not focus on product development due to limited skills and knowledge.

The availability of trade service centers scored 0.20 (very disadvantaged). There is no village market so buying and selling is done in Sapeken. People have to use the boat, making economic delays in Paliat. In addition, economic delays also happen related to access to logistics distribution and access to financial institutions (score only 0.20). The deprivation of economic access is because there are no banks, cooperatives or financial institutions in Paliat Village.

In the Environmental Dimension describes environmental quality and potential of natural disasters. The results show that the environment is self-sustaining and developing. Ecological variables in Paliat scored 0.70, meaning that the village is self-reliant in ecology. Indicators in ecological variables include environmental quality and disaster prone. The environmental quality score is 0.90 (independent) and the disaster-prone score is 0.60. The ecological condition of Paliat Village tends to be very good - the village is very natural without the existence of factory waste and it has large forest area. The ever-recorded disasters in Paliat Village are strong winds and abrasion.

*Village Development Index of Torjek.* VDI focuses more on efforts to strengthen village autonomy by building three dimensions, i.e. Social, Economic Resilience, and Environmental Dimension. The three dimensions are broken into variables, indicators, and items with a total of 52 items. VDI scores are interpreted in five (5) scales, with the status of very disadvantaged, disadvantaged, developing, developed, and independent.

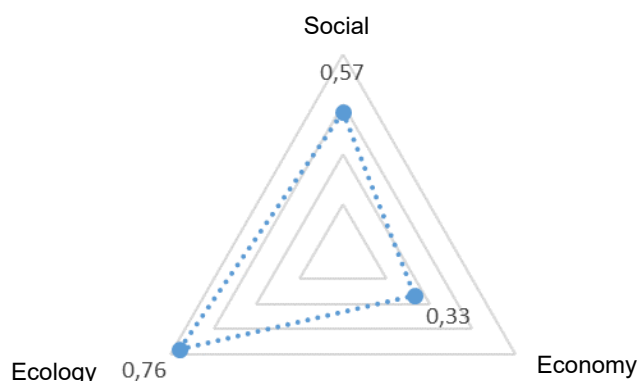


Figure 6 – Village Development Index of Torjek

Figure 6 shows the three dimensions on the Village Development Index for Torjek Village. The Social Dimension scored 0.57, which means developing, the Ecological Dimension scored 0.76, which means developing, while on the Economic Dimension scored 0.33, which means very disadvantaged.

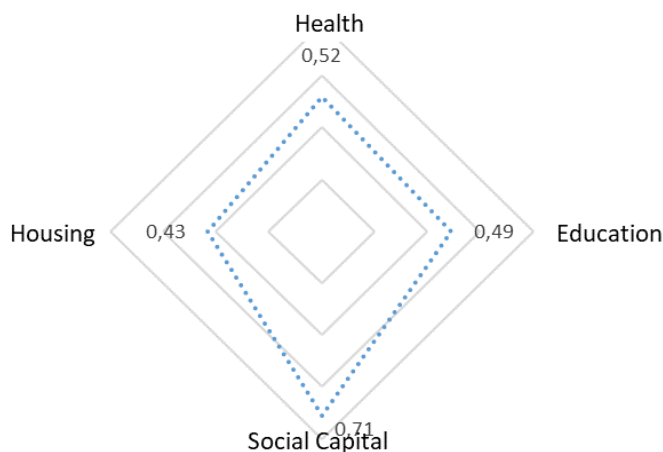


Figure 7 – Social Dimension of Torjek

Health variables in Torjek scored 0.5. Torjek has inadequate health service units, seen from the elements of infrastructure and medical personnel availability and quality. Torjek is a relatively developed village in the district as the community life shows better progresses compared to the surrounding villages. It has one public health center. Other health facilities,

such as hospitals and maternity hospitals, are not yet available in the village. The center health care is 5 km away or 20 km away in Arjasa District.

Educational variables scored 0.49 or very disadvantaged. The nearest education facility is approximately 5 km. while for high school is not yet available in this village. Meanwhile, access to non-formal education and other sources of knowledge is not available.

Social capital tends to be good, showing the highest score in Social Dimension (0.71). Community tolerance is good. Based on information from interviews with the village head, the level of dispute among the villagers is very low. The tribes in Torjek are varied, among others 70% Kangean, 20% Javanese, and 10% Bajo tribe. The people use Javanese, Kangean, and Madurese as well as Indonesian to communicate. The low level of conflict is also followed by the low level of crime that the villagers have not yet felt the urgency to establish a village security system. The excellent social capital in the village of Torjek is a mindset that emphasizes shame, so there are no beggars in the village. The community thinks that it is better to go to other regions or abroad to look for livelihood than to beg.

Most of the villagers in Torjek Village have a good source of clean water. This is evident from the number of clean water facilities owned by the majority of the local population and 40% of Torjek villagers have access to latrines—most of the people use an area in their fields to build toilets. The villagers also use their own yards or fields to manage their garbage—this means that there is no facility for a final dump in the village. When it comes to electricity, the people use their own source of energy, not from the state-owned facility.

The Economic Dimension scored 0.33 (very disadvantaged). The villagers already have a variety of economic activities. It can even be said that the villagers of Torjek have a diversity of production. The production diversity includes fields, gardens, and paddy fields covering an area of 403.12 Ha, community forest of 20.14 Ha, and fish ponds of 0.08 ha. In addition, the villagers have a variety of breeding, including beef cattle (621), horses (15), buffaloes (101), goats (34), chicken (430). The livelihood of Desa Torjek is on the primary sector such as agriculture, fisheries, and livestock.

When it comes to community trade centers, the community has to go to the district center. In the village, stores owned and managed by residents only provide daily necessities, as many as 208 stores. There are also no logistics services such as a post office and goods deposit services. These services must be accessed to other districts, which are about 40 km. There are also no financial and economic institutions; this is because Kangayan District was once part of Arjasa District (the parent district), so all banking, and postal services still follow the parent district.

Torjek is located along the main road connecting Arjasa District with Kangayan District; thus, the people have quite good access. The village can also be accessed by sea—although there is only a traditional harbor and people only use traditional boats as well. The most widely used means of transportation are motorcycles; there are 94 (ninety-four) motorcycles. Other modes of transportation such as trucks, pickups, and mini buses are not widely used. The public transportation only operates on the market day to transport goods or help traders to go to the market. There are 179 bicycles in the village, seven (7) traditional boats, and ten (10) modern boats.

The Village Development Index scored 0.766 (advanced). The natural disasters come in the forms of abrasion in coastal areas, landslides, and floods in the central or hilly areas. Flooding occurs because the hill is quite steep and too close to the beach, so rainwater from the top of the hill flows to the relatively lower village area, especially the coastal areas. The people have built waterways yet during heavy rains water could not be accommodated that floods still happen. The community wishes to have a dam so the water can be kept to be used during the dry season. Abrasion occurs because the north coast of Torjek Village directly faces the Java Sea. The coastal areas have no mangrove forest to protect it from the high waves.

Then, the second indicator is the environmental quality in the village. The air temperature is relatively cool despite being on the coastal area—this means the air is in good condition. The village is partially coinciding with protected forest areas and production forest owned by Indonesian State Forest Company, which contributes to maintaining the

environment from pollution, especially air pollution. Waste is also not a problem as the waste produced is only household waste, which is managed independently by each household.

### **CONCLUSION**

Referring to the three dimensions of VDI, there is an imbalance score for Pajenangger. Social and environmental development in Pajenangger Village is in developing status, but the economic development is very disadvantaged. The case is the same for Paliat. Torjek shows a developing category for Social Dimension and even a developed category for Environmental Dimension; yet, once again, the Economic Dimension is the same as the two villages, very disadvantaged. Thus, it can be said that the biggest weakness of the island villages of Sumenep Regency is the economy.

It is necessary for the local government of Sumenep to pay more attention to economic development due to limited access to services and limited human resources (in skills and knowledge). Economic development needs government intervention to optimize the potential of natural resources in the islands village. In fact, these island villages have a vast landscape with wealthy natural resources.

### **REFERENCES**

1. Indratno, I. 2006. Pengembangan Pusat Pertumbuhan Dalam Rangka Pengembangan Kawasan Perdesaan. Jakarta: YJP.
2. Moleong, L.J. 2006. Metode Penelitian Kualitatif Edisi Revisi. Bandung: PT. Remaja Rosdakarya.
3. Nawawi, H. & Hadari, M.M. 1995. Instrumen Penelitian Bidang Sosial. Yogyakarta: Gadjah Mada University Press
4. Miles, M.B., Huberman, A.M., & Saldana, J., 2014. Qualitative Data Analysis A Methods Sourcebook, Third Edition. USA: Sage Publications
5. Siagian, S.P. 2003. Manajemen Sumber Daya Manusia. Jakarta: Bumi Aksara.

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**ROAD DATA AND INFORMATION PROVISION IN SUPPORTING  
THE IMPLEMENTATION OF JAKARTA SMART CITY PROGRAM:  
STUDY AT HIGHWAYS DEPARTMENT OF JAKARTA**

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**ABSTRACT**

Information is a valuable material in today's digital era. Many organizations have considered data as an important asset which is then managed to be information thoroughly. This trend has influenced government organizations as well which begin to realize the importance of data and information in the information era. Indonesian government is actively campaigning for a single data movement for development with a more responsible, effective and efficient development objective. Provincial Government of DKI Jakarta through Jakarta Smart City (JSC) Program also implements single development data movement to encourage public information disclosure and public service innovation. Through Open Data program (<https://data.jakarta.go.id>), all government agencies of DKI Jakarta or related provinces are expected to actively participate in managing the data and information well and making them public. This also applies to Highways Department of DKI Jakarta. However, this department encounters several constraints on its participation in Open Data JSC. The findings of this study found that the management of road data and information in Highways Department of DKI Jakarta was done in a conventional manner and the scope was not yet comprehensive to the mandatory activities of data and road information management in accordance with the laws and regulations. Road data and information cannot support the implementation of the JSC Program due to the inability of Highways Department of DKI Jakarta to provide complete, accurate, up-to-date, easily obtained, open and accessible data and information both for the administrators and the public. There are four factors causing the problem, namely: too many rules (overregulation), no implementation guidelines, no separate data unit, and no optimal utilization of information and communication technology (ICT). While the supporting factors are: having a command center, having complaints channels, and the portal open data as data storage. Overcoming the four inhibiting factors was expected to achieve the data and information path in accordance with the legislation criteria and able to support the implementation of Jakarta Smart City (JSC) Program.

**KEY WORDS**

Policy analysis, road data, information, open data, Patton-Sawicki, smart city.

The development of information technology has spurred new ways of living (Wardiana, 2002: 1). Since the opening of internet access to the public, information technology enters a new era and spreads fast. It is not surprising if nowadays we tend to do "all-online way" in meeting everyday life needs. Supported with smartphone technology, "all-online way" grows and expands rapidly. The government obviously wants to respond to people aspirations with "online" paradigm. Therefore, the concept of e-government begins for access and products of government services to the public. Starting from the use of e-government applications, such as e-procurement, e-budgeting, e-performance etc., the concept of smart city emerges.

Muliarto (2015) states that smart city is the concept of urban planning by utilizing technological developments that will make easier and healthier life with high levels of efficiency and effectiveness. The realization of the smart city concept depends on the potential and policy directions of each region. Falconer and Mitchell (2002: 2) reveal urban or community conditions have the potential to implement smart city as a solution for the following problems: (1) increased population, currently more than 50% of the world's



population lives in urban areas. This creates a complicated problem in urban infrastructure (transportation, housing, clean water, electricity, and services). Many of them are in need of redesign and large capital expenditures; (2) polarized economic growth in urban areas. Major cities around the world will contribute 65% to gross domestic product (GDP) from 2010 to 2025; (3) increased greenhouse gas emissions. Urban areas face the challenges of sustainable living strategies including transportation, water resources management, urban planning, and environment-friendly buildings; (4) reduced financial budget. The urban economic climate tends to place tight budgetary constraints, thus reducing the ability to respond to pressures.

Jakarta Smart City (JSC) concept is implicitly stated in Regional Legislation No.2 of 2013 on Jakarta Medium Term Development Plan (RPJMD) 2013-2017 in the vision and mission of the elected governor-deputy governor for that period. The vision of Jakarta's development in that period is New Jakarta, a neatly organized modern city, a decent and humane dwelling place, a cultivated society, and is supported with a public-oriented government service. Implementation of smart city in Jakarta is supported by several things, among others: high and fast-paced economic activity, large population and high population growth rate, uneven infrastructures compared to population growth, tourism and education activities, and Jakarta as the center of Indonesian state government. All these things lead to all problems considered normal in other areas become very complex problems in Jakarta. In 2015, the population growth rate of Jakarta is 1.09% with a population of about 10 million people and the land area of about 633 km<sup>2</sup>, making Jakarta as the most populous province in Indonesia.

Jakarta Smart City Management Unit as the manager of JSC Program makes smart city concept based on 6 (six) pillars: Smart Governance, Smart People, Smart Living, Smart Mobility, Smart Economy, and Smart Environment. Through smart city, data and information are expected to be presented more transparently to increase citizen participation in development making Jakarta becomes a smart city because it involves the citizens, the government, the power, the money, and the space to make a better life for all people (<http://smartcity.jakarta.go.id>).

One of the subsystems which build JSC is an integrated data portal which provides data from all units and work units in Provincial Government of DKI Jakarta (<https://data.jakarta.go.id>). Data portal is built based on Governor Regulation No. 181 of 2014 on System and Procedure of Development Data and Information Management. It is expected to be an accurate, up-to-date, open, integrated, complete, accountable, dynamic, reliable, valid, accessible and sustainable integrated data portal with the intention of delivering quality development planning, providing effective development control, and enhancing community participation.

One of the data source organizations is the Highways Department. According to Governor Regulation No. 273 of 2016 on the Organization and Working Procedures of Highways Department, the main task of this department is to carry out planning, development, maintenance, evaluation and security of roads and bridges along with complementary buildings and road equipment. However, in implementing the physical activity, Highways Department always faces several problems every year due to lack of information when planning stage, such as the roads have been heavily damaged and have not been repaired for years.

Based on this fact, it can be concluded that road data and information in Highways Department cannot meet the criteria set out in Governor Regulation No. 181 of 2014. The problem of road data and information not only disturbs internal planning function, but also hinders the performance of JSC program. Whereas the Instruction of the Governor of DKI Jakarta Province No. 223 of 2015 on the Use of JSC Application in the Provincial Government of DKI Jakarta requires active participation of all SKPD/UKPD (Regional Work Unit, *Satuan Kerja Perangkat Daerah/Unit Kerja Perangkat Daerah*) in utilizing JSC application or subsystem. Therefore, the provision of data and road information into <https://data.jakarta.go.id> portal is a necessity.

Obviously, the merger cannot be done immediately, especially when the technology bases of the two systems are not the same. JSC program is an ICT-based system, while the data and information supply system is still conventional. Many issues must be considered, prepared, or fulfilled before the merger begins. A clear description of the provision of road data and information at Highways Department and Smart City Programs will lead to the constraining and supporting factors of the merger. Policy analysis provides the best alternative and recommendation that aims to overcome the inhibiting factors to solve the problem. The analysis is done using Patton-Sawicki's version of policy analysis theory, since this theory is considered to be sufficiently structured to perform the analytical stages and is designed to conduct a rapid policy analysis while still adhering to the principle of providing sound and appropriate recommendations.

### LITERATURE REVIEW

Patton & Sawicki argues that policy analysis can be done before and after the policy. Post-policy policy analysis is usually descriptive and is usually called ex-post (Michael Carley's term), post-hoc (Lineberry's term), and retrospective (William Dunn's term) analysis. Policy analysis conducted before the policy is called ex-ante (Carley's term), pre-hoc (Lineberry's term), anticipatory (Teitz's term), and prospective (William Dunn's term) analysis. This method of analysis is divided into two, namely predictive and prescriptive analysis. Predictive analysis refers to projected future conditions as a result of policy adoption. Prescription analysis refers to policy recommendations. Policy recommendations which are general and do not provide a particular focus are called advices. Whereas, the recommendation that presses policy makers into choosing a policy is called persuasive advice.

Based on existing models of policy analysis and the views on a quickly-applied but good-impact analysis method, Patton & Sawicki develop an analytical model called A Basic Policy Analysis process. This model consists of six policy analysis steps outlined in Figure 1 which presents policy analysis model of Patton & Sawicki.

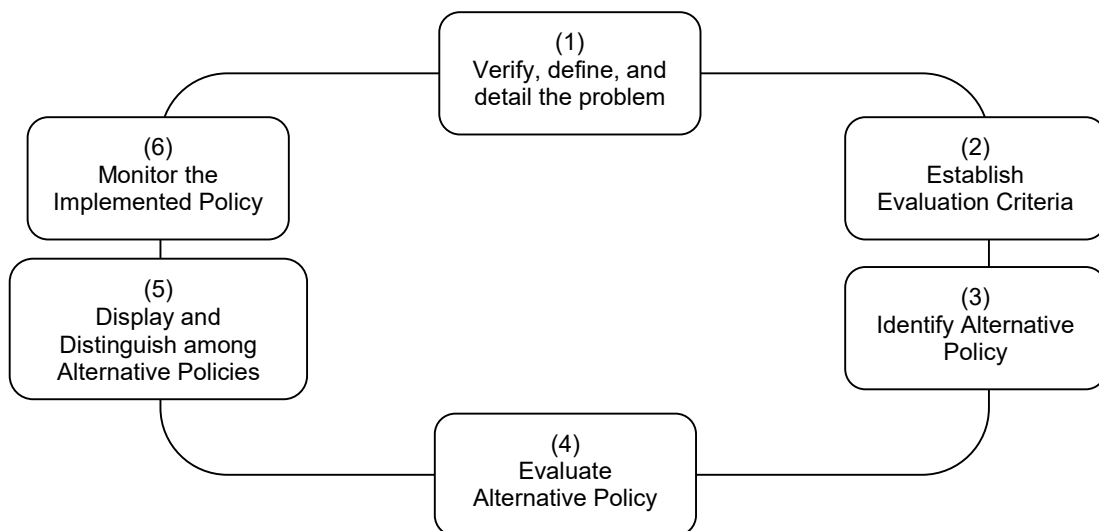


Figure 1 – Policy Analysis Model of Patton & Sawicki  
 Source: *Public Policy Fifth Edition*, Riant Nugroho (2014: 313)

**(1) Verify, define, and detail the policy problems:**

This step is often very difficult because of unclear client's goals or conflictual objectives to be achieved. There are two methods of approach which are widely used in addition to other methods. The first method is the pragmatic approach which is used when many contraries are encountered between policy alternatives so consideration is given to the

lowest cost alternative. The second method is the social-criterion approach in which the policy analyst must find the hidden meaning or expression of the social problem to be solved.

(2) Establish the policy criteria:

Criteria are specific statements about the target dimensions to be used in policy evaluation. It is necessary to distinguish some concepts to understand the criteria. Goals are statements declared formally and broadly about what will be achieved in the future. Objectives are more concrete statements and focus on the goals to be achieved, usually target time and target population are also determined. Measures are the operational, visible, and often stated criteria of definitions quantitatively.

(3) Identify alternative policies:

This step is done by looking for alternatives which can be used to solve the problem. So, it is important to recognize the hidden meaning or expression of social problems to be solved. Policy analyst should identify the root of the problem to think about and determine the right and rational alternatives.

(4) Evaluate alternative policies:

The phases stated by Patton & Sawicki are specific to the policy to be taken (ex-ante evaluation). They introduce two methods of forecasting and evaluation. Forecasting analysis includes extrapolation, modeling, and intuitive forecasting. Extrapolation techniques are to make future projections using current data and trends. Theoretical modeling technique is a forecasting technique using a particular theory approach.

(5) Display and distinguish among policy alternatives:

Patton & Sawicki assert that the policy analysis process is an evaluation of policy alternatives from the technical, economical, and political aspects, linked to their implementation. However, displaying a policy alternative faces some challenges, such as the conflict between individual rationality and group rationality; and the problem of multiple criteria. In policy analysis, one must find conflicts between the problem-solving aims and the above criteria by (1) a simple comparison approach, (2) a score-card matrix, and (3) another matrix.

(6) Monitor the implemented policy:

This phase aims to monitor the extent to which the suggested policy alternatives solve the problem. In the case of ex-ante policy analysis, one can use forecasting method or scenario writing.

## METHODS OF RESEARCH

This research used qualitative research method with descriptive approach.

The research focused on: (1) production, update, and delivery of road data and information by Highways Department of DKI Jakarta; (2) inhibiting and supporting factors affecting road data and information in accordance with smart city criteria; and (3) analysis of combining provision of road data and information into JSC Program using policy analysis model of Patton & Sawicki. This research was located in Jakarta, at Highways Department of DKI Jakarta and Jakarta Smart City Management Unit under Department of Communications, Informatics, and External Relations.

## RESULTS AND DISCUSSION

*Results.* The legal basis for the provision of road data and information used at Highways Department of DKI Jakarta is all Indonesian laws relating to roads concerning road data and information. Table 1 presents these legal bases.

Principles of laws and regulations provisions in Table 1 are summarized as follows:

1. The government, both central and regional, plays a vital role in the implementation of road data and information.
2. The government is obliged to fulfill complete, accurate, up-to-date, easily obtained, open and accessible road data and information for the administrators and the public.

3. In carrying out road data and information, Government and regional government are obliged to fulfill road databases in accordance with the laws and regulations provisions. They are obliged to complete other road information in accordance with laws and regulations provisions as well, such as road network plan and information on construction services activities.
4. Road data and information as a subsystem is a part of other larger systems, such as information and communication system of integrated traffic and road transportation as well as spatial and regional plan system.
5. Road databases are used to know the state, agency or individual assets toward roads. They are also used as source of information for the plans preparation purposes and roads implementation programs, as well as to perform other roads implementation functions.
6. The management of road data and information specified in existing laws and regulations is a conventional-based system. That is, road data and information are handled and made with hard copies. The creation and storage has not involved internet-based technology.

Table 1 – Legal Bases of Road Data and Information Provision in Jakarta

| No | Legislation  | Articles   |
|----|--|--|
| 1  | Law No. 38 of 2004 on Roads  | 14, 15, 16, and 62 paragraph 1 letter d.   |
| 2  | Law No. 22 of 2009 on Traffic and Road Transportation                                | 7 paragraph 1, 7 paragraph 2, 7 paragraph 2 letter a, 8, 245 paragraph 1, 245 paragraph 2, 245 paragraph 3, 246, 247, and 250. |
| 3  | Law No. 26 Year 2007 on Spatial Management   | 7 paragraph 1, 7 paragraph 2, 8, 9, 10, 11, and the elucidation of article 15, paragraph 2.                                    |
| 4  | Law No. 2 of 2017 on Construction  | 4 paragraph 1 letter g, 5 paragraph 1 letter m, 5 paragraph 8, 6 paragraph 7, 6 paragraph 7 letter b, and 8 letter b.          |
| 5  | Government Regulation No. 34 of 2006 on Roads  | 114 - 117.   |
| 6  | Regulation of the Minister of Public Works No. 78 / PRT / M / 2005 on Road Databases | 2, 3, 5, 6, 7, 8, 9, paragraph 1-3, 10, paragraph 1-5, 11, 12, 13, and 15, paragraph 1-7.                                      |

The mechanism of data acquisition and road information in Highways Department of DKI Jakarta Province explained by Mr. Af and Mr. HP as technical planning section staff in interview session can be summarized in the following stages:

**Data collection.** There are 4 (four) categories of road data, namely road damage data, road condition data, road trace data, and complementary building data. There are 4 (four) sources of data, namely Highways Department of DKI Jakarta Provincial, third parties or consultants, other agencies, and citizens and communities. Data collection is done through 4 (four) techniques, namely: field survey, request of information from other institution, direct aspirations from citizens or through Musrenbang (Development Planning Deliberation, *Musyawarah Rencana Pembangunan*), and citizens complaints through complaints channels. This stage generates a sketch of the location, the dimensions of the road as well as the completeness, and photographs which support the description of the situation and conditions in the field.

**Data processing.** Data processing is done by processing the results of data collection. This stage generates recapitulation and field sketches using auto cad. Once processed, these data become useful information such as information on the volume of road damage.

**Data and information archiving, presentation, and dissemination.** Street information is stored in hard copy and soft copy (word or excel). It is bundled in a large map that has been named to facilitate searching when needed again. Presentation of road data and information are through exposures during official meetings or coordination meetings. The dissemination of information is through official letters and email.

**Data and information update.** Data update is done by the official of Highways Department on the files or databases they have in the computer (soft copy) or hard copy by entering the results of related year activity in those files.

Figure 2 and 3 show the process of providing road data and information in Highways Department of DKI Jakarta.

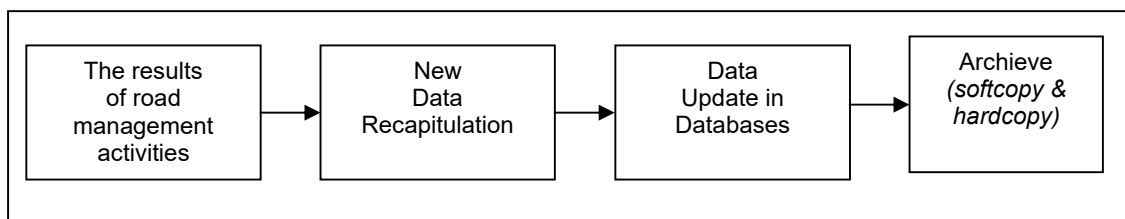


Figure 2 – Road Data and Information Mechanism Updates in Highways Department of DKI Jakarta

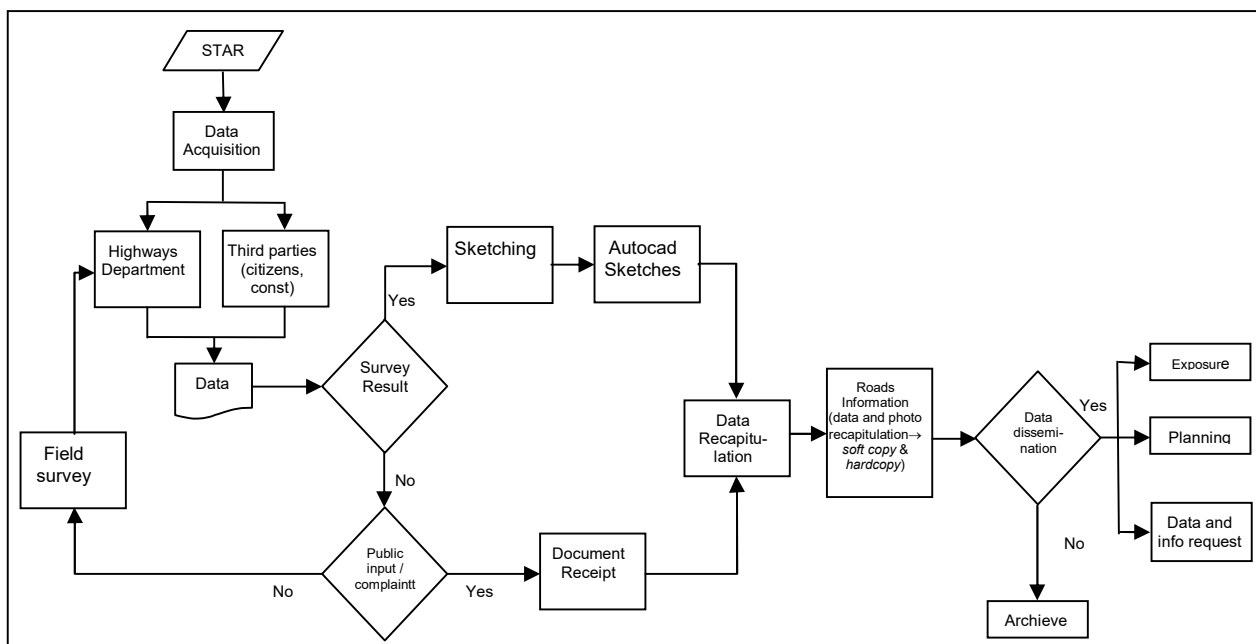


Figure 3 – Provision Path of Road Data and Information in Highways Department of DKI Jakarta

Interview on open data criteria of JSC Program with Mr. SA and interviews with Mr. Af and HP from Highways Department regarding the role of Highways Department of DKI Jakarta in JSC Program resulted in as follows:

(1) There is a difference of opinion about the openness of road data and information between JSC and Highways Department of DKI Jakarta. According to JSC, open data is standardized data and can be obtained free of charge through the open portal data of Jakarta Smart City ([data.jakarta.go.id](http://data.jakarta.go.id)). Meanwhile, according to Highways Department of DKI Jakarta, the data has been open and accessed through official application.

(2) The data and information criteria owned by Highways Department of DKI Jakarta have not been able to comply with the laws and regulations as the legal basis for their implementation. This is due to abundant laws and regulations, causing confusion of public servants to take action and even innovation. In addition, the inability to utilize information and communication technology has not been followed up with collaborative steps with the parties who are able to solve this problem.

(3) In the end, there is awareness that the ways of data treatment by Highways Department of DKI Jakarta have been no longer sufficient for the development of the current demands of society. There should be better innovation and better use of ICT sophistication through JSC program.

(4) Innovation in the provision of road data and information by utilizing the sophistication of information and communication technology is preceded by the openness of data and public information Highways Department has through open data portal. It is hoped

that there will be other parties, creators and innovators who are able to provide solutions for the problem of providing data and information on roads in Jakarta which is complete, accurate, up to date, easy to obtain, open and accessible to the administrators and the community.

## DISCUSSION OF RESULTS

Based on the findings and studies conducted on the findings, it can be concluded that the provision of road data and information by Highways Department of DKI Jakarta in order to support the implementation of JSC Program has supporting and constraining factors. These factors are identified as follows:

### (1) Supporting factors:

Having a command center. Command Center is under the control of the Planning and Budget Secretariat of Highways Department of DKI Jakarta. Although the task of the current command center is to monitor reports and public complaints through Qlue, Facebook, twitter, sms, and other social media, the functionality can be improved in road data and information management.

Having complaints channels. Qlue, Facebook, twitter, sms, hotlines and other complaints channels are very helpful for the duty of Highways Department of DKI Jakarta to get roads data, especially damaged roads.

Open data portal (<https://data.jakarta.go.id>) as data storage. The existence of open data portal as a storage of all development data held in the scope of DKI Jakarta Province, greatly facilitate Highways Department of DKI Jakarta to hold public information disclosure. Data and information that already exist and meet the criteria of open data portal can be directly uploaded. Stakeholders who need data and road information can directly download it.

### (2) Inhibiting factors:

Too much regulation (overregulation). As mentioned previously, there are 6 (six) applicable rules underlying the provision of road data and information in Jakarta. These six regulations have a national scope, while Provincial Government of DKI Jakarta has not set specific rules on road data and information. Too much regulation creates confusion for the officials, causing less action and innovation in the implementation.

Having no guidelines on the implementation of road data and information management mechanism (SOP, MSS, operational guidelines, etc.). Guidelines regulate procedures to obtain data; process, present, and disseminate data that has become information; and incomplete activities of Highways Department of DKI Jakarta in providing road data and information. With the stipulation of road data and information management procedures, it is expected that good data criteria can be realized.

Having no own data unit. Data is an asset and needs management in the process, so the complete management should be accomplished as well. Establishment of individual data units that specialize in this function is needed to achieve better data and information management affecting better results. Provincial Government of DKI Jakarta also encourages the establishment of data units in each SKPD and conducts trainings on the human resources. Provincial Government also encourages the fulfillment of public information disclosure principle through JSC open portal data.

No optimal utilization of information and communication technology (ICT). ICT used in the provision of road data and information in Highways Department of DKI Jakarta has been limited to emails and social media to receive and disseminate data. This is considered inadequate for the development in the current era. ICTs can be further utilized by innovators through the applications they build.

Combining road data and information into Jakarta Smart City program is not too difficult, as the JSC information system has provided storage for data and development information throughout Jakarta through open data (<https://data.jakarta.go.id>). However, this merger is not without any obstacles. Four obstacles have been identified in the provision of road data and information in Highways Department of DKI Jakarta.

Analysis of this data and information problem used Patton-Sawicki's policy analysis theory. The analysis is intended to provide policy recommendations that could encourage the active participation of Highways Department of DKI Jakarta in open data to realize the pillars of smart governance in the implementation of the JSC Program by addressing these four obstacles.

*Verify, define, and detail the problems.* This issue begins with too much legal basis (overregulated) of providing road data and information set by the government. Too many rules cause confusion and reluctance of the officials to carry out their duties. Other problems arise from that particular issue. The second problem is the absence of guideline on the provision of road data and information established in the scope of DKI Jakarta Province. So far, the guidelines have used legislative guidelines issued by the Ministry of Public Works. However, road databases are just one of the broader scopes of data and information. These guidelines are no longer sufficient to answer the society demands and the development urgency in this digital era. The third problem is no establishment of separate data units to perform road data and information management. The organizational structure of the road data and information provision is attached to other organizational structures within the scope of Highways Department of DKI Jakarta, so the officials often deal with the confusing conditions in determining the task priority to be completed first. The fourth problem is no optimal utilization of ICT. ICTs should also be utilized for more effective road data and information provision, by regarding the criteria set by the laws and regulations.

Based on the description of the above problems, it can be concluded that identified, detailed and verified problems are the inability of Highways Department of DKI Jakarta to provide good data and information in accordance with the criteria set out by the laws and regulations, causing the department unable to support the implementation of JSC program mainly in public information disclosure.

*Establish evaluation criteria.* Criteria used are effectiveness and efficiency because these criteria are also used in the activities of JSC Program based on Governor Regulation No. 181 of 2014. Efficiency in the scope of JSC means prioritizing the utilization of existing city resources, rather than getting them from outside. Therefore, it is necessary to recognize the present potential before making an action or innovation in the context of smart city. Effectiveness means the involvement of all stakeholders in a collaborative relationship in dealing with and seeking solutions for urban problems.

*Identify alternative policy.* The previous discussion has identified 4 (four) obstacles in fulfilling the road data and information provision in order to support the implementation of JSC Program. Each solution alternatives are identified against these four inhibiting factors.

*Evaluate alternative policy.* The aim is to provide relevant information on proposed policy alternatives. Since the policy has not yet been implemented, the ex-ante evaluation method is forecasting which takes into account the future conditions when a policy is enacted. Evaluation is done in accordance with the criteria set out in the second stage.

*Display and distinguish among alternative policies.* Patton & Sawicki argues that choosing the best policy alternative is not enough by only considering the evaluation results from the fourth stage. There are other criteria to be considered, namely political viability, administrative operability, and legal feasibility criteria. Road data and information at Highways Department of DKI Jakarta acquire sufficient support to be accomplished. This is evident from the content of the six basic laws and regulations that instruct the government in accordance with its jurisdiction to achieve good road data and information and meet the complete, accurate, up-to-date, open, accessible criteria for the administrators and the public. In addition, Law No. 14 of 2008 on Transparency of Public Information and Governor Regulation of DKI Jakarta Province No. 181 of 2014 encourage better data development and information management, including road data and information.

Then political viability, administrative operability, and legal feasibility criteria are no longer taken into account in the stages of presentation and comparison of these policy alternatives because all policy alternatives receive equal political viability, administrative operability, and legal feasibility values.

Table 2 – Comparison of policy alternatives

| Problems                                       | Alternatives 1  | Alternatives 2  | Alternatives 3  |
|--|---|---|---|
| Too many laws and regulations (Overregulation) | Status quo. Ineffective and inefficient.                          | Road document as road data. Less effective and less efficient               | Complete data and information in accordance with six legal basis. Effective and efficient.                |
| Data unit                                      | Status quo. Ineffective and inefficient.                          | New data unit. Effective and less efficient.                                | Upgrade command center into data units. Effective and efficient.  |
| Guidelines (SOP)                               | Status quo. Ineffective and inefficient.                          | Guidelines (SOP) for road documents. Less effective and less efficient.     | Guidance (SOP) for data and road information in accordance with six legal bases. Effective and efficient. |
| Technology                                     | Status quo (email and social media). Ineffective and inefficient. | Create an application / portal independently. Effective and less efficient. | Create an application / portal through open data JSC. Effective and efficient.                            |

Table 2 shows the policy alternatives reviewed in the third and fourth stages. The results of the evaluation are compared by using the criteria set in the second stage in determining alternative policy criteria. Then, the recommended policy alternative is the third alternative because all these alternatives show the fulfillment of efficiency and effectiveness criteria.

*Monitor policy implementation.* The recommended policy implementation monitoring stage is conducted by measuring whether the impact of the policy brings maximum benefit to the stakeholders. Since policy recommendations have not been implemented, the method used is the measurement of policy implementation result projection towards the satisfaction of stakeholders in performing their activities. Stakeholders in this case are the government, private sector (business), and society. The result of policy implementation is the complete, accurate, up-to-date, open, easily obtained, and accessible road data and information by the administrators and the community.

The government uses these results as decision-making consideration, development planning, monitoring and evaluation of program and activity accomplishment, quality of public services improvement, and public information disclosure. Private sector requires appropriate road data and information for the decision-making process in running the business. For the public, excellent data and information in accordance with the criteria are used as a tool to monitor the development controlled by the government. It is also used as a basis for providing input to the government for better development. In addition, it can also be used to develop the creativity and innovation of public services. Subsequently, the data and information in accordance with the complete, accurate, up-to-date, open, easily obtained, and accessible criteria for the administrators and the public will be able to meet the needs of the society in performing these activities.

## CONCLUSION

Road data and information provision within the scope of Highways Department of DKI Jakarta is one of the obligatory technical tasks as the road implementer in Indonesia's capital in order to support decision-making, planning, monitoring and evaluation functions. This study shows that technical functions in government agencies still require policy in the implementation. The policy is issued by officials who perform the activities as an implementation strategy. Stipulation of implementation strategy policy must be guided by above regulations which become the legal basis for the implementation. Therefore, it is important to take into account the flexibility of the policy implementer at the time of making the policy.



## REFERENCES

1. Nugroho, D, Riant, 2004, Kebijakan Publik, Formulasi Implementasi dan Evaluasi, Jakarta.Gramedia.
2. Nguyen, Lan. 2017. Open Data Master Plan of Toronto [Update Report]. Government of Toronto: Information & Technology Division.
3. Kumorotomo,Wahyudi, 1996, Sistem Informasi Manajemen Dalam Organisasi Publik, Yogyakarta, Gajah Mada Press.
4. Anderson, James E. Public Policy Making. New York: Holt, Rinehart and Winston. 1984.
5. Sugiyono, 2014. Metode Penelitian Kuantitatif Kualitatif dan R & D Bandung: Alfabeta
6. Wardiana, Wawan. 2002. Perkembangan Teknologi Informasi di Indonesia. Bandung
7. Winarno, Budi, 2012 .Kebijakan Publik Teori, Proses dan studi kasus, Jakarta: PT.Buku Seru.
8. <http://smartcity.jakarta.go.id> accessed on March 10, 2017 at 09.00 WIB

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## **SALES PROMOTION AND PRICE IMPACT ON PURCHASING DECISION OF XIAOMI SMARTPHONE TO CONSUMERS IN WEST JAKARTA**

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### **ABSTRACT**

This research aimed: 1) to find out any sales promotion impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta?, 2) to find out any price impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta?, 3) to find out any sales promotion and price impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta? The population was all consumers in West Jakarta. The sample of the research was limited to 100 consumers in West Jakarta. The purposive sampling method was used in this research. The data collection method was conducted by distributing questionnaires to 100 respondents. The data analysis technique was the multiple regression analysis with non-probability sampling. The findings of the research showed four results. First, sales promotion had a partially significant impact on purchasing decision with 95% probability level. Second, price had a partially significant impact on purchasing decision with 95% probability level. Finally, sales promotion and price had a simultaneously significant impact on purchasing decision with 95% probability level.

### **KEY WORDS**

Promotion, sales, purchasing decision, consumer.

Technological developments have added colors to various kinds of competition in all fields. One of them is telecommunication field. The development of telecommunication field has grown fast with the continuous growing number of mobile phone products in which initially mobile phones serve as a means of wireless communication; then it turns into a tool that is functionally in today's modern era; it is called smartphones (Berger, 2015). There are many smartphone companies competing to create popular smartphone products; one of them is Xiaomi Inc., (Liu, Liu, and Zheng, 2016). Xiaomi Inc. initially launched the smartphone in 2011. Xiaomi can bring the same features as Apple and Samsung have but with a much cheaper price. Smartphone business competition is increasingly competitive which requires companies to be able providing and delivering clear and distinct information, better than its competitors, so that the company can attract attention and purchase from the consumers. One way could be done by companies in attracting consumers is by having marketing activities (Cecere et al, 2015).

Marketing activity has several interconnected components; such as product, price, distribution and promotion. Promotion becomes one of the best strategies in delivering information to the consumer. Sales promotion takes an important role in influencing purchasing decisions. Sales promotion is a direct inducement that offers incentives or more values of a product to the consumer. Sales promotion includes a wide variety of promotional tools designed to stimulate faster or stronger market responses (Albaum and Tse, 2001). According to Chandon et al. (2000), sales promotion is a marketing communications activity; other than advertisement, personal sales, and public relations, where short-term incentives motivate consumers and channel members to immediately purchase goods or services; both by having low prices or by raising the added value.

In addition to sales promotion, price also plays an important role in making purchasing decisions. Nowadays, with the lower purchasing power of the majority of consumers, pricing is very important as consumers are increasingly critical and selective in spending money (Puccinelli et al, 2009). According to Tantry et al. (2013), defining price is everything done by consumers to get the benefits offered by the various marketing of the company. Sales

promotion is a short-term incentive in promotional activities to stimulate the purchase of a product in a variety of ways; such as trade shows, sales incentives, coupons and other (Ngai, et al, 2009). According to Achrol and Kotler, (1999) sales promotion is a key element in marketing campaigns. Sales promotion consists of a collection of various—mostly short-term—incentive tools designed to encourage the purchase of a particular product or service more quickly or greater by the consumer or merchant.

Purchasing decision of a product begins with the consumer's awareness of the problem in their needs. Consumers are aware that there is a difference between the actual and the desired conditions. The result is that the consumers will seek more information to find out which product they are interested in, (Comegys et al, 2006). Purchasing decision is an integration process that combines knowledge to evaluate two or more alternative behaviors and choose one of them, (Chen et al, 2009).

This research aimed: 1) to find out any sales promotion impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta?, 2) to find out any price impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta?, 3) to find out any sales promotion and price impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta?

## **METHODS OF RESEARCH**

One step to be considered in the implementation of a research is to determine the population of the research in which will be conducted. The population of the research was all consumers in West Jakarta who had not owned or had already owned Xiaomi smartphone. The sampling method used was non-probability sampling; it means that the sampling technique did not use the procedure of opportunity selection but rather rely on personal judgment of the researcher, (Tansey, 2007). In the research questionnaire, samples were collected and the sample total was in accordance with the rules of primary data collection. According to Wagner et al. (2007) stated that generally social research such as economics, sociology, psychology, management, banking, and marketing, obtaining primary data with samples ( $n > 30$ ). Based on the reference, then the number of samples were as many as 100 respondents.

Data collection method used in this research was by using questionnaire. Questionnaire is a data collection technique that is conducted by distributing a set of questions or written statement to be answered by the respondents. Questionnaire is an efficient data collection technique if researchers know with certainty the variables to be measured and know what cannot be expected from the respondents. Questionnaire, as a data collection technique, is perfect for collecting large amounts of data (Hammersley, 2003).

## **RESULTS AND DISCUSSION**

*Classical Assumption Test.* Before performing data analysis, to find out any sales promotion and price impact on purchasing decision of Xiaomi Smartphone to consumers in West Jakarta, classical assumption test was firstly done; including normality test, multicollinearity, autocorrelation and heteroscedasticity. Due to the data type of cross section of this research, the classical assumption testing then had only three types of normality test, multicollinearity and heteroscedasticity.

*Normality Test.* In this research, the normality test was performed by looking at the spread of data or by looking at the direction of data that follows or does not follow the normal line (Normal Probability P – P Plot) through the SPSS data processing.



Figure 1 – Normality Test

Based on the information on the figure above, the points are around the line and follow the direction of diagonal line or histogram graph so that it can be concluded that the data is normally distributed.

**Multicollinearity Test.** The existence of multicollinearity was identified by the value of VIF (Variance Inflation Factor). If the VIF value is less than 10, then the regression model does not have multicollinearity and if the VIF value is more than 10 then the regression model has multicollinearity.

Table 1 – Multicollinearity Test

| Model           | Collinearity Statistics |       |
|-----------------|-------------------------|-------|
|                 | Tolerance               | VIF   |
| Sales Promotion | 0.492                   | 2.033 |
| Price           | 0.492                   | 2.033 |

Based on the table, all variables have VIF values smaller than 10, therefore it can be concluded that the regression model has no multicollinearity.

**Heteroscedasticity Test.** Heteroscedasticity test aims to test the occurrence of variance inequality from one residual to another observation in this regression model. An appropriate regression model has no heteroscedasticity. Heteroscedasticity test can be performed by using scatter plot. If there is a certain pattern, such as points that form a regular pattern, then it indicates that there is no heteroscedasticity occurs. If there is no clear pattern and the points spread above and below 0 on the Y axis, then heteroscedasticity does not occur. The picture below will illustrate the scatter plot:

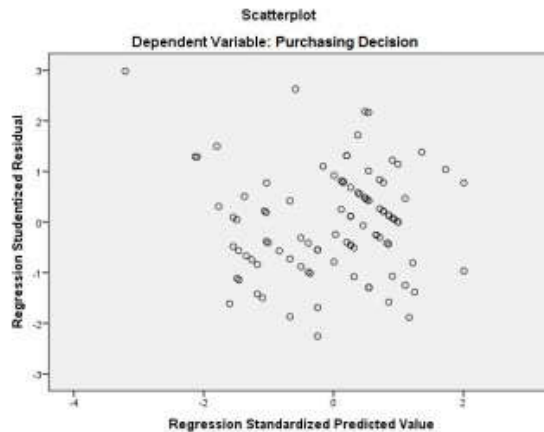


Figure 2 – Scatter Plot

Based on the picture, it can be seen that all spots spread and there is no clear pattern so it can be concluded that there is no heteroscedasticity in regression model. From the analysis of classical assumption test, it can be concluded that the regression analysis is performed well and multiple regression model can be used to analyze the data because it meets the requirements:

- 1) There is normality;
- 2) There is no multicollinearity;
- 3) There is no heteroscedasticity.

*Multiple Regression Analysis.* Multiple regression analysis is used to determine the effect of independent variable (X) on the change of dependent variable (Y). In this research, the independent variables are communication of sales promotion (X<sub>1</sub>) and price (X<sub>2</sub>). Dependent variable in this research is purchasing decision (Y). Below is the SPSS output to form a regression equation:

Table 2 – Analysis Table of Multiple Regressions

| Model           | Unstandardized Coefficients |            | Standardized Coefficients Beta |
|-----------------|-----------------------------|------------|--------------------------------|
|                 | B                           | Std. Error |                                |
| (Constant)      | 1.173                       | 1.063      |                                |
| Sales Promotion | 0.184                       | 0.053      | 0.368                          |
| Price           | 0.232                       | 0.066      | 0.371                          |

Based on the table above, the regression equation can be formulated, namely: Purchasing Decision = 1.173 + 0.184 of sales promotion + 0.232 of price. The following is the explanation of the above equation:

- If there is no sales promotion and price (X<sub>1</sub> and X<sub>2</sub> = 0) then the purchasing decision is 1,173
- If sales promotion increases and price is considered as constant, then the purchasing decision will increase by 0.184
- If the price increases and sales promotion is considered as constant, then the purchasing decision will increase by 0.232

*Hypothesis Testing.* In this research, hypothesis should be tested first to answer the formulation of research problems on any sales promotion and price impact on purchasing decision. In performing data processing, the researcher used SPSS program for windows version 20. Hypothesis testing of this research was performed simultaneously or partially. The purpose of simultaneously testing was to see the impact of all independent variables to the dependent variable. Meanwhile, the partial testing aimed to see the impact of each independent variable to the dependent variable.

*F – Test (Simultaneously Hypothesis Testing).* As discussed in Chapter III, F – Test is basically showing whether all independent variables can be included into the regression equation model which has a simultaneous influence on the dependent variable (simultaneous testing). The F – Test (ANOVA) is presented in the following table:

Table 3 – Coefficient Test of Double Regressions simultaneously with F – Test

ANOVAa

| Model        | Sum of Squares | df | Mean Square | F      | Sig.              |
|--------------|----------------|----|-------------|--------|-------------------|
| 1 Regression | 266.733        | 2  |             |        |                   |
| Residual     | 302.577        | 97 | 133.366     | 42.755 | .000 <sup>b</sup> |
| Total        | 569.310        | 99 | 3.119       |        |                   |

Based on the table, the level of significance is 0.000 in which the number has a smaller value than the value of  $\alpha$  that is equal to 0.05. Therefore, it can be concluded that H<sub>0</sub> is rejected; and it means that at least there is one independent variable that can affect purchasing decision by 95% of confidence level. Thus, in answering the research hypothesis, partial testing (t-test) can be done to know which independent variable affect the dependent variable.

*T – Test (Partial Hypothesis Testing).* T-test hypothesis testing is performed to find out how far the impact of one independent variable in explaining the variation of dependent variable individually. Partial test results on the regression coefficient can be seen in the following table:

Table 4 – T – Test Table

| Model           | Unstandardized Coefficients |            | Standardized Coefficients | t     | Sig. |
|-----------------|-----------------------------|------------|---------------------------|-------|------|
|                 | B                           | Std. Error | Beta                      |       |      |
| Sales promotion | 0.184                       | 0.053      | 0.368                     | 3.489 | .001 |
| Price           | 0.232                       | 0.066      | 0.371                     | 3.519 | .001 |

*Hypothesis Testing Against Regression Coefficient ( $\beta_1$  Test).* Based on the table, by having significance value with  $\alpha$  value of 0.05, the result is 0.001. It indicates that sales promotion variable has smaller significance value than  $\alpha$  value which means that  $H_0$  is rejected; it can be concluded that there is significant impact between sales promotion variable to purchasing decision variable (Y) if price variable is considered as constant with the level of confidence of 95%.

*Hypothesis Testing Against Regression Coefficients ( $\beta_2$  Test).* Based on the table, by having significance value with  $\alpha$  value of 0.05, the result is 0.001. It indicates that price variable has smaller significance value than  $\alpha$  value which means that  $H_0$  is rejected; it can be concluded that there is significant impact between price variable to purchasing decision variable (Y) if sales promotion variable is considered as constant with the level of confidence of 95%.

*Determination Test ( $R^2$ ).* Determination test ( $R^2$ ) is performed to know the proportion ability of independent variables in explaining the variation of dependent variable. The following is the calculation of the determination test ( $R^2$ ); it is shown in the following table:

Table 5 – Testing R. Square

### Summary<sup>b</sup> Model

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .684 <sup>a</sup> | .469     | .458              | 1.76617                    |

Based on the table, the R-square value is 0.469 which means that it is equal to 46.9%; dependent variable (purchasing decision) can be explained by independent variables (sales promotion and price) and the rest of 53.1% can be explained by other variables.

## DISCUSSION OF RESULTS

In this research, the results of validity and reliability analysis indicate that all variables are valid and reliable. In other words, they are valid because all items of the statement have corrected item-total correlation value greater than 0.2 (Aritonang, 2007) and they are reliable because the Cronbach's Alpha value is greater than 0.7 (Aritonang, 2007). It indicates that all the instruments of the statement in the questionnaire, as a measurement tool in this research, are feasible to be used and preceded to the next analysis.

According to the description of the research subjects, it is noted that the characteristics of the respondents are in terms of gender, age, price range of smartphones and smartphone turnover intensity. Classical assumptions testing on regression analysis shows that multiple regression models are appropriate to be used in data analyzing. Because it has met the requirement that there is normality, there is no multicollinearity and heteroscedasticity. Results of multiple regression analysis, to determine the impact of sales promotion and prices on purchasing decision, resulted the equation: purchasing decision = 1.173 + 0.184 of sales promotion + 0.232 of price.

The results of simultaneous hypothesis testing (F – Test) showed that the significance value of 0.000 is smaller than the value of  $\alpha$  0.05. So it can be concluded that there is at least one independent variable that affects the dependent variable with a confidence level of 95%. The result of partial hypothesis testing (t – Test) shows that sales promotion and price variable had impacts purchasing decision. Based on the conclusions of multiple regression analysis results, it can be reflected that the considerations leading to a positive purchasing decision are sales promotion and price. From the above analysis, it can be seen that the R-square value is 0.469; it means that 46.9% of the dependent variable (purchasing decision) can be explained by independent variables (sales promotion and sales) and the rest of 53.1% (100% 46.9%) can be explained by other variables that are not included in this research.

## CONCLUSION AND SUGGESTIONS

Based on the research and discussion that have been conducted, the following conclusions can be drawn:

There is an impact of sales promotion on the purchasing decision by comparing significance value with  $\alpha$  value of 0.05; the obtained result is equal to 0,001 (less than 0.05) and its impact is equal to 0,184 at regression equation.

There is an impact of price on the purchasing decision by comparing significance value with  $\alpha$  value of 0.05; the obtained result is equal to 0,001 (less than 0.05) and its impact is equal to 0,232 at regression equation.

There is an impact of sales promotion and price on the purchasing decision; the level of significance is 0.000 in which the number has a smaller value than  $\alpha$  value of 0.05. The results of regression are: purchasing decision = 1.173 + 0.184 of sales promotion + 0.232 of price.

Based on the result of the research, the researcher will provide some useful suggestions practically and theoretically, as follows:

Practically, the researcher suggested that the company minimize the production cost of Xiaomi smartphone so that the price of Xiaomi smartphone will be cheaper because in this research the most influential variable is the price, in purchasing decision of Xiaomi smartphone. In addition to price, the company should also pay attention to other factors that influence purchasing decisions such as sales promotion.

Theoretically, in order to sharpen the important findings of further research, related to purchasing decisions, it is advisable to add other independent variables that may influence purchasing decisions such as product quality, advertising and other factors.

## REFERENCES

1. Berger, A. A. (2015). *Media and communication research methods: An introduction to qualitative and quantitative approaches*. Sage Publications.
2. Liu, D., Liu, H., & Zheng, S. (2016). U.S. Patent No. D749,534. Washington, DC: U.S. Patent and Trademark Office.
3. Cecere, G., Corrocher, N., & Battaglia, R. D. (2015). Innovation and competition in the smartphone industry: Is there a dominant design?. *Telecommunications Policy*, 39(3), 162-175.
4. Albaum, G., & Tse, D. K. (2001). Adaptation of international marketing strategy components, competitive advantage, and firm performance: a study of Hong Kong exporters. *Journal of international marketing*, 9(4), 59-81.
5. Chandon, P., Wansink, B., & Laurent, G. (2000). A benefit congruency framework of sales promotion effectiveness. *Journal of marketing*, 64(4), 65-81.
6. Puccinelli, N. M., Goodstein, R. C., Grewal, D., Price, R., Raghubir, P., & Stewart, D. (2009). Customer experience management in retailing: understanding the buying process. *Journal of retailing*, 85(1), 15-30.

7. Tantry, U. S., Bonello, L., Aradi, D., Price, M. J., Jeong, Y. H., Angiolillo, D. J., ... & Kirtane, A. (2013). Consensus and update on the definition of on-treatment platelet reactivity to adenosine diphosphate associated with ischemia and bleeding. *Journal of the American College of Cardiology*, 62(24), 2261-2273.
8. Ngai, E. W., Xiu, L., & Chau, D. C. (2009). Application of data mining techniques in customer relationship management: A literature review and classification. *Expert systems with applications*, 36(2), 2592-2602.
9. Achrol, R. S., & Kotler, P. (1999). Marketing in the network economy. *The Journal of Marketing*, 146-163.
10. Comegys, C., Hannula, M., & Väisänen, J. (2006). Longitudinal comparison of Finnish and US online shopping behaviour among university students: The five-stage buying decision process. *Journal of Targeting, Measurement and Analysis for Marketing*, 14(4), 336-356.
11. Chen, Y. C., Shang, R. A., & Kao, C. Y. (2009). The effects of information overload on consumers' subjective state towards buying decision in the internet shopping environment. *Electronic Commerce Research and Applications*, 8(1), 48-58.
12. Tansey, O. (2007). Process tracing and elite interviewing: a case for non-probability sampling. *PS: Political Science & Politics*, 40(4), 765-772.
13. Wagner, G. G., Frick, J. R., & Schupp, J. (2007). The German Socio-Economic Panel study (SOEP)-evolution, scope and enhancements.
14. Hammersley, M. (2003). *Dilemma Qualitative Method*. Routledge.



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## **THE IMPLICATION OF PURCHASE INTENTION: ANALYSIS OF PERCEIVED USEFULNESS, PERCEIVED ENJOYMENT, TECHNICALITY AND PERCEIVED PRICE TOWARDS PERCEIVED VALUE**

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### **ABSTRACT**

The purpose of this study is to obtain result of analysis of the effect of Perceived Usefulness towards Perceived Value, Perceived Enjoyment towards Perceived Value, Technicality towards Perceived Value, Perceived Price towards Perceived Value, and Perceived Value towards Purchase Intention. This study is a descriptive and exploratory research. The descriptive study is a kind of research which purpose is to describe or figure out the characteristics and nature of market and consumer behavior. On the other hand, the exploratory study is a kind of research which purpose is to explore or collect any deeper thoughts about a problem. The research design used is survey in which sampling unit is observed using a questionnaire. The unit samplings used in this study are men and women who once access iTunes Store, know Kotak Band, and never once purchase Kotak's songs ("Never Dies" album). The result of the analysis using Structural Equation Modeling (SEM) shows that the data of this study have goodness of fit with the proposed research model and the measurement model of overall indicators has valid criteria and reliability or consistency of good measurement. Regarding to the result of the structural model, it can be concluded that Perceived Usefulness gives positive effect towards Perceived Value, and Perceived Enjoyment gives positive effect towards Perceived Value. On the other hand, other variables give negative effect.

### **KEY WORDS**

Purchase intention, perceived usefulness, perceived enjoyment, technicality, perceived price.

The development of internet use in business world has been wider. Because of the development of technology, the use of internet to help business activities, small-medium enterprises increase. Then, it means that every company should place itself to fulfill people's needs which are getting demanding (Gotlieb et al, 1994). Not only do they changing and improvement to their product or service offered, but also they need to change their marketing strategy (Chaffey, 2007). It is done for many reasons, but commonly, the changing of marketing strategy is done by a company to create an image or alter look among the consumers (Chellappa and Sin, 2005). Therefore, they expect that their product can be more acceptable for people and can reach wider market and affect their rating sales and company's profit (Keaveney, 1995).

In Indonesia, the e-commerce service providers are getting more. For instance, Kaskus established in 1999 was only a forum for internet users, but nowadays it becomes one of the largest e-commerce service providers in Indonesia. The users are about 5 million people and its transaction has reached up to 575 billion rupiah. Besides Kaskus, other e-commerce service providers in Indonesia are Toko Bagus, Berniaga, Lazada, Bhinneka, and many more. The e-commerce markets in Indonesia are nowadays also occupied by some banks providing online commerce websites, such as Citibank (Belibarang.com), BNI (Blandja.com), and Mandiri (Tokone.com). Moreover, Limited Liability Company of Post Office which is declining does a new alternative by launching Plaza Pos Indonesia in 2012, and now it is developing. It uses the distribution network to 3.217 sub-unit offices and international post network to more than 200 countries. Its purchasing system can be offline (coming to the post office directly) or online.

The creative industry of subsector music is a creative activity relating to the creation or composition, music show, reproduction, and distribution of voice recording. Music, in context of creative industry development, does not only a kind of expressing sounds which basis is in a form of melody, rhythm, and harmony with supporting factor in a form of idea, characteristics, and timbre, but it also an output which can be enjoyed by many people and give benefits of economy, social, and culture. Music in its development is one of creative industry emphasizing more on the development of music industry which is expected to be able to give additional economic value for people who are involved in it and give life quality for its connoisseurs.

iTunes is the benchmark of the pride and success of the digital music distribution. The minimum knowledge about digital distribution is linear with the performance of music streaming business in Indonesia. The music industry, like other industries, changes because of the development of technology (Davis et al, 1992). One of the factors causing great change is iTunes. Its existence in Indonesia in 2012 has changed Indonesian music industry. Based on the data recorded in 2014, the sales rating of music download in iTunes stores is controlled by the five-greatest-market Pan Asia, i.e. Philippine, Indonesia, India, Singapore, and Thailand.

On March 18, 2014, one of popular rock bands in Indonesia named "KOTAK" had released their album entitled "Never Dies" via iTunes. They packaged their song in a new format and the process of "Never Dies" album making was only a month. After "Never Dies" was officially released via iTunes, Kotak Band has been considered well in Indonesian music industry as it can be proven by the achievement of Kotak Band which became the first Indonesian artist receiving page artist in the world digital music canal ([www.xposeindonesia.com](http://www.xposeindonesia.com)). Kotak Band then realized that internet users are getting more. Besides, many media helped every band to promote and sell their masterpiece. iTunes is one of the media chosen by Kotak to promote and sell their songs in the "Never Dies" album ([www.xposeindonesia.com](http://www.xposeindonesia.com)).

One of members of Kotak chose iTunes because it was one of a promotion strategy of "Never Dies" album sales which made their fans easier to purchase the album without going to a store which was actually time consuming. The management of Kotak Band reveals that by selling Kotak's album in iTunes, they can control their selling album; besides, their fans do not have to spend money to purchase one album, but they only have to purchase songs they want. They think that iTunes is a benefit for them because by using iTunes, they hope their fans can get more benefits and comfort in purchasing Kotak's songs in iTunes than purchasing the real album.

Perceived usefulness is defined as how far someone believes that purchasing via online will increase his or her performance (Davis, 1989). It is done by Kotak to make Kotak's song purchasing in online music store easier. On the other hand, perceived enjoyment is one of the factors influencing Kotak's fans to purchase through iTunes. As it is stated by Hopkinson and Pujari (1999), perceived enjoyment is one of the factors influencing someone to do something. Perceived usefulness and perceived enjoyment are a part of benefit which can influence consumers to do something.

By the existence of Kotak's songs in iTunes, it can make their fans easier to purchase their songs without spending much time and money to purchase Kotak's songs through iTunes. If they purchase Kotak's songs in offline store, they need more effort than purchasing them through iTunes. It refers to the definition of technicality or nonmonetary sacrifice as it is revealed by Zeithaml (1998) that consumers will spend much time and effort in a product or service and it can influence the value perception of a product or service. In terms of price, purchasing songs in iTunes is cheaper than purchasing CD in offline stores. Kotak's fans can purchase any songs they like. In this case, it refers to the perceived price revealed by Kotler and Amstrong (2010) that price is amount of money spent by consumers to get a product or service.

The purpose of this study is to obtain the result of analysis of the effect of Perceived Usefulness towards Perceived Value, Perceived Enjoyment towards Perceived Value,

Technicality towards Perceived Value, Perceived Price towards Perceived Value, and Perceived Value towards Purchase Intention.

## METHODS OF RESEARCH

This study is a descriptive and exploratory study. The descriptive study is a study which purpose is to describe or figure out any characteristics and nature of market and consumer behavior. Besides, the exploratory study is to explore or collect any deeper thoughts about particular problem. The research designed used in this study is survey in which observing the sampling unit using a questionnaire. The questionnaire was designed orderly and structurally, and then it was distributed to the samples of a population in order to obtain specific information from the respondents (Malhotra, 2012). In general, this study will observe any factors influencing purchase intention towards Kotak's songs ("Never Dies" album) in iTunes Store. The variables of this study are perceived usefulness, perceived enjoyment, technicality, perceived price, perceived value, and purchase intention.

The unit of the samples used in this study were men and women who once accessed iTunes Stores and know Kotak and never once purchased Kotak's songs ("Never Dies" album). The defining of the number of samples was based on a theory by Hair et al. (2010) stating that the number of samples defined fit the number of question items used in the questionnaire by assuming  $n \times 5$  observation up to  $n \times 10$  observation. However, in this study, the researcher uses  $n \times 7$  with 22 question items used to measure 6 variables; thus, the number of respondents used was 22 question items multiplied by 7 meaning that there are 154 respondents.

## RESULTS AND DISCUSSION

*The Result of Structural Equation Model (SEM) Data Analysis.* To analyze SEM data in this study, the researcher used software named Lisrel Version 8.8 Program. This program helped the researcher test the correlation among variables easier. The result of the calculation of SEM using Lisrel Version 8.8 can be seen in the appendix. In SEM analysis, the evaluation towards the level of goodness of fit of the data with the model is done in some stages, such as overall goodness of fit model, measurement model testing, and structural model testing (Wijayanto, 2008).

*The Result of Overall Goodness of Fit Model Analysis.* The first step is testing the overall goodness of fit which purpose is to generally evaluate the level of Goodness of Fit (GOF) between the data and the research model (Wijayanto, 2008). This is the result of overall goodness of fit test using Lisrel version 8.8.

**Table 1. The Result of Overall Goodness of Fit Analysis**

| Goodness of Fit (GOF) Index                     | Level of Acceptable Goodness of Fit | Category     |
|---|-------------------------------------|--------------|
| Absolute Fit Measure                            |                                     |              |
| Statistik Chi – Square ( $X^2$ ) P              | 211.98 (p = 0.24)                   | Good Fit     |
| Non-Centraly Parameter (NCP)                    | 85.82 (46.03 ; 133.61)              | Good Fit     |
| Goodness-of-Fit Index (GFI)                     | 0.89                                | Marginal Fit |
| Standardized Root Mean Square Residual (SRMR)   | 0.059                               | Good Fit     |
| Root Mean Square Error of Approximation (RMSEA) | 0.021                               | Good Fit     |
| Expected Cross Validation Index (ECVI)          | M = 2.10<br>S = 3.31<br>I = 14.23   | Good Fit     |
| Incremental Fit Measure                         |                                     |              |
| Non-Normed Fit Index (NNFI)                     | 0.99                                | Good Fit     |
| Normed Fit Index (NFI)                          | 0.90                                | Good Fit     |
| Incremental Fit Measure                         |                                     |              |
| Adjusted Goodness-of-Fit Index (AGFI)           | 0.86                                | Marginal fit |
| Relative Fit Index (RFI)                        | 0.88                                | Marginal fit |
| Incremental Fit Index (IFI)                     | 0.99                                | Good Fit     |
| Comparative Fit Index (CFI)                     | 0.99                                | Good Fit     |

| Parsimonius Fit Measure                        |  |          |
|--|--|----------|
| Parsimonius Goodness of Fit Index PGFI)        | 0.70                                     | Good Fit |
| Akaike Information Criterion (AIC)             | M = 321.98<br>S = 506.00<br>I = 2177.71  | Good Fit |
| Consistent Akaike Information Criterion (CAIC) | M = 544.01<br>S = 1527.35<br>I = 2266.52 | Good Fit |

M\* = Model; S\* = Saturated; I\* = Independence

Based on the result of the providing data in the table, it can be seen that there are 12 GOF Indices showing good fit and 3 Indices showing marginal fit. Therefore, it can be concluded that the overall goodness of fit is good, so this study can be continued.

### 3.3 The Result of Structural Model Analysis

The purpose of having structural model is to know the correlation among variables which fits the research model. Based on SEM calculation using Lisrel Version 8.80, the equation of structural model research is as the following:

$$\eta_1 = 0.29 \cdot \xi_1 + 0.27 \cdot \xi_2 - 0.36 \cdot \xi_3 - 0.21 \cdot \xi_4, \text{ Errorvar.} = 0.68, R^2 = 0.32$$

Where:

- $\xi_1$  (ksi 1) = *Perceived Usefulness*;
- $\xi_2$  (ksi 2) = *Perceived Enjoyment*;
- $\xi_3$  (ksi 3) = *Technicality*;
- $\xi_4$  (ksi 4) = *Perceived Price*;
- $\eta_1$  (eta 1) = *Perceived Value*;
- $\eta_2$  (eta 2) = *Purchase Intention*.

Based on this study, when the criteria of structural model testing are going to be defined, the comparison between t-value and t-table should be made as it is shown in the path diagram figure in the following.

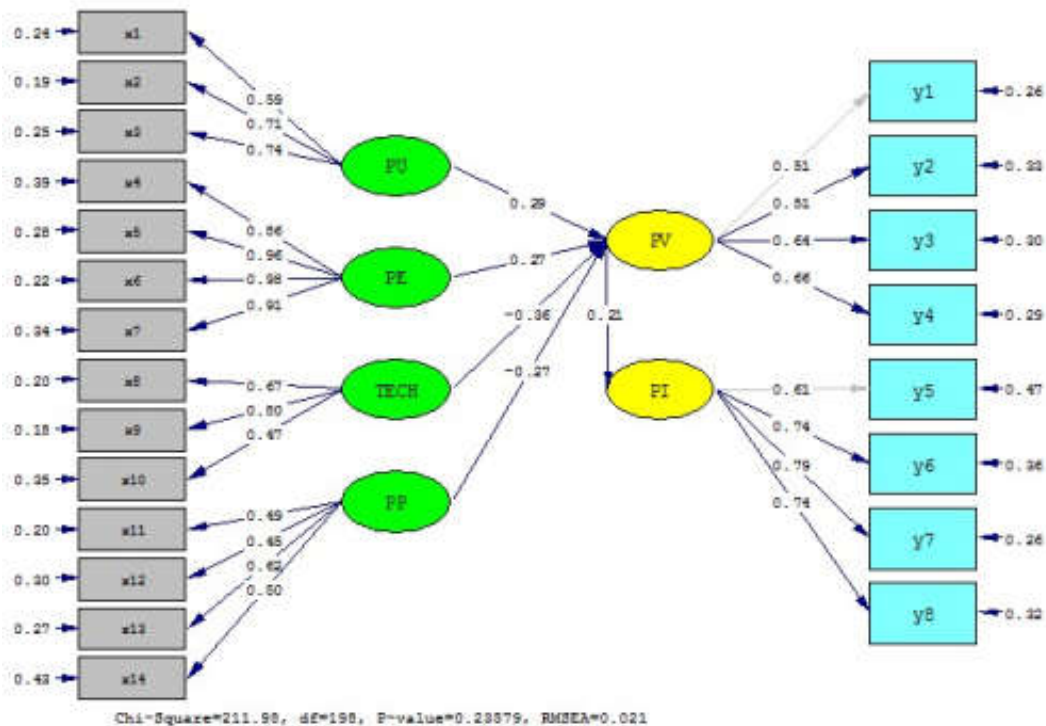


Figure 1 – Path Diagram Estimates

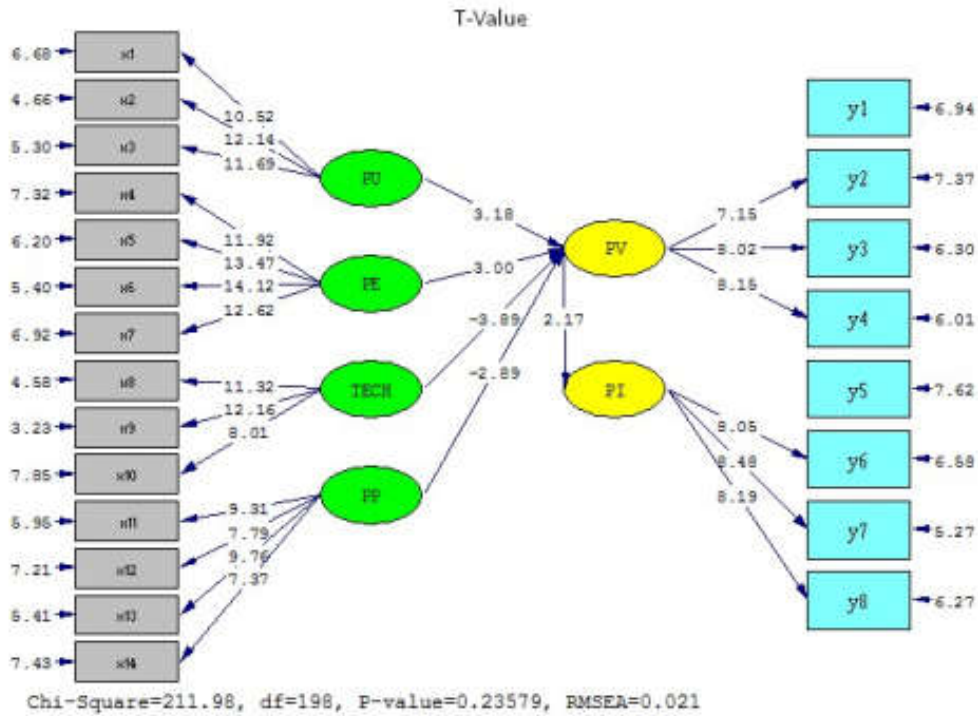


Figure 2 – Path Diagram T-Value

Table 2 – The Result of Structural Model Analysis

| H | Path                                   | Estimation | T-Value | T-Table | Conclusion      |
|---|--|------------|---------|---------|-----------------|
| 1 | Perceived Usefulness → Perceived Value | 0.29       | 3.18    | 1.96    | Data support H1 |
| 2 | Perceived Enjoyment → Perceived Value  | 0.27       | 3.00    | 1.96    | Data support H2 |
| 3 | Technicality → Perceived Value         | -0.36      | -3.89   | 1.96    | Data support H3 |
| 4 | Perceived Price → Perceived Value      | -0.27      | -2.89   | 1.96    | Data support H4 |
| 5 | Perceived Value → Purchase Intention   | 0.21       | 2.17    | 1.96    | Data support H5 |

**Hypothesis 1.** The first hypothesis is to measure the effect of Perceived Usefulness towards Perceived Value. The research hypothesis (H1) is as the following. H1: Perceived Usefulness gives positive effect towards Perceived Value. Based on the result of structural model calculation for the first hypothesis, it is found that t-value is 3.18 which is greater than t-table. Therefore, significantly, the data of this research support the statement that there is a positive effect between Perceived Usefulness and Perceived Value.

**Hypothesis 2.** The second hypothesis is to measure the effect of Perceived Enjoyment towards Perceived Value. The research hypothesis (H2) is as the following. H2: Perceived Enjoyment gives positive effect towards Perceived Value. Based on the result of structural model calculation for the second hypothesis, it is found that t-value is 3.00 which is greater than t-table. Therefore, significantly, the data of this research support the statement that there is a positive effect between Perceived Enjoyment and Perceived Value.

**Hypothesis 3.** The third hypothesis is to measure the effect of Technicality towards Perceived Value. The research hypothesis (H3) is as the following. H3: Technicality gives negative effect towards Perceived Value. Based on the result of structural model calculation for the third hypothesis, it is found that t-value is -3.89 which is lower than t-table. Therefore, significantly, the data of this research support the statement that there is a negative effect between Technicality and Perceived Value.

**Hypothesis 4.** The fourth hypothesis is to measure the effect of Perceived Price towards Perceived Value. The research hypothesis (H4) is as the following. H4: Perceived Price gives negative effect towards Perceived Value. Based on the result of structural model calculation for the fourth hypothesis, it is found that t-value is -2.89 which is lower than t-

table. Therefore, significantly, the data of this research support the statement that there is a negative effect between Perceived Price and Perceived Value.

*Hypothesis 5.* The fifth hypothesis is to measure the effect of Perceived Value towards Purchase Intention. The research hypothesis (H5) is as the following. H5: Perceived Value gives negative effect towards Purchase Intention. Based on the result of structural model calculation for the fifth hypothesis, it is found that t-value is 2.17 which is greater than t-table. Therefore, significantly, the data of this research support the statement that there is a positive effect between Perceived Value and Purchase Intention.

## **DISCUSSION OF RESULTS**

From the result of measuring model analysis showing that all variables have fulfilled the criteria of validity and reliability testing. Moreover, all of the proposed hypotheses have significant result. These are the result of discussion towards the structural model testing of each variable.

### **The Result of the Effect of Perceived Usefulness towards Perceived Value Testing**

The result of structural model testing shows that there is an effect between Perceived Usefulness and Perceived Value. It is in line with the result of a study conducted by Lee & Park (2006) stating that the level of value will increase when consumers get benefits of using online store. Moreover, Fenech (1998) states that the power of determination of consumers for a value is based on the use obtained by every consumer. Van der Heijden (2004) says that Perceived Usefulness positively affects the Perceived Value.

### **The Result of the Effect of Perceived Enjoyment towards Perceived Value Testing**

The result of structural model testing shows that there is an effect between Perceived Usefulness and Perceived Value. It is in line with the result of a study stating that how far the consumers believe that enjoyment can be derived when listening to online music and it might be encouraged by satisfaction factor when they do the transaction in an online store (Chu and Lu, 2007). It shows that Perceived Enjoyment positively affects the Perceived Value.

### **The Result of the Effect of Technicality towards Perceived Value Testing**

The result of structural model testing shows that there is an effect between Technicality and Perceived Value. It is supported by the result of a study conducted by Atkinson & Kydd (1997) stating that technicality is the degree of consumers' belief that listening online music is an effort. Therefore, the online consumers can see that they can decrease effort, decrease sacrifice, and increase the target value they want. Kim et al. (2007) states that the technique of online content service which is great can increase consumers in terms of physical and psychology. As a result, it will give negative contribution towards the Perceived Value. In other words, technicality affects negatively towards Perceived Value.

### **The Result of the Effect of Perceived Price towards Perceived Value Testing**

The result of structural model testing shows that there is an effect between Perceived Price and Perceived Value. The result is in line with the result of a study conducted by Winer (1986) stating that Perceived Price affects negatively towards Perceived Value.

### **The Result of the Effect of Perceived Value towards Purchase Intention Testing**

The result of structural model testing shows that there is an effect between Perceived Value and Purchase Intention. The result is in line with the result of a study conducted by Van der Heijden (2004) stating that Perceived Value affects positively towards Purchase Intention.

### **Managerial Implication**

Based on the result of SEM above, it has been proven that there is an effect between Perceived Usefulness, Perceived Enjoyment, Technicality, and Perceived Price towards Purchased Intention through Perceived Value. The results of this study should be able to give evaluation for Kotak Band in increasing consumers' need to do Purchase Intention. Besides, it should be supported by the increase of Perceived Usefulness, Perceived Enjoyment, Technicality, and Perceived Price through Perceived Value. In this case, there

are some approaches which can be used to increase Perceived Usefulness so that Perceived Value can increase.

To increase value towards a brand, Kotak Band should increase the function of use so that consumers get good value towards Kotak Band. The finding obtained by the researcher is that Kotak Band thinks that consumers need practicality in accessing Kotak's songs, especially songs in "Never Dies" album in iTunes Store. Consumers also want to get its easiness if it is compared to purchasing the Kotak's CD in offline stores. Through iTunes Store, consumers can also know any update information about Kotak without watching TV or listening to a radio.

Besides, there are some approaches which can be used to increase Perceived Enjoyment so that Perceived Value can increase. Basically, one of the factors in which it can make consumers happy for good value of a brand is when they feel happy for purchasing it. The finding obtained by the researcher is that consumers are happy because consumers and also Kotak's fans can listen to Kotak's song teaser in iTunes Store. Through Kotak's song teaser in iTunes Store, consumers can judge Kotak's songs.

Moreover, there are some approaches which can be used to decrease Technicality so that Perceived Value can increase. Kotak Band chose iTunes Store to release songs of the latest "Never Dies" album because iTunes Store is considered to being able to access Kotak's songs easier. The finding obtained by the researcher is that the value obtained by consumers will decrease if it is difficult and time consuming for them to play teaser. If it occurs, consumers will think that there is no difference between online purchasing and purchasing Kotak's CD because it is time consuming to obtain Kotak's songs, especially for those who want to listen to Kotak's song teaser so that there is a value obtained after listening to Kotak's song teaser. Because of the reason, the researcher suggest Kotak Band to socialize the use of iTunes Store can make consumers play Kotak's song teaser easily so that they get a value, and then decide whether to purchase Kotak's songs or not.

Moreover, there are some approaches which can be used to decrease Perceived Price so that Perceived Value can increase. Price is one of the factors for the consumers to have certain value of a brand until they decide to purchase or not. The finding obtained by the researcher is that the latest price of Kotak's songs is cheaper than its CD. However, the process of transaction in iTunes Store should use credit card. Those who do not have credit card think that there is no difference between the price offered by iTunes and the price of purchasing CD because it needs more money to register a credit card since most of the respondents seen by the researcher have no regular salary. Therefore, the researcher suggests Kotak Band to provide and sell iTunes Gift Card for consumers who want to purchase Kotak's songs in iTunes so that the value towards Kotak Band is good for consumers.

In addition, there are some approaches which can be used to increase Perceived Value so that Perceived Intention can increase. Consumers will purchase a brand if they choose good response for a brand. The finding obtained by the researcher shows that whenever consumers feel good towards Kotak's songs in iTunes Store, they will predict and be willingly to purchase Kotak's songs in "Never Dies" album in iTunes Store.

Consumers will not purchase the songs if they have no good judgment towards Kotak's songs, especially in "Never Dies" album. Therefore, the researcher suggests Kotak Band to give things which encourage consumers to judge Kotak Band well so that they want and are willing to purchase Kotak's songs, especially in "Never Dies" album in iTunes Store.

## **CONCLUSION**

Before conducting this study, the researcher administered a pretest by distributing questionnaires to 30 respondents which were distributed based on the criteria set by the researcher. The result of the questionnaires distributed to 30 respondents is respondents who wanted to purchase Kotak's songs ("Never Dies" album) in iTunes Store. Based on the interview result, the researcher deepens the study about Purchase Intention on Kotak's songs ("Never Dies" album).

The result of data analysis using Structural Equation Modeling (SEM) shows that the data of this study fit the proposed research model and all indicators of the measuring research model have valid criteria and reliability or consistency of good measurement. The results of the structural model can be concluded as:

- Perceived Usefulness gives positive effect towards Perceived Value;
- Perceived Enjoyment gives positive effect towards Perceived Value;
- Technicality gives negative effect towards Perceived Value;
- Perceived Price gives negative effect towards Perceived Value;
- Perceived Value gives positive effect towards Purchase Intention.

## REFERENCES

1. Chaffey, D. (2007). *E-business and E-commerce Management: Strategy, Implementation and Practice*. Pearson Education.
2. Chellappa, R. K., & Sin, R. G. (2005). Personalization versus privacy: An empirical examination of the online consumer's dilemma. *Information technology and management*, 6(2), 181-202.
3. Chu, C. W., & Lu, H. P. (2007). Factors influencing online music purchase intention in Taiwan: An empirical study based on the value-intention framework. *Internet Research*, 17(2), 139-155.
4. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.
5. Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of applied social psychology*, 22(14), 1111-1132.
6. Gotlieb, J. B., Grewal, D., & Brown, S. W. (1994). Consumer satisfaction and perceived quality: complementary or divergent constructs?. *Journal of applied psychology*, 79(6), 875.
7. Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate data analysis* (Vol. 5, No. 3, pp. 207-219). Upper Saddle River, NJ: Prentice hall.
8. Hopkinson, P (1999). *The Chambers Dictionary* (1993) "a consumer based assement. <http://.marketing.co.id/pertumbuhan-e-commerce-indonesia-tercepat-di-dunia>
9. Keaveney, S. M. (1995). Customer switching behavior in service industries: An exploratory study. *The Journal of Marketing*, 71-82.
10. Kotler, P., & Armstrong, G. (2010). *Principles of marketing*. Pearson education.
11. Van der Heijden, H, (2004). "User Acceptance of Hedonic Information Systems", *MIS Quarterly* Vol. 28, No. 4, pp. 695 – 704.
12. Xposeindonesia. 2014. "Band Kotak sadar akan pengguna internet semakin meningkat" 2014 <http://xposeindonesia.com>
13. Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A mean send model and synthesis of evidence. *Journal of Marketing*, 52(3), 2–22.



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## **OPEN INNOVATION AS A BUILDING BLOCK FOR SMALL MEDIUM ENTERPRISE HIGH-TECH IN «INTERNET OF THINGS» ERA: CASE OF THE INDONESIA**

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### **ABSTRACT**

Startup technopreneurship is a form of Small Medium Enterprise (SME) in Indonesia that has been able to implement an open innovation. This study aims to evaluate the application of open innovation in the SME based startup technopreneur. Furthermore, this research also analyzing the antecedent variables that drive open innovation such as the entrepreneurial orientation, organizational characteristics and environmental characteristics, then the implications on improvement SME performance innovation. This study used mixed method, with 37 startup technopreneur companies in Malang City, East Java Province, Indonesia as a respondent. Results of the study found that high tech SMEs, especially the startup technopreneur, are more prospective in applying open innovation compared to other types of SMEs in developing countries. In addition, this study shows that the entrepreneurial orientation, organizational characteristics and environmental characteristics has an important role to drive open innovation which will further improve the improvement SME performance innovation.

### **KEY WORDS**

Internet of things, open innovation, SMEs high-tech, Indonesia.

Over the past few years, a new paradigm called Internet of Things (IoT) has become a buzzwords in the academic and industrial world. The belief that massive advances in microelectronics, wireless communications and information technology have been witnessed in recent years will continue in the future underlie the emergence of the IoT revolution.

IoT is an illustration of where the virtual world through the internet is connected extensively to every-day-life objects in the real world (Raiwani, 2013; Palma et al. 2014; Samani et al., 2015). The physical object is transformed into a smart object, no longer disconnected from the virtual world, can be remotely controlled and can act as a medium of physical access to internet services in various domains such as home automation, fleet telematics, digital library, record management, e-government and smart city.

IoT is an open and comprehensive network of smart objects that have the capacity to operate automatically, share information, data and resources, reacting and acting in the face of environmental situations and changes (Madakam et al, 2015). IoT enables interoperability between human-to-human, human-to-things and even things-to-things in everyday life. This will then form the interconnection between objects to create an integrated ecosystem. IoT is ground zero for a new phase of global transformation supported by innovation technology, generating significant economic opportunities and shaping new industries.

According to the results of research from the United Nations Development Program (UNDP) (2001) in the Technological Achievement Index, Indonesia ranks 56th out of 67 countries. Therefore, Indonesia is expected to continue to innovate and produce a variety of intelligent products so that in the future Indonesia is expected to have competitive competitiveness and comparative with other countries in terms of technology.

As the development of internet in Indonesia is getting cheaper and easier, more and more people use internet media for various things, one of them entrepreneurship (Reuber

and Fischer, 2011; Berisha-Shaqiri, 2015). Now many entrepreneurs who run internet-based business, technology and information or called technopreneur. This term is a combination of technology and entrepreneurs that are usually given to entrepreneurs who are technically literate, creative, innovative, and dynamic (Okorie et al., 2014; Rosly et al., 2015; Seroka-Stolka and Tomski, 2015).

Technopreneur is a driver of high-tech Small and Medium Enterprises (SMEs) sector in Indonesia which is expected to be responsive to take the opportunity to create and participate in the integrated ecosystem, so that IT-based creative industry will get a chance to further develop. Technopreneur is a part of entrepreneurship that will play a strategic role for the rotation and acceleration of the Indonesian economy in the future. Continuous technological developments lead to intense competition among business managers applying technology as the driving force of their business.

The technopreneur who is generally dominated by young people pioneered the business or internet-based company so called startup company. Now, the number of startup companies in Indonesia more and more and offer various products or services to consumers via the internet such as Freelancer.com, Tiket.com, and others.

Although it can be categorized into SMEs, the main feature of startup companies is to use information technology to build networks that support the flow of ideas and information both into and out of organizational boundaries in the IoT era. The presence of IoT will facilitate the coordination and sharing of knowledge at low cost that can cross the boundaries of the organization and thus support the open innovation effort.

De Vrande et al. (2009) has developed a broad classification of open innovation motives specific to SMEs. They emphasize that SMEs should engage in an open innovation process for several reasons, among others, to improve product development and integrate new technologies, to gain external knowledge, to manage costs efficiently, to keep up with market developments, to optimally use employee skills and ideas, to improve employee motivation and commitment.

Researching open innovation practices on SMEs, especially high-tech SMEs is an important thing to do in order to improve the performance of technopreneur as a new industry sector. Open innovation has so far been studied primarily in high-tech and multinational companies. However, de Vrande (2009) has developed a special model used to measure open innovation practices on SMEs conducted in developed countries. This study aims to test the model de Vrande (2009) in the perspective of high-tech SMEs in Malang City, East Java Province, Indonesia which is a developing country. This study aims to examine the practice of open innovation by analyzing the factors of internal organization such as organizational characteristics, individual factors managers such as entrepreneurial orientation and external factors that are environmental characteristics that influence the practice of open innovation which then expected to affect the performance of SMEs innovation.

The first section of this article explains the background and the novelty of this study. The next section describes the review of the literature regarding open innovation and open innovation in high-tech SMEs based on startup technopreneur as well as theoretical and empirical basis supporting this research model. The third section discusses the research methodology. The fourth section presents the empirical results and discussion and the last one presents conclusions, limitations, and suggestions for further research.

## LITERATURE REVIEW

*Open Innovation.* The concept of open innovation was first introduced by Chesbrough (2003) and has received extensive attention from researchers. Open innovation has become a new paradigm in innovation management which has changed the concept of closed innovation long developed in various companies. Closed innovation model is based on the view that the company should generate and develop ideas of their own to innovate and remain competitive (Chesbrough, 2003). Chesbrough (2003) states that in open innovation,

companies can and should take advantage of their internal and external knowledge as well as expand the internal and external market to realize their potential for innovation.

*Open Innovation in Startup Technopreneur SMEs.* Van de Vrande et al. (2009) have initiated the first research on the application of open innovation in SMEs with a large sample in 605 SMEs in the Netherlands. The study has built a broad classification of the motif of open innovation for SMEs. Results of these studies confirm that SMEs pursuing open innovation, especially for market-related motives, as to meet customer demand, or maintain competitiveness with competitors. Furthermore, Lee et al. (2010) conduct a study on 817 SMEs in Korea and has developed a model of open innovation for SMEs by modifying the conventional open innovation models developed by Chesbrough (2003). Benefits for SMEs in applying open innovation, among others, for the distribution of risk, reduction of high cost structure, increasing knowledge base, and incorporation of internal resources and external companies (Tantau and Coras, 2013).

*Organizational Characteristics.* The organizational characteristic is the structure and the infrastructure equipment in the organization related to the preparation for the implementation of a management strategy (Li, 2002). This organizational characteristic is divided into 2 (two) major groups, namely, 1) technological infrastructure, constituting equipment and systems that become instruments in cross-organizational communication and management activities and; 2) organizational infrastructure, are the factors that prepare the company to be ready to collaborate with the whole social system.

*Environmental Characteristics.* Environmental characteristics are environmental factors that affect the level of implementation of a corporate strategy where there are three major factors that are very influential include environmental uncertainty in business, competitive pressure to implement and readiness of business partners to collaborate (Li, 2002).

*Innovation Performance.* The concept of innovation performance refers to the organization's overall innovative ability to introduce new products in the marketplace, opening up new markets through the incorporation of a strategic orientation with behavior and innovation processes (Wang and Ahmed, 2004). Wang and Ahmed (2004) identifies five key areas that determine overall organizational innovation performance including product innovation performance, market innovation performance, process innovation performance, innovation behavior performance and innovation strategy performance.

*Previous Research and Research Hypotheses.* In the individual context, SME management in developing countries is required to have an entrepreneurial orientation to motivate SMEs in applying open innovation. This corresponds to a case study conducted by Lakovleva (2013) on SMEs operating in the oil sector in Norway, in which entrepreneurial orientation affects the implementation of open innovation, especially in small companies engaged in oil mining sector. Ju et al. (2013) conducted a study on 161 SMEs in Taiwan and found that there is significant influence between entrepreneurial orientation, open innovation, and corporate performance.

*H<sub>1</sub>: Entrepreneurial orientation significantly influences the decisions of high tech SMEs in developing countries in implementing open innovation.*

In the organizational context, SMEs are considered to be shaping specific organizational characteristics that support the company to implement open innovation. Finger and Stuki (2009) developed a model of factors influencing open innovation, which consists of external perspective of industries and companies as well as internal factors. Internal factors consist of strategies and goals of innovation, innovation management, and organizational characteristics. In addition, research conducted by De Mel et al. (2009) also found that organizational characteristics significantly influence innovation in SMEs.

*H<sub>2</sub>: Organizational characteristics significantly influence the decisions of high tech SMEs in developing countries in implementing open innovation.*

In the environmental context, proper characteristics of environment can support SMEs to implement open innovation in and out the company. Abulrub and Lee (2012) conducted a study on 209 SMEs and 300 large enterprises in South Korea found that environmental factors have a significant effect on the application of open innovation. It is empirically supports the theory developed by Bingham (1976) stated in the adoption of innovation model

by local government, organizational characteristics and environmental characteristics significantly influence adoption of innovation.

*H<sub>3</sub>: Environmental characteristics significantly influence the decisions of high tech SMEs in developing countries in implementing open innovation.*

In the end, to be able to create and continuously improve the sustainability of the innovation performance, SMEs will require the application of open innovation as a whole. Research by Inauen and Wicki (2011) on 141 R & D managers of companies listed on stock exchanges in Germany, Switzerland, and Austria, found that management strategies using the open outside-in innovation in the innovation process have a significant effect on the performance of the company's innovation. Furthermore, Parida et al. (2012) conducted a study on 252 high-tech SMEs conducting open innovation. Results of the study confirm that open innovation has a significant impact on improving innovation.

*H<sub>4</sub>: The application of open innovation can improve the innovation performance of high-tech SMEs in developing countries.*

## METHODS OF RESEARCH

*Sample and Data Collection.* This exploratory research uses a quantitative research paradigm. Sample in this research is 37 startup companies in Malang City, Jawa Timur (East Java) Province, Indonesia. This study is a one-shot study where the data are collected simultaneously in one time period. Furthermore, this research uses survey method with questionnaire instrument. Data analysis methods used to prove the hypothesis proposed in this study using Generalized Structured Component Analysis (GSCA).

Table 1 – Frequency Distribution of Respondents by Company Type and Size

| Type of Startup Technopreneur | Size of Companies     |                         | Total |
|-------------------------------|-----------------------|-------------------------|-------|
|                               | Micro (<10 employees) | Small (10-30 employees) |       |
| Portal                        | 14                    | 2                       | 16    |
| Application                   | 4                     | 3                       | 7     |
| Game                          | 2                     | 1                       | 3     |
| Marketplace Online            | 9                     | 2                       | 11    |
| Total                         | 29                    | 8                       | 37    |

The respondents are distributed based on two main characteristics: the type of startup technopreneur and the size of the company based on the number of employees as shown in Table 1. The 37 SMEs are grouped by type of technology namely portal (16), applications (7), games (3) and online marketplace provider (11). In addition, based on the number of employees, the samples were classified into micro enterprises with number of employees less than 10 people (29) and a small company with a number of employees as many as 10 to 30 people (8).

## RESULTS AND DISCUSSION

Moreover, Table 2 shows that in general the technology startup business most often implement open innovation is portal developer, while the type tend to be difficult to implement open innovation is games development. In the case of the exploitation of technology, portal developer enterprises are the most dominant in making venture and outward licensing of intellectual property. While in terms of employee engagement, corporate online marketplace indicates the most dominant practice among other types. In terms of technology exploration, portal companies are the most dominant to practice customer engagement, R & D outsourcing, and inward license, whereas in terms of developing external network, providers of online marketplace are the most dominant than the other types of companies.

Results of testing the hypothesis with  $\alpha$  level at 5% indicate that the four hypotheses proposed are accepted and they demonstrate a significant effect. H1 calculation results show

the value of t-statistic > t-table (3.98 > 1.97) and the path coefficient of 0.422, so H0 is rejected.

Table 2 – Open Innovation Practice Based on Technology Startup Types

| Practices                             | Types                |                           |                    |                                  |
|---------------------------------------|----------------------|---------------------------|--------------------|----------------------------------|
|                                       | Portal<br>(n=16) (%) | Applications<br>(n=7) (%) | Games<br>(n=3) (%) | Marketplace Online<br>(n=11) (%) |
| Technology Exploitation               |                      |                           |                    |                                  |
| Ventura                               | 13.33%               | 10.77%                    | 7.69%              | 8.33%                            |
| Outward Intellectual Property License | 13.33%               | 10.77%                    | 12.82%             | 5.56%                            |
| Employee involvement                  | 11.67%               | 7.69%                     | 15.38%             | 27.78%                           |
| Technology Exploration                |                      |                           |                    |                                  |
| Customer Engagement                   | 11.67%               | 32.31%                    | 17.95%             | 8.33%                            |
| External network                      | 10.00%               | 6.15%                     | 15.38%             | 27.78%                           |
| External participation                | 11.67%               | 9.23%                     | 7.69%              | 8.33%                            |
| Outsourcing R & D                     | 15.00%               | 12.31%                    | 15.38%             | 5.56%                            |
| Inward Intellectual Property License  | 13.33%               | 10.77%                    | 7.69%              | 8.33%                            |

This suggests that entrepreneurship orientation has a significant positive effect toward open innovation. These results support the results by Lakovleva (2013) and Ju et al. (2013). H2 calculation results show the value of t- statistic > t-table (3.8 > 1.97) and the path coefficient of 0.388, so H0 is rejected. This shows that organizational characteristics have a significant positive effect toward open innovation. These results support the research by Stuki and Finger (2009), Mortara and Minshall (2011), and Mel et al. (2009). H3 calculation results show the value of t-statistic > t-table (7.45 > 1.97) and the path coefficient of 0.356, so that H0 is rejected. This suggests that environmental characteristics have a significant positive effect toward open innovation. These results support the research by Abulrub and Lee (2012) and the theoretical opinions of Bingham (1976). H4 calculation results show the value of t-statistic > t-table (4.44 > 1.97) and the path coefficient of 0.352, so H0 is rejected. This suggests that open innovation has a significant positive effect toward performance innovation. These results support the results of empirical research conducted by Inauen and Wicki (2011), Parida et al. (2012), Mazzola et al. (2012) and Chen and Fan (2013).

## CONCLUSION

This study shows that high tech SMEs, especially the startup technopreneur, are more prospective in applying open innovation compared to other types of SMEs in developing countries. Therefore, the application of open innovation is very suitable applied by technopreneur actors in face of IoT era. This can be due to the characteristics of open innovation is very close to the era of information disclosure and knowledge as well as the involvement of various parties related to both internal and internal as required in the IoT era. Hopefully in the future open innovation model can become building block technopreneur in face of IoT era.

Furthermore, based on the results of data analysis in this study, it can be concluded that the high-tech SME sector in developing countries tend to be more open to innovation implementation extensively is small-sized companies compared to micro companies. These results support research by Teirlinck and Spithoven (2013), Michelino et al. (2014), and Hossain (2015), but contradictory with the research by van de Vrade et al. (2009). From these shortcomings, the researcher gives some suggestions for further research. Further studies must consider wider geographic coverage of developing countries, larger samples, and more specialized companies in Asia, America, Africa, Europe, and Australia to fill the limited literature on this sector. In addition, it open innovation research has been widely found on small and medium-sized companies, but a study involving with bigger sample of SMEs such as micro, small, and medium enterprises has not been conducted.

## REFERENCES

1. Abulrub, A.H. G., and Lee, J. (2012). Open innovation management: challenges and prospects. *Procedia-Social and Behavioral Sciences*, 41: 130–138.
2. Berisha-Shaqiri, Afërdita (2015), Impact of Information Technology and Internet in Businesses, *Academic Journal of Business, Administration, Law and Social Sciences Vol 1 No 1*, pp. 73-79.
3. Bingham RD. (1976). *The Adoption of Innovation by Local Government*. Lexington, Mass.: D.C. Heath.
4. Chen, Y. and Fan, B.Q. (2013). Relationship between open innovation capability of SMEs and innovation performance. *Research and Development Management*, 25: 24-35.
5. Chesbrough, H. (2003). The era of open innovation. *MIT Sloan Management Review*, 44(3): 35-41.
6. De Mel S., Mckenzie D., Woodruff C. (2009). Innovative firms or innovative owners? Determinants of innovation in micro, small, and medium enterprises, IZA Discussion Paper No. 3962. Institute for the Study of Labour, Bonn, Germany.
7. Finger, M., and Stucki, A. (2009). Open Innovation as an option for reacting to reform and crisis: what factors influence the adoption of open innovation. 2nd ISPIM Innovation Symposium New York: *The International Journal of Innovation Management*. 1530–1700.
8. Hossain, Mokter. (2015). A review of literature on open innovation in small and medium-sized enterprises. *Journal of Global Entrepreneurship Research*. 5(6): 1-12.
9. Inauen, M., and Schenker-Wicki, A. (2011). The impact of outside-in open innovation on innovation performance. *European Journal of Innovation Management*, 14(4): 496 - 520.
10. Ju, Pei-Hung, Deng-Neng Chen, Yu-Chun Yu, Hsiao-Lan Wei. (2013). Relationships among open innovation processes, entrepreneurial orientation, and organizational performance of smes: the moderating role of technological turbulence. *Perspectives in Business Informatics Research*, 158: 140-160.
11. Lakovleva, Tatiana. (2013). Open innovation at the root of entrepreneurial strategy. *Technology Innovation Management Review*, 17-22.
12. Lee, S., Park, G., Yoon, B., Park, J. (2010). Open innovation in SMEs—an intermediated network model. *Research Policy*, 39: 290–300.
13. Li, Suhong. (2002). An Integrated model for supply chain management practice, performance and competitive advantage. Doctoral Dissertation. Toledo, OH: University of Toledo.
14. Madakam, Somayya, Ramaswamy, R. and Tripathi, Siddarth. (2015), Internet of Things (IoT) : a Literature Review. *Journal of Computer and Communications (3)* :164:73.
15. Mazzola, E., Bruccoleri, M., and Perrone, G. (2012). The effect of inbound, outbound and coupled innovation on performance. *International Journal of Innovation Management*, 16 (6): 1-27.
16. Michelino, F., Lamberti, E., Cammarano, A. and Caputo, M. (2014). Measuring open innovation in the bio-pharmaceutical industry. *Creativity and Innovation Management*, 23(4): 1-25.
17. Mortara, L. and Minshall, T. (2011). How do multinational corporations implement Open Innovation? *Technovation*, 31(10-11): 586-597.
18. Okorie N. N, Kwa D.Y, Olusunle S.O.O. Akinyanmi A.O, Momoh I.M (2014), Technopreneurship: An Urgent Need In The Material World For Sustainability In Nigeria, *European Scientific Journal* October 2014 Edition Vol.10, No.30.
19. Palma, Daniel, Juan Enrique Agudo, Héctor Sánchez And Miguel Macías Macías (2014) “An Internet of Things Example: Classrooms Access Control Over Near Field Communication”, *Sensors* 2014, 14, 6998-7012.
20. Parida, V, Westerberg, M, and Frishammar, J. (2012). Inbound open innovation activities in high-tech SMEs: the impact on innovation performance. *Journal of Small Business Management*, 50(2): 283–309.
21. Raiwani, Y.P (2013) “Internet Of Things: A New Paradigm”, *International Journal Of Scientific And Research Publications (Ijsrp)*, Volume 3, Issue 4, Pp. 1-4.

22. Reuber, Rebecca and Fischer, Eileen. (2011), International entrepreneurship in internet-enabled markets, *Journal of Business Venturing*, Volume 26, Issue 6, pp. 660-679.
23. Rosly, H.E., Junid, J., Lajin, N.F.M. and Rahim, H.L. (2015). The Relationship of Creativity And Technopreneurship Intention. *International Academic Research Journal Of Social Science* 1(1): 8-15.
24. Samani, Afshan, Hamada H. Ghenniwa, Abdulmutalib Wahaish. (2015), Privacy In Internet Of Things: A Model And Protection Framework, *Procedia Computer Science* 52, Pp. 606 – 613.
25. Seroka-Stolka, Oksana and Piotr Tomski. (2015), Internet Social Media and International Entrepreneurial Intentions, *Wei International Academic Conference Proceedings Vienna, Austria*.
26. Tantau, A. and Coras, E. (2013). A risk mitigation model in sme's open innovation projects. *Management & Marketing*, 8, 2(30): 303-328.
27. Teirlinck, P and Spithoven, A. (2013). Research collaboration and R&D outsourcing: Different R&D personnel requirements in SMEs. *Technovation*, 33(4): 142-153.
28. The United Nations Development Program (UNDP). (2001), *Human Development Report: Making New Technologies Work for Human Development*. USA : OUP.
29. Van de Vrande, V, De Jong, JP, Vanhaverbeke, W, and De Rochemont, M. (2009). Open innovation in SMEs: trends, motives and management challenges. *Technovation*, 29(6): 423–437.
30. Wang, C. L. and Ahmed, P. K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis. *European Journal of Innovation Management*, 7(4): 303-313.

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## **INNOVATIVE DEVELOPMENT AS THE FACTOR OF COMPETITIVENESS IN AGRO-INDUSTRIAL COMPLEXES OF CHINA AND RUSSIA**

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### **ABSTRACT**

Researching the problems of innovative development from the point of view of increasing the competitiveness of national agro-industrial complexes is the important sphere of world science, which considers the innovation factor as a basis for development of national economies. The main scientific and practical problem of the article is rather low degree of competitiveness of national agro-industrial complexes in China and Russia. These countries take many steps forward to develop the complexes now. The purpose of the article is consideration of innovative development as a factor of increasing the competitiveness of national agro-industrial complexes of China and Russia. The methodological basis of the study is the theses of modern theory of world economy, branch economy, the concept of innovative development, the theory of country's competitiveness. The article substantiates the actuality of innovation factor in development of the agro-industrial complex of any country, compares the agro-industrial sectors in Russia and China on the basis of a number of objective criteria. The article indicates such criteria as level of global competitiveness (general indicator), level of education of the population (general indicator), degree of modernization and labor productivity (for the agro-industrial complex), level of implementation of research and development (for the agro-industrial complex), level of patenting (for the agro-industrial complex).

### **KEY WORDS**

Innovative development, agro-industrial complex, national economy, competitiveness, industrial modernization, labor productivity, agricultural machinery, R&D in agro-industrial sector, new products in agricultural sector.

The competitiveness of national agro-industrial sector in modern economies is largely determined by achievements of scientific and technological progress, reflected in new technologies, equipment, knowledge and ways of organizing production. Traditional competitive advantages yield to more dynamic and knowledge-intensive advantages. Innovative potential of the agrarian industry acquires significance as one of the most important systemic factors of international competitiveness and economic growth of any country.

Transition to innovative development path is a key task of the investment policies in modern China and Russia. One of the priority problems is development of a new economy based on knowledge, which reflects the changing nature of development of the world economy from industrial to post-industrial [1]. Formation of a new economy can come to life due to a cardinal change of the economic structure in favor of high-tech industries, development of human capital, education sector, development of skills of personnel; transformation of the scientific and technical sphere in order to optimize its scope and structure, rise of the efficiency, and orientation on achieving concrete results. Development of knowledge economy is the basis for ensuring high, stable and high-quality economic growth in all sectors, including the agrarian industry [2].



During the research of innovation as a factor of competitiveness in the agro-industrial sector, the main task is to compare objectively development and effectiveness of the overall innovation potential of Russia and China. We can identify several key parameters: integrated indices of innovation development, assessment of contribution of the state and business companies to innovation and results obtained in the form of a certain technological level of industry. The first ones are generally accepted evaluation criteria. The second parameter is characterized by amounts of allocations of both public and private capital for research and development; number of scientific personnel in research institutions and enterprises; position of the infrastructure; as well as the educational level of population. The actual level of technological development of the agro-industrial complex can be judged by number of patents and licenses, volume of transactions for the purchase and sale of licenses and know-how [3, 4].

## RESULTS AND DISCUSSION

Researching the competitiveness of the agro-industrial sectors of China and Russia in the context of innovative activity, the following generally recognized evaluation criteria can be used: level of global competitiveness (general indicator); level of education of the population (general indicator); degree of modernization and labor productivity (for the agro-industrial complex); level of implementation of research and development (R&D) (for the agro-industrial complex); level of patenting (for the agro-industrial complex).

1. *Level of global competitiveness.* This index is made from 12 terms of competitiveness, which detail the competitiveness of countries in the world at different levels of economic development. These terms are: «Quality of Institutions», «Infrastructure», «Macroeconomic stability», «Health and primary education», «Higher education and vocational training», «Efficiency of the market of goods and services», «Labor market efficiency», «Development of financial market», «Technological level», «The size of the internal market», «Competitiveness of companies» and «Innovation potential» [5]. Fragment of the global competitiveness rating 2015-2016 is presented in table 1.

Table 1 – Places of China and Russia in the rating of countries by the Index of global competitiveness, 2015/2016 [6]

| Rating | Country      | The Index Value |
|--------|--------------|-----------------|
| 1      | Switzerland  | 5,7             |
| 2      | Singapore    | 5,6             |
| 3      | USA          | 5,5             |
| 4      | Finland      | 5,5             |
| 5      | Germany      | 5,5             |
| 6      | Japan        | 5,5             |
| 7      | Hong Kong    | 5,5             |
| 15     | Canada       | 5,2             |
| 26     | South Korea  | 5               |
| 28     | China        | 4,9             |
| 30     | Iceland      | 4,7             |
| 50     | Kazakhstan   | 4,4             |
| 52     | Philippines  | 4,4             |
| 53     | Russia       | 4,4             |
| 56     | South Africa | 4,4             |
| 57     | Brazil       | 4,3             |

As we can see in this rating China is behind a number of developed countries – the United States, European countries. Russia is behind not only developed countries, such as Switzerland, Singapore, the United States, which are on the top, but also developing ones: China, which took 28<sup>th</sup> place, Thailand (31<sup>st</sup> place), Kazakhstan (50<sup>th</sup> place). Analysis of changes in the Index of global competitiveness has proved that for Russia the average annual increase is 0.1 points. This growth rate is insufficient to enable the country to significantly improve its positions in the international rating in short period.

Among 144 countries which were included in the global competitiveness rating in 2016, Russia ranks the 53<sup>th</sup> place with 4.44 points from seven possible. The indicator of Russia's competitiveness has improved by 11 positions compared with 2013-2014, however, compared to 2008-2009 it is lower by 2 positions. Positive dynamics of Russia from 2012-2013 in the rating of global competitiveness is associated with high prices for energy products and is extremely unstable [7; 8].

2. *Level of education of population and development of the knowledge economy.* According to forecast of experts from the Organization for Economic Cooperation and Development, the main driver of economic growth for the future up to 2060 will be the growth of labor productivity, that can be achieved largely due to investments to improving the quality of labor resources. This is especially true for Russia, India, Turkey, China, Brazil, and South Africa. According to the experts, average duration of schooling will increase over the next 50 years for two years, which means that human capital will grow, and will play more important role in macroeconomics than today.

Education level is calculated according to the United Nations Development Program Education Index, measuring the achievements of the state on two evaluation criteria: adult literacy and index of cumulative share of students receiving primary, secondary and high education [5]. Australia, New Zealand, Norway, Netherlands and the United States take the highest places in the Education Index. Russia has a modest 36<sup>th</sup> place in this rating, and China took the distant 107<sup>th</sup> place (table 2).

Table 2 – Places of China and Russia in the Education Index, 2016 [5]

| Rating | Country        | The Index Value |
|--------|----------------|-----------------|
| 1      | Australia      | 0.927           |
| 2      | New Zealand    | 0.917           |
| 3      | Norway         | 0.910           |
| 4      | Netherlands    | 0.894           |
| 5      | USA            | 0.890           |
| 10     | Czech Republic | 0.866           |
| 36     | Russia         | 0.780           |
| 41     | Singapore      | 0.768           |
| 56     | Saudi Arabia   | 0.723           |
| 57     | Tonga          | 0.720           |
| 58     | Mauritius      | 0.718           |
| 106    | Philippines    | 0.610           |
| 107    | China          | 0.610           |
| 108    | Albania        | 0.609           |
| 184    | Chad           | 0.256           |
| 185    | Burkina Faso   | 0.250           |

Relatively low positions of Russia in the Education Index can be explained by Russia's transition to the European education system and lack of organizational efficiency of the process. Weak positions of China can be explained by large number of Chinese population, the incompleteness of construction of Chinese education' system, relatively low availability of higher education for a large cohort of rural population.

In the future, the most likely result of the transition to a new technological order will be the acceleration of economic growth rates, primarily in the industrially developed countries that have the highest scientific and technological potential. However, among leaders in development of new technologies may be countries from Southeast Asia, primarily China, which is cardinally increasing investment to research and development. For the period 1997-2007 such expenses increased in the country by an average of 22% per year, and in 2008-2013 – by 30% annually. As a result of the current decade, China has outrun Japan by the total expenditure on R&D and since 2015 has firmly established itself in second place in the world after the United States, taking into account the purchasing power parities of the national currency [9].

3. *Modernization and labor productivity.* At present time in China and Russia investment growth has a great importance for ensuring sustainable development of the agro-

industrial sector on the basis of modernization of production and increasing labor productivity. It is important for consolidation of China and Russia in five leading economies of the world, regardless of food and energy crises, which are becoming more and more global. It is necessary in the conditions of hardly predictable (even for short and medium periods) price dynamics on the world food market and agricultural raw materials, which largely determines the model of national economy.

Level and dynamics of modernization in Russian agro-industrial complex can be estimated by degree of technical equipment in agricultural enterprises (figure 1).

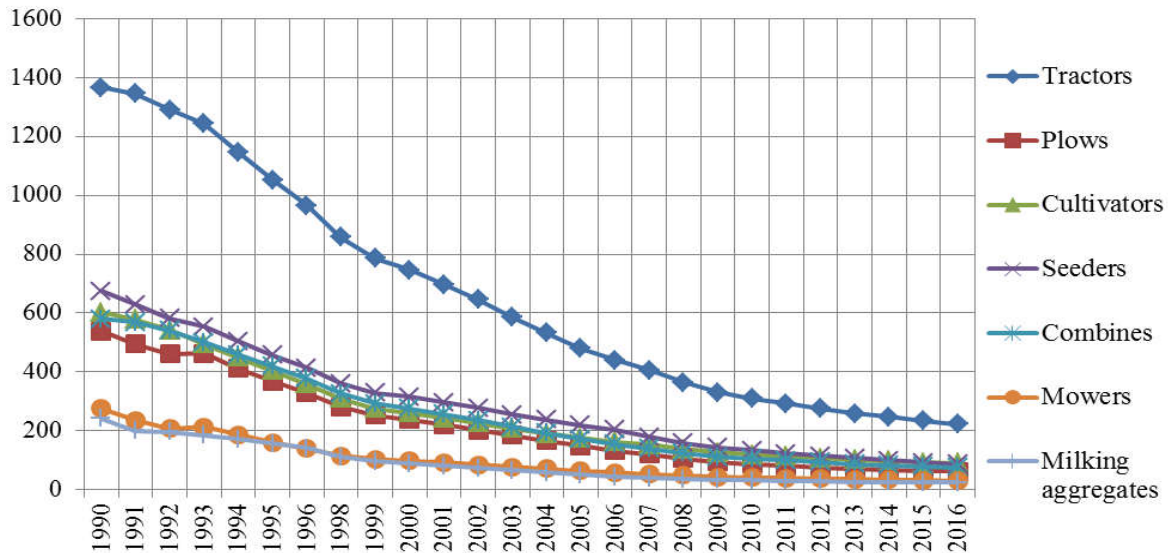


Figure 1 – Dynamics of park of main agricultural machinery in Russia for 1990-2016, thousand units [10]

As we can see, over the past 25 years in Russia, there has been a gradual but very significant reduction in technical park of agricultural machinery. At the same time, there is no full compensation by means of increase in labor productivity: the load of arable land per one tractor increased from 95 to 305 hectares, or by 3.2 times, per one combine harvester – from 152 to 425 hectares, or by 2.8 times, per one maize harvester – from 80 to 2497 hectares, or by 31.2 times [10].

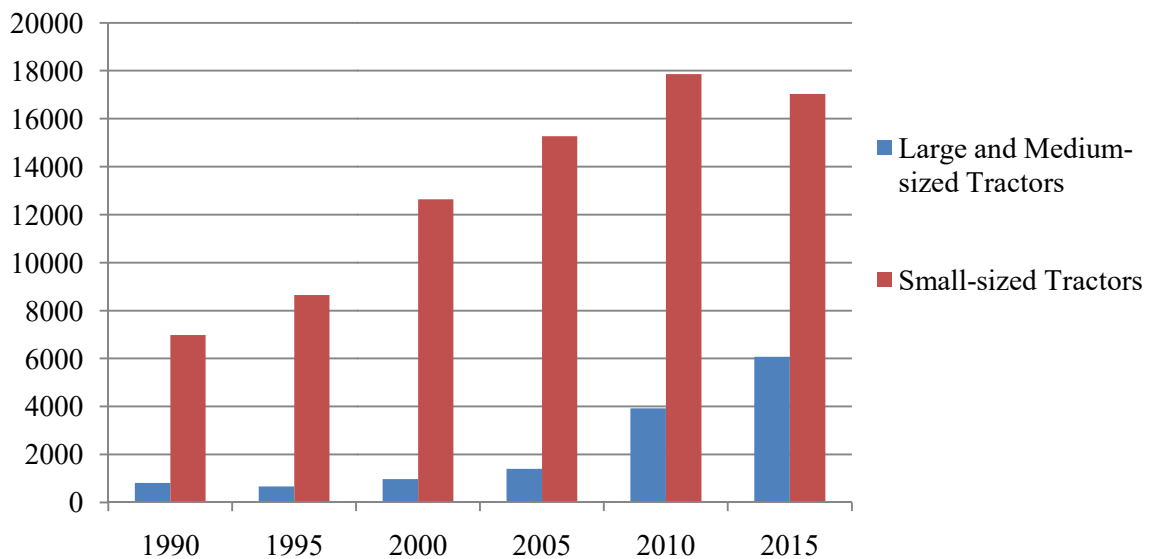


Figure 2 – Dynamics of tractors park in China for 1990-2015, thousand units [11]

Chinese statistics show a significant increase in number of technical equipment in the agro-industrial sector: in particular, the number of tractors used in the fields of China has increased by 15 million units, or by 3 times (figure 2).

Similar dynamics can be seen in other types of agricultural machinery, as well as in the total capacity used in the fields of Russia.

4. *Level of R&D in industry.* In Russia, during the years of reform, quality of science has significantly decreased. Costs of applied research have been reduced by three times, and in the agro-industrial sector – even more. Disintegration of the sphere of applied research was predetermined, in particular: the majority of scientific and production associations, sectoral scientific and technical complexes were eliminated, sectoral research institutes in agriculture were degraded. Also in connection with the reduction in funding, the scope of development suffered huge losses: the number of design bureaus, survey organizations, institutions of vegetable growing, rice growing and soybean, experimental stations of various agricultural purposes decreased. Fortunately, the least losses were borne by the sphere of fundamental agricultural research. Preservation of a significant part of potential of Russian fundamental research undoubtedly opens up prospects for the revival of national agro-industrial sector on the innovative basis.

In 2016, 3605 organizations carried out research and development in Russia, which is 10.1% (in developed countries about 30%) of the total number of organizations. Total 35% of them are state-owned research organizations, 42% are organizations in business sector, 21% are institutions of higher professional education, 2% - nonprofit organizations [10]. Russia occupies low positions by such key indicator as the proportion of scientific researchers in the structure of the workforce, which is one of the main factors of the intellectual development of society. If in 2000 there were 78 scientific researchers per 10000 people in Russia, then in 2016 only 60. During this period, this indicator grew in Republic of Korea from 51 to 128, in Germany – from 65 to 85, in France – from 67 to 98 [12]. China shows high rates of growth in number of highly qualified personnel, increasing the share of scientific and practical-oriented workers trained abroad.

In China, 3650 organizations and institutions are currently engaged in scientific research and development. This number is rather comparable to the number in Russia. Among them, 20% of the institutions are subordinated to the central government, 80% - to local provincial governments [11]. The basic statistics of innovations in the agro-industrial sector of China can be seen in table 3.

Table 3 – R&D Activities and Patents of Industrial Enterprises in the Agricultural Sector of China [11]

| Sector of Manufacturing                                   | Full-time Equivalent of R&D Personnel (man-year) | Expenditure on R&D (ths yuan) | R&D Projects (unit) | Number of Patent Applications (piece) |
|---|--|-------------------------------|---------------------|---------------------------------------|
| Processing of Food from Agricultural Products             | 43 933   | 216 005                       | 6 750               | 9 074                                 |
| Manufacture of Foods                                      | 31 589   | 135 429                       | 4 892               | 6 677                                 |
| Manufacture of Liquor, Beverages and Refined Tea          | 20 998   | 89 997                        | 3 066               | 3 610                                 |
| Manufacture of Tobacco                                    | 3 878  | 20 790                        | 1 301               | 3 110                                 |
| Manufacture of Textile                                    | 61 758   | 207 665                       | 6 918               | 17 017                                |
| Manufacture of Leather, Fur, Feather and Related Products | 18 000   | 51 051                        | 1 803               | 5 026                                 |

Large amounts of labor, intellectual and financial costs are combined with their multiple growth over the past 20 years. At the same time, the agro-industrial sector occupies about 6.8% of labor costs in innovations, 7.2% in total costs for innovations, 8.0% in the number of R&D projects and 7.0% in the total number of country patents.

China put forward a new slogan in reform of the system of science and technology named «Keep the main thing, release the rest». The words «keep the main thing» means adherence to the principle «better less, but better», according to which it is better to leave the best scientific and technical personnel of the fundamental science in the state sector, in

research of high technologies, in solving key scientific and technical problems of the public values. They should make small, but selective forces for major breakthroughs. The words «release the rest» means realization of scientific and technical potential, transfer to market principles of self-financing, redistributing their personnel. They will be involved into enterprises in various forms or will form complexes of enterprises and organizations of scientific and technical profile. The goal of «keep the main thing» is to strengthen the scientific and technical power of the country and preserve the prospects for the future and requires raising the scientific and labor potential to a new level. The goal of «release the rest» is to mobilize the scientific and technical forces on a market basis in order to make a new contribution to economic construction, to maximize the advantages of competition in the science and technology achievements. «Keep the main thing, release the rest» means active integration of science and technology to production process, reflecting its role as a primary productive force [13; 14].

5. *Level of patenting.* One of the most important indicators reflecting scientific and technical achievements in the country is the level of patenting. From 2003 to 2015 the number of patents received by Chinese specialists has grown more than by 12 times. China is the leader among the BRICS countries in the number of patents registered simultaneously in the United States, Western Europe and Japan. This impressive dynamics of growth in patent activity may indicate the preparation of China's technological expansion to the markets of developed countries.

In Russia, however, weak financial support, low level of material, technical and information support, as well as guarantees of the rights of inventors (including remuneration), and demand for research and development results are factors of low patent activity in Russia. In total, in 2015, Russian Federal Service for Intellectual Property, Patents and Trademarks got 64 266 applications, which is by 7.5% less than in 2014. By number of applications of patents for inventions, Russia in 2015 was in the 7<sup>th</sup> place in the world, significantly behind China (825139 units), the USA (571612 units) and Japan (328436 units) [15].

Table 4 – New Products Development and Production of Industrial Enterprises in the Agricultural Sector of China [11]

| Sector of Manufacturing                          | New Products (unit) | Expenditure on New Products Development (ths yuan) | Sales Revenue of New Products (ths yuan) | Export Revenue of New Products (ths yuan) |
|--|---------------------|--|--|---|
| Processing of Food from Agricultural Products    | 7 295               | 226 197  | 2 848 430                                | 129 453                                   |
| Manufacture of Foods                             | 5 201               | 138 230  | 1 334 518                                | 108 097                                   |
| Manufacture of Liquor, Beverages and Refined Tea | 2 733               | 75 036   | 1 004 757                                | 42 323                                    |
| Manufacture of Tobacco                           | 892                 | 15 014   | 1 650 742                                | 11 398                                    |
| Manufacture of Textile                           | 7 466               | 208 141  | 4 742 104                                | 598 537                                   |
| Manufacture of Leather, Fur, Feather and Related | 2 184               | 56 570   | 907 614                                  | 229 180                                   |

In 2015, 34 thousand patents for inventions were issued in Russia (1.5 times more than in 2005). Generally 23.1 thousand were received by Russian applicants, and 10.9 patents by foreign applicants. At the same time the number of patent inventions in China in 2005-2015 increased more than 5 times. According to the number of issued patents for inventions, Russia in 2014 was in the 6<sup>th</sup> place, behind the USA (277 835 units), Japan (277 079 units), China (207 688 units). 13 000 patents were granted for utility models, and 3700 patents – for industrial designs. The coefficient of inventive activity (the number of Russian patent applications per 10000 people) was 1.65 in 2015 (in 2013 – 2.0), and by 2020 it is projected to increase to 2.8 [15].

The main goal of active patent policy is to generate new scientific and technical ideas, which get the status of new business ideas then. Business ideas are transformed to new products. The number of new products in the agro-industrial sector of China is constantly

increasing. Also all the indicators accompanying the release of new products are growing, which directly speaks about the increasing innovative activity of this country (table 4).

The agro-industrial sector occupies 7.9% of the total number of new products created in China, 7.0% - in total costs for creation of new products, 8.3% - in total revenue from sale of new products and 3.8% in export proceeds of new products.

In modern global world there is no state which can act in isolation in the process of researches and development. Trade relations in purchase and sale of licenses, patents, industrial designs and know-how have the great importance. Both China and Russia are involved in the international exchange of technology. In 2016 the share of volume of innovative goods, works and services in the total volume of shipped goods amounted 9.2% in Russia (in 2012 - 8%), in China and the Republic of Korea – 27%, France – 26% , the USA – 18%, Japan – 17%, Germany – 16%. In the global export of high-tech products Russia occupies very modest positions. In 2015, the volume of Russian exports of high-tech products amounted to 8,656 million dollars, which is only 0.4% of the world exports. Russia is at the level of countries such as Brazil (8,392), the Slovak Republic (7,574), Denmark (9,185), Israel (9,635). Unfortunately, Russia is behind China conceding it 65 times, Germany (22 times), the United States (17 times), India (2 times) [12].

## CONCLUSION

As a result of the research of innovative activity as a factor of competitiveness of the agro-industrial complexes of China and Russia, the following conclusions can be drawn.

1. By a number of criteria such as level of modernization and labor productivity, economic growth rates and the level of global competitiveness, China is one of the world's economical leaders, but by financial assets per capita and by level of education of population, it still behind many other countries. This lag is due to large population in the country and rather high level of poverty;

2. By a number of criteria such as level of modernization and labor productivity, the rate of economic growth and the level of global competitiveness, Russia lags far behind other countries. The main reason for this fact is the raw material orientation of the country's economy, low level of investment in the real sector of economy. By financial assets per capita, after several years of growth in 2015, Russia sharply deteriorated its position due to the fall in ruble's exchange rate and instability of the economy. By the level of education of the population, Russia keeps rather high level among world leaders, however, in recent years there has been a lag behind in this indicator.

## REFERENCES

1. Ilchikov M.Z. (2015). Problems of innovative development of the Russian economy. Theoretical aspects: monograph. Moscow: Publ. house Knorus. – 122 p.
2. Economics of the Agro-food market: the textbook (2014) / Edited by I.A. Minakova. Moscow: Publ. house INFRA-M. – 232 p.
3. Nechaev V.I., Birman V.F., Sandu I.S., Bershitsky Yu.I., Bogoviz A.V. (2012). Organization of innovative activities in the agro-industrial complex. Moscow: Publ. house Kolos. – 296 p.
4. Anokhina M.Y. (2015). Cluster technologies as a tool for agrarian regions development // Asian Social Science. T. 11. № 6. P. 261-271
5. World Economic Forum: Global Competitiveness Rating 2015-2016 // Information and Analytical Portal «Center for Humanitarian Technologies» [Electronic resource]. URL: <http://gtmarket.ru/news/2016/09/30/7246>
6. Official site of the Organization of Central Intelligence Agency [Electronic resource]. URL: <https://www.cia.gov/library/publications/the-world-factbook/>
7. Ivanova V.N., Seryogin S.N., Novoseltseva A.V. (2016). The open economy: priorities of development of agrarian and industrial complex for overcoming of external threats and modern challenges // Food Industry. № 1. P. 8-11

8. Milner B.Z., Orlova T.M. (2015). Organization of innovation: horizontal communications and management: a monograph. Moscow: Publ. house INFRA-M. – 288 p.
9. World Economy. Statistics [Electronic resource] // Informational and analytical portal Ereport.Ru. URL: <http://www.ereport.ru>
10. Official site of the Federal State Statistics Service [Electronic resource]. URL: [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru)
11. Statistical Yearbook of China in 2016 [Electronic resource] // Official site of the National Bureau of Statistics of China. URL: <http://www.stats.gov.cn/tjsj/ndsj/2016/indexeh.htm>.
12. State Indicators [Electronic resource] // National Science Board. 2016. Arlington, VA: National Science Foundation Science and Engineering Indicators 2016 (NSB-2016-1), p. 4/45-46. URL: <https://www.nsf.gov/statistics/2016/nsb20161/#/stateind>
13. The first meeting of the Presidium of the 16th Congress of the CPC. Report of Jiang Zemin at the 16th All-China Congress of the CPC (second part) // 20121108 人民日報 [People's Daily: PRC People's Daily]. November 08, 2012
14. Lee C. (2012). State regulation of the development of the agro-industrial complex in China // Business Inform. № 2. P. 122-125
15. Official site of the Federal Service for Intellectual Property, Patents and Trademarks (Rospatent) [Electronic resource]. URL: <http://www1.fips.ru>

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**РАЦИОНАЛЬНОЕ ЗЕМЛЕПОЛЬЗОВАНИЕ В СИСТЕМЕ ЭКОНОМИЧЕСКОЙ  
БЕЗОПАСНОСТИ АГРАРНЫХ ПРЕДПРИЯТИЙ**  
RATIONAL LAND USE IN THE SYSTEM OF ECONOMIC SAFETY OF AGRICULTURAL  
ENTERPRISES

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**АННОТАЦИЯ**

В статье отражена актуальность проблемы обеспечения экономической безопасности аграрных предприятий в призме рационального землепользования в условиях трансформаций в системе земельных отношений. Доказано, что земельные ресурсы для субъектов хозяйствования в аграрном секторе являются одним из главных факторов производства и воспроизводственного процесса, природным ресурсом и объектом социально-экономических связей. Очерчены особенности земли как средства производства. Выявлено, что условия рационального землепользования являются сосредоточением угроз экономической безопасности аграрных предприятий. Определена роль фактора рационального землепользования в системе экономической безопасности. Обоснована экономическая эффективность аграрного землепользования. Сформирована модель рисков ресурсного обеспечения и рационального землепользования аграрных предприятий в системе экономической безопасности.

**ABSTRACT**

The article reflects the topicality of the problem of ensuring the economic security of agrarian enterprises in the prism of rational land use in the context of transformations in the system of land relations. It is proved that land resources for business entities in the agrarian sector are one of the main factors of production and reproduction process, a natural resource and the object of social and economic ties. The features of the land as a means of production are outlined. It was revealed that the conditions of rational land use are the concentration of threats to the economic security of agrarian enterprises. The role of the rational land-use factor in the system of economic security is defined. The economic efficiency of agricultural land use is substantiated. The model of risks of resource provision and rational land use of agricultural enterprises in the system of economic security is formed.

**КЛЮЧЕВЫЕ СЛОВА**

Рациональное землепользование, земельные ресурсы, экономическая безопасность, угрозы, риски, аграрное предприятие, ресурсное обеспечение.

**KEY WORDS**

Rational land use, land resources, economic security, threats, risks, agricultural enterprise, resource provision.

Практика хозяйствования аграрных предприятий свидетельствует о том, что не так столь важно иметь определенный ресурс, как эффективно его использовать. Таким ресурсом являются земельные ресурсы - многофункциональный фактор воспроизводственного процесса в аграрном секторе, территориальный базис осуществления деятельности, являющийся одновременно природным ресурсом,



базисом проживания общества, фактором производства, объектом социально-экономических связей, основой системы продовольственной безопасности.

Для сельского хозяйства земля является предметом труда. К. Маркс подчеркивал, что в процессе экономической реализации земельной собственности при развитии земельной ренты проявляется обстоятельство, свидетельствующее что ее величина определяется не ее получателем, а процессом развития общественного труда [1]. Таким образом, Маркс задает ориентир на инновационно-инвестиционные факторы развития аграрной сферы, которые на определенном этапе начинают доминировать среди других факторов развития отрасли. Цепь «управление + экономика + инвестиции + инновации» должна приобретать системные черты. Особую ценность в современных условиях представляет парадигма К. Маркса, которая служит абстрактно-идеальным эталоном теоретического осмысления фундаментальных процессов в экономике и в агросфере в частности, построенная от общего к частному, предлагающая вневременную стратегию развития агросферы. Исходя из теоретического наследия К. Маркса [1], можно отметить, что исходным пунктом для конвергенции теоретических достижений отечественных ученых в рамках стратегии аграрного развития России могут служить труды К. Маркса как условная парадигма, а именно цепь «управление + экономика + инвестиции + инновации».

Как средство производства земля имеет особенности, которые отличают ее от других средств производства:

1. Земля является результатом многовекового почвообразующего процесса (продуктом природы), то есть в отличие от других средств производства она не создана человеком. Используя природную основу земли, землевладельцы и землепользователи обязательно должны учитывать основные экологические законы земледелия: закон незаменимости и равнозначности факторов; закон минимума, оптимума и максимума; закон совокупного действия или взаимодействия факторов; закон возвращения питательных веществ в почву; закон плодосмены [2].

2. Земля имеет верхний плодородный слой, благодаря которому конечный результат может быть больше, чем вложенный.

3. Физическое не перемещение - каждый земельный участок имеет свое постоянное место размещения, которое не может перемещаться.

4. Качественная неоднородность - каждый земельный участок характеризуется индивидуальными физико-химическими характеристиками, вследствие чего может быть пригодным или непригодным для производства.

5. Пространственная ограниченность - из общей площади (15 млрд. га) Земного шара суша составляет около 1 млрд. га.

6. Незаменимость - подобно другим средствам производства, земля не подлежит замене.

7. Сложный процесс воспроизводства - необходимо около 100 лет на воспроизводство 0,5 - 2 см почвы.

8. Неизнашиваемость - при правильном использовании земля не изнашивается в отличие от других средств производства, а при условии надлежащего использования может качественно улучшаться и становиться более продуктивной.

В научной литературе исследованию проблем рационального использования земельных ресурсов посвящено достаточно много внимания, существует множество толкований понятия «рациональное землепользование», однако единого определения его сущностного наполнения нет. Мысли ученых сводятся к тому, что, имея целью получение прибыли, землепользователь, учитывая качественные характеристики принадлежащих ему земельных ресурсов, выбирает направление специализации. Учитывая это, рациональным аграрным землепользованием будет такое, которое обеспечивает достижение цели землепользователя в каждом конкретном случае. Термин «землепользование» имеет двойственное значение: с одной стороны, это система пользования землей, регламентированная законодательством для различных категорий земель, собственников земли и землепользователей, а с другой -

определенный земельный массив, территория, находящаяся в собственности или в пользовании.

Категорию «рациональное использование земель» ученые исследовали еще в советские времена. Так, ученый Аксененок Г.А. подчеркивал, что главным в решении проблемы рационального использования сельскохозяйственных земель является повышение их плодородия и качества, увеличение полезных элементов, что необходимо для удовлетворения потребностей общества [3]. Ученый сформулировал два понятия «научно обоснованное использование земли» и «рациональное использование земли», что свидетельствует о том, что автор связывал научно обоснованное использование земель с их рациональным использованием, однако он их четко разграничивал. С его точки зрения, «рациональное» не включает составляющий признак «научно обоснованное».

В. Горлачук [4] под термином «рациональное использование земельных ресурсов» понимает целесообразность, полноту и степень эффективности использования земель, указывая, что полнота использования земель определяется степенью вовлечения их в сельскохозяйственный оборот, степенью сельскохозяйственной освоенности земельного фонда. По мнению В. Русан, рациональное землепользование - это научно обоснованное использование земельных участков сельскохозяйственного назначения, направленное на достижение максимального эффекта в процессе хозяйствования, с учетом их качественных характеристик и конкретных природно-экономических условий производства и соблюдения экологических условий [5].

Таким образом, понятие «рациональное землепользование» является комплексным, включающим совокупность общественных интересов и отношений, возникающих по поводу распределения, использования и восстановления земельных ресурсов, и совокупность научных представлений о составе и содержании действий, обеспечивающих эффективное освоение и использование земельных ресурсов.

В рыночных условиях хозяйствования ученые усиливают внимание на экономической и экологической составляющей рационального землепользования [6]. Выделение экономической составляющей рационального сельскохозяйственного землепользования объясняется задачами экономической теории, ведь это наука об использовании обществом ограниченных природных ресурсов (земли) для производства различных товаров с последующим их обменом [7]. Выделение экологической составляющей обусловлено тем, что земля является средой обитания микроорганизмов, таким природным ресурсом, от состояния которого зависит экологическая стабильность государства.

Г. Чогут выделяет две составляющие эффективности использования земель сельскохозяйственного назначения: экономическую и экологическую. Экономическую эффективность ученый определяет как максимальное производство продукции, которая необходима обществу, при наименьших затратах общественного труда и ресурсов на ее единицу. Экологическую эффективность ученый определяет как сохранение природных характеристик и устойчивое функционирование агросистем, составляющей которых является земля [8].

А. Третьяк и В. Другак предлагают выделять экологическую, производственно-экономическую, инвестиционную и социальную эффективность землепользования [9].

Ученые во главе с Федоровым Н.Н. рациональным землепользованием считают такое использование земель, которое обеспечивает научно обоснованный экономический эффект хозяйствования и при этом улучшает плодородие почв и экологическое состояние окружающей среды [10, 11].

В. Русан предлагает эколого-экономический механизм рационального сельскохозяйственного землепользования. К экономической составляющей автор относит регуляторы влияния на землепользователей, целью которых является стимулирование их деятельности к рациональному использованию земельных ресурсов. Задачей экологической составляющей является формирование бережного отношения к такому уникальному природному ресурсу как земля (рис. 1) [12].

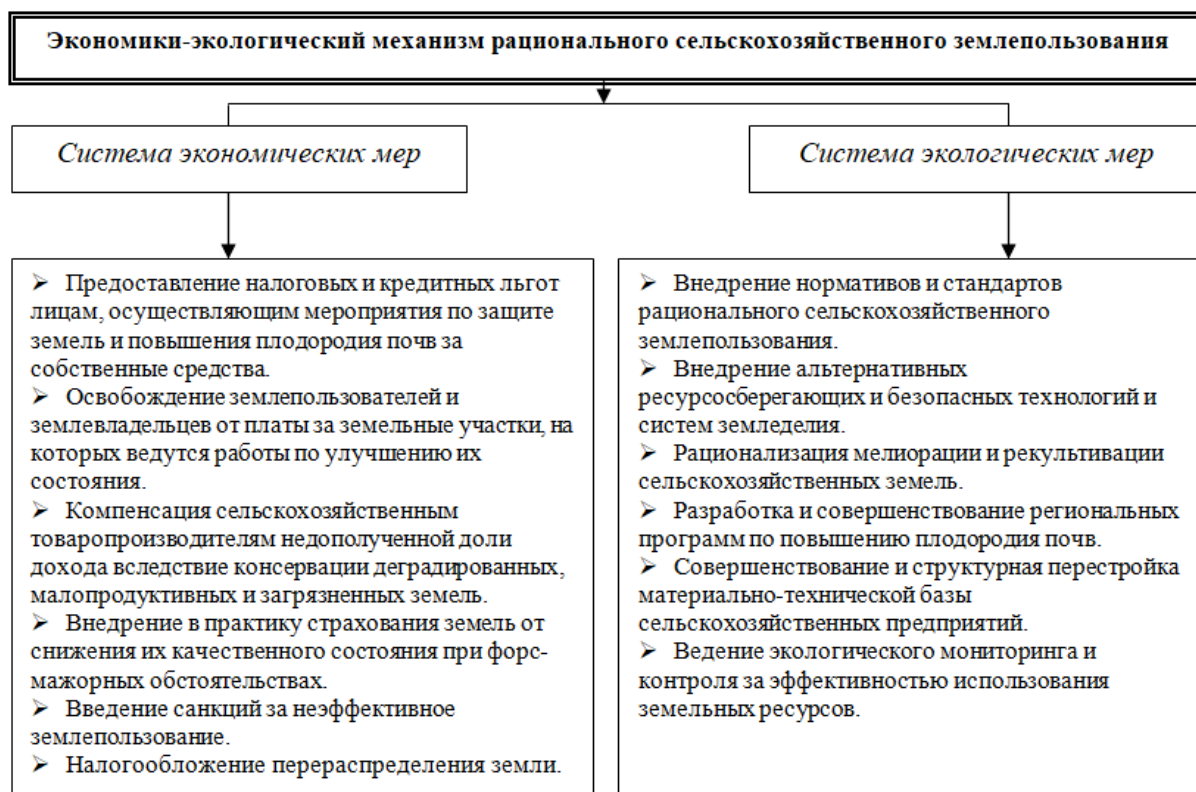


Рисунок 1 – Экономика-экологический механизм рационального сельскохозяйственного землепользования

Таким образом, согласно подходов к определению системы рационального землепользования мысли ученых можно разделить на группы: экономисты-аграрии, которые являются сторонниками интенсивного земледелия; ученые, которые настаивают на применении альтернативных (биологических) систем земледелия; сторонники почвозащитного земледелия, которое предусматривает рациональное сочетание мер интенсивного и биологического земледелия, направленного на восстановление плодородия почв. Такое расхождение во взглядах можно объяснить разницей в определении полезного эффекта, получаемого в результате использования земли. В частности, экономическую эффективность использования земли определяют с помощью системы стоимостных и натуральных показателей. Так, А. Гуторов [13], В. Андрейчук [14], выделяют натуральные и стоимостные показатели:

1) натуральные: урожайность культур; производство отдельных видов животноводческой продукции на 100 га соответствующих земельных угодий (продукцию скотоводства и овцеводства на 100 га сельскохозяйственных угодий, свиноводства - на пашню, птицеводства - на площадь зерновых);

2) стоимостные: производство валовой продукции в сопоставимых ценах, товарной продукции в текущих ценах реализации, чистой продукции и прибыли в расчете на гектар сельскохозяйственных угодий.

Натуральные показатели характеризуют производительность определенной части угодий, а стоимостные - всей их площади [14].

Экономическую эффективность землепользования целесообразно оценивать, учитывая систему экономических законов и законов природы, что требует таких критериев оценочных показателей землеустройства:

- при определении экономической эффективности различных типов землепользования необходимо учитывать коллективные и личные интересы землепользователей и землевладельцев, а с другой стороны - общественные интересы. Это требует использования как хозяйственного (коммерческого), так и народнохозяйственного подходов;

- при экономической оценке землеустройства необходимо учитывать условия воспроизводства плодородия почв и экологические характеристики территории, поскольку земля является элементом окружающей среды (биосферы);

- при определении показателей эффективности важно выделить эффект землеустройства, сопоставив его с соответствующими затратами, обеспечив качественную однородность и количественное сравнение показателей в разных хозяйствах.

Обобщая взгляды ученых на классификацию и показатели эффективности использования земель, можно выделить следующие ее виды: экономическая, технологическая, экологическая, эколого-экономическая, социальная и инвестиционная.

Итак, рациональное землепользование воплощает принципы и способы экономической оптимизации процесса хозяйственной деятельности, осуществляемой на конкретной земельной территории. Землепользование определяет условия и принципы рационального размещения, организации и управления производственными процессами с учетом дифференциации свойств земельных ресурсов и пространственной принадлежности, неоднородности, возможности ренты. Исходя из этого, рациональное землепользование в аграрных предприятиях трактуем как социально-экономическую категорию, которая воплощает отношения между землевладельцами и землепользователями в процессе производства сельскохозяйственной продукции с целью удовлетворения потребностей населения в продуктах питания, обеспечения восстановления естественного плодородия почвы, увеличение продуктивного потенциала земельных ресурсов и их использования в условиях высокого уровня экологичности. Вместе с тем, рациональное землепользование должно обеспечить экономический, природоохранный, ресурсосберегающий и восстановительный характер использования земельных ресурсов.

С нашей точки зрения, рациональное землепользование целесообразно рассматривать в пятимерной системе координат:

- экономической (экономические потребности использования земельных ресурсов и почв, характер использования земли, рынок продуктов, размещение производства, уровень интенсификации, развитие инфраструктуры);

- технологической (уровень использования земель в процессе производства, главным критерием которого является научно-обоснованная система ведения сельского хозяйства, максимизация производства при определенном объеме земельных ресурсов, минимизация количества земельных ресурсов, обеспечивающих заданный объем производства);

- социальной (социальные институты землепользования и землевладения, в частности, хозяйственный уклад, комплекс распоряжений и обязанностей человека по отношению к земле, земельный строй, право собственности на землю, сервитуты, социальная инфраструктура);

- экологической (природно-ресурсный потенциал, агроэкологические особенности использования почв, качество продукции, экологическое состояние почв, экологические ограничения);

- инвестиционной (совокупность инвестиционных ресурсов в расчете на площадь сельскохозяйственных угодий).

Получение экономического эффекта от рационального использования земли прослеживается в реализации следующего комплекса мероприятий:

- для приведения в соответствие биологических особенностей растений производственным и территориальными свойствами земель необходимо разместить посевы и сформировать севообороты с учетом качества угодий, их расположения;

- с целью обеспечения не только эффективного использования плодородия почв, но и его подъема следует использовать технологии, которые бы учитывали особенности конкретного участка пашни;

- необходимо осуществлять комплекс ресурсосберегающих и природоохранных мероприятий и внедрять экологически чистые технологии;
- концентрация ресурсов в целях строительства и эксплуатации почвозащитных, мелиоративных, природоохранных объектов;
- обязательная компенсация экологического и производственного ущерба;
- стимулирование улучшения и сохранения земель, обеспечение экологического равновесия в агроландшафтах, агросистемах.

Таким образом, есть основания полагать, что рациональное землепользование - это процесс воздействия субъектов (землевладельцев и землепользователей) на объект землепользования (земельные ресурсы) для достижения экономических, экологических, производственных результатов при наименьших затратах труда, энергии и материалов. Главный этап этого процесса - разработка механизмов мотивации субъектов землепользования.

С точки зрения ресурсного подхода, ресурсное обеспечение является обязательным условием функционирования аграрного предприятия и основой для обеспечения экономической безопасности. Оно может находиться в разных плоскостях: недостаточное обеспечение, чрезмерное, несбалансированное по количественным или качественным признакам, что дестабилизирующе влияет на экономическую безопасность и вызывает ряд угроз.

Следует подчеркнуть, что ресурсное обеспечение в системе экономической безопасности предприятия рассматривается как совокупность действий по поиску, выбору и использованию ресурсов аграрного предприятия, а также созданию административно-правовых, организационно-управленческих, технико-технологических, морально-психологических, информационно-аналитических условий, необходимых для обеспечения безопасности предприятия от влияния системных и несистемных угроз на тактическом и стратегическом уровнях деятельности.

С нашей точки зрения, с помощью оценки ресурсного обеспечения субъектов хозяйствования в аграрном секторе возможно выявлять угрозы экономической безопасности, потому что ресурсное обеспечение является сосредоточением угроз экономической безопасности аграрного предприятия. С этой целью целесообразно проводить оценку состояния ресурсного обеспечения с выделением его отдельных составляющих, на которые сильно влияют угрозы.

Земельные ресурсы для аграрных предприятий являются одним из главных факторов производства и воспроизводственного процесса, выступают одновременно как природный ресурс и объект социально-экономических связей. Современные земельные отношения базируются на рыночных принципах, когда главным мотивом деятельности землепользователей становится систематическое получение прибыли в условиях конкуренции [15]. Именно в этих условиях и возникает разнообразие рисков и угроз экономической безопасности предприятий, связанных с рациональным использованием земельных ресурсов. Но процесс рационального землепользования обусловлен определением объема, количества и характера использованием различных видов ресурсов: человеческих, финансовых и материальных ресурсов. Исходя из этого, нами сформирована модель оценки рисков ресурсного обеспечения аграрных предприятий в системе экономической безопасности (табл. 1).

Выдвинутое предположение относительно того, что ресурсное обеспечение и рациональное землепользование является сосредоточением угроз экономической безопасности аграрного предприятия, предопределяет необходимость учета риска (угрозы) ресурсного обеспечения и рационального землепользования. Есть все основания считать, что если землепользование убыточное, норма прибыли становится ниже, а земельная рента - отрицательной, то такое землепользование становится экономически невыгодным. С точки зрения экологических основ землепользования, разрушением можно считать такие необратимые изменения, после которых землепользование нельзя вернуть в экологически безопасное состояние.

Таблица 1 – Модель рисков ресурсного обеспечения и рационального землепользования аграрных предприятий в системе экономической безопасности

| <i>Причины возникновения угроз ресурсного обеспечения и рационального землепользования в системе экономической безопасности</i> |   |   |   | <i>Угрозы</i>   |
|---|---|---|---|---|
| По отношению к деятельности   |   | По происхождению  |   |   |
| Объективные   | Субъективные  | Причины, возникающие под влиянием внутренних факторов - эндогенные  | Причины, возникающие под влиянием внешних факторов - экзогенные   |   |
| <b>Тактический уровень деятельности предприятия</b>   |   |   |   |   |
| <i>Ограниченность ресурса</i>   | Неадекватное поведение персонала                        | Неэффективная логистика   | Нарушение сроков выполнения обязательств по поставкам ресурсов  | <i>Потеря ресурса</i>   |
| <i>Рост цен на ресурсы</i>  | Незагруженность производственных мощностей              | Недостаток собственных средств  | Низкий уровень платежеспособности покупателей   | <i>Потеря те кущей доходности</i>   |
| <i>Сокращение производства</i>  | Низкая квалификация кадров                              | Отсутствие защиты коммерческой информации   | Наличие дебиторских обязательств  | <i>Потеря платежеспособности</i>  |
| <i>Нарушение оптимальных экономических параметров землепользования</i>  | Неэффективный характер использования земельных ресурсов | Низкий уровень материально-технического обеспечения, организации труда и мотивации, недостаток квалифицированных кадров | Получение сверхприбыли землепользователями, неурегулированность земельных отношений, недостаточный уровень развития инфраструктуры              | <i>Потеря плодородия почв, нарушение научно-обоснованных севооборотов</i>   |
| <i>Нарушение оптимальных экологических параметров землепользования</i>  | Агроэкологические особенности использования почв        | Нарушение объемов орошения, мелиоративного режима   | Природно-ресурсный потенциал, экологические ограничения, государственное экологическое регулирование  | <i>Снижение качества продукции, нарушение экологического состояния почв</i> |
| <i>Нарушение оптимальных социальных параметров землепользования</i>   | Неэффективный характер использования земельных ресурсов | Получение сверхприбыли землепользователями  | Социальные институты землепользования и землевладения, земельное устройство, право собственности на землю, сервитуты, социальная инфраструктура | <i>Угрозы продовольственной безопасности страны</i>                         |
| <b>Стратегический уровень деятельности предприятия</b>  |   |   |   |   |
| <i>Рейдерские захваты</i>   | Склонность топ-менеджмента к рискам                     | Физический и моральный износ основных средств   | Зависимость от поставщиков ресурсов   | <i>Снижение управляемости предприятием</i>                                  |
| <i>Недобросовестная конкуренция</i>   | Неподдержанние коммерческой тайны                       | Заведомое производство некачественной продукции   | Низкое качество ресурсов  | <i>Ухудшение репутации предприятия</i>                                      |
| <i>Высокая энергоёмкость производства</i>   | Несогласованность бизнес-процессов                      | Нарушение регистрации прав на недвижимое имущество и землю  | Нарушение административного и криминального законодательства  | <i>Снижение стоимости предприятия</i>                                       |

Проявлениями этих тенденций является антропогенное загрязнение среды, истощение почв и истощения черноземов, деградация земельных ресурсов, нарушение природных экосистем, экологические кризисы. Социальным критериям наступления разрушения системы рационального землепользования является совокупность параметров землепользования, при которых поддержание минимально допустимого уровня благосостояния населения требует больших затрат ресурсов, чем можно получить при использовании имеющегося земельно-ресурсного потенциала территории.

Исходя из этого, безопасное рациональное землепользование направлено на управление земельными ресурсами аграрных предприятий через призму минимизации

рисков в сфере использования и охраны земельных ресурсов и является основой для разработки новой парадигмы использования земли как ресурса хозяйственной деятельности, влияющего на обеспечение экономической безопасности.

Результаты проведенного исследования позволяют сделать вывод о том, что ресурсное обеспечение является основой для обеспечения экономической безопасности аграрных предприятий, а рациональное землепользование является сосредоточением угроз. Ресурсное обеспечение в системе экономической безопасности предприятия рассматривается как совокупность поиска, выбора и использования ресурсов предприятия, а также создание административно-правовых, организационно-управленческих, технико-технологических, морально-психологических, информационно-аналитических условий, необходимых для обеспечения безопасности предприятия от влияния системных и несистемных угроз. Земельные ресурсы для аграрных предприятий являются одним из главных факторов производства и воспроизводственного процесса, поэтому и возникают риски и угрозы экономической безопасности, связанные с рациональным использованием земельных ресурсов.

### БИБЛИОГРАФИЯ

1. Маркс К. Сочинения / К. Маркс, Ф. Энгельс. 2-е изд. Т. 26. Ч. I. — М.: Государственное издательство политической литературы. 1969. 480с.
2. Харченко О. В. Основи програмування врожаїв сільськогосподарських культур: навч. посіб. / О. В. Харченко. — 2-е вид., перероб. і доп. — Суми: Університетська книга, 2003. — 296 с.
3. Аксененок Г. А. Обеспечение рационального использования земли / Г. А. Аксененок // Советское государство и право. — 1968. - №10. — С. 24-28.
4. Управління земельними ресурсами: навч. посіб. / В.В. Горлачук, В.В. В'юн, А.Я. Сохнич. — Миколаїв: Вид-во МФ НаУКМА, 2002. — 316 с.
5. Русан В.М. Економіка раціонального сільськогосподарського землекористування: моногр./ В.М. Русан. — К ННЦ «ІАЕ», 2009. - 198 с.
6. Быстряков И. К. Управление рациональным землепользованием: теоретический дискус / И. К. Быстряков // Теорія і методи оцінювання, оптимізації використання та відтворення земельних ресурсі: матеріали Міжнар. наук. конференції: У 2 ч. — Ч.1. — К., 2002. — С. 139 – 142
7. Самуельсон П. Экономика / П. Самуельсон: пер. с англ.: В 2 т. Т.1. — М.: НПО “Алгон”, “Машиностроение”, 1997. — 334 с.
8. Чогут Г. И. Определение эколого-экономической эффективности использования сельскохозяйственных земель / Г. И. Чогут // Весник ВГУ. — Серия: экономика и управление. — 2005. - №2. — С.74 – 78.
9. Третьяк А. М. Наукові основи економіки землекористування та землевпорядкування / А. М. Третьяк, В. М. Другак. — К.: ЦЗРУ, 2003. — 337 с.
10. Федоров М. М. Економічне стимулювання суб'єктів господарювання за раціональне використання і охорону земель // Екологічність продукції АПК: економіка та технологія. Українська академія аграрних наук. — у 2 т. Т.1. — Суми: 2000. — 300 с.
11. Федоров М.М. Розвиток орендних земельних відносин у новостворених агроформуваннях: моногр. / М.М. Федоров. — Х.: ХНТУСГ, 2010. — С. 89-97.
12. Русан В. М. Економіко-екологічний механізм раціонального сільськогосподарського землекористування / В. М. Русан // Економіка АПК. - 2006. - №4. — С. 31 – 37.
13. Гуторов О. І. Земельно-ресурсний потенціал та проблеми його раціонального використання / О. І. Гуторов. - Х.: Харківський національний аграрний університет, 2002. — 70 с.
14. Андрійчук В. Г. Економіка підприємств агропромислового підкомплексу: підручник / В. Г. Андрійчук. - К.: КНЕУ, 2013. - 779 с.
15. Kuzubov A.A. Implementation of monitoring subsystem in the regulation system of agro-food sector on regional level / A.A. Kuzubov, N.V. Shashlo // Russian Journal of Agricultural and Socio-Economic Sciences. 2017. Т. 62. № 2. С. 33-41.

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**УПРАВЛЕНИЕ БЕЗОПАСНОСТЬЮ АВТОТРАНСПОРТНЫХ СИСТЕМ  
АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА НА ОСНОВЕ КОМПЛЕКСНОГО  
ИНФОРМАЦИОННОГО ПОДХОДА**  
SAFETY MANAGEMENT OF THE AGRO-INDUSTRIAL COMPLEX'S TRANSPORT  
SYSTEMS ON THE BASIS OF AN INTEGRATED INFORMATION APPROACH

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**АННОТАЦИЯ**

В статье приведены результаты исследований, направленных на изучение влияния информационного обеспечения на безопасность транспортных работ в агропромышленном комплексе. Рассмотрены основные подходы к управлению безопасностью биотехнической автотранспортной системы «человек – машина – среда – груз» и выявлены недостатки информационного взаимодействия элементов системы.

**ABSTRACT**

The article presents the results of studies aimed at studying the impact of information support on the safety of transport operations in the agro-industrial complex. The main approaches to safety management of the biotechnical vehicle system "man-machine-environment-cargo" are considered and shortcomings in information interaction of the system elements are revealed.

**КЛЮЧЕВЫЕ СЛОВА**

Безопасность, транспортные работы, информация, телематика, риск.

**KEY WORDS**

Security, transportation, information, telematics, risk.

Агропромышленный комплекс является ключевой отраслью экономики России, политическая и экономическая ситуация, сложившаяся в последние три года в нашей стране, требует постепенного перехода на импортозамещение, что было одним из пунктов «Государственной программы развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013 - 2020 годы» еще до ввода санкций. По данным Минсельхоза РФ Россия во многом продвинулась в достижении поставленных целей, страна достигла 90 % обеспеченности по мясу птицы и свинине, производство зерна увеличилось на треть, как и производство тепличных овощей, площадь виноградников и садов выросла на 40-60 %, однако по ряду направлений, имеются существенные проблемы, которые требуют незамедлительных решений [1,2]. Такая ситуация требует ускоренными темпами развивать отдельные направления деятельности предприятий АПК, и в частности транспортную составляющую отрасли. Текущее и перспективное развитие сельскохозяйственного производства, комплексная механизация отрасли, неразрывно связаны с ростом объема транспортных работ, значительная доля которых составляет неотъемлемую часть технологических процессов возделывания и уборки



сельскохозяйственных культур. В общем объеме работ в АПК на транспортные и погрузочные работы приходится до 30-35% затрат труда, 35-40% стоимости механизированных работ и до 50% затрат энергии. Объем перевозок сельскохозяйственных грузов составляет в среднем от 20 до 60 т.км на 1 га пашни [2,3]. При этом, следует отметить, что транспортные работы остаются одними из наиболее опасных в отрасли и управление их безопасностью является значимой научной и практической задачей.

Рассматривая вопрос управления безопасностью транспортных работ в АПК, следует отметить, что одной из основных современных тенденций развития в системе менеджмента качества является «процессный подход», применение которого существенно меняет подход к управлению. В полной мере это относится и к процессам, протекающим на предприятиях АПК и в частности в отраслевых автотранспортных системах. Управление процессами позволяет повысить эффективность, снизить издержки, улучшить качество продукции, и что особенно важно, повысить безопасность выполнения работ. Стандарт ИСО 9001.2008 «Системы менеджмента качества. Требования», направлен на применение «процессного подхода» при разработке, внедрении и улучшении результативности системы менеджмента качества в целях повышения удовлетворенности потребителей путем выполнения их требований [4].

Для успешного функционирования предприятия АПК должны осуществлять управление многочисленных взаимосвязанных видов деятельности. В полной мере выше сказанное может быть применено к рассмотрению безопасности отраслевых автотранспортных систем.

В рассматриваемом случае, объектом выступает отраслевая автотранспортная система АПК, которая включает в себя совокупность элементов, выполняющих различные функции. Применение системного подхода, позволяет сформировать целевые показатели, направленных на обеспечение безопасности транспортного процесса. Системный подход является универсальной методологией управления сложными объектами и процессами, когда решаемая проблема содержит элементы как количественного, так и качественного характера. Развитие системных представлений, характеризуется постепенным переходом от простого к сложному – от структурных понятий к методам функционирования, которые определяют эффективность систем.

Для анализа опасностей технических объектов широкое распространение получила биотехническая система «человек – машина – среда» (Ч-М-С), которая объединяет входящие в нее элементы в единый комплекс, ориентированный на выполнение заданных функций. Система Ч-М-С включает в себя технические средства, людей и окружающую среду, взаимодействующие друг с другом. Основными элементами такой системы являются человек, машина, среда, а сложные процессы, происходящие между основными компонентами, нуждаются в управлении [5,6].

Технологическому процессу транспортных работ в АПК, как и любой технической системе также присущи эти свойства. Однако следует отметить, одну характерную особенность, объектом при выполнении транспортных работ выступает груз, который в силу присущих ему особенностей, может выступать как самостоятельным источником опасности и должен быть рассмотрен как отдельный элемент системы. Это особенно актуально, при рассмотрении технологических процессов, протекающих при перевозке опасных, крупногабаритных, тяжеловесных, наливных грузов. Следовательно систему Ч-М-С, при рассмотрении технологического процесса транспортных работ, представляется целесообразным дополнить еще одним элементом – «грузом», вместе с которым будет образована новая биотехническая система «человек – машина – среда – груз» (Ч-М-С-Г).

При рассмотрении вопросов безопасности выполнения транспортных работ основное внимание должно быть уделено системному подходу с учетом факторов, влияющих на показатели риска, т.е. анализу риска. Анализ риска при выполнении транспортных работ, может быть определен как процесс идентификации опасностей и оценки риска для людей, участвующих или не участвующих в технологическом

процессе, транспортных средств, грузов, сооружений, окружающей природной среды, а также других объектов.

Под риском при выполнении транспортных следует понимать ожидаемую частоту или вероятность возникновения опасностей определенного характера, или размер возможного ущерба (потери или вред, связанные с ранениями или гибелью людей, потери технико-экономического характера, экологический ущерб) от аварий или комбинацию этих величин [7].

Количественно риск, возникающий при выполнении транспортных работ, можно определить, как математическое ожидание величины нежелательных последствий. При этом следует признать, что определение математического ожидания ущерба от перевозки потребует нового подхода к формированию информационной базы. Таким образом, принимая во внимание все возможные виды опасных происшествий, вызванные нарушениями в системе Ч-М-С-Г и количественную оценку риска, математическое ожидание величины ущерба можно определить по следующей зависимости:

$$R_{i\bar{A}} = \sum_{i=1}^n P_i \cdot U_i ,$$

где  $P_i$  – вероятность возникновения  $i$ -го опасного события в системе Ч- М-С-Г;  $U_i$  - величина ущерба при  $i$ -ом событии.

Процесс зарождения и развития риска складывается под влиянием, различных факторов и условий, определяемых системой Ч-М-С-Г. Анализ системы позволяет выявить первопричины риска, заключенные в свойствах элементов системы. Вследствие возможности возникновения этих причин, технологический процесс выполнения транспортных работ находится в неустойчивом состоянии, т.е. риск является неизбежным.

В этих условиях безопасное функционирование системы, во многом определяется эффективностью информационного взаимодействия элементов системы. Как показали проведенные исследования, информация в системе Ч-М-С-Г, разноразмерна, разнопланова, разнонаправлена, формируется и передается, различными способами, но имеет одну важнейшую особенность – она снижает степень неопределенности системы и тем самым снижает существующие в ней риски, и следовательно, повышает безопасность.

Любая человеко-машинная система, в том числе Ч-М-С-Г, является одновременно и информационной системой, однако далеко не всегда она имеет целостную структуру, подчиненную целям и задачам основной системы [8]. В ходе проведенных исследований были выявлены основные проблемы, определяющие направления совершенствования информационного обеспечения: информация чаще всего связывает отдельные элементы системы, не обеспечивая системного информационного взаимодействия; информация зачастую неоправданно дублируется, что ведет к усложнению и удорожанию информационной системы; информационные системы не являются в полной мере адаптивными; информация должным образом не структурирована; используемые каналы передачи информации не всегда соответствуют уровню ее оперативности; человек, как один из основных получателей информации, перегружен этой информацией, зачастую информацией второстепенной, представленной в неудобной для восприятия форме, а следовательно не способен ее воспринимать правильно и в полном объеме.

Учитывая выше сказанное можно сделать вывод о том, что современные требования к безопасности автотранспортных систем требуют иного подхода к разработке и реализации информационного обеспечения человеко-машинных систем. В данном случае можно вести речь о комплексной информационно-коммуникационной технологии обеспечения безопасности и управлении транспортных работ в АПК.

Предлагаем дать следующее определение информационно-коммуникационной технологии обеспечения безопасности транспортных работ в АПК. Информационно-коммуникационная технология обеспечения безопасности транспортных работ АПК в системе Ч-М-С-Г - это процессы, методы поиска, сбора, хранения, обработки, предоставления, распространения информации в рамках этой системы, направленные на повышение безопасности их выполнения.

Термин «информационно-коммуникационные технологии», традиционно используют для определения компьютерных технологий, однако в рамках проводимого исследования, предлагаем использовать термин в широком понимании, с учетом охвата всей области создания, передачи, хранения и восприятия информации.

В рамках наших исследований, представляется целесообразным, рассматривать информацию как ключевой ресурс, позволяющий повысить безопасность транспортной системы. Термин «информация» происходит от латинского *informātiō* - разъяснение, представление, понятие о чем либо, а так же от латинского *informare* - придавать вид, форму, обучать; мыслить, воображать, таким образом информацию можно определить, как сведения, независимо от формы их представления, воспринимаемые человеком или специальными устройствами как отражение фактов материального мира в процессе коммуникации [9].

Международные стандарты дают такое определения понятия «информация»: знания о предметах, фактах, идеях и т. д., которыми могут обмениваться люди в рамках конкретного контекста (ISO/IEC 10746-2:1996) [10]; знания относительно фактов, событий, вещей, идей и понятий, которые в определённом контексте имеют конкретный смысл (ISO/IEC 2382:2015) [11].

Хотя информация должна обрести некоторую форму представления (то есть превратиться в данные), чтобы ей можно было обмениваться, информация есть в первую очередь интерпретация (смысл) такого представления (ISO/IEC/IEEE 24765:2010) [12].

В рамках проводимых исследований представляется целесообразным выделить свойства информации как самостоятельного ресурса, позволяющего повысить безопасность транспортной системы: вся информация должна быть четко структурирована; с помощью информационных продуктов должны решаться конкретные задачи безопасности отраслевых автотранспортных систем; информация позволяет получать необходимые знания для обеспечения безопасности перевозочного процесса; информация должна быть связана, с аналогичных свойствам традиционных ресурсов; информация дает возможность дополнительной свободе действий; ценность информации определяется ее ролью, при принятии конкретных решений; ценность информации возникает только тогда, когда она будет использована; информация снимает неопределенность; информация после потребления, может быть использована повторно, а так жн для иных целей; информация теряет или вовсе утрачивает свою ценность по мере того, как предоставляемое ей знание утрачивает свою актуальность; информация носит адресный характер; потребление информационного продукта требует детального анализа полученной информации.

Информация выступает условием принятия решений, но в системах безопасности она всегда, в той или иной степени, ограничена, в этом случае следует говорить о асимметричной (неполной) информации. Процесс принятия решений в условиях асимметричной информации имеет следующие особенности: риск практически неизбежен; прогнозы оправдываются не во всех случаях; возможно принятие ошибочных решений; ошибочные решения приводят могут приводить несчастным случаям; полностью избежать ошибок невозможно.

Исходя из выше изложенного, можно сделать вывод, что оптимизация информации в системе Ч-М-С-Г позволит снизить неопределенность и тем самым снизить риск. Установлено, что большинство ошибочных решений связано с недостатком информации. Получение такой информации может значительно снизить величину риска. При этом получение информации как правило требует, серьезных

затрат и ведет усложнению системы. Поэтому, чтобы определить количество необходимой информации, следует сравнить ожидаемые от нее предельные выгоды с ожидаемыми предельными издержками, связанными с ее получением.

Для анализа информационного взаимодействия элементов системы Ч-М-С-Г разработана информационная модель, в которой информация графически представлена в виде информационного поля, внутри которого находится сама система. Элементы системы являются одновременно источниками и потребителями информации.

В рамках предложенной модели проведена классификация информации в системе Ч-М-С-Г. Временные интервалы, связанные с получением и последующим использованием информации, предлагаем разбить на пять групп: долгосрочная, среднесрочная, текущая, оперативная и мгновенная. Разработанная модель предполагает интеграцию всей, даже совершенно разноплановой информации в единое информационное поле.

Каналы получения и передачи информации включают в себя: традиционные, интерактивные и дистанционные системы обучения; бумажный и электронный документооборот; компьютерные сети; проводная и беспроводная связь; звуковая сигнализация; визуальная и световая сигнализация; беспроводные каналы обмена информацией.

Как показали проведенные исследования, формирование, передача, хранение и использование информации в оперативном и мгновенном временном интервале должно базироваться на современных телематических средствах, в основу которых положено применение оборудования глобального позиционирования на основе спутниковых навигационных систем ГЛОНАСС-GPS, передачи полученных данных через интернет по каналам GPRS, использование сетевых технологий, применение технологий бесконтактного обмена информацией объектов транспортной системы, транспортно-телематического оборудования.

Для реализации информационного обеспечения безопасности отраслевых транспортных систем можно выделить следующие направления применения средств безопасности на основе информационных, транспортно-телематических технологий: системы глобального позиционирования транспортных средств; устройства голосовой связи в экстренных случаях; тревожная кнопка; ЭРА ГЛОНАСС; контроль за состоянием груза во время рейса; мониторинг критических параметров движения автомобиля; контроль режима труда и отдыха водителя; оперативный контроль за утомлением водителя на основе физиологических параметров; контроль трезвости; контроль за движением по маршруту; нахождение автомобиля на опасных объектах; мониторинг режимов движения транспортного средства; оперативная информация о дорожной обстановке; оперативное реагирование на критическое изменение параметров технического состояния транспортного средства, обеспечивающих безопасность дорожного движения; оперативное реагирование на аварийные ситуации в улично-дорожной сети; мониторинг экологической безопасности транспорта.

Как показал проведенный анализ, применение средства безопасности на основе транспортно-телематических технологий за последнее время заметно расширилось, однако, применяемые устройства имеют как правило направленность, ограниченную узким кругом функций, реализованных в отдельных устройствах, при этом их огромный потенциал возможно эффективно использовать только на основе комплексного подхода, в рамках системы человек-машина-среда-объект [7,13]. Предпосылками реализации информационных технологий безопасности отраслевых автотранспортных систем комплексно, обусловлена тем, что существующая на сегодняшний день практика самостоятельного рассмотрения вопросов по различным направлениям безопасности не всегда оправдана как с точки зрения технологии транспортного процесса, оптимизации управления, в том числе управления рисками, кадрового обеспечения, так и с точки зрения экономической целесообразности.

Опираясь на проведенные нами исследования, можно сделать следующие выводы: комплексный подход в управлении перевозочным процессом в АПК на основе информационного обеспечения, снижает степень неопределенности системы и повышает безопасность транспортных работ; системы сбора, обработки, хранения и использования информации должна обеспечить возможность ее функционирования с заданными параметрами безопасности, т.е. допустимым уровнем риска в системе.

### БИБЛИОГРАФИЯ

1. Постановление Правительства РФ от 14 июля 2012 г. N 717 № «Государственной программе развития сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия на 2013 - 2020 годы» (с изменениями и дополнениями), // «Собрание законодательства РФ», 14.08.2012, № 15, ст. 1691.
2. Агрпромышленный комплекс России. Итоги 2016 года. Перспективы развития в 2017 году (аналитический отчет) - Режим доступа: <http://arcobaleno.ru.livejournal.com/16328.html>. (дата обращения 20.11.2017).
3. Мумладзе Р.Г. Основы логистики в АПК: учебник - М.: РУСАЙНС, 2016. - 328 с.
4. ГОСТ Р ИСО 9001.2008 «Системы менеджмента качества» Режим доступа: [https://www.vyatsu.ru/uploads/file/1408/gost\\_r\\_iso\\_9001\\_2008.pdf](https://www.vyatsu.ru/uploads/file/1408/gost_r_iso_9001_2008.pdf) (дата обращения 18.11.2017).
5. Гальянов И.В., Студенникова Н.С., Тимохин О.В. Травматизм сельских жителей на производстве и в быту // Вестник аграрной науки. - 2017. - № 3 (66). - С. 164-172.
6. Гальянов И.В. Виды и причины несчастных случаев с тяжелыми последствиями в сельском хозяйстве и основные направления их предупреждения / Национальные интересы: приоритеты и безопасность. - 2015. - № 27 (312). - С. 47-60.
7. Трясцин А. П. Формирование комплексной технологической безопасности автотранспортных систем // Мир транспорта и технологических машин». - 2013. - №3 (42). - С. 89-95.
8. Винер Н. Кибернетика, или управление и связь в животном и машине. Кибернетика и общество. - М.: Наука, 1983. - 344 с.
9. Когаловский М. Р. и др. Глоссарий по информационному обществу / Под общ. ред. Ю.Е. Хохлова. - М.: Институт развития информационного общества. - 2009. - 160 с.
10. ISO/IEC 10746-2:1996, Information technology - Open Distributed Processing - Reference Model: Foundations.3.2.5: knowledge that is exchangeable amongst users about things, facts, concepts, and so on, in a universe of discourse Режим доступа: <https://www.iso.org/standard/18836.html> (дата обращения 20.11.2017).
11. ISO/IEC 2382:2015 Information technology - Vocabulary: knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts, that within a certain context has a particular meaning Режим доступа: <https://www.iso.org/standard/63598.html> (дата обращения 20.11.2017).
12. ISO/IEC/IEEE 24765:2010 Systems and software engineering - Vocabulary: Although information will necessarily have a representation form to make it communicable, it is the interpretation of this representation (the meaning) that is relevant in the first place Режим доступа: <https://www.iso.org/standard/50518.html> (дата обращения 20.11.2017).
13. Трясцин А.П., Баранов Ю.Н., Данилина О.Н. Методологические аспекты системного анализа опасностей при эксплуатации мобильных самоходных машин сельскохозяйственного назначения // Вестник АПК Верхневолжья. - 2009. № 3. С. 77-80.

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**THE IMPORTANCE OF BUREAUCRACY STRUCTURE FACTOR  
IN THE IMPLEMENTATION OF MINIMUM STANDARD OF HEALTH SERVICE  
IN CENTRAL JAVA PROVINCE, INDONESIA**

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**ABSTRACT**

This paper examines the phenomenon of incompatibility of the institutional structure of Regional Public Hospital which causes the disruption of the achievement of Minimum Service Standards (MSS) indicator in the health sector, especially maternal health in the Provincial Government of Central Java. In Central Java, the largest number of maternal mortality rate was in the hospital in 2015 amounted to 85.71%. Meanwhile, the coverage rate of delivery assisted by health personnel in accordance with the indicator of MSS is 98.09%. In 2015, Central Java is the province with the second highest national of maternal mortality rate case amounted to 619 cases. The Provincial Government as the coordinator of MSS implementation in the region through the Bureau of Pemotda and the Cooperation of Regional Secretariat of Central Java has a significant role in the successful implementation of the Regulation of Minister of Health 43/2016 on MSS in Health Sector. In which MSS has a function to observe the implementation of health program in the region. This research uses a qualitative approach, the type of research is a case study and interactive model analysis from Miles, Huberman, and Saldana. The results of the analysis show that the implementation process of the policy in Bureau of Pemotda and the Cooperation of Regional Secretariat of Central Java has not run well obstructed by bureaucratic structure factor. It can be seen from the unfulfilled policy objective which is to provide convenience to local government in the preparation of planning document on the achievement of health MSS indicator. Although health MSS is achieved, it will not be able to reduce the maternal mortality rate.

**KEY WORDS**

Bureaucracy structure, minimum service standards, health.

Public Administration is an important instrument in realizing the goals of the state. Furthermore, the process in the administration public will result in public policy products. The RPJMD of Central Java Province in 2013-2018 shows that the health is a major problem, in accordance with the data of Central Java Health Profile (2015: 12-18) which indicates high maternal mortality rate amounted to 111.16 per 100,000 of live birth (KH) with 619 cases in 2015 and the second highest nationwide (Kemenkes, 2016). Meanwhile, the achievement result of health MSS in the same year obtaining the result that the coverage of delivery assisted by health personnel was high enough to reduce the maternal mortality rate. The phenomenon in the Provincial and Regency/Municipal Government is that the implementation of Permenkes 43/2016 on MSS of Health Sector is partly integrated into planning and budgeting documents, but not in accordance with the stages of achievement of MSS indicator. Thus, the maternal health services are not optimal.

The frontliner of the MSS implementation in the region should not only involve the community health center but also the Department of Health Affairs, Hospital, and other health service providers. In addition to the institution of technical function, the optimal coordination

with the institution of coordination function namely Bureau of Pemotda and the Cooperation as the coordinator of the implementation of health MSS in the region. In accordance with Government Regulation 18/2016 on Regional Government Agency article 43 states that "there is Regency/City of Technical Implementation Unit (of a government body) (UPTD) in health sector in the form of Regency/City of Regional Public Hospital and community health center as the organizational unit with functional nature and service unit working professionally". Thus, Hospital as the functional implementer of health affair works under the Department of Health Affairs. Where previously the status of the Hospital is parallel to the Department of Health Affairs as a Regional Technical Institute that is directly responsible to the Regional Head.

Under the parallel condition alone cannot overcome the problem of maternal mortality, where the highest maternal mortality occurred in the Hospital amounted to 85.71% in 2015 (ekib.dinkesjatengprov.go.id, 2015). Furthermore, with the institutional change where the Hospital has to be under the Department of Health Affairs affecting the budgeting mechanism. It is well known how complex the of structural needs and budgeting of a Hospital. According to the data of Health BPJS of 2014, the childbirth was ranked on number 2 from the top 10 inpatient cases nationally and ranked on number 4 of top 10 inpatient claims that requires a substantial cost. This shows the significant role of the Hospital as the determinant of the successful achievement of health MSS target, especially maternal health indicator. The management of the institutional structure has the function to eliminate the power in one health affairs in the region, thus coordination of the implementation of health affairs in accordance with the Regulation of the Minister of Health 43/2016 on MSS of health sector can be achieved.

This study discusses the implementation process of MSS based on Regulation of the Minister of Health 43/2016 on MSS of health sector at the coordination function that is in Bureau of Pemotda and the Cooperation of Regional Secretariat of Central Java Province as the coordinator of the implementation and achievement of MSS in the region. "Implementation is essentially an effort to understand what should happen after the program in the policy implemented" (Sugandi, 2011: 88), thus the implementation plays an important role in the process that occurs between the policy and its purpose. There are two research questions in this study. Firstly, how is the implementation process of Regulation of the Minister of Health 43/2016 on MSS of Health Sector in Bureau of Pemotda and the Cooperation of Regional Secretariat of Central Java? Second, what are the inhibiting factors on the process Implementation of the policy?

## LITERATURE REVIEW

"The journey of public administration cannot be separated from politic as part of the public dynamic" (Sugandi, 2011: 1). Dimock and Fox (1983) in (Ibrahim, 2013: 15) state that "Public administration is produced of good service designed to serve the needs of citizen-costumers". This is in accordance with the principle of policy concerning health as the service of basic needs for the society. In Indonesia, its implementation must be guided by MSS of health sector set by the Central Government in accordance with Article 18 of Law 23/2014 on Regional Government. Subsequently followed up by the Ministry of Health, through Minister of Health Regulation 43/2016 on MSS of Health Sector. Graham and Hays (1986) in (Ibrahim, 2013: 15) mention "In ordinary usage, public administration is a generic expression for the whole bundle of activities that are involved in the establishment and implementation of public policy". In which the public administration is the whole activity related to the formation and implementation of public policy. Similarly, for the preparation of policy on MSS of the health sector in Indonesia, such activities are part of the public administration up to its implementation.

In accordance with Anderson quoted by Wahab, "formulating the policy as a step of action that is intentionally done by an actor or a number of actors with regard to the existence of a problem or a particular problem that is currently facing" (Wahab, 2004: 3). "The uniqueness of public administration lies on the foundation of the science of administration

itself, namely politic and public policy. The uniqueness of decision-making that follows the direction of power” (Sugandi, 2011: 65). Anderson (1987: 22-42) says that “public policies are developed by governmental bodies and official,” it can be interpreted that public policy is “policies developed by government agencies and officials”.

Dye (2011) in Nugroho (2017: 539), attributes the notion of policy to the process of policy analysis, namely "a series of intellectual activities undertaken in the policy-making process and visualized as a series of interdependent stages arranged according to time". The arrangement of the policy process, as shown below:

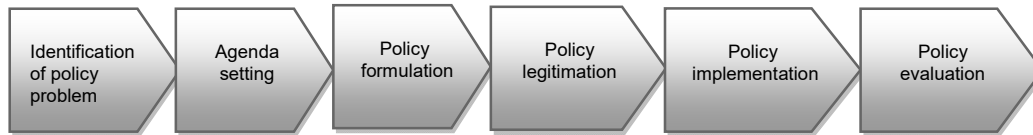


Figure 1 – Dye Policy Process

Model is the tool or concept created to facilitate us in reviewing the public policy. Unlike the theory in which its validity has been proven through empirical testing, although the model has not yet become the empirical theory, the model can still be used as the guidance in the research (Brodbeck, 1959: 374) in (Winarno, 2016: 35). “Implementation is a crucial stage in the policy process” (Ripley and Franklin, 1982, in Tarigan, 2000: 14; Wibawa et al., 1994: 15). This is in accordance with the statement of Edwards III (1984: 1) that "without effective implementation, the decision of the policymaker will not be carried out properly". According to Sugandi (2011: 88) “it is essentially an effort to understand what should happen after the program in the policy implemented., so all parties should have the same opinion, there should not be a difference in the perception to achieve the goals”. Regulation of the Minister of State for the Empowerment of State Apparatus Number PER/04/M.PAN/4/2007 concerning General Guidelines for Formulation, Implementation, Performance Evaluation, and Revision of Public Policy in the Environment of Central and Regional Government Institutions, in the general sense stating that the policy implementation is “the activity or process of implementation or application of the established public policy”.

George Edward III (1980: 1) asserts that the main problem of public administration is the lack of attention to the implementation. The policy implementation model developed by George C. Edward III has a top-down perspective. Edward III (in Agustino, 2008: 149-154) named his public policy implementation model with Direct and Indirect Impact on Implementation. Edward requires four key issues for effective implementation of the policy, "communication, resource, disposition or attitudes, and bureaucratic structures". Model is the tool or concept created to facilitate us in reviewing the public policy:

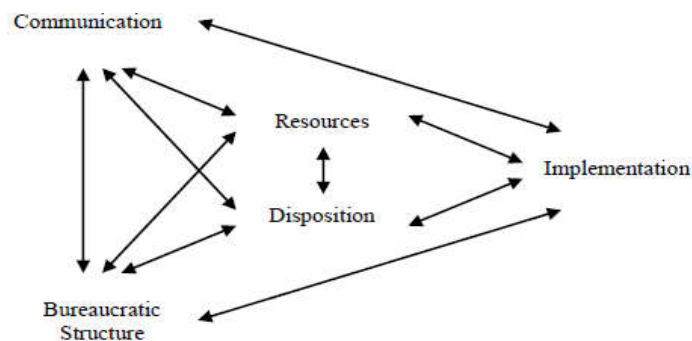


Figure 2 – Edward III Policy Implementation Model

Some policy experts have their own opinion on the determinant of the success of a policy implementation. One of the models has the character of policy implementation identified to have the pattern of top-down, bottom-up, enforced mechanism dan market mechanism. The implementation of the top-down model is “the process where its



implementation from the vertical and centralized side following the bureaucratic hierarchy” (Hill, 2009) in Yuliani (2011: 5). “Formulation of the policy is made by the high level of the state institution, the policy implementation and evaluation are conducted by the implementer of institutional bureaucracy” Sabatier, 1986) in Yuliani (2011: 5). According to Berman (1980) and Hill (2009) in Yuliani (2011: 12-13), the weakness of the top-down model is that “the complex social reality and its own policy affecting many sectors and involving organizations, actors, and bureaucratic level with different goals, interests, and resources “. It proves that it is impossible for one policy to succeed if it is only implemented by a single government agency.

According to Nugroho (2017: 754) enforced mechanism: command and control are to prioritize the importance of public institution as the sole institution with the power to monopolize on the forced mechanism in the country without incentive mechanism for the implementation, but there is sanction for those who refuse to implement or violate it. In line with the definition in the Complete Dictionary of Law (2012: 56), the enforced mechanism is supervised by the scheme of making rules and conducting inherent supervision. This mechanism will be less effective if it is lacking supervision and availability of resources in the (Aziz, 2010: 63). Meanwhile, the model of market mechanism: economic incentives according to Nugroho (2017: 754) is a model that prioritizes incentive mechanism for those who implement it but no sanction or incentive will be given to those who do not implement it.

## **METHODS OF RESEARCH**

The research method used in this research is qualitative, where the researcher has the nature of emic in collecting data, based on the perspective of the data source not the perspective of the researcher (Sugiyono, 2015: 6). The type of the research is a case study. Arikunto (2002) in (Gunawan, 2015: 116) state that “the case study method is one of the kinds of descriptive approach, a detailed, in-depth incentive study of a particular organism (individual), institution or a certain symptom with a limited area or subject “. Data were collected through interview, observation, and documentation. This case study is based on existing theories. The position of utilization of existing theory is intended to determine the direction and focus of the research (Gunawan, 2015: 123).

The data analysis technique of this research is interactive Model of Miles, Huberman, and Saldana (2014), “the activity of data analysis consisting of three activities path that happened simultaneously namely: condensation data, data presentation, and conclusion/verification”. The data found are tested by analyzing and clarifying them with the model implementation of George C Edward III, top-down, enforced mechanism, and market mechanism. Afterwards, validity testing is done with the field source and method, as well as the discussion. The conclusion is interpreted from verification tailored to the data and studies obtained during the research.

## **RESULTS AND DISCUSSION**

The implementation of MSS of health sector through Regulation of the Minister of Health 43/2016 is a top-down implementation. In accordance with the implementation model of George C Edward III, one of the characteristics of the top-down model is the National Strategic Program policy set by the Central Government, namely the Ministry of Home Affairs and the Ministry of Health. Containing clear guidelines: standard, target, and standard rule, as in appendix Regulation of the Minister of Health 43/2016. Meanwhile, the implementation process of Regulation of the Minister of Health 43/2016 on MSS of health sector has not reached its objective. The reason is that it has not been able to facilitate for the region in making the planning of achieved target of MSS in the health sector in the Regency/City in its planning document, either in the Bureau of Pemotda and the Cooperation, Department of Health Affairs, Community Health Center and Hospital.

This MSS of health sector implements the enforced mechanism and market mechanism model. Where there will be incentive/reward from Special Allocation Fund of

National State Budget (in accordance with the attachment of Regulation of the Minister of Health 43/2016) for those who implement it, and there will be sanction (according to the Article 68 of Law 23/2014 on Regional Government) for those who do not implement, violate or not reach the target. Limited surveillance and resource systems such as the location of the case study, resulting the Province and Regency/City in the Central Java face many difficulties in arranging the target and achievement of MSS in the health sector in the case of its planning document. Target and achievement that have been integrated into the planning document cannot leverage the achievement of MSS of the health sector. Where appropriate, with a top-down policy implementation model, the Central Government only uses forced mechanism. Health is the basic rights that should be provided by the government for its citizen, in which it does not need an incentive in its implementation. On the other hand, the sanction should be given to the local government that has not been providing health services to their citizen optimally. To this day sanction has not been implemented well. Using two mechanisms at once has caused the implementation process of MSS of health sector less effective.

Table 1 – Data Presentation

| Focus                  | Data source  | Result   |
|------------------------|--|--|
| Communication          | Interview: Coordination Function (Bureau of Pemotda and the Cooperation) and                         | Socialization, training has not been able to improve the understanding of human resources in the structure of coordination function and technical function;<br>The difference of unit or coordination of MSS between Regency/City and between Province and Regency/City              |
| Resources              | Technical Function (Provincial Department of Health Affairs and Tugurejo Hospital); Observation; and | Lack of the number and quality of human resources where it keeps changing both in coordination and technical function;<br>Development and information are not evenly distributed;<br>Lack of Health Equipment for Maternal's Health;<br>Health budget allocation is still below 10%. |
| Disposition            | Document   | Appointment of bureaucrats has not adjusted to the professional ability of its officials;<br>Reward and punishment are not executed for the achievement of MSS.  |
| Bureaucratic Structure |  | MSS team has not worked according to tupoksi: no follow-up on technical function;<br>There is no SOP on MSS of health sector;<br>Fragmentation occurs: there is no cooperation between institutions of coordination and technical function.  |

Communication, effective implementation requires not only clear communication but also consistent communication. A good transmission process with the inconsistent order will cause confusion among the implementers. The detailed and complex requirements of MSS complicate the implementing apparatus and the field apparatus which generate large budget projections. This will eventually cause the policy not optimally implemented. Furthermore, the SPM and Provincial/District Officers are not synchronized complicating the delivery of the information regarding the Regulation of the Minister of Health 43/2016 clearly, appropriately with mutual understanding. Transmission issues at Bureau of Pemotda and the Cooperation occur when the policy to be implemented must go through a layered structure of the bureaucratic without available adequate communication channels (resources). In the implementation of the MSS, the implementer is divided into technical and coordination function. The communication between these two functions (Bureau of Pemotda and the Cooperation, Department of Health Affairs and Hospital) has not been built comprehensively.

Resources, the ability of the Bureau of Pemotda and the Cooperation in implementing the policy requires resources, namely: 1) staff, which is still very lack of staff in Subbag Urpem and MSS of Bureau of Pemotda and Cooperation in terms of quality, quantity and the presence of turnover of the highly dynamic apparatus; 2) information, Regulation of the Minister of Health 43/2016 has clearly stated as well as the Operational manual and Technical manual; 3) authority, this has not been used maximally by Bureau of Pemotda and the Cooperation as coordinator of the MSS implementation; and 4) facilities, it is not yet available with sufficient health financing, which is used to fund facilities, infrastructure, and health equipment as well as internet networks. Including the financing through health care providers, where hospitalization cost is usually very high.

Disposition, implementation is determined by the disposition according to Goerge C. Edward III (in Agustino, 2008: 152-154), namely the recruitment of official and incentive. Where incentive is one of the strategies for policy implementation to run according to policy objectives. Thus, when the reward in the form of incentive from the central government (DAK) is not executed resulting in the region only to report the achievements of MSS. The existence of structural changes both in institutional and apparatus, complicate its implementation. The placement of officials on certain structures must also be paid attention to the professional skill and professional skill of the official on the occupied position.

Bureaucracy Structure, the Implementation Team of MSS Achievement has not worked according to tupoksi: No follow-up from the preparation of MSS Team; There is no SOP, which regulates the MSS reporting, the performance of MSS staff and the coordination of MSS at the Provincial level; and there is no synergy cooperation between the coordination agency (Bureau of Pemotda and the Cooperation) and technical function (Department of Health Affairs and Provincial Hospital). Up to this day, they are only guided by the regulation of each Ministry which is very technical. The government should prepare the Standard Operating Procedures (SOP), both technical and non-technical (coordinative function). This leads to fragmentation or sectoral ego, in Central Java Province there is fragmentation between coordination function and technical function in which the coordination does not work at all. For example, the current condition between Hospital and Department of Health Affairs where the other has technical function constrained by the coordination due to the institutional change of the Hospital against the Department of Health Affairs. Not to mention the coordination with other coordination functions namely the planning and supervisory agencies. They maintain the function sector and deny the effort of policy coordination in the implementation of MSS health program. The worst consequence of bureaucratic fragmentation is inhibition of coordination. In fact, the top-down distribution of authority from the central government comes from different functions, namely Ministry of Home Affairs and Ministry of Health, thus to implement complex policy requires coordination. In general, greater coordination will reduce the possibility of successful implementation of Regulation of the Minister of Health 43/2016 on MSS in Health Sector.

The implementation of Regulation of the Minister of Health 43/2016 on MSS of Health Sector, the study case in Bureau of Pemotda and the Cooperation of Regional Secretariat of Central Java: communication in the coordinator institution and technical implementation of MSS achievement in health sector, lack of human resources and budget, appointment of bureaucratic officials professional and the absence of SOP in the coordination and technical implementation of MSS in health sector, causing fragmentation between coordination function and technical function. In the end, the implementation of MSS health will not succeed.

## **CONCLUSION**

Implementation process of Regulation of the Minister of Health 43/2016 on MSS of Health Sector in Bureau of Pemotda and the Cooperation of Regional Secretariat of Central Java has not run well due to several inhibited factors such as: (1) there is no mutual understanding in the communication between coordinator institutions and technical implementer of MSS of health sector; (2) lack of human resources and budget; (3) appointment of bureaucrats has not adjusted to the professional ability of its officials; and (4) there is no SOP in the coordination and technical implementation of MSS of health sector.

## **REFERENCES**

1. Abdul Wahab, Solichin, 2002. Analisis Kebijakan: Dari Formulasi ke Implementasi Kebijakan Negara. Jakarta: Sinar Grafika.
2. Agustino, Leo, 2008. Dasar-Dasar Kebijakan Publik. Bandung: Alfabeta.
3. Aziz, Iwan J, 2010. Pembangunan Berkelanjutan: Peran Dan Kontribusi Emil Salim. Jakarta: Kepustakaan Populer Gramedia.

4. Dinas Kesehatan Provinsi Jawa Tengah, 2015. Profil Kesehatan Provinsi Jawa Tengah Tahun 2015. Semarang.
5. Edward III, George C., 1980. Implementing Public Policy. USA: Congressional Quarterly Press.
6. Gunawan, Imam, 2015. Metode Penelitian Kualitatif Teori & Praktik. Jakarta: Bumi Aksara.
7. Ibrahim, Amin, 2013. Pokok-Pokok Administrasi Publik Dan Implementasinya. Bandung: Refika Aditama.
8. Kementerian Kesehatan Republik Indonesia, 2016. Profil Kesehatan Indonesia Tahun 2015, Jakarta: Kementerian Kesehatan RI.
9. Kementerian Sekretariat Negara, t.t. Undang-undang No. 23 Tahun 2014 tentang Pemerintahan Daerah. Jakarta.
10. Peraturan Menteri Kesehatan No. 43 Tahun 2016 tentang Standar Pelayanan Minimal Bidang Kesehatan. Jakarta.
11. Maribun, Rocky, 2012. Kamus Hukum Lengkap: Mencakup Istilah Hukum Dan Perundang-Undangan Terbaru. Jakarta: Visi Media.
12. Miles, Matthew B., A. Michael Huberman, dan Saldana, 2014. Qualitative Data Analysis: A Methods Sourcebook. SAGE Publication.
13. Moeloek, Nila Farid, 2016. Kebijakan Pembangunan Kesehatan, Rapat Kerja Kesehatan Nasional, Jakarta: 5 April 2016.
14. Nugroho, Riant D., 2017. Public Policy: Dinamika, Analisis Kebijakan, Manajemen Politik, Etika dan Kimia Kebijakan Publik. Jakarta; PT. Elex Media Komputindo.
15. Sugiyono, 2015. Metode Penelitian Kuantitatif, Kualitatif, Dan R & D. Bandung: Alfabeta.
16. Winarno, Budi, 2016. Kebijakan Publik Era Globalisasi Teori, Proses dan Studi Kasus Komparatif. Yogyakarta: Center Of Academic Publishing Service.
17. Yuliani, Sri, 2011. Model Implementasi. Surakarta: FISIP UNS.

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## THE INFLUENCE OF SEXUAL VIOLENCE CODE EXPOSURE TOWARD PARENTS' COGNITION ROUTES

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### ABSTRACT

Messages and sign have certain influence toward humans' cognition, yet different person might perceive them differently. Persuasive message appears to be one type of messages which has the strongest potential in modifying ones' behavior. Children and anything about them are parents' biggest proximity. Regarding to the massive exposure of sexual violence cases happened to children, parents demand access to know more information on this issue. This research is intended to see the effect of the exposure on news about sexual violence in children toward cognition route of parents who have daughters, and to see if there is any different cognition route between fathers and mothers in perceiving news related to sexual violence on children. This research employed an experimental method using the one group pre-post test design. This research involved 15 parents who have daughters who were chosen using an accidental sampling method. This reseach was conducted in the computer laboratory of FISIP UB. Sexual violence codes were displayed in some videos which showed some news on sexual violence happened to children. After that, an instrument in the form of central code and peripheral cognition route scale which was developed from the elaboration likegood model (ELM) was given to the samples in the form of questionnaires after they watched some persuasive messages. The results of the data were analyzed using t-test of SPSS 22.0 program. The result of this reseach shows that there is an effect of sexual violence news toward parents' congition route at 0.820 in a level of significance 0.000, while the congition route of mothers shows higher mean value at 104.66 than fathers at 91.73.

### KEY WORDS

Code message exposure, sexual violence, cognition route, parents.

Women and children are stigmatized to be the weak group among the society in Indonesia. It can be seen from the presence of the protection of women and children and other non-government organizations that focus on this issue. Domestic violence is often blown up on the media, highlighting on the poor condition of women and children as the victims. Moreover, mass media also put spotlight on the news of sexual violence happen to children in some parts of Indonesia. According to the national commission of women and children, case of domestic violence tends to increase in these past years. In 2015, as many as 321.752 case of domestic violence were recorded which is significantly higher than the number of domestic violence in the previous year 232.220 cases (MAP Corner-Klub MKP UGM, 2016). Jacob Oetama (*Perpektif Pers Indonesia*) stated that "news is not a fact, but it is a report of a fact". Thus, the high requence of news on sexual violence to children reflects the real condition in the society. Even more, the condition is rather like an ice berg phenomena, in which the cases exposed by the media are merely a small part of the real condition in the field (Fauziah, Luluk – *Pusat Pelayanan Terpadu Pemberdayaan Perempuan dan Anak (P2TP2A)* Sidoarjo – 2015).

The frequent news on the matter has a high proximity for parents since parents hold the duty to protect their family. Hence, news about sexual violence happened to children can be classified as persuasive news for parents, especially those who have daughters. Persuasive news has certain effect on humans' behavior. Based on the theory on the Elaboration Likelihood Model (ELM), the effect is caused different cognition among individuals in perceiving certain messages.

ELM provides a general framework as a guide to manage, classify and understand the basic process of an effective persuasive communication. There are two different routes of a persuasion (Petty, 1977; Petty & Cacioppo, 1978). The first route is obtained by individuals who are very careful and considerate in filtering certain information given to them (central route). The second one is obtained as the result of perceiving signs and other attractive persuasion with less detail in analyzing the real fact (peripheral route). ELM is often applied in psychotherapy and counseling model (Cacioppo, Petty & Stoltenberg, 1985; Petty, Cacioppo & Heesacker, 1984) and in creating advertisement to increase sales (Cacioppo, Petty, 1985; Petty & Cacioppo, 1983a, 1984b; Petty, Cacioppo & Schumann, 1984), besides it is also used in political acts or communication attempts by politicians.

Socio-psychologic transition has resulted a review on communobiology field which according to Littlejohn & Foss (2009, h.964) consists of three big branches which are: behavior, cognition, and biological domain. The term communobiology refers to a study on communication seen from biology point of view (Littlejohn dan Foss, 2009, h. 65).

Different social construction between men and women has raised a view that men tend to think rationally, while women are rather irrational in perceiving certain reality. The psychological condition of women that creates emotional behavior and thoughts was used as the starting point to begin this research in comparing the cognition routes between men and women in perceiving persuasive news with strong proximity related to their role as parents of their daughters. This research also intended at analyzing the effect of frequent news on sexual violence happened to children toward their cognition routes. In addition, this research was also done to find out if there were any differences on cognition routes of fathers and mothers in perceiving the news.

## LITERATURE REVIEW

*Message codes and cognition route.* Elaboration Likelihood Model is a theory that focuses on the change of human behavior triggered by the use of cognition route in receiving stimulus in the form of message. Different cognition routes lead to different effects of a certain persuasive message; either it leaves temporary effect or permanent effect.

“... ELM (Petty & Cacioppo; 1981a) *which believe provides a fairly general framework for organizing, categorizing, and understanding the basic process underlying the effectiveness persuasive communication*” (Richard E. Petty and John T Cacioppo; 1986 – 125).

Persuasive attempts that generate permanent effect are better than the ones that leave temporary effects. Previous reseach have shown a proposition that permanent effects are obtained out of ones' ability to think critically and rationally.

This theory is commonly applied in psychotherapy and counseling (Cacioppo, Petty & Stoltenberg, 1985; Petty, Cacioppo & Heesacker, 1984), and in designing advertisement and sales (Cacioppo & Petty, 1985; Bitner. May J. & Obermiler. Carl, 1985; Petty & Cacioppo, 1983a, 1984b; Petty, Cacioppo & Schuman, 1984). This theory was also used in medical field to generate effective communication in heath promotion for behavior modification by Richard E Peety, Jamie Barden and Christian Wheeler. Especially within the interrelationship of congition routes, comprehension on messages and behavior change (Helweg. Larsen dan Collins, 1997; McNair, 1991) are the indicators to describe the strength of certain behavior such as self-esteem which needs to be measured (Petty and Krosnic, 1995).

ELM is a general framework to manage, classify, and understand the basic process in creating high effectiveness of a persuasive communication. There are two different routes of a persuasion persuasi (petty, 1977; petty & Cacioppo, 1978). The two routes deal with the cognitive process in perceiving certain message (Petty dan Cacioppo ,1986, h. 131). It has been known that by enhancing motivation, the central route puts more emphasize on the argumentation of certain problem, while peripheral route works when the ability is limited and the behavior is likely influenced by positive or negative signs within a persuasive context. Those two routes are directly associated with where the message is stored and how ones create simple conclusion to measure the validity of a message.

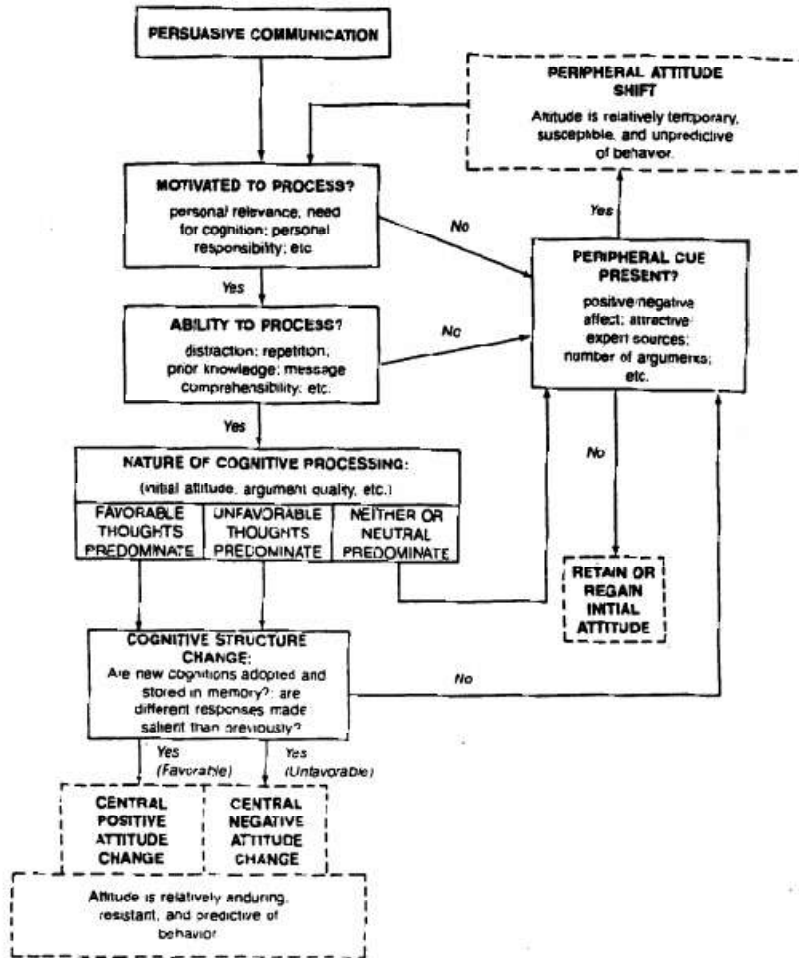


Figure 1 – Central and peripheral routes to persuasion (adapted from Petty, 1977; Petty & Cacioppo, 1978, 1981a)

There are three variables that influence the strength and the orientation of human behavior which are: (a) the presence of persuasive argument, (b) the presentation of a message as a peripheral sign (c) the expansion of the scope and the orientation of the argument. Based on the result of previous research, simple and easy-to-understand message appears to be the strongest factor that determines the effectiveness of a persuasive argument. Peripheral signs are affectively influential and it is later associated with the behavioral objects. Similar to compelling and impelling acts which are believed to contain peripheral signs, rules and inferences are also considered as kinds of peripheral signs (h. 134). A research on information processing has a strong correlation with verbal stimulus and focus of central processing upon the content of a message (Rader, 1994 h.1). other variables that are frequently used in designing an advertisement are colors, shapes, motions, sounds, visualization, images and music. Musical arrangement also influences information processing through awareness, attention, distraction and retrieval (Alpert & Alpert, 1990; Scott, 1990).

Study on message codes embraces three major topics including (1) source cue studies, (2) message cue studies, (3) additional cue studies which each has its own condition. Meanwhile, peripheral factors which are often used as to explain behavior change are: (1) social evidence, (2) benefits gained, (3) scarcity, (4) persuaders' credibility, (5) returning the favor, and (6) authority (Griffin 2003, West and Turner 2008, O' Keefe 1990, Larson 2006). In this research, the researchers employed message cue and additional cue without using the source cue.

*Parents and gender stereotyping.* Among adults, generally they perceive parenting as a duty that should be well-planned and it should be coordinated with other roles, besides it is also expected to develop according to individuals' economic state. In a family, parents have a major influence to the children since children spend most of their time at home. Parents hold the duty to educate their children. In this context, generally, parents are also responsible in maintaining their children physical health by providing good food and good life. Parents always try to give attention and affection to their children which attention comes out of centralization or concentration of individuals' activity directed at an object or at some objects. Attention can be seen from (Walgito, 2010): (1) the source of attention; (2) the number of object covered by an attention within a certain period of time; (3) the scope of the attention; (4) the fluctuation of the attention.

Identifying the role of gender should start by defining the term gender itself. The term gender is also associated with sex (Echols and Hassan Shadily, 1995). Gender is a socio-cultural and psychological dimension of women and men, while sex refers to the biological dimension owned by men and women. The role of gender as stated by Wilson in Khanafi, in a broader scope "*gender is a basis for beginning the different contributions that man and woman make to culture and collective life by distinction which they are as man and woman.*" (Wilson, 1989: 2).

The strong socialization has shaped a gender ideology through organizational social construction (Fakih, 2008). Women are constructed as creatures who are in need of protection, dependant, irrational, emotional, and so on. The concept of this gender has created differentiation in the role of gender within a family which puts the women or wives to hold their role within a narrow domestic scope to take care of households. Whereas, men are put in public scope to make living. Gender stereotyping also covers broader scope which reflects ones' belief on appropriate behavior that should be shown by women and men (Santrock, tt: 197) including the role differentiation in taking care of children.

#### *Research Hypothesis*

H<sub>1</sub>: there is an effect of sexual violence code message exposure toward parents' cognition routes;

H<sub>0</sub>: there is no effect sexual violence code message exposure toward parents' cognition routes.

## **METHODS OF RESEARCH**

The researchers were interested in knowing if there was any effect of news on sexual violence happened to children toward the congition routes of fathers and mothers. This research was done under the quantitative approach using experimental method. Experiment method was used, in which the researchers gave certain treatment or manipulation on one or more variables in a certain way that it influences other treatment in the measurement (Michael, 1977: 24). Variable refers to a concept that has variation of values. The identifitication of variables in this research were: independent variable (X): Sexual Violence News; and dependent variable (Y): Cognition Route.

#### *Operational Definition:*

Code message is a factor that influences the degree of behavior change related to sexual violence including (a) the presence of persuasive argumentation, (b) the presentation as peripheral signs, (c) the ability to expand the scope and direction of an issue and the explanation on the argumentation.

Cognition route is the path taken to cognitively process a message which includes (Petty and Cacioppo ,1986, h. 131):

- *Central route* –Central route is used when an individual has high motivation and ability to understand the argumentation of a certain issue.
- *Pherpheral route* – Peripheral route is used when an individual has relatively low ability and whose behavior is highly influence by either positive or negative signs of a persuasion which are later associated with the position of the message or by using simple conclusion as a validity measurement.



The population of this research included male parents (fathers) and female parents (mothers) who had daughters. Out of the population, 15 fathers and 15 mothers whose daughter were teenagers were chosen as the sample of this study. Accidental sampling technique was used to pick the samples.

Questionnaires were distributed twice, before and after the treatment. Besides questionnaires, the researchers also employed a visual instrument in the form of video that contained various news on sexual violence happened to children. This research took place in the computer laboratory which had been modified to fit the need of this research such as modifying the available devices, and procedures in filling up the scales when they were exposed with news on sexual violence happened to children.

The procedure of this research was divided into three parts: 1) research planning, 2) research implementation, 3) data analysis. In the research planning, operational actions done in this step included: a) designing code message in the form of informational videos on sexual harassment happened to children. Questionnaires on the cognition route were also created (attached), b) preparing the tools and instruments in conducting the research, and rechecking the data of the research subjects, c) designing the experimental treatment.

The implementation of the research was initiated by conducting the pretest, followed by giving treatment to the experimental group. The treatment was done by showing the subjects videos that contained certain code messages on sexual violence happened to children. The treatment took place in the computer laboratory, and lastly, the subjects were given questionnaires to answer related to cognition route.

Lastly, the obtained data were analyzed using the t-test of SPSS application version 22.0

*Experimental Design.* Experimental research method was employed in this study using one group pretest-posttest design. In the early stage of the research, the dependent variable was measured using pretest. After being manipulated through certain treatment, the variable was then re-measured using the same instrument (Christensen, in Seniati, Yulianto, Setiadi, 2005).

The experimental design used in this study is presented in Table 1.

Table 1 – Experimental Design

| Measurement (O1) | Manipulation (X) | Measurement (O2) |
|------------------|------------------|------------------|
|------------------|------------------|------------------|

Notes: O1 - Measurement before the manipulation; X – Manipulation; O2 - Measurement after the manipulation.

## RESULTS AND DISCUSSION

*The obtained data on the effect of code message about sexual violence toward parents' cognition routes.* The results of the data analysis indicate the influence of code message on sexual violence exposure to the parents toward their cognition route at a level of significance 0.000. The result of the measurement is shown in Table 2.

Table 2 – Average score of pretest and posttest

|        | n/n      | Mean    | N  | Std. Deviation | Std. Error Mean |
|--------|----------|---------|----|----------------|-----------------|
| Pair 1 | pretest  | 95.7667 | 30 | 7.52322        | 1.37355         |
|        | posttest | 98.2000 | 30 | 9.28254        | 1.69475         |

The data show that there is a significant improvement in the mean value from 95.76 to 98.20 which implies that there is a change on the cognition routes taken by the parents after watching the video containing code message on sexual violence happened to female children.

Table 3 – Correlational value and significance

|        | n/n                | N  | Correlation | Sig. |
|--------|--------------------|----|-------------|------|
| Pair 1 | pretest & posttest | 30 | .820        | .000 |

The obtained values show a strong and positive correlation between the two variables at a correlational value of 0.820 at the level of significance 0.000. Thus, it is confirmed that there is an effect of code message about sexual violence happened to children toward parents' cognition routes.

Table 4 – Result of the t-test

| n/n    |                    | Paired Differences |                |                 |   |         | t      | df | Sig. (2-tailed) |
|--------|--------------------|--------------------|----------------|-----------------|---|---------|--------|----|-----------------|
|        |                    | Mean               | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference |         |        |    |                 |
|        |                    |                    |                |                 | Lower                                     | Upper   |        |    |                 |
| Pair 1 | pretest - posttest | -2.43333           | 5.31545        | .97046          | -4.41816                                  | -.44851 | -2.507 | 29 | .018            |

The t-value is found at -2.507 at the level of significance 0.018 which points out that there is a gap between the condition before the treatment and after the treatment.

*The differences of cognition routes between fathers and mothers.* The result of this research shows that the cognition route taken by mothers is significantly higher than the route taken by fathers. The data is presented in Table 5.

Table 5 – Average score of cognition routes based on sex

|                 | Sex  | N  | Mean     | Std. Deviation | Std. Error Mean |
|-----------------|------|----|----------|----------------|-----------------|
| Cognition route | 1.00 | 15 | 104.6667 | 6.51007        | 1.68089         |
|                 | 2.00 | 15 | 91.7333  | 6.81874        | 1.76059         |

Notes: sex 1 = female; sex 2 = male.

The mean score of cognition route in female parents is 104.66 which is higher than the mean score obtained by fathers at 91.73. It implies that mothers have higher awareness toward the matter which can be seen from the detailed information presented by the central and peripheral routes compared to fathers.

Table 6 – Result of the t-test

| n/n         |                             | Independent Samples Test                |      |                              |        |                 |                 |                       |   |          |
|-------------|-----------------------------|---|------|------------------------------|--------|-----------------|-----------------|-----------------------|---|----------|
|             |                             | Levene's Test for Equality of Variances |      | t-test for Equality of Means |        |                 |                 |                       |   |          |
|             |                             | F                                       | Sig. | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |          |
| rutekognisi | Equal variances assumed     | .010                                    | .922 | 5.313                        | 28     | .000            | 12.93333        | 2.43415               | 7.94721                                   | 17.91946 |
|             | Equal variances not assumed |   |      | 5.313                        | 27.940 | .000            | 12.93333        | 2.43415               | 7.94672                                   | 17.91994 |

The t-value at 5.313 at the level of significance 0.000 shows that there is a difference between the cognition routes taken by mothers and fathers.

Table 7 – Cognition route of fathers

| n/n             | N  | Mean    | Std. Deviation | Std. Error Mean |
|-----------------|----|---------|----------------|-----------------|
| Male central    | 15 | 57.8667 | 4.95504        | 1.27938         |
| Male peripheral | 15 | 33.8667 | 3.56304        | .91997          |

The mean score shows that fathers tend to activate the central cognition route more than the peripheral route at the central value of 57.86 and the peripheral value of 33.86.

Table 8 – Cognition route in mothers

| n/n        | N  | Mean    | Std. Deviation | Std. Error Mean |
|------------|----|---------|----------------|-----------------|
| central    | 15 | 64.8000 | 3.82099        | .98658          |
| pheriperal | 15 | 39.8667 | 4.08598        | 1.05500         |

The mean scores show that mothers tend to use central cognition route more often than the peripheral cognition route. The mean of central cognition route is 64.80, while the peripheral cognition route shows mean score 39.86. The high value of the central cognition route shows the ability of mothers in rationalizing the content.

Code message about sexual violence happened to children is a persuasive message which is able to influence the parents to internalize the message. Within the context of ELM, the strength of the persuasion depends on the content that is being processed which is highly influenced by motivation, opportunity and ability to process the persuasive message (Purbawaningsih, 2012:4). The higher ones' motivation and ability in processing persuasive messages, the higher the tendency to take the central cognition route, and the vice versa (Cacioppo & Petty, 1981). The message about sexual violence happened to children has been strong enough in growing parents' motivation in understanding and processing the content.

The development of persuasion model as explained in *The Social Psychological Approach* (2002: 203) includes: (1) change of behavior as the result of the persuasion through some steps (2) persuasion includes congitoin or information processing; (3) persuasion emphasizes on the active role of the persuade as the information-processing agent.

The theory of Elaboration Likelihood Model also identifies two routes that are generally used in processing persuasive messages namely cerntal route and peripheral rotue. The difference between those two routes relies on the persuasion effect, behavior change, and any other changes (Dainton, 2010:109). People who need more adequate cognition tend to use the central route and they evaluate the message only from its function. Whereas, using the peripheral route, ones process information by associating the message with other information around it (Payne, 2005).

There is an obvious different between how mothers and fathers use their cognition route. Mothers show greater average value on the use of central cognition compared to fathers. The use of this central cognition route is indicated by the information processing which puts stronger consideration on the quality of the message or content, involving various knowledge and experience in evaluating the message and critically analyzing any information. Men's tendency in using central route more than other routes was also highlighted by Rizkana and Perbawaningsih in their unpublished thesis.

The level of involvement shows how someone become motivated to deeply think abot persuasive messages they receive (Rader, 1994. p.3). In the other words, the higher someone's involvement, the more systematic his/her thought through peripheral approach. Petty and Caciopo's (1981) stated that if the involvement is high, the central processing becomes more obviously seen, yet when the involvement is low, the peripheral processing appears more clearly.

Different from ELM, Chaiken's assumption identifies the role of peripheral codes such as music in influencing those who show high involvement (Rader, 1994. p.4). Literature information processing displays the non-verbal element (NVE's) which is as high as the verbal element. There is no certain differences between the verbal and non-verbal element which have specific relationship with the components of information. This research also has successfully identified that both fathers and mothers own lower level of peripheral route compared to the central route. Seen from the theory of ELM, parents have strong motivation to critically process any persuasive messages without thinking too much about peripheral codes.

Non-verbal components are often considered emotional and contain less informational (Edell, 1988) which make them often employed to attract certain audiences who tend to communicate using feeling and emotion. In this context, women tend to use feeling and

emotion in processing certain information. Verbal and non-verbal communication may simultaneously appear in the form of gesture, facial expression and body language. They can also appear in the form of social and physical signs, environmental structure, other symbols such as colors, sounds and figures (Rader, 1994. h.7). Ones rather use the peripheral route when the message is out of the content and it contains information beyond the message in the form of colors, pictures, music, figures, photographs, and so on.

Fishbein and Ajzen (1981) stated that neglecting information in a message is the main problem in the research on communication and persuasion (Petty & Cacioppo, 1986 p. 133). The mean score of the cognition route in mothers is significantly higher than the one of the fathers which implies that mothers have stronger attention to the details of an information using the central processing, while fathers are likely to use the peripheral processing. Ones will not perceive a phenomena as a whole phenomena, instead they create some options which are highly influenced by the attention, interest, and focus. Each person has certain differences in the number of code message received, interest, and involvement which enhance the motivation to give extra information on the given information. Mothers are likely to have higher motivation in receiving more detailed code message compared to fathers.

Personal relevance of a certain issue also influences the strength of a persuasive message for a person. Petty highlighted that ELM divides a message into two categories; strong and weak. The strength is affected by some factors including: disturbance, repetition, involvement and cognition necessity (Petty & Cacioppo, 1996 p.144). The degree of involvement enhances the motivation, enabling a person to critically elaborate the content of a message. Personal relevance is labelled as 'ego-involvement' (Rhine & Severance, 1970; Sherif & Nebergall, 1965), "issue involvement" (Kiesler, Collins & Miller, 1969), 'personal involvement' (Apselrs & Sears, 1968; Sherif, Kelly, Rodgers, Srup & Tittler, 1973) and so on.

A person might have a hidden interest toward an issue that is being displayed or have certain personal insights on the matter. Personal relevance rises when a person owns an expectation that the issues have certain significant effects in life. The word 'significant' itself covers some dimensions such as the degree to which personal insights affect the issues, the consequences and the length of the consequences. Specifically, the higher the personal relevance, the more motivated a person in processing the relevant issues by providing good argumentation (Petty & Cacioppo, 1996 p.146).

Personal responsibility toward a certain issue makes a person give more effort in evaluating any relevant arguments that are being presented. '*Need for cognition*' is a need to structure relevant situations in meaningful, integrated ways. It is a need to understand and make reasonable the experiential world (Cohen, Stotland and Wolfe, 1955 in Petty & Cacioppo, 1996 p.151). A person who is in need of knowledge would do more effort in satisfying the curiosity by actively collecting information on the matter.

## CONCLUSION

The exposure of code message on sexual violence happened in children affects parents' cognition route with the t-value of 0.820 at the significance level of 0.000. Thus, the alternative hypothesis of this study is accepted in which the code message has been perceived as a persuasive message. This condition is influenced by the high personal relevance of the parents both mothers and fathers toward the issue about sexual violence happened in children. The result of this study shows that parents tend to activate the central cognition route rather than the peripheral cognition route. There is an obvious difference between the cognition route taken by mothers and the fathers at a level of significance 0.000. The mean score obtained by the mothers was 104.66 which are higher than the score obtained by the fathers at 91.73. Therefore, it can be implied that mothers tend to investigate the code message in a more detailed way and they tend to collect more information on the matter compared to fathers. Mothers have their both central and peripheral cognition routes more active than fathers. Gender difference does not have any significant effect to the use of cognition route in processing the code message on sexual violence happened to children.

## REFERENCES

1. Dani Alia. (2012). Perbedaan sikap ayah dan ibu terhadap kekerasan oleh guru. artikel.
2. Fakih, Mansour. (1998). Analisis gender da transformasi sosial, Yogyakarta:Pustaka Pelajar
3. Griffin, Em. 2003. A First Look at Communication Theory. New York: McGraw Hill Higher Education.
4. Littlejohn, Stephen W and Foss, Karen A. 2005. Theories of Human Communication. Eight Edition. California: Thomson.
5. Larson, Charles U. 1996. Persuasion Reception and Responsibility. California: Wadsworth Publishing Company.
6. McCroskey, James and Beatty, Michael J. (2000) The Communibiological Perspective: Implications for Communication in Instruction. Communication Education, Vol. 49, No. 1, January 2000: 1-6
7. Perwaningsih, Yudi. 1012. Menyoal Elaboration Likelihood Model dan Teori Retorika. Volime 9 no. 1 h. 1-17. Jurnal Ilmu Komunikasi UAJY. Diakses dari: <http://ojs.uajy.ac.id/index.php/jik/article/view/50>
8. Petty, R. E. and Wegener, D. T. (1998) Attitude change: multiple roles for persuasion variables. In D. Gilbert and S. Fiske (eds) The Handbook of Social Psychology (Vol. 1, 4th ed.) 323–390. New York, NY: McGraw-Hill.
9. Petty, R. E. and Cacioppo, J. T. (1986) The elaboration likelihood model of persuasion. Advances in Experimental Social Psychology 19: 123–205.
10. Papalia, D.E, Olds, S. W, & Fieldman, R.D. (2009). Human Development: Perkembangan Manusia. Jakarta: Salemba
11. Payne, Collin Richards (2005) The Elaboration likehod model of persuasion: Implication for trial advocacy. The International Journal of Speech, language and the Law (IJSLL vol. 14.2, 2007) 309-312
12. Soetjiningsih. (2004). Tumbuh Kembang Remaja dan permasalahannya. Jakarta: CV. Sagung Seto
13. Sarwono, S. W. (2011). Psikologi Remaja. Jakarta: PT Rajagrafindo Persada
14. Seniati, L. Yulianto, A. Setiadi, B. (2005). Psikologi Eksperimen. Jakarta: Indeks.
15. Walgito, B. (2010). Pengantar Psikologi Umum. Yogyakarta: CV. Andi Offset
16. Zaduqisti. (2009). Stereotipe peran gender bagi pendidikan anak. Jurnal Muwazah Vol.1, No.1, 2009.

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## **SPECIAL ECONOMIC ZONES AS FORMS OF PUBLIC-PRIVATE PARTNERSHIP IN THE TERRITORIAL ASPECT OF INDUSTRIAL AGGLOMERATIONS**

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### **ABSTRACT**

Subject of the article is devoted to the special economic zones (SEZs) creation or so-called points of accelerated growth in Russia. In the world practice one of the most widely used methods of increasing the national economies welfare, regions and solving local economic problems is the creation of special economic zones – territories with a special mode of economic activity, which is subject to a preferential business regime, and the free customs zone procedure can be applied. They are used as a way to attract investment as in developing countries and a tool for regional economic policy as in developed countries to stimulate depressed regions and solve problems of equalizing the economic development level.

### **KEY WORDS**

Special economic zones, business development, competitiveness, public-private partnership, depressed regions, investment projects.

With the beginning of the market development relations in Russia and for two decades, the important tasks such as the transition to an innovative economy with high scientific and technical potential, the growth of production volumes with high added value, the withdrawal from the fuel industry remain unresolved and, therefore, always topical – the raw orientation of domestic exports, attracting direct investment in priority economic activities and preventing capital outflows abroad.

The analysis of foreign experience proves once again that the strategically important industries development is largely determined by state policy aimed at creating favorable conditions for investment, protecting the domestic market and improving the competitiveness of products. The set tasks achievement should be ensured by such well-established instruments worldwide as concessional lending and taxation, provision of state guarantees for external export production financing, a «package» provision of privileges and privileges to investors, and a policy of state assistance in promoting domestic products, both domestically and in the foreign market [1].

In the world practice, one of the most widely used methods of increasing the national economies welfare, regions and solving local economic problems is the creation of special economic zones – territories with a special mode of economic activity, which is subject to a preferential business regime, and the free customs zone procedure can be applied.

Special economic zones have a number of common features: it is part of the national territory, which has expanded autonomy in resolving economic issues, a special management regime and preferential conditions of economic activity for foreign and national enterprises. They are used as a way to attract investment (this applies to developing countries) and a tool for regional economic policy (using developed countries to stimulate depressed regions and solve problems of equalizing the economic development level) [2].

The world practice knows two alternative methods for creating special economic zones:

1. According to the state program and mainly on budgetary funds, creation of special economic zones is managed by the departmental structure and provide for a permissive procedure for private investment (for example, China, Republic of Korea);
2. Special economic zones is managed by a legal entity in the form of a special company of private or mixed ownership, building relations with investors on a civil contractual basis with a declarative investment procedure. This form is more widely used in the world today [3].

Currently, several thousand similar territorial and economic entities function in the world, and their organizational and functional structure is quite diverse.

Russia also has experience in the creation, development and operation of special economic zones. The first attempts to create specialized territories in Russia were made in 1994, but this led to inconsistencies with the current legislation, and the projects were canceled. The full development of special economic zones in our country began in 2005, the legal regulation of relations in the SEZ in the Russian Federation is carried out in accordance with the Federal Law of 22.07.2005 No. 116-FL «On Special Economic Zones in the Russian Federation». SEZs are created for a period of 49 years [4].

Today, special economic zones in Russia are created to develop high-tech and manufacturing industries, develop tourism, sanatorium and resort facilities, port and transport infrastructures, develop technologies and commercialize their results, and produce new types of products. Creation of special economic zones is economically justified for the state and is beneficial for entrepreneurs and investors. In Russia, each one is called upon to solve the most important strategic tasks. Attracting investment in a particular region contributes to its development. In addition, there is a bet on any industry and the direction of services, from the successful operation of which it is expected to replenish the budget, expand the opportunities for foreign trade.

By creating special zones, the state solves the following tasks:

1. Ensures the flow of private domestic and foreign capital.
2. Promotes an increase in the number of jobs, especially for highly qualified employees, which is necessary to motivate the best minds of the country to remain within it.
3. Realizes the import substitution rate, makes it possible to restore and create domestic production.

In turn, residents and companies registered in the zones territory can:

1. Reduce their production costs and administrative issues through reduced rates for customs duties, taxes, etc. This gives greater freedom in designating the price of the product, which increases its competitiveness.
2. To use the infrastructure created by the state, in most cases at the initial stage these expenses are carried out from the budget.
3. To have an advantage when choosing qualified specialists [5].

For 12 years of work in special economic zones more than 600 residents have registered, of which more than 100 companies are with foreign capital from 33 countries around the world. Over these years, the total volume of investments made amounted to 244 billion rubles, about 25,000 jobs were created, and about 35 billion rubles of tax deductions and contributions to extra-budgetary funds were paid, as well as 30 billion rubles of customs payments. Each special zone is endowed with a special legal status that gives special economic zones investors a number of tax benefits and customs preferences, as well as guarantees access to engineering, transport and business infrastructure. The costs of investors in the projects implementation in the SEZ are on average 30% lower than in the Russian Federation.

The special zones created comfortable conditions for business development, implementation of investment projects, and creation of new industrial and high-tech products.

Claim for the status of the special economic zones can be the territory that meets the following conditions: advantageous location (proximity to the borders of the country or to the regions with which cooperation is planned, access availability to the sea, places suitable for organizing recreation areas); availability of unoccupied areas, where it is possible to locate enterprises and complexes; the presence of a sufficient number of staff at the required

qualifications level; openness to international and interregional contacts; appropriate sector focus [6].

Table 1 – Comparative characteristics of special economic zones in Russia

|                                | Industrial-production SEZ  | Technical and innovative SEZ   | Tourist and recreational SEZ   | Port SEZ   |
|--------------------------------|--|--|--|--|
| Permitted activities           | Projects in the sphere of production and logistics activities  | Projects in the sphere of creation, production and sale of scientific and technical products, provision of services for the implementation and maintenance of programs, databases, topographies of integrated microcircuits, information systems; projects on the provision of innovative infrastructure services to residents of the special economic zones | Projects in the sphere of construction, reconstruction and operation of objects of sanatorium treatment, medical rehabilitation, etc. Projects in the field of development of deposits of mineral waters, therapeutic muds and other natural and medicinal resources, their extraction and use, industrial bottling of mineral waters. | Construction / reconstruction of infrastructure facilities of sea and river ports, airports; conducting production and logistics activities; creation of a p / p for the production, repair, maintenance, modernization of sea and river vessels, aviation equipment; creation of a p / p for the processing of aquatic biological resources, etc. |
| Investment requirements        | Capital investments in the amount of at least 120 million rubles. (excluding intangible assets) within 3 years from the date of the conclusion of the Agreement on the conduct of business.  | There are no minimum requirements.   | There are no minimum requirements.   | The volume of investments is at least 400 million rubles. at construction and not less than 120 million rubles. at reconstruction of objects of port infrastructure.   |
| Tax breaks                     | The profit tax is from 2 to 15.5% (depending on the SEZ region); property tax - 0% (for 10 years); land tax - 0% (for 5 years); transport tax - 0% (from 5 to 10 years)  | The profit tax is from 2 to 15.5% (depending on the SEZ region); property tax - 0% (for 10 years); land tax - 0% (for 5 years); transport tax - 0% (from 5 to 10 years); benefits on deductions to off-budget funds:<br>14% until 2017<br>21% until 2018<br>28% until 2019.  | The profit tax is from 2 to 15.5% (depending on the SEZ region); property tax - 0% (for 10 years); land tax - 0% (for 5 years); benefits on deductions to off-budget funds:<br>14% until 2017<br>21% until 2018<br>28% until 2019.   | The profit tax is from 2 to 15.5% (depending on the SEZ region); property tax - 0% (for 10 years); land tax - 0% (for 5 years);  |
| Other benefits and preferences | Privileged conditions for leasing / redemption of land plots; absence of payment for technical connection to engineering networks; allowed to conduct technical and innovative activities with the provision of additional privileges on deductions to off-budget funds (decrease to 14%); | Benefits for renting office and laboratory premises; Privileged conditions for leasing / redemption of land plots; lack of payment for technical connection to engineering networks;   | Privileged conditions for leasing / redemption of land plots; absence of payment for technical connection to engineering networks;   | Privileged conditions for leasing / redemption of land plots; absence of payment for technical connection to engineering networks;   |
| Special customs regime         | The customs procedure of the "free customs zone": the absence of import duties and VAT on imported technological equipment, materials, components; a special procedure for the calculation and payment of duties and VAT on products produced in the SEZ                                   | The customs procedure of the "free customs zone": the absence of import duties and VAT on imported technological equipment, materials, components; a special procedure for the calculation and payment of duties and VAT on products produced in the SEZ   |  | The customs procedure of the "free customs zone": the absence of import duties and VAT on imported technological equipment, materials, components; a special procedure for the calculation and payment of duties and VAT on products produced in the SEZ   |



Special economic zones of the following types can be created on the Russia`s territory: industrial-production special economic zones (SEZ PPT or PPZ); technical and innovative special economic zones (SEZ TVT or TVZ); tourist and recreational special economic zones (SEZ TRT or TRZ); port special economic zones (SEZ PT or PSEZ) [4].

Today, 26 special economic zones operated under the management of three management companies: JSC SEZ, OJSC KSK and JSC SEZ Titanium Valley.

To date, in Russia there are 10 industrial-production SEZs, the priority areas of activity, which are engineering; automotive industry; aircraft building; manufacture of vehicles, equipment and components; petrochemistry; pharmaceutical industry; Construction Materials; consumer goods, etc., with planned state investments in infrastructure from 5 to 20 billion rubles. Industrial special economic zones, such as «Alabuga», «Lipetsk», «Titanium Valley», «Togliatti» is a fairly large area located in large industrial regions of the country. Their relative proximity to the resource base for production and access to the finished infrastructure and transport routes are the main advantages of the PPT. The location of production on their territory allows to increase the products competitiveness on the market due to lower costs. For example, the industrial-production special zone «Alabuga» is located in the Republic of Tatarstan, near the federal highway and the railway branch. Occupies an area of 20 square meters. km, employs about 5000 employees. More than 40 enterprises of residents are engaged in the production of: buses, household appliances, medicines, furniture, complex chemicals, aircraft [7].

A prerequisite for residents is to make investments in the amount of 1 000 000 euros in the first year of operation, and 10 000 000 euros for the period for which the contract is concluded.

The advantages of business organization in «Alabuga» are: in the ability to locate and use foreign-made equipment without paying VAT and customs fees; in the exemption from the export duty for the export of manufactured products; in the absence of obligations to pay taxes on transport and land to the regional budget; in the benefits for income tax until 2055 (2% - the first five-year plan, 7% - the second, 15.5% - the subsequent period) in the provision of reduced prices of land with a prepared infrastructure.

Location of technology-innovative special economic zones («Dubna», «Zelenograd», «St. Petersburg», «Tomsk») in the largest scientific and educational centers with rich scientific traditions and recognized research schools, opens large opportunities for the innovative business development, production of science-intensive products and its withdrawal to Russian and international markets. Providing a «package» of customs privileges and tax preferences, access to professional human resources, coupled with the growing demand for new technologies and the modernization of various sectors of the Russian economy, makes technological special zones attractive for venture funds, as well as developers and manufacturers of high-tech products. The territory of the technical-innovative zone «Dubna» in 200 hectares is divided into three fragments, each of which is allocated for programmers, nanotechnologists or nuclear physicists. The main activities include: nanotechnology, information development, development of nuclear physics, biotechnology, innovations in the field of medicine [8].

Residents of the special zone «Dubna» receive the following preferences: tax benefits (the first 5 years of payment is subject only to income tax transferred to the regional budget); simplified procedures for documenting land; subsidized connection to communications and rent; lack of customs restrictions.

Port special economic zones («Ulyanovsk-Vostochny», «Sovetskaya Gavan» and zone in the Murmansk region) are located in close proximity to global maritime trade routes and air corridors. Based on the main transport routes, logistics special zones can become a platform for organizing shipbuilding and shiprepairing activities, providing logistics services, as well as a base for new routes.

Tourist and recreational type of SEZ («Russian Island», Grand «Spa Yutsa», «Gate of Baikal», «Altai Valley», North Caucasus Tourist Cluster, etc.) being located in the most picturesque and sought-after tourists regions of Russia, offers favorable conditions for the organization of tourist, sports, recreational and other types of business. Also there are wide

opportunities for the development of beach, adventure recreation, ecotourism, extreme sports.

Tourist and recreational SEZ «Turquoise Katun» is the largest in terms of the area occupied - 3326 hectares. This is the only project that really takes tourists today. 24 objects and the most part of the planned communication systems are constructed. Under the terms of the signed agreement, tax and administrative benefits are provided until 2055 [9].

But because of the revealed violation of the balance of capital investments by the state and private investors, the project can be transferred to the regional department or lose the status of a special zone. Despite on this, the influx of tourists is growing every year, and the entrepreneurs interest in the region is also increasing. In any case, as of the state of the territory for 2017, «Turquoise Katun» is attractive for business in terms of a prepared platform and comfortable conditions for renting land.

The Ministry of Economic Development of the Russian Federation has prepared a report on the results of the operation of special economic zones for 2016, as well as for the period since the beginning of the special economic zones operation.

According to the results of 2016, the best performance indicators for special zones of the technical-innovative type (96% efficiency index), industrial-production type (95%) and port type (94%). The most effective for the entire period of SEZ existence are zones of industrial-production type (100%) and technology-innovative type (99%). The lowest efficiency indicators for the port zones (37%) and tourist-recreational type (33%) [10].

In October 2017, four Russian economic zones were noted in the annual global rating «Free Economic Zones – 2017» according to the authoritative international magazine fDi, which is part of the Financial Times group.

The number of Russian special zones included in the rating included the «Alabuga». It became the best economic zones in Europe for large residents for the third time in a row. In 2016, the rating compilers noted the expansion of the special economic zones infrastructure through the acquisition of the Yelabuga TPP and the Alabuga City Hotel. The management company SEZ «Alabuga» provides services for the construction of premises for rent in accordance with the requirements of the investor – build-to-suit. In addition, the second time in a row, «Alabuga» is mentioned in a similar nomination among the best in the world [11].

The special economic zone «Lipetsk» became the winner of the global rating of the special economic zones around the world in two categories: «SEZ of the year for expansion of projects» and «SEZ of the year for tax reforms». The victory in these nominations was awarded for increasing investment volumes and a significant lines expansion, as well as for effective efforts coordination with local tax and customs authorities in taxation matters and administration of resident companies.

The special economic zone of Togliatti was awarded for the third year in a nomination «Potential competitors». The rating notes that the special economic zone has made a breakthrough in terms of infrastructure construction, including customs, and in attracting and productive work with investors.

Among the «newcomers» of the fDi rating is the special economic zone «Titanium Valley». The Sverdlovsk zone became the only free zone in the world specializing in metallurgy, and also entered the list of SEZs that attracted the largest investors. The compilers of the rating separately singled out the Ural Boeing Manufacturing project – the joint production of Boeing and VSMPO-AVISMA corporations [11].

Along with the existing advantages, this instrument of structural policy requires serious refinement and resolution of organizational, regulatory, information and methodological issues. Within the framework of the state's structural policy, the economic zones have become a large-scale federal project aimed at developing the regions by attracting direct Russian and foreign investments in high-tech sectors of the economy, import substituting production, shipbuilding and tourism.

The possibility of solving many problems in Primorsky Krai can be the development of projects within the framework of public-private partnership (PPP) to create special economic zones of regional and municipal level. The creation of such zones is most relevant for projects that do not involve large investments in the basic infrastructure, large purchases of

imported equipment and already having potential investors [12]. Today special economic zones are created for a period of 49 years with the right to purchase a land plot in the property at a reduced price after the project is implemented. Each special economic zones is endowed with a special legal status that gives investors a number of tax privileges and customs preferences (Table 1), and also guarantees access to engineering, transport and business infrastructure. It should be noted that the costs of investors in the implementation of projects in special economic zones are on average 30-40% lower than all-Russian indicators. The implementation of this idea on a municipal scale requires the introduction of the necessary changes in regional legislation and the organization of development and launch of investment projects.

*Conclusion.* From all of the above, it follows that the problem of managing various investment and innovation projects requires a consistent state policy to attract investment in the special economic zones on the public-private partnership principles, as well as the creation of an effective mechanism for its implementation. This task is particularly important for depressed areas, subsidized regions and single-industry towns, where the consequences of financial and economic crises are most negative.

Determination of priority directions for the region development (oblast, krai, city), the system development for selecting applicants for the creation of a special economic zones at the regional (municipal) level and a mechanism for customs and tax incentives will create favorable prerequisites for the development of domestic branches of the economy by attracting investments and creating new competitive industries.

Hydrocarbons export is not a sufficient condition for sustainable economic growth of the country. Consequently, Russia needs to provide competitive advantages in key sectors of the national economy, primarily at the local, regional level, and only then - at the federal and international levels. Stimulating the regions to form special economic zones for the development of the socio-economic base and greater participation of private business in the creation and management of the SEZ will ensure sustainable economy development and national competitiveness increase.

## REFERENCES

1. Zimenkov R.I. (2011) Free economic zones: textbook. Moscow: Unity-Dana. 224 p.
2. Tinitskaya, O.V. Makarova, G.V. (2014) Free economic zones: tutorial: textbook. St. Peterbyrg: Intermedia. 250 p.
3. Movtsev V.V. (2008) Special economic zones // Invest Region No.4. - P. 2
4. Russian Federal Law «On Special Economic Zones in the Russian Federation», July 22, 2005 No. 116-FZ [Electronic resource] // Official site of «ConsultantPlus», URL: <http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=LAW;n=142952>
5. Kryukova E.V. (2010) Features of attracting foreign capital in analyzing the functioning of free economic zones. // Russian Entrepreneurship. Vol. 11. No. 11. P. 15-21.
6. Akhmetshina L.G. (2011) Principles and trends of the formation of special economic zones in the region // Journal of Russian Entrepreneurship. Vol. 12. No. 8. P. 150-154.
7. Special economic zones (2016), [Electronic resource] // Official site of Ministry of Economic Development, URL: <http://economy.gov.ru/minec/activity/sections/sez/>
8. Special economic zone «Dubna» (2017), [Electronic resource] // Official site of SEZ «Dubna», URL: [http://dubna-oez.ru/about\\_oez/](http://dubna-oez.ru/about_oez/)
9. Special economic zone «Turquoise Katun» (2016), [Electronic resource] // Official site of ROSSEZ, URL: [http://www.russez.ru/oez/tourism/altai\\_territory/bir\\_katun/](http://www.russez.ru/oez/tourism/altai_territory/bir_katun/)
10. Report on the results of the special economic zones operation for 2016 and the period since the beginning of the operation of special economic zones (2016), [Electronic resource] // URL: <http://economy.gov.ru>
11. SEZ of Russia entered the rating of the best in the world (2017), [Electronic resource] // Official site News Economy, URL: <http://www.vestifinance.ru/articles/92795>
12. Furshchik, M.A. Public-Private Partnership: New Instruments of Russian Structural Policy // Russian Economic Journal, No. 2, 2007.

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## **EFFECT OF ENTREPRENEURIAL COMPETENCY ON COMPETITIVE ADVANTAGE AND MARKETING PERFORMANCE IN MICRO, SMALL AND MEDIUM ENTERPRISES OF SEAWEED PROCESSING**

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### **ABSTRACT**

Indonesia has a very abundant seaweed resource and is a major producer of world seaweed. However, Indonesia still sells more seaweed without being processed. It is only dried seaweed which has very low value compared to when it is processed. This study aims to examine and analyze the effect of entrepreneurial competency on competitive advantage and marketing performance on Micro, Small, and Medium Enterprises (MSME) processing seaweed in South Sulawesi Province. Population in this research is all owner/manager at Micro, Small, and Medium Enterprises (MSME) of seaweed processing in South Sulawesi Province fulfilling criteria according to Law Number 20 Year 2008 regarding Micro, Small, and Medium Enterprises (MSME). Owners/managers are selected because they know best the strategies implemented by MSMEs. The total samples of this study are 158 respondents. Besides, the analysis method used Structural Equation Model (SEM) by utilizing AMOS and SPSS program. The results of the study find that entrepreneurial competency positively and significantly gives effect on competitive advantage. The better the entrepreneurial competency of an entrepreneur, the more increasing the competitive advantage will be. Entrepreneurial competency has a direct positive and insignificant influence on marketing performance. It is because the reliable entrepreneurial competency that an entrepreneur possesses will drive to increase marketing performance.

### **KEY WORDS**

Competitive advantage, entrepreneurial competency, marketing performance.

Indonesia's marine wealth has not been fully utilized in the right way so that it affects the national economy. It is confirmed that Indonesia has an area of 6.315.222 km<sup>2</sup> of waters with 99,093 kilometers of coastline as well as the number of islands of 13,466 islands. Indonesia has a very abundant seaweed resource and is a major producer of world seaweed. Seaweed is one of the country's sources of foreign exchange and a source of income for coastal communities. There are 500 high value products that can be produced from seaweed. However, Indonesia still sells more seaweed without being processed. It is only dried seaweed which has very low value compared to when it is processed. Seaweed is very potential to be a superior commodity of Indonesia. When it is processed correctly, potency of seaweed can reach hundreds of billion rupiah. Seaweed is a high class product whose customers are from all over the world. In addition to being used as food, beverages and medicines, some processed seaweed such as gelatin, alginate, and carrageenan are quite important compounds in the industry.

Micro, Small and Medium Enterprises (MSMEs) have an important role as the backbone of the economy in almost all countries. In Indonesia, MSMEs contribute significantly to the Gross Domestic Product (GDP), which is 60% with total employment reach to 97% of total workforce (BPS, 2011).

South Sulawesi province is recorded as the largest producer of seaweed in Indonesia with a potential land of 250 thousand hectares on the seafront and 98 thousand hectares of cultivation area. From that area, South Sulawesi generates about 25 thousand tons per year. South Sulawesi is the second largest sea-producing region in the world after Chile which is capable of producing about 50 thousand tons per year.

The company's strategy is always directed to produce good marketing performance (such as sales volume and sales growth rate) as well as good financial performance. High marketing performance is expressed in three major values, namely sales value, sales growth, and market share (Ferdinand, 2000).

Entrepreneurial competency is a representation of the managerial capacity to explain the relationship between the attributes and the behavior of the owner/manager of the business success (Bird, 1995; Man.et al., 2002). Ahmad et al. (2010) defines entrepreneurial competency as an individual characteristic that includes attitudes and behaviors that trigger entrepreneurs to achieve and maintain business success or performance. Moreover, business performance is determined from the relationship between attributes and behaviors through the ability of owner/manager behave in running their business and behavior aspect is the representation of entrepreneur to execute strategy in entrepreneurship.

The most important thing in achieving the success of the strategy implemented is to identify the true company assets, in this case the tangible and intangible resources that make the organization unique (Porter and Van der Linde, 1995). There are two footholds in achieving competitive advantage which are resource superiority and position superiority, meaning that the company's competitive advantage is affected by performance (Day and Wensley, 1988). RBV is expressed as a strategic approach with two different views, namely the tendency of views that lead to capabilities that are the core of competition but are still influenced by market forces (Barney, 1991). RBV indirectly recommends to companies (MSMEs) to focus on more efficient resource utilization. Management business based on resources (*Resources-based*) is one of the alternative solutions for MSMEs because through such management, it is able to create a special competence and to provide strategic selection for reach sustainable competitive advantage (Barney, 1991). For gaining sustainable competitive advantage, it is not free from *resource based-view* (RBV) that directs companies' management to identify, master, and develop strategic resources in order to make optimal performance (Barney *et al.*, 2007).

Based on the results of empirical review, this research is conducted by purposes to test and to explain how the effect of market orientation and entrepreneurial competency towards MSMEs competitive advantage and marketing performance of seaweed processing in South Sulawesi Province.

## LITERATURE REVIEW

*Theory of Resource-Based View of the Firm (RBV Theory)*. Some views in outlining and classifying resources within the company are provided. Company resources can include: all assets, capabilities, organizational processes, company attributes, information, knowledge, and others that are controlled by the company and it enables the company to formulate and implement strategies that will improve its efficiency and effectiveness.

The RBV theory is usually expressed as a strategic approach with two different views, namely the tendency to view that leads to capabilities that are the core of competitive position but are still influenced by market forces (Barney, 1991). RBV indirectly advises companies to focus on the more efficient use of resources.

Resources refer to tangible assets, where resources can be financial and physical assets, licenses and patents, trademarks, reputation, skills as trade secret, scientific processes and knowledge and social capital and human capital, including networks, organizational culture, and collective learning (Ainuddin *et al.*, 2007).

Based on the view of the resources grouping, it can be seen that basically the company's resources can be in the form of tangible assets, the physical and financial resources used by the company to provide value for customers. These assets include: production facilities, raw materials, financial resources, buildings and equipment. These resources are easily identifiable and are often included in a company's balance sheet. Resources are also in the form of intangible assets, a power source such as brand, corporate reputation, organizational morale, technique understanding, patents and trademarks, as well as the accumulated experience of the organization. Lastly, the company's resources are

organizational capabilities, which are not specific inputs such as intangible assets, but it is rather capabilities and ways to combine the assets, labor, and processes that an organization uses to convert inputs into outputs.

*Entrepreneurial Competency.* Success or failure of effort will be affected by the skills and abilities (competencies) of the owner/manager. Understanding the role of entrepreneurs provides a better insight into what competencies are required by employers to ensure business survival and business success (Akhmad *et al.*, 2010: 67-75). Kiggundu (2002: 239) states that entrepreneurial competence is as a whole of entrepreneur attributes such as attitudes, beliefs, knowledge, skills, abilities, personalities, competencies, and behavioral trends which are necessary to maintain and to succeed business. Successful entrepreneurs are entrepreneurs who have the competence that is: someone who has the knowledge, skills, and individual qualities that include the attitudes, motivations, values, and behaviors which are necessary to perform the work or activities.

Entrepreneurial competency is an important factor in advancing the business. The dominant contributors to business success cover: personality traits (49%), ability to connect with customers (17%), ability to understand the business environment (15%), future orientation and flexibility (11%), personal awareness (4%), and other factors (4%) (Hasan, 2015). Success or failure of effort will be affected by skills and abilities (competencies) of the owner or manager. Understanding the role of entrepreneurs provides a better insight into what competencies are required by employers to ensure business survival and business success.

*Competitive advantage.* Basically, every company that competes in an industrial environment has a desire to be superior to its competitors. Generally, company applies this competitive strategy explicitly through the activities of various existing company functional departments. The basic idea of creating a competitive strategy begins with the development of a general formula of how business will be developed, what exactly the goal is, and what policy will be needed to achieve that goal.

The definition of competitive advantage itself has two different meanings but it is interconnected. The first definition emphasizes superiority in terms of resources and expertise of the company. Companies that have competence in marketing, manufacturing, and innovation can make it as a source to achieve competitive advantage. Through these three areas of competence, the company can develop strategies so that it can produce products that sell well in the market. On the other hand, the second definition emphasizes the superiority in achievement of performance over the years.

The term competitive advantage according to Day and Wensley (1988: 5) has at least two different but it has related meanings that competitive advantage can be defined as focusing on excellence (superiority) in skill or resources, while the second is related to competitive advantage of performance results.

*Marketing Performance.* Marketing performance is a common construction (factor) used to measure the impact of the company's strategy. Company's strategy is always directed to produce performance, both marketing performance and financial performance. Marketing performance is a concept to measure the market performance of a product (Ferdinand, 2000).

Barney (1991) states that firms can have competitive performance if: (1) they know how to extend, disseminate, and exploit knowledge internally; (2) if they know how to protect knowledge from competitors' imitations; (3) if they know how to share (share / transfer) and receive knowledge from their business partners. Therefore, it can be concluded that the main role of the next company or organization is to manage the asset knowledge in order to improve its performance.

Performance refers to the level of achievement of the company within a certain period of time. The company's performance is crucial in the development of the company. The purpose of the company to remain exist, gain profit, and can grow (*growth*) can be achieved if the company has a good performance. Performance of the company can be seen from the level of sales, profit, the rate of capital return, the level of turnover, and market share which are achieved (Jauch and Glueck, 1998).

Based on the phenomenon, theoretical and empirical studies presented above, *Grand Theoretical Model* or Basic Theoretical Model can be described which is the basis of this research, as in the following figure:

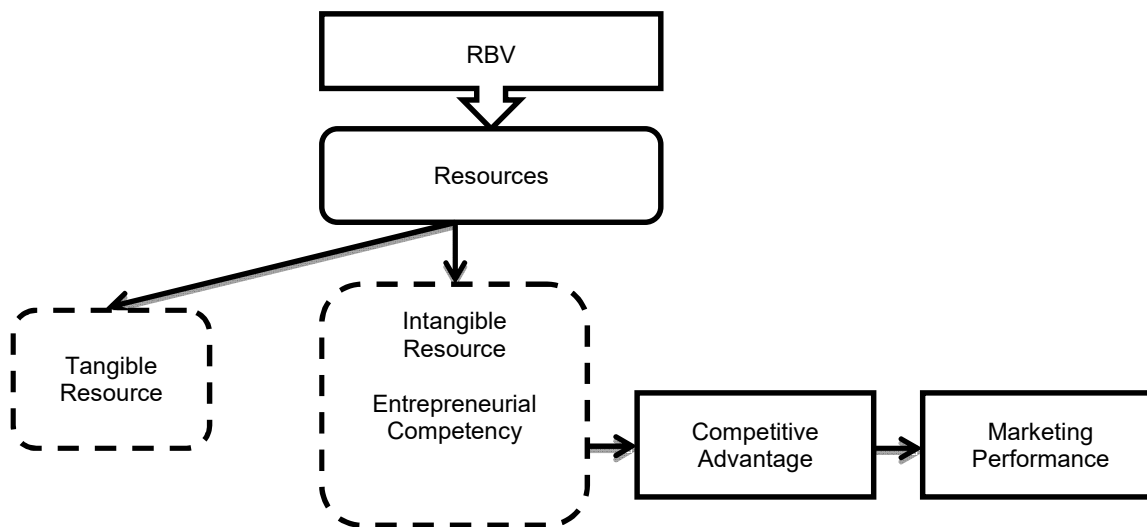


Figure 1 – Theoretical Framework Research  
(Source: Processed from the study of concepts and previous studies, 2016)

## METHODS OF RESEARCH

This research is an exploratory research that is trying to find relationships that are relatively new, and explanatory research is done by describing the symptoms caused by a research object. Sources of data in this study consist of primary and secondary data. Primary data is the data obtained from observation, questionnaire, and interview. Besides, secondary data is the data obtained from MSMEs' document of seaweed processing in South Sulawesi. The unit of analysis is all owners and managers of MSMEs of seaweed processing in South Sulawesi. The sample is determined by using *Probability sampling* method. The owner and manager selection as the unit of analysis is caused because they (owner/manager) are the main resource owned by MSMEs. Besides, the owner and manager are individuals who are considered being able to explain the variables analyzed. The total samples of this study are 158 respondents. Data analysis techniques used in explaining the phenomenon in this research is descriptive statistical analysis techniques and analysis of *Structural Equation Modeling* (SEM). Calculations in descriptive statistical analysis are performed with the help of computers using the AMOS program and SPSS version 22.0.

## RESULTS OF STUDY

The results of research and discussion in this study focus on the problems observed that will be analyzed in accordance with the results of data if using statistics after the data tabulated and validated in normality and reliability. Furthermore, the frequency is done to analyze the characteristics of respondents and each variable according to the indicator, then SEM analysis (*Structural Equation Model*) is conducted to see the variable constructs in accordance with the eight criteria of *goodness of fit* to test the hypothesis in knowing direct effect and indirect effect whether it is positive or negative and significant or not significant.

The analysis of the research result is by using *Structural Equation Model* (SEM) model with *confirmatory factor analysis* (CFA) of AMOS 24.0 Program (*Analysis of Moment Structure*, Arbuckle, 1997). The predictive power of the observed variables at both individual and construction levels is seen through the *critical ratio* (CR). If the *critical ratio* is significant, then the dimensions will be stated useful for predicting constructs or latent variables. The latent variable (*construct*) of this research consists of entrepreneurial competency,

competitive advantage, and marketing performance. By using the structural equation model of AMOS, dimensions of fit model will be obtained. The benchmark used in testing each hypothesis is the value of *the critical ratio (CR)* in the *regression weight* with a minimum value of 2.0 in absolute terms.

The criterion used is to test whether the proposed model is compatible with the data or not. The fit model criterion consists of: 1) The *degree of freedom* must be positive and 2) *Significance of Chi-square* (for sample  $\leq 250$ ) required ( $p \leq 0.05$ ). Hair et al. (2006: 753), 3) *incremental fit* above 0.90 ie GFI (*goodness of fit index*), *Adjusted GFI (AGFI)*, *Tucker Lewis Index (TLI)*, *The Minimum Sample Discrepancy Function (CMIN)* divided by *degree of freedom (DF)* and *Comparative Fit Index (CFI)*, and 4) *RMSEA (Root Mean Square Error of Approximation)* is low.

From the evaluation model, it shows that the eight criteria of *goodness of fit index* are seen from the eight criteria proposed, although none has met the criteria, but look at the number of samples and indicators in this study, then there needs to be a proof whether there is a suitability between the model and the data through the fulfillment of *goodness of fit index* criteria until modification of the model by performing correlation between error indicators in accordance with the instructions of modification index with modification requirements are made without changing the meaning of relationships between variables.

The test result of model conformity gives *P-Value* of *Chi-square* statistics on degree of freedom does not meet the *fit* model criterion ( $P \leq 0.05$ ). However, if seen from other GFT, both RMSEA and CFI values meet the fit model criteria (RMSEA  $0.040 \leq 0.08$  and CFI  $0.969 \geq 0.95$ ). Hence, it can be concluded that the proposed model fit with the data. It means that the proposed model is able to estimate the population kofarian matrix which is not different from the sample data covariance matrix. It suggests that the model parameter estimation results can be applied to the population. Hair (2006) in Kusnendi (2008: 341)

Based on the empirical model proposed in this study, the hypothesis proposed through the testing of path coefficients in the model of structural equations can be tested. The following table is a hypothesis testing by looking at the value of *p value*, if the value of *p value* is smaller than 0.05, then the relationship between the variables is significant. Test results are presented in the following table:

Table 1 – Direct Effect Hypothesis Testing

| HIP | Independent Variables      | Dependent Variables    | Direct Effect |       |                |                     |
|-----|----------------------------|------------------------|---------------|-------|----------------|---------------------|
|     |                            |                        | Coefficient   | CR    | <i>p-value</i> | Information         |
| H1  | Entrepreneurial Competency | Competitive Advantages | 0,266         | 2,005 | 0,045          | (+) Significant     |
| H2  | Entrepreneurial Competency | Marketing Performance  | 0,105         | 0,746 | 0,455          | (+) Not Significant |

From the two hypothesized direct path models, there is one significant path and one insignificant path.

## DISCUSSION OF RESULTS

*H<sub>1</sub>. The Effect of Entrepreneurial Competency to Competitive Advantage on MSMEs of Seaweed Processing.* Entrepreneurial competency has a significant positive effect on the performance of competitive advantage with  $P = 0.045 < 0.05$  with a coefficient of 0.226 indicates that the better the entrepreneurial competency of an entrepreneur, the more increasing the competitive advantage will be.

Based on the results of research, it proves that directly entrepreneurial competency has a positive and significant impact on competitive advantage in MSMEs of seaweed processing. It reveals that entrepreneurial competency is already owned and provides an increase to the competitive advantage of MSMEs processing seaweed. The higher the competence of entrepreneurship, the more increasing the competitive advantage will be.



The dimension of building the concept of the highest respondent appraisal is the part of the entrepreneurial competency possessed by every business actors of MSMEs in processing seaweed product to realize competitive advantage. Building on the concept means that the ability of business actors to develop their new business ideas into something real actualized in developing a business oriented to increasing competitiveness. Building a business concept becomes an important and essential thing for business actors to determine and to take strategic decisions in realizing competitive advantage that it faces according to the uniqueness of the product, the quality of the offered product, and the price competition.

The dimension of taking advantage of opportunities is the part of the entrepreneurial competency that is destined for business actors to have a careful instinct in viewing various opportunities and exploit these opportunities concretely to gain recognition and development to realize competitive advantage. Utilizing the opportunity is the principal for every business actor such as MSME to always search, determine, and exploit the opportunities available to be able to develop seaweed product business by continuously expanding the development in realizing competitive advantage based on the uniqueness of the product, the quality of the offered product, and the price competition.

The dimension of building relationships that according to the assessment of the respondents is still weak is the part of the entrepreneurial competency that should be owned by business actors such as MSMEs in finding various relationships to be invited to cooperate in developing and expanding the partnership network to support the strengthening of business actors to be able to have competitive advantage. Building relationships means creating partnerships with other business actors working in the same field to develop and to promote business in order to become a competitive business leader to introduce the uniqueness of its products, to guarantee product quality, and to develop a competitive pricing policy.

The dimension of learning is the part of the entrepreneurial competency that must be had by every business actor to always look for various learning resources, then participate in the learning process, able to evaluate the achievement of a learning that has been occupied by business actors, which causes the business actor able to realize competitive advantage. The learning process of entrepreneurs in the field of entrepreneurship requires that business actors have experience, follow the existing development of skills from the training that followed, in order to lead and able to develop their business in accordance with the competitive advantage that must be actualized. The form of learning process that requires business actors able to create work standards in order to have competitive advantage by constantly developing product uniqueness, product quality and competitive pricing in the process of trying as in the field of MSMEs of seaweed processing.

The dimension of personal ability is the part of the entrepreneurial competency in which every business actor is required to have a host to never give up in running the business, the knowledge of identifying opportunities and threats, strengths and weaknesses, as well as the ability to motivate themselves and others so that with the provision of these personal capabilities, business actors, such as MSMEs, are able to increase the competitive advantage with the same business actors. On this basis, it is necessary to continuously improve and enhance the ability of business actors that will be developed into a professional capability in the business field in order to increase competitive advantage.

Entrepreneurial competency is a capability had by business actors in running their business in accordance with their potential. The competence of business actors of MSMEs is seen from their ability to build concepts, take advantage of opportunities, build relationships, have potential learning, and have personal skills in striving to realize competitive advantage.

The reason for entrepreneurial competency has a positive and significant impact on competitive advantage because the success of MSMEs is determined by the ability of business actors in expanding their potential in concept, opportunity, customer relationship, learning activity, and personality ability shown to be very supportive for business actors to enhance competitive advantage in creating unique product ideas and concepts to market, able to exploit opportunities according to ability, cost and maintain good relationships with all

parties in business, and also have the advantage to maintain competitive prices among business actors of MSMEs engaged in the same field.

*H<sub>2</sub>. The Effect of Competence on Marketing Performance in MSMEs of Seaweed Processing.* Entrepreneurial competency has an insignificant positive effect on marketing performance with  $P = 0.455 > 0.05$  with coefficient value of 0.105, indicating that entrepreneurial competency owned by an entrepreneur has not been able to improve marketing performance. It shows that entrepreneurial competency had by an entrepreneur encourages to increase competitive advantage thereby it impacts on the increase of marketing performance.

Based on the results of research, it is proven that directly entrepreneurial competency has a positive and significant impact on competitive advantage in MSMEs of seaweed processing. It shows that entrepreneurial competency is already owned and provides an increase to the competitive advantage of MSMEs processing seaweed. The higher the competence of entrepreneurship, the more increasing competitive advantage will be.

The dimension of building the concept of the highest respondent appraisal is the part of the entrepreneurial competency possessed by every business actors of MSMEs in processing seaweed product to realize competitive advantage. Building on the concept means that the ability of business actors to develop their new business ideas into something real actualized in developing a business oriented to increasing competitiveness. Building a business concept becomes an important and essential thing for business actors to determine and to take strategic decisions in realizing competitive advantage that it faces according to the uniqueness of the product, the quality of the offered product, and the price competition.

The dimension of taking advantage of opportunities is the part of the entrepreneurial competency that is destined for business actors to have a careful instinct in viewing various opportunities and exploit these opportunities concretely to gain recognition and development to realize competitive advantage. Utilizing the opportunity is the principal for every business actor such as MSME to always search, determine, and exploit the opportunities available to be able to develop seaweed product business by continuously expanding the development in realizing competitive advantage based on the uniqueness of the product, the quality of the offered product, and the price competition.

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The dimension of personal ability is the part of the entrepreneurial competency in which every business actor is required to have a host to never give up in running the business, the knowledge of identifying opportunities and threats, strengths and weaknesses, as well as the ability to motivate themselves and others so that with the provision of these personal capabilities, business actors, such as MSMEs, are able to increase the competitive

advantage with the same business actors. On this basis, it is necessary to continuously improve and enhance the ability of business actors that will be developed into a professional capability in the business field in order to increase competitive advantage.

Entrepreneurial competency is a capability had by business actors in running their business in accordance with their potential. The competence of business actors of MSMEs is seen from their ability to build concepts, take advantage of opportunities, build relationships, have potential learning, and have personal skills in striving to realize competitive advantage.

The reason for entrepreneurial competency has a positive and significant impact on competitive advantage because the success of MSMEs is determined by the ability of business actors in expanding their potential in concept, opportunity, customer relationship, learning activity, and personality ability shown to be very supportive for business actors to enhance competitive advantage in creating unique product ideas and concepts to market, able to exploit opportunities according to ability, cost and maintain good relationships with all parties in business, and also have the advantage to maintain competitive prices among business actors of MSMEs engaged in the same field.

Therefore, entrepreneurial competency has a positive and significant effect because every business actors seeks to develop a clear business competence concept, always strives to exploit business opportunities with various alternative methods, always builds and creates mutually beneficial partnership relationship, always willing to gain experience through learning process, and always improves the personal ability in facing the challenges and business dynamics that they do. This entrepreneurial competency guides the MSMEs business actors to always increase the competitive advantage on the processing of seaweed.

## CONCLUSION

Based on the formulation of the problems explained and supported from theoretical and empirical studies, the research results are concluded as follows:

Entrepreneurial competency positively and significantly affects competitive advantage. Building concepts, taking advantage of opportunities, building learning relationships and personnel capabilities have been run as entrepreneurial competency in increasing competitive advantage. The better the entrepreneurial competence of an entrepreneur, the more increasing the competitive advantage will be.

Entrepreneurial competency has a direct positive and insignificant effect on marketing performance. The existing entrepreneurial competence is less supportive in realizing the achievement of marketing performance. It is because the high entrepreneurial competency that an entrepreneur possesses will drive to increase marketing performance.

## REFERENCES

1. Ahmad, N. H., Halim, H. A., & Zainal, S. R. M. (2010). Is Entrepreneurial Competency The Silver Bullet for SME Success in a Developing Nation. *International Business Management*, 4(2), 67-75.
2. Ainuddin, R. A., Beamish, P. W., Hulland, J. S., & Rouse, M. J. (2007). Resource Attributes and Firm Performance in International Joint Ventures. *Journal of World Business*, 42(1), 47-60.
3. Arbuckle, James L, 1997, Amos 7.0 User's Guide. Chicago, IL: SPSS Inc.
4. Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
5. Barney, Jay B. (2007). *Gaining and Sustaining Competitive Advantage*. Pearson Education Inc., Upper Saddle River, New Jersey.
6. Bird, B. (1995). Towards a Theory of Entrepreneurial Competency. *Advances in Entrepreneurship, Firm Emergence and Growth*, 2(1), 51-72.
7. Biro Pusat Statistik (BPS). (2015). *Kontribusi UKM Indonesia*. Jakarta

8. Day, G. S., & Wensley, R. (1988). Assessing advantage: a framework for diagnosing competitive superiority. *The Journal of Marketing*, 1-20.
9. Ferdinand, Augusty. (2000). "Manajemen Pemasaran: Sebuah Pendekatan Strategy". Research Paper Series. No.01 Program Magister Manajemen Universitas Diponegoro
10. Hasan, I. (2015). Penguatan Kompetensi Kewirausahaan dan Daya Saing UKM Komoditi Unggulan Ekspor di Provinsi Aceh. *INFOKOP*, 19(1).
11. Jauch, Lawrence. R dan Glueck, William. (1998). *Manajemen Strategis dan Kebijakan Perusahaan*. Terjemahan Murad dan Henry Sitanggang. Penerbit Erlangga. Jakarta.
12. Kiggundu, M. N. (2002). Entrepreneurs and Entrepreneurship in Africa: What is known and what needs to be done. *Journal of developmental entrepreneurship*, 7(3), 239
13. Man, T. W., Lau, T., & Chan, K. F. (2002). The Competitiveness of Small and Medium Enterprises: A conceptualization With Focus on Entrepreneurial competencies. *Journal of business venturing*, 17(2), 123-142.
14. Porter, M. E., & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *The journal of economic perspectives*, 9(4), 97-118.

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## THE EFFECT OF MACROECONOMIC AND RISK FACTORS TOWARDS STOCK RETURN OF INDONESIA INDUSTRIAL SECTOR IN 2008 TO 2015

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### ABSTRACT

The study about stock is to determine whether risk and macroeconomic factors can affect stock return in a population of all industrial sectors in Indonesia. The stock investment does not save money in a short-run, and then expect immediate return, but it is also a long-run investment which should be analyzed using good business model. However, behind the capital market development, people are still more interested in using money for operational activities than for an investment. Moreover, they think that it is more beneficial to invest for saving than for stock because the percentage of interest offered to customers is definitely higher than the return stock's. In this study, multiple regression method in Eviews 8 is used. Besides, the variables consisting of non-systematic risk variable involving beta stock and macroeconomic variable involving inflation, interest, and exchange rate are involved in the hypothesis model to answer whether there is an effect of the variables as a stock return estimator during 2008 to 2015. From 259 issuer samples in all sectors, it is found that the macroeconomic variable changes can simultaneously explain the fluctuation of stock return. The result of each specific sector shows that stock return can be predicted using exchange rate, inflation, and interest.

### KEY WORDS

Macro-economy, risk, stock return, industrial sector.

Indonesia is a country which has adapted the capital market of Netherlands since 1912, but its condition and form of capital market are still young (Steven, 2013). The capital market products are able to give return from high investment which is not similar to other markets in Asia, America, and Europe (Jogiyanto, 2003); thus, the products of Indonesian capital market are more hunted and run by foreign investors than locals (Sulistio, 2016). In the twenty-fifth, Indonesia Stock Exchange (IDX) had showed investment's products in the capital market, such as portfolio, mutual fund, and bond. However, a problem appeared in the capital market was that when the products were launched in the exchange market, they were not fully understood by people who majority have low information about capital market (Merawati and Putri, 2016).

The main point is that a good investor will realize that stock investment does not save money in a short-run, and then expect immediate return, but it is a long-run investment which should be analyzed using good business model. As a funding feature and funding management, capital market has produced blue chip Company in its development. However, behind the capital market development, people are more interested in spending money for operational activities than for investment. Moreover, they think that saving investment is more beneficial than stock because the percentage of interest offered for customers is definitely higher than stock return (Kusmawati, 2011).

Besides those concepts, the quality of investors run in the capital market tend to be trader-like and follow people who analyze of negative price and short-run expectation which value is small but in a big quantity to be able to get stock return (Cooper, 2013). These investors prefer investing low price in stock split event, but they are placed in high-liquidity corporations as a hedging concept to protect their money while investing (Ahmad and Halim, 2014; Gomez and Yague, 2005).

There are a lot of studies conducted in Indonesia to find out any factors affecting the stock movement. Practitioners of fundamental and technical investor analysis have described some ways to predict the value of stock in certain period and pattern. Their analyses are: the

analysis of market reaction towards a portfolio in a form of hypothetical market and stock risk (Jemmy, 2012; Mutiara, 2012; Nurhayanto, 2011), the analysis of stock towards macroeconomic condition, events and its country development (Adtyara, 2012), and the progress of company's performance in generating stock return for its investors (Indayani and Yahya, 2013). They are some examples of stock analysis research which are conducted to find out predictors of stock movement. The book-to-market performance ratio can predict return and risk of cash flow uncertainty which can produce predictor return (Lewellen, 2000). The interest rates, the number of spread between high and low obligation, and dividend rate can predict time variation from expected return (Fama et al., 1977; Keim and Stambaugh, 1986; Fama et al., 1898; Kothari and Shanken, 1997)

The concept of this research is obtained by the writer from the various results of previous studies in predicting stock return in Indonesia. In 2004 to 2008, stock return was not affected by liquidity, profitability, and dividend in LQ45 index (Deitiana, 2011). In 2008 to 2013, the cash flow and profit development simultaneously affected stock returns in hundreds manufacture companies in Indonesia Stock Exchange (Uluipuli, 2007; Suhemi, 2015; Ginting, 2011). It is found that the cash flow of funding activities which affected stock abnormal return was on the manufacture population in 2008 to 2011 (Nelvianti, 2013). During 2011 to 2014, profitability affected return, whereas growth and liquidity did not affect the return of 116 companies of property and real estate sectors (Anggrahini and Priyadi, 2016).

Based on the results of previous studies, the writer was inspired to make this research which purpose is to answer problems obtained from difference findings using macroeconomic and risk variable. Besides, the writer wants to know whether macroeconomics and risk affect stock return in 2008 to 2015. It is expected that the benefits of this study can contribute knowledge relating to some factors which can predict the price of stock of industrial sectors in Indonesia investment.

## METHODS OF RESEARCH

The characteristic used by the writer in this study is purposive sampling method with applied research design (Nasution and Usman, 2007), a kind of research used to answer problems, and then use the result of the study in the following implementation. Then, it is obvious that the explanation used in this study is qualitative and quantitative method (Nachrowi and Usman, 2006). The variables of this research are: 1) Stock return measured from the stock price in year one to the previous year; 2) Stock beta or systematic risk of company measured from the covariant and variant per issuer; 3) The rate of three-month interest rate from Jakarta Interchange Bank Offer Rate (JIBOR); 4) The median rates of Rupiah towards USD by Bank of Indonesia, and 5) The percentage of inflation measured from Consumer Price Index by Central Bureau Statistics. The analysis of financial report content is used to obtain index from the research variables.

The writer collected data population of dependent variables from 505 issuers registered from each Indonesian industrial sector. The scope of the years in this research is limited to information about interest rate from JIBOR which was available on [www.bi.go.id](http://www.bi.go.id) in 2008 to 2015. The survived issuers during this research were 259 issuers or about 51.29% who was then used as the samples of this study. The framework of research variables and hypothesis about the relationship between variables and research models is figured and formulated as the following.

$$\text{STPR} = a + \beta_1\text{BETA} + \beta_2\text{INFL} + \beta_3\text{EXCR} + \beta_1\text{INTR} + e \quad (1)$$

Where:

STPR = Stock return  
 BETA = Stock beta  
 INTR = Interest rate  
 INFL = Inflation rate  
 EXCR = Exchange rate

The writer uses Eview 8 with dated panel (Gujarati, 2004) as the test device and format of analysis from monthly data of monthly research variables. The analysis of multiple linear regression equation with least square model least and spurious-testing analysis are done in all research models. The data analysis are done to answer problems in which: 1) the regression on the model is to know that all variables simultaneously affect return in all industrial sectors; 2) the regression in each industrial sector model is done to know more details about the specificity and characteristics of the research variables in each sector.

## RESULTS OF STUDY

Investing decision of an investor can be motivated by his understanding towards investment ranging from the type of investment, returns to be gained, risks encountered, to other matters related to the investment itself. Knowledge about investment can be obtained from anywhere, such as formal education including in college and non-formal education including training (Sharpe, 2005). Investors should know that stock investment can be done by knowing stock market information reflected by good corporate governance (Rahmawati and Handayani, 2017) and commitment from current funding sources by expecting greater future funding sources (Bodie et al, 2004) and to know macro and micro risk factors influencing stock, such as economic growth, inflation, exchange rate, capital structure, and asset levels (Maga et al, 2016).

Table 1 – Research Sectors

| Sector                                      | Issuer | Total Issuer | Coverage |
|---|--------|--------------|----------|
| Trade, Service and Investment               | 53     | 126          | 58%      |
| Finance                                     | 47     | 84           | 44%      |
| Basic Industry and Chemistry                | 39     | 68           | 43%      |
| Various Industry                            | 29     | 38           | 24%      |
| Consumption goods Industry                  | 26     | 40           | 35%      |
| Property and Real Estate                    | 25     | 63           | 60%      |
| Utilities and Transportation Infrastructure | 20     | 60           | 67%      |
| Mining                                      | 15     | 42           | 64%      |
| Agriculture                                 | 5      | 15           | 67%      |
| Total                                       | 259    | 536          | 52%      |

Based on the research samples in Table 1, the trade and service industrial sector from 2008 to 2015 (production and consumption goods, hotels, restaurants, and tourisms, and printings) and finance sector are industries with the largest entity in Indonesia and for the infrastructure, property, mining, and agriculture sector, they have the highest data coverage on Indonesia Stock Exchange in this research. From the data, retail sector or consumption goods industry is the industrial sector with the lowest number of issuer coverage in this study (surviving from 2008 to 2015).

However, in reality, the consumption goods sector, such as food and beverage, pharmacy, cosmetics and household goods, household appliances and tobacco dominate the stock market which indicates that the majority of every issuer is engaged in those industries because they are profitable, having high stock value, and the sectors are mostly demanded by business owners to establish business and by investors to invest their capital. The finance sector, such as banks, securities market and its financing is also a sector with the largest number of issuer companies although it is not a sector with the highest stock value.

An industrial sector in Indonesia having the highest stock return in exchange is consumption goods sector which the average growth of stock returns reaches 6.1 times of 2.455 becoming 17.465. In this sector, the developments of stock return are highly increase and steep from the increasing development as much as 6% up to 186% in 2008 to 2014. The in each industrial sector of Indonesia can be seen in table 2 above. The stock returns in industrial sectors in Indonesia have the development average which is increasing during the years of the research. The average of stock return development in each industrial sector in Indonesia can be seen in the Table 2.

Table 2 – The Average of Stocks of Each Industrial Sector in 2008 to 2015

| Industrial sector                           | 2008  | 2009  | 2010  | 2011   | 2012   | 2013   | 2014   | 2015   |
|---|-------|-------|-------|--------|--------|--------|--------|--------|
| Consumption goods Industry                  | 2,455 | 3,395 | 9,726 | 12,884 | 18,025 | 25,239 | 26,697 | 17,465 |
| Agriculture                                 | 3,866 | 3,934 | 4,675 | 4,718  | 4,547  | 4,163  | 5,374  | 4,237  |
| Mining                                      | 1,535 | 1,435 | 1,877 | 2,006  | 1,644  | 1,302  | 1,352  | 901    |
| Utilities and Transportation Infrastructure | 813   | 721   | 760   | 713    | 790    | 857    | 892    | 909    |
| Finance                                     | 624   | 728   | 1,145 | 1,375  | 1,494  | 1,694  | 2,005  | 2,020  |
| Basic Industry and Chemistry                | 611   | 633   | 883   | 1,084  | 1,225  | 1,392  | 1,378  | 1,186  |
| Various Industry                            | 428   | 405   | 719   | 1,132  | 1,358  | 1,380  | 1,368  | 1,157  |
| Trade, Service and Investment               | 360   | 368   | 515   | 766    | 1,065  | 1,147  | 1,236  | 1,188  |
| Properties and Real Estate                  | 339   | 323   | 370   | 550    | 741    | 1,339  | 1,590  | 1,636  |
| Average                                     | 832   | 935   | 1,796 | 2,305  | 2,951  | 3,791  | 4,062  | 3,033  |

Source: Researcher data (2017).

The writer's analysis about the rising of stock return of consumption goods sector is explained from the addition of retail outlets in Indonesia, either it is in whole seller or franchise and small retail located around housing and settlement which support the distribution of products and increasing company's financial performance in this sector, excluding the economic condition. The agricultural sector in the post-crisis in 2008 had received subvention from the government by adjusting the State Budget in 2009. In the finance sector, the slackening business activities and widespread termination of employment increase the bank of non-performing loan, and in the future, it will hold banks in disbursing credit (Tjahjono et. al., 2009).

The downward movement of the mining sector's stock return shows that Indonesia's mining sector consisting of coal, oil and gas, metals and minerals and other subsectors has declining stock price from 2012 to 2015. One of the explanations of the stock sector declining was caused by Constitution No. 4 in 2009 about minerals and coals without special treatment within 4 years which required each sector entrepreneur of mining to build mineral purification construction or smelter to produce processed-products before selling it to the international market (non-raw export).

The utility and transportation infrastructure sector with energy subsector have increased because of raising export, transportation subsector having raising stock return in 2012 to 2015; one of them is caused by technological advances in global positioning system increasing the needs of transportation. On the other hand, the real estate sector is the sector with the lowest stock return due to the fundamental factor of its industrial sector is the sector which tends to keep the solvability more than the liquidity, have capitalization and high expansion, and move in long-run context. From the nature of business, the stock of property industry is the lowest stock among all sectors.

Table 3 – Indonesia Inflation Rate in 2008 to 2015

| Period    | 2008    | 2009    | 2010    | 2011    | 2012    | 2013    | 2014    | 2015    |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|
| January   | 158.3%  | 113.8%  | 118.0%  | 126.3%  | 130.9%  | 136.9%  | 111.0%  | 118.7%  |
| February  | 159.3%  | 114.0%  | 118.4%  | 126.5%  | 131.0%  | 137.9%  | 111.3%  | 118.3%  |
| March     | 160.8%  | 114.3%  | 118.2%  | 126.1%  | 131.1%  | 138.8%  | 111.4%  | 118.5%  |
| April     | 161.7%  | 113.9%  | 118.4%  | 125.7%  | 131.3%  | 138.6%  | 111.4%  | 118.9%  |
| May       | 164.0%  | 114.0%  | 118.7%  | 125.8%  | 131.4%  | 138.6%  | 111.5%  | 119.5%  |
| June      | 110.1%  | 114.1%  | 119.9%  | 126.5%  | 132.2%  | 140.0%  | 112.0%  | 120.1%  |
| July      | 111.6%  | 114.6%  | 121.7%  | 127.4%  | 133.2%  | 144.6%  | 113.1%  | 121.3%  |
| August    | 112.2%  | 115.3%  | 122.7%  | 128.5%  | 134.4%  | 146.3%  | 113.6%  | 121.7%  |
| September | 113.3%  | 116.5%  | 123.2%  | 128.9%  | 134.5%  | 145.7%  | 113.9%  | 121.7%  |
| October   | 113.8%  | 116.7%  | 123.3%  | 128.7%  | 134.7%  | 145.9%  | 114.4%  | 121.6%  |
| November  | 113.9%  | 116.7%  | 124.0%  | 129.2%  | 134.8%  | 146.0%  | 116.1%  | 121.8%  |
| December  | 113.9%  | 117.0%  | 125.2%  | 129.9%  | 135.5%  | 146.8%  | 119.0%  | 123.0%  |
| Average   | 132.73% | 115.06% | 120.97% | 127.45% | 132.90% | 142.18% | 113.22% | 120.42% |

Source: Central Bureau of Statistics: Percentage of Consumer Price Index 2008-2015.

The Indonesian inflation movement summarized in Table 3 resembles the wave which



increases to the point in May 2008 reaching 164.01%, decreases in the next month, and continue to increase to the highest peak in 2013 before declining in 2014. This inflation volatility was caused by the rising of world oil and fuel price. The rising inflation in 2008 was also caused by rising world food commodity price (Kompas, July 25, 2008) and raising volume of vehicles (Darmadi, 2011; Gunawan, 2014). The condition of global economic crisis in 2008 occurred in Indonesia was preceded by a subprime mortgage or crisis of low-quality housing loan in the United States, corporate bankruptcies, such as Lehman Brothers and AIG (Sugema, 2012).

In Indonesia, the inflation is triggered by the decline of the balance of trade due to the low rate of Indonesia exports. Inflation began to creep down to the lowest point in June 2008 to 2013. By the end of 2013, the highest inflation was 146.8% which was caused by the rising fuel and electricity price (Bagi, 2017). The decline in inflation after its peak in 2013 came after the government implemented an accelerated quota of imports from products with declining price, such as meat and spices (Jacobs, 2013).

The development of inflation is in line with the development of Indonesian exchange rate. The exchange rate of rupiah towards US dollar as the exchange rate becomes the benchmark of the majority of companies and economic trade in Indonesia. The average exchange rates which increased from January 2009 to 2013 were a form of currency stability protection towards the price of goods and services as well as the stability towards other currencies. The first aspect was reflected in the development of the inflation rate, while the second aspect was reflected in the development of the rupiah exchange rate towards other currencies.

Table 4 – The Rates of Rupiah Exchange Rate towards United States Dollar in 2008 to 2015

| Period    | 2008      | 2009      | 2010     | 2011     | 2012     | 2013      | 2014      | 2015      |
|-----------|-----------|-----------|----------|----------|----------|-----------|-----------|-----------|
| January   | 9,406.35  | 11,167.21 | 9,275.45 | 9,037.38 | 9,109.14 | 9,687.33  | 12,179.65 | 12,579.10 |
| February  | 9,181.15  | 11,852.75 | 9,348.21 | 8,912.56 | 9,025.76 | 9,686.65  | 11,935.10 | 12,749.84 |
| March     | 9,184.94  | 11,849.55 | 9,173.73 | 8,761.48 | 9,165.33 | 9,709.42  | 11,427.05 | 13,066.82 |
| April     | 9,208.64  | 11,025.10 | 9,027.33 | 8,651.30 | 9,175.50 | 9,724.05  | 11,435.75 | 12,947.76 |
| May       | 9,290.80  | 10,392.65 | 9,183.21 | 8,555.80 | 9,290.24 | 9,760.91  | 11,525.94 | 13,140.53 |
| June      | 9,295.71  | 10,206.64 | 9,148.36 | 8,564.00 | 9,451.14 | 9,881.53  | 11,892.62 | 13,313.24 |
| July      | 9,163.45  | 10,111.33 | 9,049.45 | 8,533.24 | 9,456.59 | 10,073.39 | 11,689.06 | 13,374.79 |
| August    | 9,149.25  | 9,977.60  | 8,971.76 | 8,532.00 | 9,499.84 | 10,572.50 | 11,706.67 | 13,781.75 |
| September | 9,340.65  | 9,900.72  | 8,975.84 | 8,765.50 | 9,566.35 | 11,346.24 | 11,890.77 | 14,396.10 |
| October   | 10,048.35 | 9,482.73  | 8,927.90 | 8,895.24 | 9,597.14 | 11,366.90 | 12,144.87 | 13,795.86 |
| November  | 11,711.15 | 9,469.95  | 8,938.38 | 9,015.18 | 9,627.95 | 11,613.10 | 12,158.30 | 13,672.57 |
| December  | 11,324.84 | 9,457.75  | 9,022.62 | 9,088.48 | 9,645.89 | 12,087.10 | 12,438.29 | 13,854.60 |
| Average   | 9,692.11  | 10,407.83 | 9,086.85 | 8,776.01 | 9,384.24 | 10,459.09 | 11,868.67 | 13,389.41 |

Source: Bank of Indonesia: The average Rupiah Exchange Rate towards United States Dollar in 2008-2015.

Table 4 shows the interest rate of Bank of Indonesia in 2008 was the highest interest rate which average was 9.37%; it was a form of government policy to anticipate crisis and reflect actual credit condition. Its increase was the government response towards the economic crisis and high interest rates from other debt instruments. The decline of the highest interest rate after 2008 was government's policy to change the reference of loan savings in Indonesia.

In relation to the research, the interest rate which can be measured by interest rate of Bank of Indonesia, JIBOR, as well as the percentage of bond interest loan as a product of capital market is the fluctuated research variable (Mutiara, 2012; Pangemanan, 2013). The interest rate set by the government from Bank of Indonesia is macroeconomic variable described in Table 5 as a variable with high volatility, and then adjusted to the movement of loans and deposits based on the interest rate of Bank of Indonesia certificate.

Systematic risk of the industrial sectors in 2008 had an average value below one (average stock beta 0.45) indicating the company's defensive stock movement, and it did not follow the movement of Jakarta Composite Index (JCI) during the economic crisis. Companies were not responsive towards the JCI which began to rise up after the economic crisis in 2009 to 2011, especially agricultural sector with beta value above one. The measurement method of stock beta (Sarumaha, 2015) in the study is a variable in a company which can be affected by macroeconomic variable and corporate fundamentals.

Table 5 – The Movement of Interest Rate of Indonesia in 2008 to 2015

| Period  | 2008   | 2009   | 2010  | 2011  | 2012  | 2013  | 2014  | 2015  |
|---------|--------|--------|-------|-------|-------|-------|-------|-------|
| Jan     | 7.99%  | 10.68% | 6.71% | 6.28% | 4.46% | 4.23% | 6.63% | 6.26% |
| Feb     | 7.97%  | 9.42%  | 6.69% | 6.09% | 4.14% | 4.60% | 7.82% | 6.10% |
| Mar     | 7.98%  | 8.87%  | 6.67% | 6.67% | 3.80% | 4.16% | 7.53% | 6.29% |
| Apr     | 8.00%  | 8.40%  | 6.57% | 6.54% | 3.80% | 4.59% | 7.22% | 6.21% |
| May     | 8.21%  | 7.95%  | 6.48% | 6.90% | 3.72% | 4.36% | 6.48% | 5.91% |
| Jun     | 8.66%  | 7.43%  | 6.51% | 6.25% | 4.42% | 4.56% | 7.84% | 6.29% |
| Jul     | 9.25%  | 7.10%  | 6.50% | 6.86% | 4.52% | 5.45% | 7.35% | 6.10% |
| Aug     | 9.54%  | 6.79%  | 6.50% | 5.34% | 3.84% | 5.15% | 7.67% | 6.62% |
| Sep     | 10.36% | 6.71%  | 6.47% | 5.40% | 4.63% | 6.75% | 7.44% | 7.02% |
| Oct     | 11.26% | 6.72%  | 6.41% | 5.58% | 4.41% | 6.37% | 7.03% | 7.65% |
| Nov     | 11.70% | 6.72%  | 6.30% | 5.18% | 4.18% | 6.89% | 6.79% | 8.23% |
| Dec     | 11.49% | 6.74%  | 6.24% | 4.75% | 3.97% | 6.75% | 6.05% | 7.21% |
| Average | 9.37%  | 7.79%  | 6.50% | 5.99% | 4.16% | 5.32% | 7.15% | 6.66% |

Source: Bank of Indonesia: JIBOR quarterly 2008-2015.

The stock beta of each industrial sector during 2008 to 2015 can be seen in Table 6.

Table 6 – Beta Stock of Indonesian Industrial Sector 2008 to 2015

| Sector                                      | 2008  | 2009 | 2010 | 2011 | 2012  | 2013  | 2014 | 2015  |
|---|-------|------|------|------|-------|-------|------|-------|
| Various Industry                            | -0.49 | 0.99 | 0.55 | 0.78 | 0.17  | 0.02  | 1.15 | -0.89 |
| Consumption goods Industry                  | -0.45 | 0.86 | 0.70 | 1.20 | 1.03  | 0.20  | 1.47 | -0.68 |
| Basic and Chemical Industry                 | -0.34 | 0.91 | 0.61 | 0.68 | 0.51  | -0.01 | 1.75 | -0.65 |
| Utilities and Transportation Infrastructure | -0.41 | 0.56 | 0.48 | 0.50 | 0.53  | -0.24 | 2.80 | -1.18 |
| Finance                                     | -0.49 | 0.94 | 1.03 | 0.73 | 0.78  | 0.00  | 2.67 | -0.69 |
| Trade, Service and Investment               | -0.49 | 0.99 | 0.76 | 0.83 | 0.67  | 0.05  | 1.10 | -0.70 |
| Mining                                      | -0.39 | 0.92 | 0.67 | 0.55 | -0.03 | 0.19  | 0.69 | -0.85 |
| Agriculture                                 | -0.42 | 1.27 | 1.05 | 1.08 | 0.75  | 0.28  | 0.62 | -0.19 |
| Property and Real Estate                    | -0.50 | 1.05 | 0.61 | 0.54 | 0.87  | 0.01  | 3.00 | -0.66 |
| Average                                     | -0.45 | 0.93 | 0.72 | 0.75 | 0.61  | 0.03  | 1.81 | -0.74 |

Source: Bank of Indonesia: quarterly JIBOR from year 2008-2015.

The results of research model from all sectors are as the following:

$$\text{Stock Return} = -0.89183 + 0.063672 \text{ BETA} - 1,544872 \text{ INFL} - 8.0300005 \text{ EXCR} + 19.24832 \text{ INTR} + 3.765577$$

In all sectors, the significant relationship that affects stock return is beta in positive and inflation in negative. Research model on all sectors have Rsquare value as much as 44.29%, and based on F test, the value is.007148 showing that independent variable simultaneously and partially influence the stock return. From the result, there is a significant correlation between each inflation and systematic risk variable towards the stock return across all industrial sectors in 2008 to 2015. The research model has met the requirements as an estimator without spurious relationship in which Durbin Watson value obtained from the equation is 1.999 which is greater than the R-square.

The explanation of this result also mentions that the predictor of the stock return is 55.71% by other factors, such as company's financial performance, trading volume, cash flow, and other non-financial factors, such as corporate reputation, auditor, or public ownership. From the result of this study, it can be explained that macroeconomic and non-systematic risk factors can affect stock returns during 2008 to 2015. Macroeconomic factors, such as inflation, interest, exchange rates and systematic risk simultaneously affect the return of company's stock.

In specific sector test, the significance test of the research model (F test) and significant variable test (T test) show that in each industrial sector during 2008 to 2015, all independent variables in the model simultaneously affect stock return. The summary of equation test result in each sector is presented as the following.

Table 7 – All sector and Specific Sector Test Result

| Sector                                      | R-square | F Test   | Significant Variables<br>(variable with value T Test < 0.000) | Durbin Watson |
|---|----------|----------|---|---------------|
| Whole sector                                | 44,29%   | 0.007148 | BETA, INFL  | 1.9983        |
| Various Industry                            | 38,96%   | 0.000934 | EXCR  | 1.8700        |
| Consumption goods Industry                  | 30,38%   | 0.000005 | INTR  | 1.2383        |
| Basic Industry and Chemistry                | 55,47%   | 0.000003 | EXCR  | 1.2168        |
| Utilities and Transportation Infrastructure | 31,01%   | 0.004361 | BETA  | 2.0027        |
| Finance                                     | 71,23%   | 0.005203 | EXCR  | 1.9233        |
| Trade, Service and Investment               | 30,68%   | 0.000036 | EXCR  | 1.6092        |
| Mining                                      | 43,23%   | 0.000375 | BETA  | 1.9226        |
| Agriculture                                 | 38,76%   | 0.000654 | BETA  | 1.9914        |
| Property and Real Estate                    | 48,12%   | 0.000036 | INTR  | 1.9243        |

## DISCUSSION OF RESULTS

Based on result of the regression of each industrial sector, it is found that systematic risk has significant influence in estimating stock return for agricultural, mining and infrastructure sector. Sectors that control public needs and have specific buyers (such as fisheries, agricultural products, and mining products) make them have characteristics in their respective businesses. Changes in composite stock price index and other non-systematic risk factors will make company's characteristics reflect their stock returns. Moreover, exchange rates have a significant effect on the basic industrial sectors of chemistry, various industry, financial and service trade, and investment sector. In these industrial sectors, raw material required doesn't come directly from the origin country of the company. The purchase of financial services, chemical and other industries for trade needs makes the currency influence the operation of these sectors' issuers. The interest rate has a significant effect on the industrial sector of consumption goods and real estate property. In these industrial sectors, interest is the driving force because these sectors are a type of sector requiring loan funds to expand or pay suppliers, so the performance of their stocks is influenced by the interest rate.

The findings of this study confirm the empirical test results of macroeconomic and systematic risk variable on stock returns. Simultaneously, this research shows that inflation, interest, and exchange rate variable significantly influence the composite stock price index (Dodi, 2014). Inflation is assumed that it has negative influence towards Indonesia Composite Index (Nyoman, 2014) because the rising price will cause Indonesia Composite Index declines in purchasing power and stock fluctuation. The existence of independent variable besides macroeconomic in research model also shows that inflation, deposit interest rate, and stock trading volume have positive effect to stock return (Mirza and Nasir, 2011; Sutrisno, 2017; Indriastuti and Nafiyah, 2017; Ikkoku and Hosseini, 2008; Oshaibat, 2016; Majid, 2010). However, the results of this study show different things from other studies (Linzy, 2017; Arika and Soedarsa, 2016) showing that macro-economy in this research has no effect on stock returns.

The volume of stock trading in this study is recognized to be closely related to the stock return. Associated with the theory of market efficiency (Fama, Eugene and French, 1988), the demand for an issuer's stock will lead to demand that increases price and return the stock. From the volume of trade and theory of market efficiency, the positive relationship between stock return and beta is explained based on Capital Asset Pricing Model theory. In equilibrium condition, stock return increases along with the increasing constant of beta or non-systematic risk.

In each specific sector, non-systematic risk, inflation, exchange rate, and interest have influence on stock return. The effect of exchange rates on trade, service, and investment sector and basic chemical industrial sector is along with a research in one of specific example on hotels subsector in 2012 to 2013 (Artini et al, 2015; Tommy and Mahilo, 2015). In hotels subsector, exchange rates negatively affect returns, while company's profitability variable positively affects return. Moreover, the interest rate positively affects return in 28 banking corporates in 2006 to 2008 (Mirza and Nasir, 2011) because the rising interest rate becomes conventional instrument to determine the value of stock in the future. The level of investment will be higher if the interest rate is high because the rate of return expected by investors will

increase from the rising interest. Furthermore, other non-economic factors, such as market reaction towards a particular event can also be a reference in determining stock return of other macro and microeconomic variables (Barus and Christina, 2014).

## CONCLUSION

Based on the effect of economic condition in Indonesia and on the data collected by the writer, it is found that macro economy measured using consumer price index inflation, exchange rate of Rupiah towards United States Dollar, JIBOR interest rate, and systematic risk or beta stock of a company simultaneously affect the company's stock return in all industrial sectors. This study shows that variety of industrial sectors reach its stock return which can be estimated about 44.29% by macroeconomic factors. Then, for future research, the writer suggests the future writers to use non-systematic risk and other variables to show research models, such as: 1) the risk of each industrial sector; 2) Non-economy variables, such as management and corporate governance involving public ownership and managerial participants, and 3) Financial ratio reflecting the characteristics of each company.

## REFERENCES

1. Adityara, E. (2012). The Influence of the World Stock Market Against Indonesia Stock Market (Pengaruh Pasar Saham Dunia Terhadap Pasar Saham Indonesia). UIN Syarif Hidayatullah Jakarta. Journal Etikonomi Vol 11. No. 2.
2. Ahmad, A. A. & Halim A. A. (2014). The Concept of Hedging in Islamic Financial Transactions. Asian Social Science; Vol. 10, No. 8; 2014. Canadian Center of Science and Education
3. Anggrahini, D. P. & Priyadi M. P. (2016). The Effect Of Financial Performance And Growth Opportunity To Stock Return (Pengaruh Kinerja Keuangan Dan Growth Opportunity Terhadap Return Saham). Journal Science and Accounting Research: Volume 5, Nomor 3, Maret 2016.
4. Artini, L. G. S., Wiksuana, I. G. B., Eka P. E. (2015). The Effect of Rupiah Exchange Rate on Stock Return with Profitability as Intervening Variable (Pengaruh Nilai Tukar Rupiah terhadap Return Saham dengan Profitabilitas sebagai Variabel Intervening). Article E-Journal Economics and Business University Udayana.
5. Bagi. (2017). Inflation in Indonesia (Consumer Price Index). Citing Internet sources URL <https://www.indonesia-investments.com/id/keuangan/angka-ekonomi-makro/inflasi-di-indonesia/item254?> Access date August 1, 2017.
6. Barus, A. C. & Christina. (2014). The Influence of Market Reaction To The Stock Price of Companies Listed In Indonesia Stock Exchange (Pengaruh Reaksi Pasar Terhadap Harga Saham Perusahaan Yang Terdaftar Di Bursa Efek Indonesia). Journal Wira Ekonomi Mikroskil Volume 4, Nomor 01, April 2014.
7. Cooper, I. et al. (2013). The Effect of Investor Sentiment on Stock Returns in Norway and Vietnam. Journal BI Norwegian Business School. Oslo University, Norwegia.
8. Darmadi, B. (2011). Land Transport Vehicles Grow 20% (Kendaraan Angkutan Darat Tumbuh 20%). Citing Internet sources URL <http://www.kemenperin.go.id/artikel/4649/>. Access date August 1, 2017.
9. Deitiana, T. (2011). The Influence of Financial Ratio, Growth Of Sales And Dividend To Stock Price (Pengaruh Rasio Keuangan, Pertumbuhan Penjualan Dan Dividen Terhadap Harga Saham). Journal of Business and Accounting Vol 13. No. 1 April 2011. p56-66.
10. Dodi, A. (2014). Influence of Gross Domestic Product, Total Money Supply, Inflation and BI Rate Against Indonesia Composite Stock Price Index Period 2007 - 2013. Journal of Scientific Business Economics. Volume 19 No. 3 December 2014.
11. Fama, Eugene & French K. (1988). Permanent and Temporary Components of Stock Prices, Journal of Political Economy No. 96. p246-273.
12. Fama, Eugene & French K. (1989). Business Conditions and Expected Returns on Stocks and Bonds. Journal of Financial Economics No. 25. p23-49.

13. Fama, Eugene & Schwert G. W. (1977). Asset Returns and Inflation. *Journal of Financial Economics* Vol. 5. pp. 115-146.
14. Ginting, S. (2011). Influence Analysis of Cash Flow Growth and Profitability to Return of Stock at LQ-45 Company in Indonesia Stock Exchange. *Journal of Economic Wira Mikroskil 2012 Indonesia*. Volume 1, No. 02, Oktober 2011.
15. Gujarati, D.N. (2004). *Basic Econometric* (4th Ed.). The McGraw-Hill Companies. NewYork. p28.
16. Gunawan, H. (24 Januari 2014). Land transportation growth this year only 4% (Pertumbuhan transportasi darat tahun Ini cuma 4%). Citing Internet sources URL <http://industri.kontan.co.id/news/> Access date August 1, 2014
17. Ikoku, A. & Hosseini, A. (2008). The Comparative Performance of African Stock Markets: Nominal, Real And U.S. Dollar Returns. *International Journal of Business* 13(3), 2008.
18. Indayani & M. Nur Yahya. (2013). The Influence of Cash Position, Debt Ratio To Equity, And Growth Potential Of The Dividend Distribution Ratio In Manufacturing Companies Listed In Stock Exchange (Pengaruh Posisi Kas, Rasio Utang Terhadap Ekuitas, Dan Potensi Pertumbuhan Terhadap Rasio Pembagian Dividen Pada Perusahaan Manufaktur Yang Terdaftar Di BEI). University Syiah Kuala. *Journal Etikonomi* Vol. 12 No. 1 April 2013
19. Indriastuti, A. & Nafiah, Z. (2017). The Effect of Trading Volume, Exchange Rate And Market Risk Against Stock Return (Pengaruh Volume Perdagangan, Kurs Dan Risiko Pasar Terhadap Return Saham). *Journal STIE Semarang* Vol 9 No. 1 Edisi Februari 2017.
20. Jacobs, P. (2013). July Peak Inflation 2013. Press Release Communications Department. Citing Internet sources URL <http://www.bi.go.id/id/ruang-media/> Access date August 1, 2017.
21. Jemmy, H. (2012). *Stock Overreaction Analysis of Basic and Chemical Industrial sector In Indonesia Stock Exchange Period 2006-2011*. Published Thesis. University of Indonesia Faculty of Economics.
22. Jogiyanto. (2003). *Portfolio Theory and Investment Analysis Third Edition (Teori Portofolio dan Analisis Investasi Edisi Ketiga)*. Yogyakarta:BPFE-Yogyakarta.
23. Kiem, D. B. & Stambaugh, R. F. (1986). Predicting Returns In The Stocks And Bond Markets. *Journal of Financial Economics* 17 (1986) p357 – 390 North Holland.
24. Kompas. (2008). Inflation Rate 33 Cities Above National Inflation. URL <http://lifestyle.kompas.com/read/2008/07/25/21101598> Access date August 1, 2017.
25. Kothari, S.P. & Shanken J. (1997). Book To Market, Dividend Yield, and Expected Market Returns: A Time Series Analysis. *Journal of Financial Economics* No. 44. p169-203.
26. Kusmawati. (2011). The Influence Of Motivation Of Interest In Investing In The Capital Market With The Understanding Of Investment And Age As Moderate Variables (Pengaruh Motivasi Terhadap Minat Berinvestasi Di Pasar Modal Dengan Pemahaman Investasi Dan Usia Sebagai Variabel Moderat). *STIE Musi Palembang. Journal of Economics And Accounting Information* Vol. 1 No. 2 Mei 2011.
27. Lewellen, J. W. (2000). *Predictability of Stock Returns: Theory and Evidence*. School of Business Administration. University of Rochester Rochester, New York
28. Linzzy, P. P. (2017). Influence of Inflation and Rupiah Exchange Rate on US Dollar on Stock Performance of Property and Real Estate Companies in Indonesia (Pengaruh Inflasi dan Nilai Tukar Rupiah Atas Dollar AS terhadap Kinerja Saham Perusahaan Property dan Real Estate di Indonesia). *Journal Ekonomikawan: Journal of Economic Science and Development Studies* Vol 17, No 1 2017.
29. Maga, Y.L.V., Tommy, P. & Tulung, J.E. (2016). *Analys Of Capital Structure, Profitability, And Assets Structure Of Stock Value In Tekstil And Garment Company Listed In Indonesia Stock Exchange Period Of 2011-2014*. Artikel Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi Vol.4 No. 3 September 2016, p411-421.
30. Majid. M. S. A. (2010) *Stock Returns, Economic Activity And Inflationary Trends In Malaysia: Evidence From The Post-1997 Asian Financial Turmoil*. The IUP Journal Of Applied Finance, Vol. 16, No. 3, 2010.
31. Merawati, L. K. & Putra, J. S. (2016). *Impact of Capital Market Training on Investment Knowledge and Student Investing Interest (Dampak Pelatihan Pasar Modal Terhadap*

- Pengetahuan Investasi Dan Minat Berinvestasi Mahasiswa). *Journal Accounting Prodi Faculty of Economics LPPM University Mahasaraswati, Denpasar*.
32. Mirza, A. & Nasir, A. (2011). Influence of Exchange Rate, Inflation, Deposit Interest Rate and Stock Trading Volume to Return of Stock at Banking Company Registered at Indonesia Stock Exchange (Pengaruh Nilai Kurs, Inflasi, Suku Bunga Deposito dan Volume Perdagangan Saham terhadap Return Saham pada Perusahaan Perbankan yang Terdaftar di Bursa Efek Indonesia). *Jurnal Ekonomi University Riau Vol 19, No 04 2011*.
  33. Murtianingsih. (2012). Macroeconomic Variables And Composite Stock Price Index (Variabel Ekonomi Makro Dan Indeks Harga Saham Gabungan). *Journal of Management and Accounting Desember Vol 1 No.3 tahun 2012. p3*.
  34. Mutiara, M. (2012). Stock Portfolio Return Analysis Based on Mispricing Level (Analisis Return Portofolio Saham Berdasarkan Tingkat Mispricing). Thesis. Faculty of Economics University Indonesia. Depok. p8.
  35. Nachrowi, N. D. & Usman, H. (2006). A Popular Approach and Practical Econometrics For Economic and Financial Analysis (Pendekatan Populer dan Praktis Ekonometrika Untuk Analisis Ekonomi dan Keuangan). Jakarta: Lembaga Penerbit Faculty of Economics University Indonesia. p10.
  36. Nasution, M.E., & Usman, H. (2007). Quantitative Research Process (Proses Penelitian Kuantitatif). Jakarta: Lembaga Penerbit FEUI. p13.
  37. Nelvianti, N. (2013). The Influence of Cash Flow Information, Profit And Company Size Against Abnormal Return of Shares In Manufacturing Companies Listed In Indonesia Stock Exchange (Pengaruh Informasi Arus Kas, Laba Dan Ukuran Perusahaan Terhadap Abnormal Return Saham Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia). *Accounting Journal Vol 2. Tahun 2013*.
  38. Nurhayanto. (2011). Market Risk Analysis Portfolio Investment Shares With Value At Risk Method (Case Study At RST Pension Fund) (Analisis Risiko Pasar Portofolio Investasi Saham Dengan Metode Value At Risk (Studi Kasus Pada Dana Pensiun RST)). Unpublished Thesis. Faculty of Economics Indonesian University. Depok. p11.
  39. Oshaibat, S. A. (2016). The Relationship Between Stock Returns And Each Of Inflation, Interest Rates, Share Liquidity And Remittances Of Workers In The Amman Stock Exchange. *Journal Of Internet Banking And Commerce, August 2016, Vol. 21, No. 2*
  40. Pangemanan V. (2013). Inflation, Exchange Rate, Interest Rate Against Systematic Risk In Sub-Sector Company Food And Beverage At BEI (Inflasi, Nilai Tukar, Suku Bunga Terhadap Risiko Sistematis Pada Perusahaan Sub-Sektor Food And Beverage Di BEI). *Journal of Economic Research, Management, Business and Accounting Vol.1 No.3 September 2013. p189-196*.
  41. Rahmawati, F. I. & Handayani, S. R. (2017). The Influence Of Good Corporate Governance Practice On The Stock Price (Study On Company Of Lq45 Index In Indonesia Stock Exchange During 2012-2016). *Journal of Business Administration Vol. 50 No. 6 September 2017. p164*.
  42. Sarumaha, A. (2015). Analysis of Macroeconomic Influence And Fundamental Factor Of Companies On Stock Beta In Mining Industry Registered In Indonesia Stock Exchange (Analisis Pengaruh Makro Ekonomi Dan Faktor Fundamental Perusahaan Terhadap Beta Saham Pada Industri Pertambangan Yang Terdaftar Di Bursa Efek Indonesia). *E-Journal Widya Ekonomika 2015. p104*.
  43. Sharpe, Alexander & Bailey, (2005). *Investment*. Intermasa Jakarta. Edisi enam Jilid 1.
  44. Soedarsa, H. G. Arika & Prita, P. R. (2016). Influence of Inflation Rate, GDP Growth, Company Size, Leverage, and Profitability to Share Price at Property and Real Estate Sector Companies Listed on Indonesia Stock Exchange Period 2005-2013 (Pengaruh Tingkat Inflasi, Pertumbuhan PDB, Ukuran Perusahaan, Leverage, dan Profitabilitas terhadap Harga Saham pada Perusahaan Sektor Properti dan Real Estate yang Terdaftar di Bursa Efek Indonesia Periode 2005-2013). *Jurnal Akuntansi dan Keuangan University Bandar Lampung. Journal of Accounting and Finance Vol. 7, No. 1, March 2016. p87-102*.
  45. Steven, M. (28 Mei 2013). Indonesian Capital Market Still Holds Negative Sentiment (Pasar Modal Indonesia Masih Tahan Sentimen Negatif). Citing Internet sources URL

[www.republika.co.id](http://www.republika.co.id) Access date August 1, 2017.

46. Sugema, I. (2012). Global Financial Crisis 2008-2009 And Its Implications In Indonesia's Economy (Krisis Keuangan Global 2008-2009 Dan Implikasinya Pada Perekonomian Indonesia). *Journal of Agricultural Science of Indonesia*, Desember 2012 Vol.17 (3): 145-152
47. Suherni, F. (2015). Influence of Cash Flow and Profit Growth on Stock Return on Manufacturing Companies Listed In Indonesia Stock Exchange 2008-2013 (Pengaruh Arus Kas Dan Pertumbuhan Laba Terhadap Return Saham Pada Perusahaan Manufaktur Yang Terdaftar Di Bursa Efek Indonesia 2008-2013). *Electronic Journal; Faculty of Economics UMRAH* 2015
48. Sulistio T. (2016). Foreign Investors Take Control of Indonesian Market? (Investor Asing Kuasai Pasar Indonesia?) Citing Internet sources URL [www.viva.co.id](http://www.viva.co.id) Access date August 1, 2017.
49. Sutrisno, B. (2017). Relationship Volatility And Trading Volume In Indonesia Stock Exchange (Hubungan Volatilitas Dan Volume Perdagangan Di Bursa Efek Indonesia). *Journal of Business and Management* Volume 7(1), April 2017. p15-26.
50. Tjahjono et. al. Team Biro Riset Ekonomi. (14 April 2009). Outlook Ekonomi Indonesia 2009 - 2014 : The Global Financial Crisis and Its Impact on the Indonesian Economy (Krisis Finansial Global dan Dampaknya terhadap Perekonomian Indonesia). Citing Internet sources URL <http://www.bi.go.id/id/publikasi/> Access date August 1, 2017.
51. Tommy, P. & Mahilo, M. B. (2015). Influence of Interest Rate Risk, Inflation, and Exchange Rate on Return of Food and Beverage Company Shares Go Public in Indonesia Stock Exchange (Dampak Risiko Suku Bunga, Inflasi, dan Kurs terhadap Return Saham Perusahaan Makanan dan Minuman yang Go Public di Bursa Efek Indonesia). *Journal of Economic Research, Management, Business and Accounting* 1 Vol.3 No.3 Sept. 2015, p1-10.
52. Uluipuli, I G. K. A. (2007). Influence Analysis of Liquidity Ratio, Leverage, Activity, And Profitability To Stock Return (Study On Food And Beverage Company With Consumption goods Industry Category In JSE) (Analisis Pengaruh Rasio Likuiditas, Leverage, Aktivitas, Dan Profitabilitas Terhadap Return Saham (Studi Pada Perusahaan Makanan Dan Minuman Dengan Kategori Industri Barang Konsumsi Di BEJ)). *Journal of Accounting and Business Sciences*.
53. Yague, J. C. & Gomez, J. (2005). Price and Tick Size Preferences in Trading Activity Changes Around Stock Split Executions. *Spanish Economic Review* Rev 7. pp. 111-138.

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## **ANALYSIS OF MIGRANTS' COMPETITIVENESS IN INDONESIA**

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### **ABSTRACT**

This study was conducted to investigate and analyze the influence of skills toward migrants' competitiveness and the influence of wisdom toward migrants' competitiveness in Pekanbaru, the capital city of Riau Province, Indonesia. This study employed a quantitative approach in the form of survey. There were 125 migrants who participated in this study who were chosen using quota sampling technique based on the classification of migrants' activities. The first finding shows that there is a significant influence between migrants' skills and their competitiveness. Secondly, migrants' wisdom has certain positive yet insignificant influence toward their competitiveness. The results of this study also show that migrants' competitiveness has been satisfying. Migrants are also known to have strong basic characteristics to achieve certain target or to reach their success.

### **KEY WORDS**

Migrants, motivation, competitiveness, skills, wisdom.

City is an ecosystem of life which also becomes the machine of life for cities provide various source of living. Thus, this machine is expected to be effective and efficient in serving the people. Cities are a set of functional arrangement in which houses, jobs, shopping centers, and services are clearly separated. This makes sub urban areas which were considered as recreational spots now have been used as expanded residential area. Pekanbaru is one of big cities in Indonesia which is located in a strategic location. Pekanbaru has 12 sub-districts and 58 villages in approximately 632.26 km<sup>2</sup> area. 24% of the area has been used as residential area (around 75% of this area), government offices, trading area, educational area, industrial area, military area, airports, and so on. Around 76% of the city area are protected forest, farms, forest, etc. Pekanbaru needs larger city area since the number of the people is highly increasing. This has led the city to remain narrow available area. The high population is dominated by the high number of migrants in Pekanbaru.

Starting from the implementation of local autonomy as stated in the Act Number 32 of 2004 on local governance, local governments are given chances to develop and raise their own economy. Hence, small cities are well developing and attract job seekers to migrate there. The same phenomena also occurs in Pekanbaru which as much as 60.8% of the population are migrants and Pekanbaru has reached up to 9.2% of economic growth every year (Dinas Kependudukan dan Catatan Sipil, 2010). Migrants refer to residents who live in Pekanbaru in a certain length of time and who have fulfilled conditions as migrants in the form of *Kartu Ijin Pendatang* (KIP) which is an identity card for legal migrants given by the municipal government issued by the *Dinas Kependudukan dan Catatan Sipil (Distardukcapil)*, according to Local Act No.5 of 2008.

Subagyo (2002) stated that environmental damages are triggered by two factors; natural factors and human made factors. Those factors are highly correlated to each other since environmental damages caused by natural events might appear as the result of human destructive activities. Residents of a city hold the responsibility to keep the environment healthy. Higher population in an ecosystem also becomes another problem. The correlation between population density and the quality of the environment is quite strong, for instances;



the lower the quality air and water, the higher the population since industries demand more workers to run their business. It is explained that the increase in the population leads to the higher need of jobs along with the necessities of other production factors and how well the technologies provide good output. As the implication, the increase in the population decrease the quality of the environment through the relationship between the number of population and the availability of workers and the relationship between the availability of workers and production capacity and economic problems (Suparmoko, 2008).

The phenomena of people coming into a city is called immigration and immigration is triggered by certain causes and has certain effects toward the environment of a city. There are various factors that motivate the people to move out to a city as explained by Lee (1995) in which it is stated that migration volume goes equally with environmental variety. There are positive factors, negative factors and neutral factors of both previous area and the target city. According to Lee, Todaro, Titus (in Mantra, 2003), economic motive is the strongest factor that motivates a person to migrate. This problem is triggered by imbalanced economic development of the suburban area and the urban area. Todaro (2002) considered this economic motive a rational reason to migrate.

Noris (in Mantra, 2000) added three components into Lee's model of migration which are; re-migration, obstacles and forced migration. Noris explained that the factors from the suburban area are the most important ones. Jones also mentioned that modernization does not simply attract people from other area, yet it might also motivate natives to move out of a city due to the advancement of education system, transportation and communication. Advancement of technology, transportation and communication has made migration easier.

Other theory has been proposed by Lewis (1954) on the migration process of workers from suburban area to urban area which was later formulated and expanded by Fei and Ranis (1964) as a general theory on national development of surplus workers in third world countries. The main focus of this model is the process of workers; migration and job opportunity in the modern sectors.

Based on this explanation, it is obvious that cities are considered as a machine to make living. Therefore, the existence of a city needs to be maintained. This study focuses on the migrants who tend to have high motivation to migrate due to the attractiveness of a city, thrust from the place of origin, personal factors and obstacles in the form of government's rules. The research question of this study is related to both simultaneous and partial influences of skills and wisdom as the capital of migrants' competitiveness in Pekanbaru.

## **LITERATURE REVIEW**

In a theory of development by Goutlet (in Todaro, 2002), development refers to any exhaustive changes including an attempt to conform the whole social system to fit humans' basic necessities and different expectations of individuals and social group within the system, and the need to move from an unfavorable condition to a better and favorable condition which is more humane in the terms of materials and spirituals. Development should consider the factors of humanity that can be reached by these three basic necessities: (1) life needs which refers to the fulfillment of human welfare that is often reflected by per-capita income, (2) freedom from slavery and freedom to choose which refer to the needs of education, health and general quality of life and (3) self esteem and self respect.

Based on the theory of development by Lewis (in Suparmoko, 2008), development is measured through the economic matters. Retarded state of economy is identified by two sectors: (1) traditional sectors; ove population sub-urbans shown by marginal productivity close to zero or surplus of workers caused by the shifting of agriculture workers to industrial workers without any loss of output; and (2) industries in cities which have higher productivity attract workers from the subsystem sectors (sub-urban).

Furthermore, Suparmoko (2008) explained that the relationship between economic growth and the availability of natural resources is not the same as the relationship between economic growth and the availability of resources used in a production process. The faster the economic growth, more natural resources are needed for production process which

eventually decreases the availability of natural resources. Therefore, the acceleration of economic development in the developing countries demands higher amount of natural resources taken from the earth which decreases the volume of the natural resources. There is a positive correlation between the quality of the quality of resources and economic growth, yet there is also a negative correlation between economic growth and the amount of natural resources available in the earth.

Migrants are people who migrate from one place to another place. Mattulada (1994) stated that migration is human movement as individuals or as a group from one place to another place. This process is followed by the transmission of cultural products, customs, minds, and skills exchange among individuals, groups or from a society to societies. From the ecological point of view, human accept physical environment, society, and culture of where they live. When the condition is stable, there will be a balance of daily necessities availability. In this condition, there will be an equilibrium of the number of population and the resources need, balanced state of mortality and nativity in both short term and long term. If any changes occur in this balanced biotic condition, there will be a change of relationship among human, environment and food stock. Adjustments should be made to follow the changes including the change of the relationship between human and their need of food.

Some concepts of migration theories are presented as follows.

*Lee's Push-Pull Theory (1995)*. According to Lee (1995), migration in a broader scope means a permanent and semi-permanent changes of one's place of living. There is no limit of either distance or ones' intention to migrate (forced or voluntarily). In the other words, migration is a movement of human from a place to stay in another place. Meanwhile, migrants refers to the individuals who do migration. Regardless of how far the distance or the condition, migration always involves the place of origin, target place, and obstacles. Distance is one of the migration factors.

A place has some factors that make the residents stay in the place or even attract other people to live in that place. Some factors have similar effects toward some people, yet there are also some factors which give different effect toward some people. Positive and negative factors are always found by migrants and future migrants related to their attitude toward the condition of the place of origin and the target place. The positive factor of the place of origin is in the form of the drive experienced by a person to leave the place. Whilst, the negative factor of the place of origin obstructs a person from leaving out the place. Similarly, negative factors of the target place include any factors that are considered unfavorable, which prevents people from coming and living in that place. Ones might have positive, negative or neutral views toward certain factors. It depends on the personal condition of a person which can be influenced by education, experience, necessities and personalities, Ones also might have different perception on the obstacles of migration. Migration obstacles include distance, travel cost, immigration procedures, and the number of the family members.

*Zipl's Theory of Gravity*. Zipl has proposed a classic model of gravity related to migration. It is stated that the number of migrants in two places goes directly proportional with the multiplication results of the number of the population and it goes inversely proportional with the closest distance of transportation between the two places. Lowry and Rogers have modified the Zipl formula by adding up the per-capita income, unemployment, and the workforce into the measurement. This formula is used to count the number of migrants of two places. However, this formula does not include information of the target place and the existence of families there as important factors. Some theories related to migration are: 1) the farther the distance, the lower the number of migrants. This theory is known as distance-decay theory. 2) ideal migration raises an exchange in the form of reverse flow. 3) gaps between urban area and sub-urban area also trigger migration. 4) women tend to migrate to nearby paces and 5) the advancement of technology increases the intensity of migration and 6) economic matters are the main motives of migration.

*Jones' Theory of Migration (2009)*. Jones (2009) described migration as a process of modernization. Jones also mentioned that modernization does not only attract people from outskirts area to come but it also motivates the natives to migrate as the education,

transportation and communication are advanced. Advancement of technology, transportation and communication make migration easier.

*Lewis's (1954) and Fei and Ranis' (1968) Theory.* The pattern of a city development gives an implicit consideration of workers movement from sub-urban area to urban area. This Lewis's (1954) and Fei and Ranis' (1968) theory has been accepted as a general model applied in the third world countries that experience the surplus of workers. In this model, economy consists of sub-urban subsystem sector which is identified by the surplus of workers while the modern industrial sectors in urban areas is seen from the high production capacity.

*Todaro's Migration Theory (1996).* Todaro (1996) assumed that the decision to migrate is a rational economic phenomena. Even though cities have high number of unemployment, Todaro believed that ones always have expectation to earn higher income from cities than wages from agriculture sector. As implication massive number of people migrate in order to earn higher income. However, the fact does not always match the expectation.

There are four essential characteristics of Todaro's model of migration theory (1996) which are: 1) migration is initiated by rational economic consideration of income and outcome; 2) the decision to migrate depends on the real expected wages between urban and sub-urban instead of the actual wages between urban and sub-urban; 3) the probability to get a job in a city is reversely proportional to the number of unemployment; 4) the volume of migration is higher than the availability of jobs in cities.

Migrants are those who migrate. Mattulada (1994) mentioned that migration is a movement of individuals and groups from a place to another place. This process is followed by the transmission of cultural products, customs, minds and skills from individuals, from groups to groups and from societies to societies. Seen from the ecology point of view, one accepts the conditions that they face including the physical environment, other individuals and the culture of where she/he lives.

Wijaya (2007) defined competitiveness as an ability to achieve better result. Whilst, Mitriani (in Preffer, 2002) stated that competitiveness is a basic characteristic that is related to the effectiveness and achievement of how ones' perform their jobs.

Ubaedy (2009) stated that competitiveness is the same as competence which refers to the ability or readiness. Compete, competition, and competitive mean the act to create something special and better. Soetjipto (2007) explained that competitiveness is something that is appealing and unique that can be used to consistently win over other competitors. According to Wljaya and Mitrani in Prefer and Ubaedy and Soetjipto, competitiveness is defined as the basic characteristics of individuals that can be used to achieve success, achievement or to reach goals.

Indicators of competitiveness according to Khairul Muluk (2008) include the dimension of competitiveness, competition of efficiency, productivity, quality, adaptation and innovation. The framework of this study is related to migrants' motivation (attractiveness, driving force, obstacles and competitiveness as independent variables and their effects for migrants in Pekanbaru as the dependent variable.

## METHODS OF RESEARCH

This study was conducted in Pekanbaru city that has 12 sub-districts. The researcher employed a survey technique to collect the data of this study. The population includes 130,805 head of family migrants in Pekanbaru who had various jobs and were classified based on their length of stay in Pekanbaru. The target population of this study are migrants who had been staying in Pekanbaru for less than one year, migrants who possess migrants' identity card of 2012, and migrants who had been staying for one to five years and more than five years.

The sample of this study included some migrants who owned migrants' identity card (*KIP*). In order to determine the number of the sample used in this study, researchers set level of representativeness at 95% toward 130,805 population. Samples included migrants who had been living in Pekanbaru for more than five years. There were 10 indicators.

Accidental sampling technique was employed to choose 125 samples. Meanwhile, the data collection was conducted using documentary study and questionnaires. The data were then analyzed using SEM to measure the contribution of the coefficient in each diagram path of causal relationship of the variables X1 and X2 toward the variable Y. This scheme was the base to measure the equation structure model (SEM) which was then calculated using AMOS.

**RESULTS OF STUDY**

Based on the determination of model value, the variables of the model measurement in this stage were classified into exogenous variables and endogenous variables. Exogenous variables refer to the skills and wisdom. Whereas, endogenous variable of this study refers to the competitiveness. The result of the SEM analysis in this stage can be seen in Figure 1.

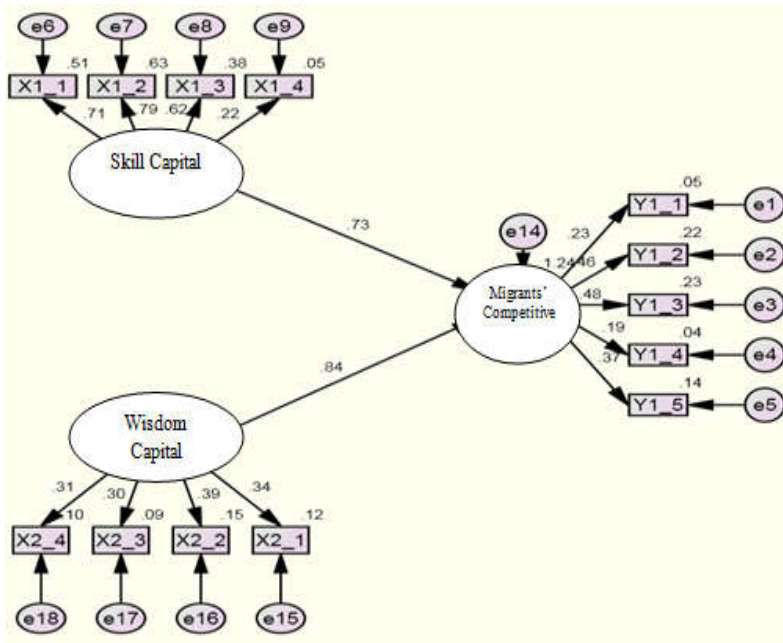


Figure 1 – Results of SEM Analysis

The hypothesis testing on the structural model has direct relationship with the result of the regression coefficient measurement of each path. Hypothesis testing was done by measuring the level of significance and the probability value. If the probability value is lesser or equal to 0.05, the correlation is significant (Boge, 2009). The regression coefficient of each path is shown in Table 1.

Table 1 – Results of Variable Measurement

| n/n            | Estimate | S.E. | C.R.  | P    | Label  |
|----------------|----------|------|-------|------|--------|
| Skill Capital  | .192     | .049 | 3.956 | ***  | par_13 |
| Wisdom Capital | .041     | .080 | .517  | .605 | par_14 |
| X1_1           | .184     | .034 | 5.393 | ***  | par_21 |
| X1_2           | .150     | .038 | 3.977 | ***  | par_22 |
| X1_3           | .323     | .051 | 6.361 | ***  | par_23 |
| X1_4           | .298     | .039 | 7.736 | ***  | par_24 |
| X2_1           | .315     | .087 | 3.642 | ***  | par_25 |
| X2_2           | .136     | .035 | 3.918 | ***  | par_26 |
| X2_3           | .257     | .051 | 5.015 | ***  | par_27 |
| X2_4           | .306     | .076 | 4.030 | ***  | par_28 |

Source: Analyzed Data, 2016.

Table 2 – Result of the Structural Model Hypothesis Testing

| <i>Hypothesis</i>                          | <i>Estimate</i> | <i>S.E.</i> | <i>C.R.</i> | <i>P</i> | <i>Label</i> | <i>Note</i>   |
|--|-----------------|-------------|-------------|----------|--------------|---------------|
| Skill Capital → Migrants' competitiveness  | .210            | .107        | 1.957       | .050     | par_8        | Significant   |
| Wisdom Capital → Migrants' competitiveness | .521            | .829        | .628        | .530     | par_12       | Insignificant |

Table 1 and 2 imply the explanation of the hypothesis as follows.

*Testing of Hypothesis 1.* Migrants' skill is found to have a significant influence toward migrants' competitiveness in Pekanbaru at the regression coefficient of 0,210, CR of 1,957 and level of significance of 0,05. Therefore,  $H_0$  is rejected. The result of this study shows that skill has a positive and significant influence toward migrants' competitiveness in Pekanbaru.

From the measurement of each indicator, the influence of each indicator toward migrants' competitiveness is explained as follows.

1. The influence of knowledge toward migrants' competitiveness. The influence of knowledge toward competitiveness is found at 0.184, and CR at 5.393 with the level of significance at 0.000. It implies that knowledge has a positive and significant influence toward migrants' competitiveness.
2. The influence of education toward migrants' competitiveness. The influence of education toward migrants' competitiveness is found at 0.150, CR at 3.977 and level of significance at 0.000. Thus, education has a positive and significant influence toward migrants' competitiveness.
3. The influence of skills toward migrants' competitiveness. The influence of skills toward competitiveness is found at 0.323, CR at 6.361 and level of significance at 0.000. This result shows that skills have a positive and significant influence toward migrants' competitiveness.
4. The influence of experience toward migrants' competitiveness. The influence of experience toward migrants' competitiveness is found at 0.298, CR at 7.736 and level of significance at 0.000. This indicates that experience has a positive and significant influence toward migrants' competitiveness. Out of those four indicators, migrants' skill appears to have the strongest influence toward migrants' competitiveness, followed by experience. Whilst, migrants' education shows the lowest influence.

*Testing of the Hypothesis 2.* Migrants' wisdom is found to have a significant influence toward migrants' competitiveness in Pekanbaru at the regression coefficient of 0.521, CR of 0.628 and level of significance of 0.530. Therefore,  $H_0$  is accepted. The result of this study shows that wisdom has a positive yet insignificant influence toward migrants' competitiveness in Pekanbaru.

The result of each indicator testing toward migrants' competitiveness is explained as follows.

1. The influence of self-conceptualization toward migrants' competitiveness. The influence of self-conceptualization toward migrants' competitiveness shows value of 0.315, CR at 3.643 and level of significance at 0.000. This implies that self-conceptualization has a positive and significant influence on migrants' competitiveness.
2. The influence of awareness toward migrants' competitiveness. The influence of awareness on migrants' competitiveness shows value of 0.136, CR at 3.918 and level of significance at 0.000. It means that awareness has a positive and significant influence on migrants' competitiveness.
3. The influence of patience toward migrants' competitiveness. The influence of patience on migrants' competitiveness shows value of 0.257, CR value at 5.051 and level of significance at 0.000. Thus, patience shares a positive and significant influence on migrants' competitiveness.
4. The influence of cultural values toward migrants' competitiveness. The influence of cultural values toward migrants' competitiveness shows value of 0.306, CR at 4.030 and level of significance at 0.000. It implies that cultural values have a positive and significant influence on migrants' competitiveness.

The result of this study also shows that self-conceptualization and cultural values appear to be the indicators that have strongest influence toward migrants' competitiveness in Pekanbaru.

## DISCUSSION OF RESULTS

Based on the data of this study, the influence of each variable is explained as follow.

*Current Migrants' Competitiveness in Pekanbaru.* Migrants' competitiveness (Y) has been considered good at an average score of 1.8. It indicates that generally, migrants in Pekanbaru have adequate competitiveness and possess basic characteristics to reach good achievement, success or to reach their goals. A study conducted by Borja (2015) states that even though immigrants come with awful economic loss, they will get higher opportunities to develop themselves. Compared to the other indicators, productivity has the higher mean score. The productivity of migrants' competitiveness shows score 2.2 which shows that the results of their productivity or output remain strong in each job period. Quality is following with a score of 2.1, meaning that migrants' quality or achievement have been able to fulfill their daily necessity both primary needs and secondary needs. Adaptation also appears to be an indicator with high score at 1.9 which implies that the ability to adapt appears to be migrants' strength in facing difficult challenges. It can be seen from the length of their stay in which the longer they have stayed, the better their ability to adapt as experienced by migrants who had been living in Pekanbaru for 10 to 15 years. This result supports the finding of Borja, whose study shows that the within one or two decades after the arrival, migrants in America earn income closer to the average income even greater than the income of natives from the equal state of social and economy. In addition, only few research have shown that immigrants give negative effect toward natives' job opportunity. Generally, empirical studies show optimistic results related to immigrants' contribution for the economy of America.

In this study, there were two respondents who gave low scores for efficiency and innovation respectively at 1.5 and 1.3. This finding shows that efficiency in the form of attitude for hybrid life in Pekanbaru is still weak. Innovation in the form of the agility to catch opportunities seen from migrants' creativity is still weak since they tend to be passive. The productivity of migrants should be taken into account since it has high contribution to the nations' fiscal. In line with the result of a study conducted by Dutesmann and Frattini (2014) on the fiscal effects of immigration in UK shows that migrants in European countries tend to give positive contribution for England compared to migrants from other European countries. This positive contribution gives major benefits for the economy of Pekanbaru city.

*The influence of skills toward migrants' competitiveness in Pekanbaru.* Skills as a capital have a significant influence on migrants' competitiveness at a regression coefficient of 0.210, CR at 1.957, and level of significance at 0.05 which rejects the  $H_0$ . The result of this study shows that skills have a positive and significant effect toward migrants' competitiveness in Pekanbaru.

Out of those four indicators, skills appear to have the strongest influence toward the competitiveness, followed by the experience. Meanwhile, knowledge and education are found to have weak influences. A study conducted by Hamberger (2009) highlights the importance of human resource as a precious capital which becomes a key factor of immigrants integration. Serious attempts should be made to improve the human resources capital to prevent immigrants from being burdens to a nation. It is also stated that human resource is often neglected as a capital when it is supposed to be well utilized. Nations should grow awareness that immigrants need be educated and well trained instead of being judged upon any stereotypes. Government should also make use of this human resource as a strong capital and take the most benefits from immigrants' background. In the other words, government need to see immigrants as a beneficial capital, not for merely a matter of formality, but government has to put it into practices.

*The influence of wisdom capital toward migrants' competitiveness in Pekanbaru.* Migrants' wisdom has a significant influence toward their competitiveness with a regression

coefficient at 0.521, CR at 0.628, and level of significance at 0.530. These values accept the  $H_0$ . The result of this study indicates that migrants' wisdom has a positive yet insignificant influence toward their competitiveness. This result goes in line with Coleman (1998) who found out that the culture where individuals grow up (usually referred as "social capital") can be seen as a human capital. He mentioned that social capital changes the job opportunity and significantly influences the attitudes, improve the human resources as the product of job market. In addition, he also conducted the study in the low-end class which result shows that integration has a strong influence for immigrants are required to adapt themselves into the new environment they are living in. Integration refers to the inclusion process and long-term acceptance of migrants upon the core institution, relationship and the status of the new society. Integration of migrants also refers to the process of learning new culture, receiving rights and access toward certain position and status, building up personal relationship with the target society, internalizing the feeling of belonged and identification of the immigrants society. Integration is also an interactive process between migrants and the natives in which natives have more power and prestige than the immigrants (Heckmann, 2005 as cited in King and Skeldon, 2010).

Hypothesis which states that this fact has an extern effect toward the accumulation of human capital has been widely used in sociology and social studies. It is also seen from the data that self-conceptualization and cultural values are hypotheses which have the strongest influence toward migrants' competitiveness in Pekanbaru.

### **CONCLUSION AND SUGGESTIONS**

Regarding to the result of this study as mentioned previously, conclusions are drawn as follows.

Generally, migrants' competitiveness is considered good. Migrants own the basic characteristics to achieve good job achievement or success in reaching their goals. Two indicators obtained low scores; efficiency and innovation. It shows that migrants need to improve their attitude toward efficiency in the form of hybrid life style in Pekanbaru. Whilst, innovation refers to the ability to catch any opportunities which can be seen from their creativity in doing various jobs.

Skills of migrants have a significant influence toward their competitiveness at a regression coefficient of 0.201, CR of 1.957, and level of significance of 0.05, which indicate that the  $H_0$  is rejected. The result of this study also shows that skills have a positive and significant influence toward migrants' competitiveness. Out of those four indicators, life skill appears to be the indicator with the strongest influence, followed by migrants' experience. Whereas, knowledge and educations are the indicators that have the lowest influence.

Migrants' wisdom also has a significant influence on their competitiveness at the regression coefficient at 0.521, CR at 0.629, and level of significance at 0.530. therefore,  $H_0$  is accepted. Based on the result of this study, migrants' wisdom has a positive yet insignificant influence toward their competitiveness. This study also shows that self-conceptualization and cultural values are indicators that have the strongest influences toward migrants' competitiveness in Pekanbaru.

Moreover, based on the result of this study, some suggestions are made on how to improve migrants' competitiveness in Pekanbaru.

Migrants are suggested to improve their attitudes related to efficiency and innovation before coming to Pekanbaru in order to reach a success in the city.

The government of Pekanbaru is expected to be more selective in accepting migrants as permanent residents by adding higher requirement related to migrants' skills and experience in order to prevent the migrants from being jobless that eventually become big burden for the government.

Government of migrants' origin should give motivation to the migrants related to their goals of leaving the hometown. It is also important to enhance the cultural values understanding of migrants to help them adapting to the new circumstances well.

## REFERENCES

1. Borja, G.J. (2015). Immigration and Globalization: A Review Essay. *Journal of Economic Literature*, Vol. LIII (December). Harvard Kennedy School, USA.
2. Coleman, J.S. (1998). Social Capital in the Creation of Human Capital. *Amer. J. Sociology*, Supplement, 94, pp. S95–120.
3. Dinas Kependudukan dan Pencatatan Sipil. (2010). Catatan Sipil dalam Angka 2010. Pekanbaru: Dinas Kependudukan dan pencatatan Sipil.
4. Dustmann, Christian & Frattini T. (2014). The Fiscal Effects of Immigration to The UK. *The Economic Journal*, USA.
5. Hamberger, A. (2009). Thematic Articles – Identity, Integration And Citizenship Immigrant Integration: Acculturation and Social Integration. *Journal of Identity and Migration Studies*, Volume 3, number 2. Cambridge University, UK.
6. Jones, Terry-Ann. (2009). Migration Theory in the Domestic Context: North-South Labor Movement in Brazil. *Human Architecture: Journal of the Sociology of Self-Knowledge*. Vol. 7, Issue 4, 5 - 14
7. King, R. & Skeldon, R. (2010). Mind the Gap: Integrating Approaches to Internal and International Migration. *Journal of Ethnic and Migration Studies*, 36: 10, 1619 — 1646, University of Sussex, UK.
8. Lee, E.S. (1995). *Teori Migrasi*. Translated by H. Daeng and reviewed by I.B. Mantra. Yogyakarta: Pusat Penelitian Kependudukan, UGM.
9. Lewis, M.A. (1954). *Economic Development With Unlimited Supplies of Labour*. UK: Manchester School.
10. Mattulada. (1994). *Lingkungan Hidup Manusia*. Jakarta: Pustaka Sinar Harapan.
11. Mantra, I.B. (2000). *Demografi Umum*. Yogyakarta: Pustaka Pelajar.
12. Mantra, I.B. (2003). *Demografi Umum (Edisi 2)*. Yogyakarta: Pustaka Pelajar.
13. Preffer, J. (2002). *Paradigma Baru Manajemen Sumber Daya Manusia*. Yogyakarta: Amara Books.
14. Ranis, G. & Fei, J.G. (1964). *Development of the Labor Surplus Economy: Theory and Policy*. Homewood, Illinois.
15. Suparmoko. (2008). *Ekonomi Sumber Daya Alam dan Lingkungan Hidup*. Yogyakarta: FE-UGM.
16. Todaro, M.P. (1996). *Kajian Ekonomi Migrasi di Negara Berkembang: Telaah atas Beberapa Model*. Translated by I.B. Mantra. Yogyakarta: Pusat Penelitian Kependudukan, UGM.
17. Todaro, M. (2002). *Pembangunan Ekonomi di Dunia Ketiga*. Translated by H. Munandar. Jakarta: Bumi Aksara.



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## **THE HOUSE FACILITATION FOR THE LOW-INCOME COMMUNITY: A STUDY ON THE SELF-RELIANCE HOUSING STIMULUS PROGRAM**

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### **ABSTRACT**

There have not been many studies examining the success of the Self-Reliance Housing Stimulus Program in improving the quality of habitable houses from the perspective of the low-income communities. This study tries to explore the success of the program in improving the quality of the habitable houses before and after getting the support by surveying 388 low-income households in cities and regencies located in the Central Java Province. The result of the research shows that with the program has helped the low-income people to improve the quality of their houses. The increase can be seen in the physical factors of the building, the environmental, and the health factors.

### **KEY WORDS**

Habitable house, low-income communities, self-reliance housing stimulus.

Based on the mandate of the 1945 Constitution and the Article 28H of the Amendment to the 1945 Constitution, the right to adequate housing is one of the basic rights of the people and therefore every citizen shall have the right to live and receive a good and healthy living environment. In addition, home is also a basic human need in improving the dignity and quality of life and livelihood as well as a personal reflection in the effort to improve the standard of living as well as to form the character and personality of the nation. Home is also the smallest environment that serves as a place where humans interact in the process of growing up. Because of its fundamental nature, every year there is always an increase in the needs of housing along with the increase of population. The orientation of housing and settlement development is focusing on providing housing with such low funds. The number of rented houses in 2016 amounted to 8.51% and self-owned houses amounted to 82.58% (BPS, 2017).

The 1945 Constitution mandates that the right to adequate housing is one of the basic rights of the people and that the state through the government shall provide assistance to people who have not been able to own a house or already have a house but not fulfilling the standard of adequate housing. According to Mungkasa (2011), the condition allows the government to have self-reliance housing programs as one of the spearheads of the fulfillment of human rights. However, many things must be done to make the programs run effectively and efficiently. A comprehensive scenario, from the paradigm, basic principles, policies, strategies, road maps, to the funding and human resource, needs to be agreed upon by all stakeholders. The programs by the government of Indonesia in fulfilling the needs of habitable housing are run by the Ministry of Public Works and Housing, one of which is the Self-Reliance Housing Stimulus Program dedicated to Low-Income Communities. The program has been in implementation since 2009 until now.

The program is in the form of social assistance to encourage the low-income communities to build habitable housing and/or healthy and safe environments. This assistance is a leverage of community self-reliance in various forms either in the form of additional funds, labor, or other support. It is hoped that this assistance can foster self-reliance initiatives for their own good as well as beneficial for the relatives, neighbors, and the surrounding environment, so the support can be used to complete the construction or improve the quality of houses.

The fulfillment of the needs for houses mandated in the 1945 Constitution is set forth in the National Long Term Plan of the Republic of Indonesia from 2015 to 2019 in the Self-

Reliance Housing Stimulus Program, where the target to be completed by 2019 is 1,750,000 housing units on the construction of new self-reliance houses of 250,000 units and an increase of self-reliance housing quality by 1,500,000 units. In 2015, the program is planned to build 20,756 new housing units and improve the quality of 61,4489 old housing units (the Ministry of Public Works and Housing, 2016). The following is the realization of the program in 2015 in 31 provinces of Indonesia.

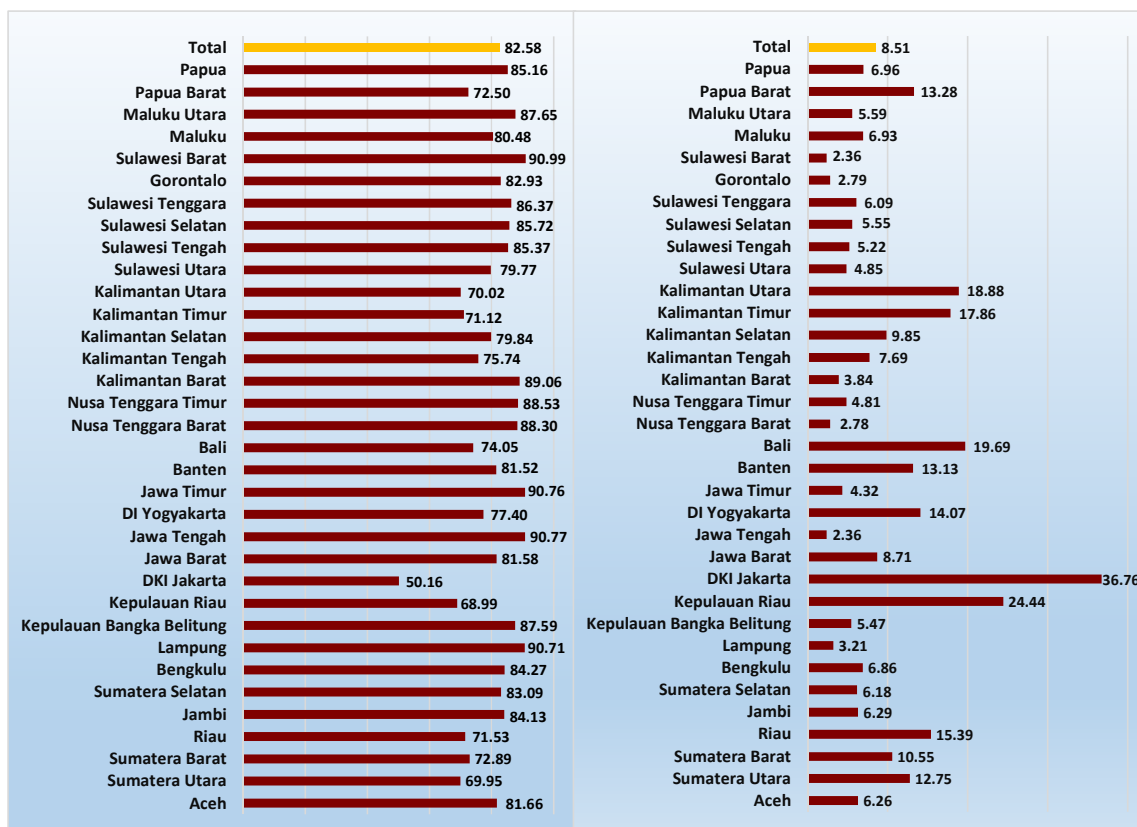


Figure 1 – Percentage of Households by Provinces and the Status of Self-Owned Houses, 2016 (Source: BPS, 2017)

Figure 2 – Percentage of Households by Provinces and the Status of Rented Houses, 2016 (Source: BPS, 2017)

Table 1 – The Number of New Housing Units Built and Old Housing Units Improved by the Self-Reliance Housing Stimulus Program in 2015

| n/n | Province           | Quality Improvement | New Houses Built | Total  |
|-----|--------------------|---------------------|------------------|--------|
|     | 2                  | 3                   | 4                | 5      |
| 1   | Riau               | 410                 | -                | 410    |
| 2   | Sumatera Utara     | 2,289               | -                | 2,289  |
| 3   | Aceh               | 1,605               | -                | 1,605  |
| 4   | Sumatera Barat     | 4,154               | 2                | 4,156  |
| 5   | Kepulauan Riau     | 239                 | -                | 239    |
| 6   | Lampung            | 1,592               | 1,159            | 2,751  |
| 7   | Bengkulu           | 1,042               | 377              | 1,419  |
| 8   | Sumatera Selatan   | 1,764               | 136              | 1,900  |
| 9   | Jambi              | 603                 | 542              | 1,145  |
| 10  | Jawa Barat         | 5,833               | 3,235            | 9,068  |
| 11  | Banten             | 13                  | 826              | 839    |
| 12  | Jawa Tengah        | 12,414              | 1,322            | 13,736 |
| 13  | D.I. Yogyakarta    | 575                 | 1,746            | 2,321  |
| 14  | Jawa Timur         | 5,043               | 1,617            | 6,660  |
| 15  | Kalimantan Barat   | 3,164               | 9                | 3,173  |
| 16  | Kalimantan Selatan | 1,742               | 3                | 1,745  |
| 17  | Kalimantan Tengah  | 1,721               | -                | 1,721  |
| 18  | Kalimantan Utara   | 110                 | 1                | 111    |

| 1  | 2                   | 3      | 4      | 5      |
|----|---------------------|--------|--------|--------|
| 19 | Kalimantan Timur    | 488    | -      | 488    |
| 20 | Gorontalo           | 1,437  | 1,616  | 3,053  |
| 21 | Sulawesi Selatan    | 2,173  | -      | 2,173  |
| 22 | Sulawesi Tengah     | 3,318  | 1,350  | 4,668  |
| 23 | Sulawesi Tenggara   | 2,974  | 218    | 3,192  |
| 24 | Sulawesi Utara      | 693    | -      | 693    |
| 25 | Sulawesi Barat      | 1,353  | 167    | 1,520  |
| 26 | Bali                | 609    | 1,080  | 1,689  |
| 27 | Nusa Tenggara Barat | 1,587  | 3,090  | 4,677  |
| 28 | Maluku              | 1,398  | -      | 1,398  |
| 29 | Maluku Utara        | 938    | 583    | 1,521  |
| 30 | Papua               | 208    | 710    | 918    |
| 31 | Papua Barat         | -      | 967    | 967    |
|    | Total               | 61,489 | 20,756 | 82,245 |

Source: The Directorate General of The Ministry of Public Works and Housing RI, 2016.

Construction of houses along with infrastructure, facilities, and public utilities can indirectly encourage regional growth and regional economy, can support socio-cultural development as well as can provide a tangible contribution to improving the quality of housing, economic growth, poverty alleviation, and welfare improvement. Therefore, the development of a decent and healthy housing and environment is a way for the development of Indonesian human resources in the future. This study aims to see the perceptions of the low income communities as the receivers of the assistance and see the effect of the program in improving the quality of habitable home.

## LITERATURE REVIEW

In 2015, the Government of the Republic of Indonesia launched the Million Houses Program to reduce the housing backlog. One of the main targets of the Million Houses Program is the low-income communities. The success or failure of the national program is not only seen from the number of houses built, but also the accuracy of the target of providing houses, i.e. for low-income people. Based on the income levels, laborers and employees whose income is the same as the Provincial Minimum Wage are included in the low-income criterion. In addition, there are also poor people living below the poverty line, which ranks at the bottom of the low-income level.

*Low-Income Communities.* The low-income community, hereinafter abbreviated as LIC, based on the Act Number 11 of 2011 regarding Housing and Settlement Area, refers to those with limited purchasing power so it is necessary for them to get government support to obtain housing. Article 126 of the Act states that the government and local governments provide facilities and/or assistance in the form of finance for the construction and acquisition of public houses and self-reliance houses for these low-income people. There are 3 (three) segments of the low-income people based on the ability to access home ownership. They are the low-income people: who already own land or houses but are unable to build/repair their houses; who are able to buy a house but of low ability to repay the mortgage; and who cannot afford to buy a house.

*Habitable House.* Based on the regulation of the Ministry of Public Works and Housing Number 20/PRT/M/2014 on the liquidity facility of housing finance in the framework of obtaining housing through credit for low-income people (changed by the regulation Number 20/PRT/M/2015), the target group of the Housing Credit Program represents those low-income people with regular income and with irregular income. The income limit of the target group of the Housing Credit Program is the people with income of IDR 4 million for the landed house.

A habitable house is a house that meets the building safety requirements, the minimum adequacy of building area, and the occupant health. To meet the requirements as a habitable house, the criteria and technical requirements are as follows.

1. The Criteria:

- a. Meet building safety requirements, including:
    - Lower structure/foundation;
    - Structure/column and log (beam);
    - Upper structure.
  - b. Ensure health includes lighting, air circulation and sanitation;
  - c. Meets minimum minimum adequacy of 7.2m<sup>2</sup>/person up to 12m<sup>2</sup>/person.
2. The Technical Requirements:
    - a. Safety/security factors. The house can provide a sense of security for residents and the environment around the house. The structure of the building must be in accordance with the condition of the land where the house is built, so the structure is able to withstand dead loads and live loads therein and the burden arising from certain natural conditions, such as earthquakes, wind and flood.
      - b. Health factors. In addition to providing a sense of security for its inhabitants, the house must also meet health standards such as caring systems and optimal natural lighting, good sanitation and the use of building materials that do not interfere with occupant health and the environment.
      - c. Comfort factors. The house is able to provide comfort for the inhabitants, including:
        - circulation or spaces associated with the organization of relations between rooms of the house;
        - temperature, the house can be used as a refuge from the hot weather during the day and cold air during the night; and
        - view, the home can maintain the privacy of the occupants when performing certain activities without the worries of being seen from the outside.

## METHODS OF RESEARCH

This study examines the perspective of low-income communities as the beneficiaries of the program in the sub-program of home improvement. This study was conducted in 2015 in Central Java Province as the province had the highest number of beneficiaries in 2015. The population consisted of 12,414 people in one (1) city and twenty-one (21) regencies. The sample of the study consisted of 388 respondents, obtained using Slovin formula with  $\alpha$  5%. The determination of sample per region (city and regency) was done proportionally because the number of beneficiaries was not the same in each city and region. The distribution of samples in each city and regency is as follows:

Table 2 – Sample Proportion According to the City and Regency in Central Java

| n/n | City/Regency                   | Population | Sample |
|-----|--------------------------------|------------|--------|
|     | 2                              | 3          | 4      |
| 1   | Kota Pekalongan (city)         | 50         | 2      |
| 2   | Kabupaten Brebes (regency)     | 921        | 29     |
| 3   | Kabupaten Pemasang (regency)   | 269        | 8      |
| 4   | Kabupaten Batang (regency)     | 433        | 14     |
| 5   | Kabupaten Wonosobo (regency)   | 671        | 21     |
| 6   | Kabupaten Banyumas (regency)   | 243        | 8      |
| 7   | Kabupaten Kebumen (regency)    | 1.421      | 44     |
| 8   | Kabupaten Purwokerto (regency) | 705        | 22     |
| 9   | Kabupaten Klaten (regency)     | 897        | 28     |
| 10  | Kabupaten Wonogiri (regency)   | 450        | 14     |
| 11  | Kabupaten Sukoharjo (regency)  | 901        | 28     |
| 12  | Kabupaten Sragen (regency)     | 691        | 22     |
| 13  | Kabupaten Tegal (regency)      | 656        | 21     |
| 14  | Kabupaten Pekalongan (regency) | 798        | 25     |
| 15  | Kabupaten Jepara (regency)     | 371        | 12     |
| 16  | Kabupaten Boyolali (regency)   | 472        | 15     |
| 17  | Kabupaten Temanggung (regency) | 397        | 12     |
| 18  | Kabupaten Semarang (regency)   | 775        | 24     |

| 1     | 2                            | 3      | 4   |
|-------|------------------------------|--------|-----|
| 19    | Kabupaten Pati (regency)     | 325    | 10  |
| 20    | Kabupaten Kendal (regency)   | 665    | 21  |
| 21    | Kabupaten Magelang (regency) | 83     | 3   |
| 22    | Kabupaten Cilacap (regency)  | 220    | 7   |
| Total |                              | 12.414 | 388 |

Source: The Directorate General of The Ministry of Public Works and Housing RI, 2016.

This data analysis technique uses a description analysis. It is used to describe or give an idea of the object under study through the data or samples collected as it is without making any analyses or conclusions. In other words, the descriptive analysis takes the problems or focuses on the problems as they are when the research is conducted; the results of which are then processed and analyzed for conclusion (Sugiono, 2009). Prior to the analysis, research instruments were tested for validity and reliability.

## RESULTS OF STUDY

The initial stage of this study was testing the instrument validity to the questionnaire used. The results of the questionnaire validity test against the 16 (sixteen) items about habitable home variables were valid. The value of r-count was greater than the r-table for the whole items. Furthermore, after the validity test, the reliability test with alpha 1% (N-2) was performed. The result was that the correlation coefficient value greater than the r-table value ( $0.877 > 0.148$ ); thus, the instrument was significantly reliable. To capture the perspective of respondents, questionnaires with closed questions were used. There were sixteen (16) statements with A-D alternatives.

*Physical Factors of the Building.* This relates to the level of house damage before receiving the assistance. There were 283 or 73% of low-income people. The house damage before receiving assistance reached 26% - 50%. There were 89 people (23%) experienced <25% house damage, and 16 people experienced 51% -75% house damage. After the program, 206 (53%) people stated that their house was much better compared to the previous condition, 167 (42%) people stated that their house was better, and 19 (5%) people stated that their house was quite good.

Related to the width of the house before getting assistance, as many as 171 (44%) people had about 51 m<sup>2</sup> to 75 m<sup>2</sup>, 167 (43%) people had about 37 m<sup>2</sup> to 50 m<sup>2</sup>, 43 (11%) people had > 76 m<sup>2</sup>, and 8 (8%) had a total area of > 36 m<sup>2</sup>. The addition of house building area after the program by 25% was experienced by 237 (61%) people, by 50% was experienced by 147 (38%) people, and by 75% was experienced by 4 (1%) people.

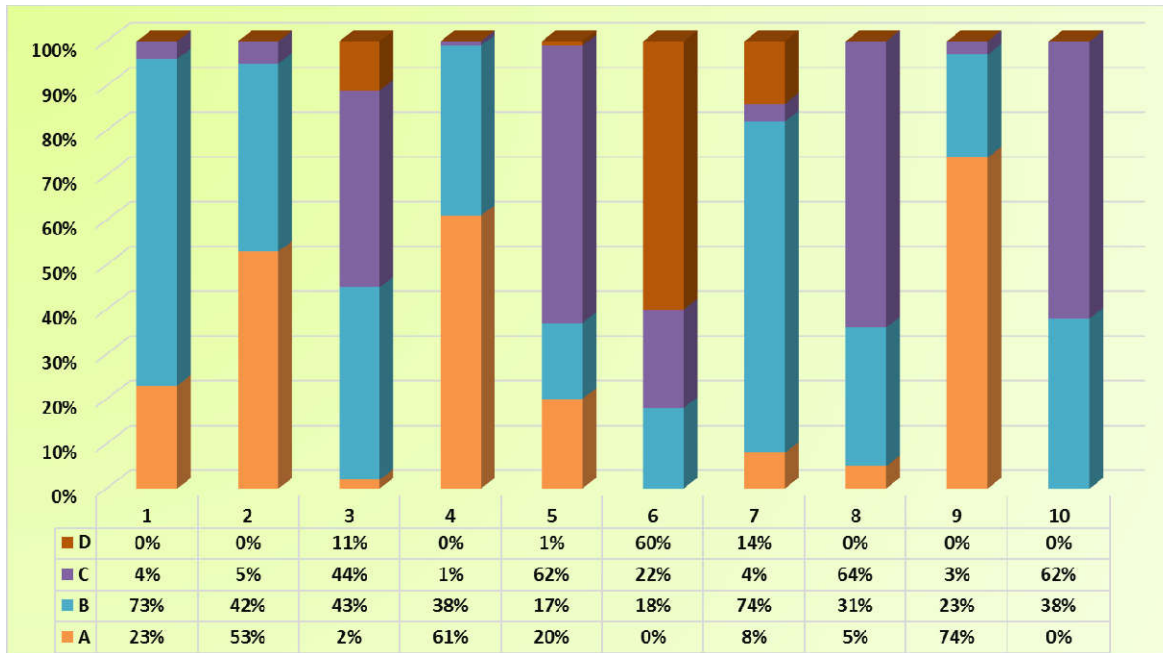
In terms of improving the quality of houses, the program requires the beneficiaries to pay attention to building materials used, such as the roof. The material previously used by 241 (62%) people was asbestos, 78 (20%) people used rumbia, 66 (17%) people used zinc corrugated roof, and 4 (1%) people used the roof tile. After the program, 233 (60%) people used the roof tile. As many as 85 (17%) people still used asbestos, and the rest 70 (18%) people used zinc corrugated roof.

The next material to change was the wall. Wall materials used by the community were mostly wood. A total of 287 (74%) people still used woods for the walls, 16 (4%) people used concrete, 31 (8%) used tarpaulins, and 54 (14%) people used other types of materials. After the program, 198 (51%) people used concrete, 120 (31%) used woods, and used 19 (5%) tarpaulins.

The program also required beneficiaries to use appropriate flooring materials for the improvement of quality of life. Currently, as many as 287 (74%) people used no tiles, 89 (23%) used cement flooring, and 12 (3%) people already used ceramics. The change after the program was the use of the ceramic material by 241 (62%) people and cement flooring by 147 (38%) people.

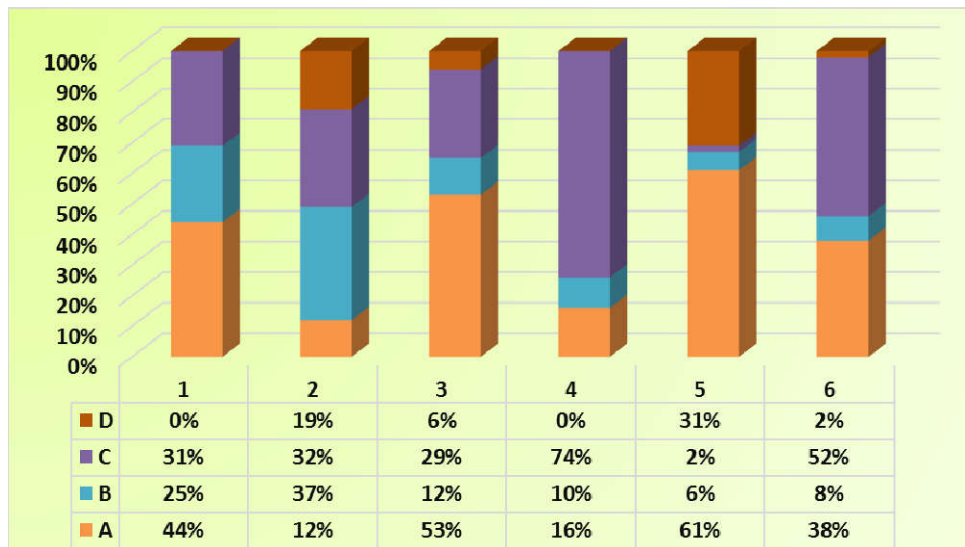
*Health Factors.* The home environment health in this study is based on Ministerial Regulation Number 06 of 2013 on Guidelines for Implementation of Self-Reliance Housing Stimulus Program. Article 3 states that the type of assistance provided may be the

construction of infrastructure, facilities, and utilities attached to the house, among others, sources and networks of clean water, bathrooms, landfills.



Source: Primary Data Processed 2017.

Figure 3 – The Perspective of the Low-Income Communities on the House Improvement Sub-Program through the Self-Reliance Housing Stimulus Program (Physical Building Factor)



Source: Primary Data Processed 2017.

Figure 4 – The Perspective of the Low-Income Communities on the House Improvement Sub-Program through the Self-Reliance Housing Stimulus Program (Health Factor)

The surrounding environment of the houses of the low-income communities is not so healthy. For drinking water infrastructure, 171 (44%) people utilized river water, 120 (31%) people used drilled well water, and 97 (25%) people used spring as the drinking water source. After the program, 144 (37%) people already used springs as the drinking water source, 124 (32%) people still used drilled well water, and 47 (12%) people kept on using river water as a the source of drinking water. Some communities have also realized the

importance of healthy drinking water sources; thus, a large number of people already used the water provided by the local water company.

As many as 206 (53%) people used public toilets. A total of 47 (12%) people still used the river, 113 (29) people used water closet (WC) in their house, and as many as 23 (6%) used other facilities. The real change after the program was the increase in the number of people using private water closet (WC) as many as 287 (74%), 62 (16%) used the public toilets, while others still used the river.

Another environmental health factor is related to landfills. Before the program, most of the people preferred to burn the garbage. Based on the result of the research, there were 237 (61%) people burnt their garbage, 120 (31%) people dumped the garbage in the river, 23 (6%) buried their garbage, and only 8 (2%) people dumped garbage in a landfill around their house. Following the program, 202 (52%) people used the landfill, 147 (38%) people still burnt their garbage, 31 (8%) people buried their garbage, and the real impacts arising from the program was a lower number of people throwing their garbage in the river, which was only 8 (2%) people.

## **DISCUSSION OF RESULTS**

Based on the results of the analysis, it can be seen that from the perspective of low-income communities receiving the program, there has been an increase in the quality of the habitable house building from the aspects of physical factors. Before the program, the level of damage was 26% to 50%, yet after the program, the condition of the house has been very good. The house building area after the program has increased by 25%. The roofing material has been changed to tiles, the walls have been changed to concrete, and almost all floors have already used ceramics.

Based on the results of the analysis, it can be seen that from the perspective of low-income communities receiving the program, there has been an increase in the quality of the habitable house building from the aspects of the health of the surrounding environment. The people mostly nowadays have used drilled well water. Before the program, most of them used the river water and springs as a source of drinking water. In addition to drinking water, after the program, the community already has had a water closet (WC) inside the house, where previously most of them used the river as the toilet. The other benefit of the program is that the community now has a garbage dump in each house, so they do not dispose household garbage in the river or by burning and burying.

The idea that 'occupant control' contributes to the impacts of the habitable home has been proven. The idea is supported by Huchzermeyer and Omenya (2004), comparing the independent self-reliance houses with non-independent self-reliance houses (let alone government intervention too strong). Independent self-help house is better and wider and grows much better. This is also supported by the high sense of belonging by the residents that result in their high satisfaction. Based on the results of research conducted by Carmon and Gayrieli (1987), comparing self-reliance and non-self-reliance housing, the first housing produced more qualitative homes, better neighborly relationships, and more satisfied residents. In addition, the community is also encouraged to maintain its environmental conditions. This condition is achieved with only a small government cost compared to non-self-reliance housing (Ntema, 2011). Habitable home conditions can have an impact on improving the condition of the economy of its inhabitants. It is evident that improved family economic conditions encourage gradual improvement of housing conditions (quality and extent) (Pugh, 2001). Nevertheless, the occupant control can encourage residents to ignore the economic difficulties they face and still improve the quality of their homes.

## **CONCLUSION**

From the study, it can be concluded that the Self-Reliance Housing Stimulus Program of the Ministry of Public Works and Housing is able to give a direct impact on the improvement of the quality of habitable home. The improved quality is in the physical quality

and home environment health. The success of the program cannot be separated from the support and active participation of the low-income communities. The form of support is self-funding and the participation of family members and beneficiary groups in the house building process.

Theoretically, this study can be used as a reference about the Self-Reliance Housing Stimulus Program. In addition, it can also increase knowledge and insight on how to improve the quality of habitable home for the low-income people). The Ministry of Public Works and Housing must manage the program well to realize what has been mandated in the 1945 Constitution and Article 28H of the amended 1945 Constitution in which each citizen is entitled to live and get a good and healthy living environment .

### **LIMITATION AND FUTURE STUDY**

This study does not include all the criteria and technical requirements of a habitable house determined by the Indonesian government. Criteria not been included in the study are (1) health factors including optimal air and natural lighting, air circulation and sanitation; (2) safety/security factors including the structure of the building that must be in accordance with the condition of the land where the house is built, so the house is able to withstand dead loads and live loads as well as the burdens arising from certain natural conditions such as earthquakes, wind, and flood; (3) comfort factors such as circulation or movement of space, temperature, and so forth.

This study also needs further development as to calculate the amount of leverage that occurs along with the self-reliance housing program to improve the quality of the houses. As it is known, the self-reliance housing is designed for residents to develop their own houses in the long term. This is in accordance with Turner's idea that a house should be viewed as a verb and not a noun. A house should be regarded as a process (Turner, 1976), so it will never finish but will continue to grow. Similarly, when observations are made, they are not recommended to be instantaneous (snap shot) but in a long time.

### **REFERENCES**

1. Undang-Undang Dasar Negara Republik Indonesia Tahun 1945 pasal 28H ayat 1. [www.hukumonline.com](http://www.hukumonline.com)
2. Undang-Undang Republik Indonesia nomor 11 Tahun 2011 tentang Perumahan dan Kawasan Permukiman. [www.hukumonline.com](http://www.hukumonline.com).
3. Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia nomor 06 Tahun 2013 tentang Pedoman Pelaksanaan Bantuan Stimulan Perumahan Swadaya. [www.birohukum.pu.go.id](http://www.birohukum.pu.go.id).
4. Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia nomor 20 Tahun 2015 tentang perubahan atas peraturan menteri pekerjaan umum dan perumahan rakyat nomor 20 tahun 2014 tentang Fasilitas Likuiditas Pembiayaan Perumahan dalam Rangka Perolehanrumah Melalui Kredit/Pembiayaan Pemilikan Rumah Sejahterabagi Masyarakat Berpenghasilan Rendah. [www.birohukum.pu.go.id](http://www.birohukum.pu.go.id).
5. Badan Pusat Statistik Jakarta Pusat , 2017. Statistik Indonesia Tahun 2016. Jakarta Pusat: Badan Pusat Statistik.
6. Carmon, Naomi dan Gayrieli, Tamar. 1987. Improving Housing by Conventional Versus Self-help Methods: Evidence From Israel. *Urban Study*, 24 (4), 324-332, Agustus.
7. Direktorat Rumah Swadaya. 2016. Pengembangan Pelaksanaan Bantuan Rumah Swadaya. Kementerian Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia: Jakarta
8. Huchzermeyer, M. & Omenya, A. (eds). 2004. Housing Definitions for Republic of South Africa. Directorate of Policy and Programme Monitoring, National Department of Housing, Pretoria, South Africa



9. Kementerian Perencanaan Pembangunan Nasional. 2014a. Rencana Pembangunan Jangka Menengah Nasional (RPJMN) 2015-2019: Buku I Agenda Pembangunan Nasional, Kementerian Perencanaan Pembangunan Nasional: Jakarta.
10. Ntema, Lejone John. 2011. Self-Help Housing in South Africa: Paradigms, Policy and Practice. Disertasi. Faculty of The Economic and Management Sciences (Centre for Development Support) University of the Free State, Bloemfontein, Afrika Selatan.
11. Mungkasa. 2011. Perumahan Swadaya Konsep, Pembelajaran dan Praktek Unggulan. Bappenas, Jakarta.
12. Pugh, C. 2001. The Theory and Practice of Housing Sector Development for Developing Countries, 1950-99. *Housing Studies*, 16(4), 399-423.
13. Sugiyono. 2009. Metode Penelitian Bisnis (Pendekatan Kuantitatif, Kualitatif, dan R&D). Bandung: Alfabeta.
14. Turner, J.F.C. 1976. *Housing by People. Towards Autonomy in Building Environments*. Marion Byers, London.

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## LEGAL PROTECTION OF CREDITORS IN THE IMPLEMENTATION OF SUBSIDY CREDIT WITH GUARANTEE SECURITY LETTER

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### ABSTRACT

In the case of Mortgage buyer can not appear before a Notary or PPAT, Article 15 of the Law Mortgage provides the opportunity for the assigning of dependents to use the Power of Attorney Imposing Mortgage (SKMHT). Based on the research we concluded that, SKMHT this period to be increased to APHT for 1 month to 3 months registered land and for the land has not been registered. This time period according to Article 15 (5) of the Act Mortgage excluded by Minister of State for Agrarian Affairs / Head of National Land Agency Number 4 of 1996 concerning the use of an expiration date SKMHT to guarantee repayment of certain credits. In the area of mortgages, especially for mortgages subsidized SKMHT time period is set during the loan period so that the debtor is not burdened with the cost APHT again. These rules are not in line with the execution of the auction mortgages arranged by auction house KPKNL (the State Property Office and Auction) because the main requirement can be done auction security rights that is the SHT (certificate of encumbrance) in the UUPA.

### KEY WORDS

Power subsidy, legal credit, small business, loan guarantee.

The making of SKMHT is possible in the case that the right to land which is the object of the Mortgage Right has not yet been certified. In the mortgage agreement (mortgage) the debtor receiving the loan provides collateral in the form of house and land purchased from the credit facility of the bank. Bank lending bank usually only as the holder of SKMHT alone, because the right of land rights which is the object of guarantee has not been done individually. In the Housing Loan agreement (KPR) there are 3 (three) related parties, namely: the debtor (consumer) party is the buyer of the house built by the developer with the money borrowed from the bank; the creditor party is the bank as a funding bank which provides credit facilities in the form of money used by the debtor to pay for the house purchased from the developer; developers are developers and builders of housing projects ie houses that are sold to buyers either in cash or credit.

To guarantee credit payment in accordance with the terms of the credit agreement, the debtor agrees to provide the house and land purchased with the bank's credit. In Article 4 of Ownership Credit Agreement made by the State Savings Bank, it is stated that if the collateral in the form of house and land is deemed to be insufficient, the debtor may add certain other items which the bank specifies as additional collateral.<sup>1</sup> Housing Loans (KPR) granted for housing procurement under Article 1 Paragraph (2) of Regulation of the State Minister of Agrarian Affairs / Head of BPN concerning the Stipulation of Deadline for the Use of Power of Attorney to Charge the Guarantee (SKMHT) to guarantee Types of Specific Credits

*During the achievements in credit agreements pledged with Rights.* Deposit is fulfilled well by the debtor, then the right of dependent as security right does not look its function. New Deposit right works if the debtor has an appointment injury. Article 4 paragraphs (1) and (2) of UUHT determined that what may be the object of Mortgage Right is the right to land from: property rights; cultivation rights; building rights; use rights on state land which by their nature must be registered and transferable.

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<sup>1</sup> Hermansyah, *Hukum perbankan Nasional Indonesia (edisi revisi)*, Jakarta, Kencana Prenada Media Group, 2005, hlm. 126

Before the promulgation of UUHT, in the practice of banking, the power of attorney to install Hypotics (SKMH) rarely, or almost never done the installation of mortgages in real, on the grounds that cause creditor tidal directly install mortgages among others:

- The process of installing a mortgage is relatively long.
- Bank long enough to know the character of the debtor.
- The cost of mortgage loading is felt very expensive by the debtor, therefore the debtor feels objection if the bank (creditor) requires that it be done directly mortgage installation on the guarantee submitted by the debtor.

In the event that the buyer of Mortgage's Rights cannot be present in the presence of Notary or PPAT, Article 15 UUHT provides an opportunity for the Depository to use the Power of Attorney for Deposit Rights (SKMHT). The Insurer shall be appointed as the authorized party by SKMHT in the form of authentic and must meet the following conditions:

- Does not contain the power to perform other legal acts other than to impose the Mortgage Right.
- Does not contain substitution power that is the replacement of the authorized recipient through the transfer so that there is a new power of attorney.
- To clearly state the object of the Deposit Rights, the amount of debt and the name and identity of the creditor and debtor

Based on Article 15 paragraph (3) and (4) UUHT, SKMHT is limited period enactment:

- For land already registered SKMHT shall be immediately followed by Deed of Assignment Rights (APHT), no later than 1 (one) month after it is granted.
- For land that has not been registered, the obligation must be fulfilled within 3 (three) months of SKMHT granted.

Elucidation of Article 15 paragraph (5) of UUHT stipulates that the provisions of Article 15 paragraph (3) and (4) do not apply to SKMHT for certain types of credit, namely KUK, KUT, KPR. According to Article 1 of Regulation of the Minister of Agrarian Affairs Number 4 of 1994 concerning the Determination of Time Limit for the use of SKMHT to guarantee the repayment of certain credits, the period of validity of SKMHT "until the expiration of the principal agreement concerned". Related to the provision of subsidized credit or small business loans with a credit limit of 50 million to 250 million which should be every credit tied with mortgage rights in order to process the execution of the object of mortgage rights can be done. Based on Article 3 paragraph 1 of Law No. 4 of 1996 concerning the Rights of Dependence (obviously) the creditor has full rights over the object of the mortgage in case if the debtor is defaulted then the creditor can execute.

As for the predicting of subsidy credit or small business credit as regulated in the Regulation of the Minister of Agrarian Affairs / Head of National Land Agency Number 4 of 1996 stated in Article 2 paragraph 2 (clear) credit with a ceiling of 50 million up to 250 million only in bind with SKMHT not until HT while under the rules related auction execution object collateral / guarantee must with HT over the object. Duration of this SKMHT to be increased to APHT for 1 month for registered land and 3 months for land not yet registered. This period according to Article 15 paragraph (5) UUHT is exempted by Regulation of the Minister of Agrarian Affairs / Head of National Land Agency Number 4 Year 1996 regarding the stipulation of time limit of SKMHT usage to guarantee the repayment of certain credits. In the field of KPR, specifically for the KPR subsidy, the term of SKMHT is stipulated during the loan period so that the debtor is not burdened with APHT fees anymore. The regulation is not in line with the execution of the auction of mortgage rights arranged by KPKNL auction because the main requirement of the auction of mortgage rights is the existence of SHT (certificate of mortgage rights) in the provisions of Law No. 5 of 1960 on Basic Agrarian Basic Regulation (UUPA).

## **METHODS OF RESEARCH**

The type of research used in the completion of this thesis is the type of normative juridical research. In accordance with the objectives to be achieved, the methodology in this

thesis research uses two approaches, namely the statute approach and the conceptual approach (conceptual approach). In collecting this legal material the author uses the method or way by classifying, categorizing and inventorying legal materials used in analyzing and solving problems.<sup>2</sup>

## DISCUSSION OF RESULTS

*Execution on Assurance Objects on Subsidized Loans Tied By SKMHT.* The substance of SKMHT is limited, that is, it only contains legal law Imposing a Deposit Rights does not contain the right to substitute a power of attorney through a transfer and contains the name and identity of the creditor, debtor, the amount of debt, as well as the object of the Deposit Rights. In addition to the above, to prevent the protracted provision of power and for the achievement of legal certainty SKMHT limited period of validity. Article 15 Paragraph (3) of the Mortgage Act determines against registered lands, SKMHT shall be immediately followed by the establishment of Deed of Assignment Rights (APHT) within a period of 1 (one) month after it is granted. Against the land that has not been registered, the obligation must be fulfilled within 3 (three) months. If the tenure requirement is not fulfilled, SKMHT becomes "null and void" as defined in the provisions of Article 15 paragraph (6) of the Mortgage Act.

The above provisions do not apply in the case of SKMHT granted to secure certain credits, such as program loans, small business loans and mortgage loans (mortgages) and similar credits. The determination of the time limit for the validity of SKMHT for certain types of credit is stipulated in the Regulation of the State Minister of Agrarian Affairs / Head of BPN Number 4 Year 1996 regarding the Determination of the Time Limit of SKMHT validity to guarantee certain types of credit. In the provision of Article 1 of Regulation of the Minister of Agrarian Affairs / Head of BPN Number 4 of 1996 states that, the Power of Attorney imposes a Deposit Rights granted to secure the repayment of types of Small Business Credit as referred to in Decree of the Board of Managing Directors of Bank Indonesia Number 26/24 / KEP / Dir dated May 29, 1993, the following applies to the date of expiry of the principal agreement.

Loans given to small business customers, which include:

- Credit to Village Unit Cooperatives
- Agricultural Credit
- Credit to Primary Cooperatives for Members.

Housing Loans held for housing procurement, namely:

- Credit granted to finance the ownership of a nuclear, simple or flats house with a maximum land area of 200m<sup>2</sup> (two hundred square meters) and a building area of not more than 70m<sup>2</sup> (seventy square meters);
- Loans granted for the ownership of Ready Warehouse (KSB) with a land area of 54m<sup>2</sup> (fifty-four square meters) up to 72m<sup>2</sup> (seventy-two square meters) and credits granted to finance the building;
- Credit granted for repair / renovation of houses as meant in letters a and b.

Other productive credit granted by Commercial Banks and Perkre Bank-ditan Rakyat with credit limit not exceeding Rp. 50.000.000,00 (fifty million rupiah), among others:

- a) Rural Public Credit (BRI);
- b) Business Feasibility Loan (disbursed by a Government Bank);

Related to the provision of subsidized credit or small business credit with a credit limit of Rp.50.000.000,00 (fifty million rupiah) up to Rp.250.000.000,00 (two hundred fifty million rupiah) which should be every credit tied with the right of dependents to be in the process of execution of the object of mortgage rights can be done. Under the provisions of Article 3 paragraph (1) of the Statutory Rights Act it is clearly stated that the creditor has full rights to the object of such mortgage in case if the debtor is defaulted then the creditor can execute. In the case of subsidized credit credits or small business loans as regulated in the Regulation of the Minister of Agrarian Affairs / Head of the National Land Agency Number 4 of 1996

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<sup>2</sup> Peter Mahmud Marzuki. *Penelitian Hukum*. Jakarta, Kencana Prenada Media Group, 2015, hlm. 181

stated in Article 2 paragraph (2) that the credit with a ceiling of Rp.50.000.000,00 (fifty million rupiah) up to Rp.250.000.000,00 (two hundred and fifty million rupiah) is only tied with SKMHT not until the Deposit Rights while under the rules relating to the auction of execution of collateral object / guarantee shall be with the Insured Rights of the object.

Duration of this SKMHT to be increased to APHT for 1 month for registered land and 3 months for land not yet registered. This period of time under Article 15 paragraph (5) of the Mutual Rights Act is exempted under the Regulation of the Minister of Agrarian Affairs / Head of the National Land Agency Number 4 of 1996 on the Determination of Time Limits on the Use of SKMHT to secure the repayment of certain credits. In the field of KPR, specifically for the KPR subsidy, the term of SKMHT is stipulated during the loan period so that the debtor is not burdened with APHT fees anymore. The regulation is not in line with the execution of mortgage auction which is arranged by KPKNL auction because of the main requirement of the auction of mortification right is the existence of SHT (Certificate of Dependent Rights).

Based on the above description, basically the issuance of Regulation of the Minister of Agrarian Affairs / Head of National Land Agency Number 4 Year 1996 on Determination of Time Limit SKMHT Use to guarantee the repayment of certain credits is to facilitate the debtor in the implementation of credit, especially credit subsidy or small business credit, however, in practice it will provide a loss to the creditor in particular in the event of default until the execution, in the absence of a mortgage certificate.

SKMHT is a deed which is authorizing by the landlord / building to the creditor to impose the Mortgage right on the land / building which is used as the debt guarantee. Basically SKMHT is not a guarantee bonding, but it is merely a power to impose the Mortgage Rights and hence the Creditor has not gained the widest possible rights. In this case the position of the creditor is no longer the preferred creditor (preferred creditor), as seen from the elements and the characteristics of the mortgage.

In the Insurance Right Act states that any credit which is collateral in form of land along with objects related to the land shall be installed / burdened by the Mortgage Rights. While the process of making the burden of the Constitution right according to the Act is not always directly with the making in the form of deed is the Deed of Assignment Rights, but preceded by the making of Power of Attorer Charging the Dependent Rights as regulated in Article 15 of the Mortgage Rights Act. Article 15 Paragraph (3) of the Constitution Law states that for the rights to land already registered, the Power of Attorney to impose the Mortgage Right shall be followed by the Deed of granting of dependent right no later than 1 (one) month after the power of attorney to impose the mortification right is signed. Meanwhile, Article 15 Paragraph (4) of the Mortgage Rights Act states that for the rights to land not yet registered, it must be followed by the Deed of granting of dependent right not later than 3 (three) months after the Power of Attorney for Burdening of Mortgage is signed.

The relevant land boundary has been certified but has not been registered on behalf of the Depositors as its new rights holder. Much of what happens in practice, developers do not break their land rights certificates into individual parcels, but they are still in the form of master certificates (which have been measured in accordance with Measurements issued by the National Land Agency). Article 15 Paragraph (6) of the Constitution Law states that within the period referred to in Article 15 Paragraphs (3) and (4), the Power of Attorney to impose the Deposit Insurance must be followed by the creation of the Mortgage Benefit Document.<sup>3</sup>

If such time period is not followed by the making of the Concession Rights, the Power of Attorney shall be canceled by law. As for the issue of law in the implementation of the Power of Attorney often Burdening the Mortgage which has been signed by the Bank / Creditor with the debtor is often null and void, so that the Power of Attorney Charging the Deposit Rights cannot be used to make the Deed of Mortgage Right this is because the Land Rights certificate has not been completed behind the name in accordance or on behalf of the debtor. If this happens then the creditor would be very disadvantaged, because the position of the creditor is not guaranteed with the right of dependents.

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<sup>3</sup> Munir Fuady, *Hukum Perkreditan Kontemporer*, Cetakan Ke-2. Edisi Revisi, Bandung : Citra Aditya Bakti, 2002, hlm. 22

With the enforcement of the Mortgage Rights Act is also known Power of Attorney Charging Guarantee (SKMHT), but SKMHT is made before the Deed of Assignment Rights (APHT). In the Mortgage Act, it is desirable to create a Power of Attorney for Deposit Insurance (SKMHT), which must be accompanied by the making of the Deposit Rights. For the validity of a Power of Attorney to impose the Mortgage Right (SKMHT) other than must be made by Notary Deed or the Deed of the Officers of the Deed of Land (PPAT), pursuant to Article 15 Paragraph (1) of the Mortgage Law must also be fulfilled SKMHT requirements:

- Does not contain the power to perform other legal acts rather than impose the Mortgage Right.
- Does not contain the power of substitution.
- To clearly state the Object of Mortgage Rights, the amount of debt and the name and identity of the creditor, the name and identity of the debtor if the debtor is not a Depositary.

From the explanation of Article 15 paragraph (1) of the Mortgage Law, it can be explained that SKMHT is a Power of Attorney granted the Depositary to the creditor as the recipient of the dependent Right to impose the Insurance Rights on the Object of the Dependent Rights. SKMHT is a special power of attorney given by the debtor to a special creditor for the installation of the imposition of the Insurance Rights only. Deposit Rights may also be levied on land rights and existing, existing or existing buildings, plants and works which are united with the land, and which are the property of the holder of land rights whose charges are expressly stated in the Deed of Granting of Works, not owned by the holder of land rights, the imposition of mortgages on such items may only be made by signature as well as on the Deed of granting the relevant Mortgage Rights by the owner or authorized for it by an authentic deed.<sup>4</sup>

The mortgages in the form of buildings, plants, and works such as temples, statues, gates, reliefs that are one with the land concerned. Buildings that can be burdened with mortgage right along with the land include buildings that are above or below the surface of the land such as basement, which has to do with the right to the land concerned. Consequently, the imposition of mortgages on buildings, plants and works which constitute a union with land other than the holder of the land rights shall be conducted simultaneously with the granting of the land title concerned and declared in a Deed of Mortgage Rights, signed together with their owners and holders of the rights to their lands or their powers, both as the mortgagee.

If within the time limit specified in the Mortgage Rights Act is not immediately carried out the creation of the Deed of Assignment Rights (APHT), the Power of Attorney for Imposing the Insured Priority has been null and void. 1 (one) month period restrictions on certified and 3 (three) months of land for non-certified lands in banking practice are felt to be too short because in the practice of generally registered and unregistered land take longer time in the process of handling it, consequently the Power of Attorney Charging the Guarantee Right (SKMHT) is null and void, but it is not possible to create a new APHT, the repetition to make the deed of grant of new Mortgage will give difficulties for the bank.<sup>5</sup>

Thus, it is possible to avoid the cancellation of Power of Attorney for Burdening Rights (SKMHT) within the period referred to in Article 15 paragraph 3 and 4 of the Mortgage Rights Act. The provisions concerning the period referred to in the provisions of Article 15, paragraphs 3 and 4 shall not apply if the Power of Attorney for Assignment (SKMHT) is granted for the provision of certain credits, especially program loans, small business loans, refundable credits and other credits. According to the authors of the provisions regarding the period of time mentioned in Article 15 paragraphs (3) and (4) shall not apply if the Power of Attorney Charging the Mortgage Right (SKMHT) is granted for the granting of certain credits, the making of SKMHT and APHT in the imposition of Mortgage Rights, if it is seen from the order of the Legislation, the decision of the minister allowing the non-validity of SKMHT and

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<sup>4</sup> Effendi Perangin-angin, *Praktik Penggunaan Tanah Sebagai Jaminan Kredit*, Jakarta: Rajawali Pers, 1981, hlm. 9

<sup>5</sup> Kartini Muljadi dan Gunawan Widjaja, *Perikatan Yang Lahir dari Perjanjian*, Jakarta : Rajawali Pres, 2003, hlm. 45

APHT to certain credits can not be implemented because it is contrary to the higher regulation namely the Mortgage Rights Act.<sup>6</sup>

In the Registration of Deed of Mortgage Rights (APHT) to obtain the Mortgage Right, it is determined that its management is done within 7 (seven) days and the Mortgage Right itself is born at the time of bookkeeping in the land office land so that the certainty about the time of registration of the Mortgage Right is very important for creditor. Article 13 paragraph 4 of the Mortgage Rights Act specifies that, the date of the Book of Mortgage and the imposition of a Deposit Rights on a land certificate in the land title certificate subject to the Deposit Rights, is the date of the seventh day after the complete receipt of the required letters for registration Mortgage right.

The existence of the grace period in the maintenance for the birth of the Deposit Rights according to the opinion of the writer will be able to harm the interest of the creditor, the loss can occur if within the time period stipulated the Insurance Rights Act that begins the creation of Power of Attorney Charging Guarantee (SKMHT) and the making of the Right Granting Deed Dependence (APHT) and continued with the registration of the right Loan occurred bad credit.

### CONCLUSION AND SUGGESTIONS

The legal power of Subsidized Credit or Small Business Credit with the guarantee of Mortgage Right, that as long as the agreement is made in accordance with the terms of the validity of the agreement (Article 1320 Civil Code), the credit agreement is binding on the parties making it so that to the parties of the agreement the same position as legislation for the parties making it (Article 138 Civil Code). Meanwhile, the collateral made with SKHMT has no impact on the legal standing of the agreement because the collateral agreement is merely an *accessoir* agreement. Subsidy loans or small-scaled business loans with Deposit Guarantee under Regulation of the Minister of Agrarian Affairs / Head of the National Land Agency Number 4 of 1996 in accordance with the provisions of Article 15 paragraph (5) of the Mortgage Law that the time limit for the validity of Power of Attorney guarantee certain types of credit are exempted from the provisions of Article 15 paragraphs (2) and (3).

With only SKHMT, the creditor's position does not have any privileges as if imposed with APHT, so as a creditor preference he can execute on his own. One of the safeguards is to file a lawsuit against the court with the risk of additional costs incurred during the litigation process in the court. Legal protection of creditors upon default by debtor with a guarantee on subsidized credit or small business credit from the registration of mortgage rights with registration of Deed of Assignment Rights by PPAT for the manufacture of Certificate of Mortgage Right. With the registration of such mortgage security, the publicity principle fulfilled is a guarantee of legal certainty to the creditor in the return of the debtor's receivables. The weaknesses in the implementation of legal protection for the creditor in a mortgage agreement are still many found in practice in the business world of security guarantee objects made by the Deed of Assignment that is not continuously registered to the Land Office or only made under the deed under the hand consequently, the executorial of the deed is lost and the creditor does not get his / her preferential right.

Based on the existing problems and associated with the conclusions that have been mentioned above, it can be given suggestions as follows:

The problems that arise in relation to the concept of land rights implication contained in Article 1 paragraph (1) of Law No. 4 of 1996 can be resolved wisely if the element of trust contained in Giving Mortgage more highlighted. This trust element becomes necessary and important considering the granting of the mortgage rights with the guarantee of land that has not been certified to the debtor who has not been able to guarantee that the granting of SKMHT can be upgraded to the Deed of Assignment Rights (APHT), because the judicial property rights of the debtor have not actually changed from debtors to creditors.

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<sup>6</sup> *Sutan Remy Sjahdeini, Hak Tanggungan Azas-Azas, Ketentuan Pokok dan Masalah Yang Dihadapi Oleh Perbankan (Suatu Kajian Mengenai Undang Undang Hak Tanggungan, Bandung, Alumni, 1999, hlm. 72*

The establishment of Law No. 4/1996 on the guarantee of Mortgage Rights and the Regulation of the Minister of Agrarian Affairs / Head of the National Land Agency Number 4 of 1996 is due to the problems arising from the legal need for a strong guarantee institution which can be imposed on the right to land dependent, in addition to accommodate the interests of small entrepreneurs because of limited business capital so no need to certify the rights to his land as collateral and simply submit a girik or petuk that prove his property in a trust only.

Power of Attorney imposes a Deposit Rights due to The debtor can not come directly for the signing or installation of the Deed of Assignment of Collateral on the land and housing guarantee as collateral to the bank or creditor and it is expected that the time period in the Power of Attorney to impose the Mortgage right is not passed, as set forth in the Elucidation of Article 15 paragraph (4) of the Deposit Insurance Law, prior to the issuance of the Mortgage Rights Act to be registered with the Certificate of Mortgage Right at the local Land Office.

### REFERENCES

1. Effendi Perangin-angin, Praktik Penggunaan Tanah Sebagai Jaminan Kredit, Jakarta : Rajawali Pers, 1981
2. Kartini Muljadi dan Gunawan Widjaja, Perikatan Yang Lahir dari Perjanjian, Jakarta : Rajawali Pres, 2003
3. Sutan Remy Sjahdeini, Hak Tanggungan Azas-Azas, Ketentuan Pokok dan Masalah Yang Dihadapi Oleh Perbankan (Suatu Kajian Mengenai Undang Undang Hak Tanggungan, Bandung, Alumni, 1999
4. Eugina Liliawati Mulyono, 1996, Eksekusi Grosse Akta Hipotek Oleh Bank, Rinneka Cipta, Jakarta
5. Gunawan Widjaja dan Ahmad Yani, 2000, Jaminan Fidusia, Grafindo Persada, Jakarta
6. H. Tan Kamelo, 2004, Hukum Jaminan Fidusia ; Suatu Kebutuhan Yang Didambakan, Bandung, Alumni.
7. Peter Mahmud Marzuki. 2015, Penelitian Hukum. Jakarta, Kencana Prenada Media Group.
8. Rachmadi Usman, 2003, Aspek-Aspek Hukum Perbankan di Indonesia, Jakarta, Gramedia Pustakatama.
9. Rochmat Soemitro, 1987, Peraturan dan Instruksi Lelang, Eresco, Bandung
10. Sri Soedewi Masjchoen Sofwan, 1998, Hukum Jaminan di Indonesia Pokok-Pokok Hukum Jaminan dan Jaminan Perorangan, Badan Pembinaan Hukum Nasional Departemen Kehakiman, Liberty, Yogyakarta
11. Sutan Remy Sjahdani, 1999, Hak Tanggungan, Asas, Ketentuan-Ketentuan Pokok dan Masalah yang dihadapi oleh Perbankan; Suatu Kajian Mengenai Undang-Undang Hak Tanggungan, Bandung :Alumni, Bandung
12. 2008, Hukum Jaminan Keperdataan, Jakarta Sinar Grafika



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## EFFECT OF DIFFERENT RUBBER MARKET SYSTEM ON FARMER'S INCOME IN SOUTH SUMATRA PROVINCE, INDONESIA

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### ABSTRACT

Indonesia is the second biggest natural rubber producer in the world; however its processed rubber has low quality and price. This is because the rubber plantation most cultivated by non estate plantation (*smallholding plantation*). Central government of Indonesia has developed some policies to overcome this problem and one of them is to establish the Processing and Marketing Unit of Rubber material or PMUR ('UPPB') since 2008. However until 2014 only a few farmers (around 5%) had sold their products with PMUR and most farmers sell their products through traditional marketing channel. This study's aims are to discuss how big impact the existing of new marketing channel (PMUR) to farmer's income is. Study conducted in two districts (Banyuasin and Musi Rawas) of South Sumatera Province, which represent two kinds of marketing channels, those are the auction market system and the partnership market system. Sampling taken of 64 farmers (as respondents), represent participant and non participant of new market system. Data collection was done in April to September 2017. The result of this study shows that there are significantly different income for farmer's participants (PMUR) and non participants (non PUMR). The farmer's income at the auction system is higher (about 57%) and the farmer's income at the partnership system is higher (about 64%) than traditional marketing system. However income of both new marketing systems or PUMR (auction and partnership systems) are not significantly different.

### KEY WORDS

Auction, partnership, rubber, income, processing and marketing unit.

In 2015, Indonesia was the second biggest natural rubber producer (3.2 million tones) in the world, whereas Thailand as competitor of Indonesia has higher rubber production (4.5 million tones). Total rubber area of Thailand was smaller (2.8 million hectares) than Indonesia (3.7 million hectares), because of higher rubber productivity in Thailand than Indonesia. In fact, low rubber productivity is high correlation to total area of rubber smallholding plantation, where the contribution of rubber smallholding area in Indonesia (85%) was more than area in Thailand, (60%). Total area of rubber plantation was the third portion, where the first and the second portions were oil palm and oil coconut plantations. However the rubber products could contribute US\$ 4.4 billions in export value and 25 to 40 percents for plantation sector's devisa (FAO, 2016).

South Sumatera Province is the biggest rubber area in Indonesia (1.3 million hectares), almost 93 percents are smallholding plantation, consist of 579,574 farm households (Plantation Government Office of South Sumatera Province, 2017).

According to Syaffendi (2015), Indonesia rubber industry has low productivity and low processed product quality, therefore in the world market, Indonesia's bargaining power was smaller than other rubber producers (Thailand, Malaysia, Vietnam and India). In local market level, farmer's share and rubber price were lower than other countries (Thailand and Malaysia), because of long market channel (Asmara and Hanani, 2012).

Central government of Indonesia has developed some policies or regulations and programs to increase the rubber quality and price by the Agriculture and Trade Ministries such as determination of the processed rubber National Standard, method of good rubber processing and marketing, and controlling of processed rubber quality for exporting etc. The same fact in South Sumatera Province, there are still found dominantly the low quality of processed rubber (Syarifa, Agustina and Nancy, 2013). According to Malian and Djauhari

(1999), there are some social economic factors which influence those problems, such as: rubber factory as demand of processed rubber ('slab') has not supported increasing of the rubber quality, there are still some brokers or wholeseller as rent seekers, and not yet formed the partnership between the rubber farmers and the crumb rubber factories

South Sumatera Government has developed some policies to overcome this problem and one of them is to establish the Processing and Marketing Unit of Rubber material (PMUR) since 2013. Until 2016 had developed 123 PMUR for seven districts as centrals of rubber producers. Each PMUR has to manage 100 hectares of rubber areas. If in South Sumatera Province has 1.2 million hectares of rubber area, so it can be formed 12,517 PMUR.

The PMUR is one of organized rubber marketing channels in South Sumatera. Basically, there are two kinds of rubber market channel, that is traditional channel and organized channel (Plantation Government Office of South Sumatera Province, 2014). Traditional channel used almost 95 percents of small farmers, and the organized channel (*auction* and *partnership systems*) used by the rest of farmers. According to Tarmizi (2014), these organized channels are able to give the higher price for rubber farmers. *The auction system* consist of *spot auction* by PMUR ("UPPB") registered in South Sumatera Plantation Government Office and *forward auction* by Village Unit Cooperation ('KUD') ex Smallholder Rubber Developing Program or SRDP ('PPKR') in Muara Enim and Prabumulih Districts. Whereas partnership pattern only in Musi Rawas District.

The organized channels have to produce clean and good rubber products, based on Agriculture Ministry Regulation No 38, that is: (1) non contaminated rubber product, (2) only uses recommended rubber coagulant by Government, (3) no apply some treatments such as dipping in water, drying under sun shine during storage session, (4) the thickness of processed rubber ('slab') is no more than 15 centimeters.

Based on the fact and development of rubber market in South Sumatera, it is interested to find the explanation why there only a few of farmers who sell the processed rubber products in the organized market system are. Some studies about organized channel had been done in Jambi Hermansyah *et. al* (2014) and Tarmizi (2014). The same studies in South Sumatera had not been done yet, including to compare both kinds of organized channels (*auction* and *partnership systems*). It is interested to analyze how big different income are between traditional and organized systems, and between different market systems (*auction* and *partnership system*) in organized rubber market channel.

## METHODS OF RESEARCH

This research has been done at two rubber production centers which marketing their products by organized channel of different market systems, that is Musi Rawas District (*partnership system*) and Banyuasin District (*auction system*). Selection of Musi Rawas because the *partnership system* is only in this district, whereas selection of Banyuasin because the *auction system* (in PMUR) is the most than others. Survey method chosen by using questionair as data collection method to respondents (rubber farmers, traders, and staff of PMUR as samples). Second source of research data was collected from Plantation and Trading Government Office, Association of Indonesia Rubber Entrepreneurs ("GAPKINDO") in South Sumatera Province. Firstly, selection of PMUR with most members, then used proporsionate stratified random sampling as sampling method, total respondents are 128 farmers, represent PMUR participants (64 farmers) and non PMUR participants (64 farmers). Trader sampling method use snow ball method, select 3 big rubber traders and 2 small rubber traders.

Data processed mathematically and statistically, presented by using tabulation, discussed descriptive qualitatively and quantitatively. T-test by using parametric statistics used to compare both different market channels and market systems (Jhonson, 1982):

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{(s_1^2 / n_1) + (s_2^2 / n_2)}}$$

Where:

- $x_1$  = average rubber farmer samples' income of traditional channel;
- $x_2$  = average rubber farmer samples' income of organized channel;
- $s_1^2$  = variance of rubber farmer samples' income of traditional channel;
- $s_2^2$  = variance of rubber farmer samples' income of organized channel;
- $\mu_1$  = average rubber farmer population's income of traditional channel;
- $\mu_2$  = average rubber farmer population's income of organized channel;
- $n_1$  = the number of rubber farmer samples of traditional channel;
- $n_2$  = the number of rubber farmer samples of organized channel.

With decision:

- $t_{hitung} \leq t_{tabel}$  accept  $H_0$ : means rubber farmer's income of traditional channel and rubber farmer's income of organized channel are different insignificantly
- $t_{hitung} > t_{tabel\ reject}$   $H_0$ : rubber farmer's income of traditional channel is lower than rubber farmer's income of organized channel

## RESULTS AND DISCUSSION

*Market System of Traditional Channel.* In this system, the farmers sell their rubber products to the rubber traders individually. There is no formal regulation in rubber transaction, all quality level of rubber can be marketed. Determined the rubber quality is only based on only water contain and non rubber ingredients in rubber products ('slab'). The farmers' bargaining position to determine rubber price depend on quality of rubber product, the amount of rubber farmer's loan to traders. However, there are some benefits of traditional system according to farmers, such as the rubber product sale frequently and regularly, such as daily, weekly or monthly depend on the farmer's wants and paid by trader at the same time, after transaction. The trader usually come to the rubber farmers.

Generally, in each village there are some small traders who buy the farmer's rubber and then sell them to the big traders as wholesalers or brokers, finally sell out to crumb rubber's factory which located in several cities or districts. Until 2016, there are 29 crumb rubber factories in South Sumatera Province, mostly in Palembang (12 units), the rest are located in Musi Banyuasin (2 units), Ogan Komering Ilir (2 units), Banyuasin (5 units), Muara Enim (4 units) and Musi Rawas (3 units).

*Market System of Organized Channel with 'The Auction System'.* In this system, the farmers in group (as farmer's institution) sell their rubber products to big traders in that location. The farmer's institution can be as Village Unit Cooperation ('KUD') or the Processing and Marketing Unit of Rubber material or PMUR ('UPPB'). This market system by 'KUD', firstly done by Smallholder Rubber Developing Program (SRDP) in 1980s. This system has established until now in Muara Enim District and Prabumulih City. The auction system in this location is namely *forward auction system*, where 'KUD' (represent farmers) sell the rubber product to big traders. 'KUD' only collect and measure the weight of rubber which are sold by farmers and keep for several days (it can be one or two weeks). During the auction, the manager of 'KUD' only determine the winner of auction (who give the highest price), and time of payment by traders to the farmers. Transaction of auction are only once for each two weeks or four weeks. Some 'KUD' make the transaction rules in auction, such as the traders have to give some guarantee and deposit some money.

Nowdays developed *spot auction system*, the transaction between farmers and traders (measurement the weight and payment the rubber product), has been done at short time (may be several hours). This auction can be found most districts or cities in South Sumatera Province. The participants of auction system come from South Sumatera or Jambi and North

Sumatera. The big traders, then sell their rubber products ('slab') to crumrubber manufacturing. The rubber price based on international price

Some PMUR ('UPPB') determine the minimum price of farmer's rubber in auction market based on Dry Rubber Content (DRC) and FOB price. This price daily can be detected easily on line via SMS, by Sumbawa Plantation Research Office. Farmers estimate their rubber's DRC base on big trader's information or their experiences

*Market System of Organized Channel with 'The Partnership System'.* In this system, the farmers in group (as farmer's institution) sell their rubber products directly to crumb rubber factory (without the big traders in that location as mediator). This system establish only in Muara Enim District, between some PUMRs with crumb rubber factory ('PT Kirana Windu') in Musi Rawas Utara ('Muratara') District. Price determination is similar to auction system (based on DRC), however the value of DRC measured at manufacture's laboratorium by controlling farmers and PMUR's manager/staff, but it takes more time (about 3 hours). Another method is observed visually by experienced staffs, which has high accuration level (margin error is only 2%). This method done when the rubber product enter to factory area, before weighting. However, if the seller doesn't agree so they come back to use the first method.

*Farmer's Income Comparison.* Income is the most indicator used to compare two different systems, so by using farmer's income of different market systems, it can conclude that the market system is better or not. Table 1 below present comparison between the farmer's income in auction or non auction system

Table 1 – The Income Difference between participant and non participant of Auction System

| Description                  | Auction system |                 | Different Value |          |
|------------------------------|----------------|-----------------|-----------------|----------|
|                              | Participant    | Non participant | Nominal value   | Percents |
| Production (kg/ha/year)      | 3,823          | 3,431           | 393             | 11.00    |
| Production Cost (Rp/ha/year) | 3,918,450      | 6,980,890       | -3,062,441      | 44.00    |
| Fertilizer (Rp/ha/year)      | 1,181,560      | 672,222         | 509,337         | 76.00    |
| Land rent (Rp/ha/year)       | 0              | 5,015,356       | -5,015,356      | 100.00   |
| Coagulant (Rp/ha/year)       | 957,064        | 138,000         | 819,064         | 594.00   |
| Average Cost (Rp/kg)         | 1,025          | 2,035           | -1,010          | 50.00    |
| Marketing cost (Rp/kg)       | 350            | 0               | 350             | 100.00   |
| Product price (Rp/kg)        | 8,131          | 7,084           | 1,047           | 15.00    |
| Revenue (Rp/ha/year)         | 31,088,473     | 24,302,839      | 6,785,635       | 28.00    |
| Income (Rp/ha/year)          | 27,170,024     | 17,321,949      | 9,848,075       | 57.00    |

Source: result of farmers's questionair (2017).

Base on informtion on Table 1, participant's rubber production is higher than non participant (11%), whereas the age of rubber tree is older (16 years) or not planted in the peak session (12 years) such as differ for non participant's rubber tree (11 years). This higher production because of plant caring by using more fertilizer (76%). This behavior is caused the training result of extension service in farmer's group. The participant's production cost is higher the non participant's production cost, especially in coagulant cost due to applying high price recommended liquid, such as 'asam semut' rather than low price non recommended liquid, such as 'sulfat acid'. Land Rent is only charged for non participant because most farmers are only as an operators not an land owners. They use yield share (operator: owner is 40%: 60%), then this share calculated as land rent. Then, there are no marketing cost for non participant, because the rubber traders come to the field and buy the farmers' rubber. Otherwise the participant has to pay ,marketing cost such as the transportation cost and management fee for PMUR (Rp350 per kg). The rubber price for participant and non participant are slight different (15%), however, the incomes are big different (more higher) because participated farmers has higher rubber production, but lower production costs than non participant. This result indicate that auction system can increase the productivity and rubber product price (as expected of the objectives of PMUR forming).

Then to test the different populations, used t test of parametric statistical. The result shows that t value (13.9) is still bigger than t-table (2.0) in 95% confidence level. It means that reject Ho (zero Hipotesis) or receive Ha (alternative Hipotesis). Meaningly, both

participant and non participants' incomes are different statistically, or participant's income is higher than non participant' income of auction market system.

Next analysis, can be seen on Table 2 below, which present comparison between the farmer's income in partnership and non partnership of organized system.

Table 2 – The Income Difference between participant and non participant of Partnership System

| Description                  | Partnership System |                 | Different Value |          |
|------------------------------|--------------------|-----------------|-----------------|----------|
|                              | Participant        | Non participant | Nominal value   | Percents |
| Production (kg/ha/year)      | 2,861              | 3,052           | -191            | -6.00    |
| Cost Production (Rp/ha/year) | 1,367,143          | 1,573,679       | -206,536        | -13.00   |
| Fertilizer (Rp/ha/year)      | 530,488            | 711,039         | -180,551        | -25.00   |
| Average Cost (Rp/kg)         | 478                | 516             | -38             | -7.00    |
| Marketing Cost (Rp/kg)       | 1,000              | 0               | 1,000           | 100.00   |
| Price (Rp/kg)                | 10,400             | 6,179           | 4,221           | 68.00    |
| Revenue (Rp/ha/year)         | 29,751,614         | 18,856,515      | 10,895,099      | 58.00    |
| Income (Rp/ha/year)          | 28,384,471         | 17,282,836      | 11,101,635      | 64.00    |

Source: result of farmers's questionair (2017).

Based on informtion on Table 2, participant's rubber production is lower than non participant (6%), because of higher DRC (or lower weight of wet 'slab') and lower fertilizer dosage (indicted by lower fertilizer cost). This can cause the participant's rubber price is higher than non participant (68%). Eventhough the participant has to spend marketing cost to sell their product toh the auction system, but the much higher price of participant (68%) are able to keep up the participant's income so that their income are still higher than non participant's (64%). This profit difference is really significant so the partnership system is very beneficial for rubber farmers. Unfortunately, in South Sumatera Province is only 29 crumbrubber Estates who apply the partnership system.

Then to test the different populations, used t test of parametric statistical. The result shows that t value (4.4) is still bigger than t-table (2.0) in 95% confidence level. It means that reject Ho (zero Hipothesis) or receive Ha (alternative Hipothesis). Meaningly, both participant and non participants' incomes are different statisticcally, or participant's income is higher than non participant' income.

Next analysis, Table 3 below present comparison between the farmer's income in auction and partnership of organized system. Base on informtion on Table 3, the rubber production of partnership is lower than auction (25%), it cause the higher DRC (or lower weight of wet 'slab') due to small frequncy of marketing (only once or twice a month). Besides that the rubber tree's age of partnership participant is older (around 25 years) than the rubber tree's age of auction participant (they are in the peak production or around 16 years). The partnership participant has lower production cost because of fertilizer cost for older rubber plant and lower coagulant cost due to lower frequence of marketing (once or twice a month). The significant difference for both marketing systems are the price (28%) due to different DRC or different product quality (partnership's rubber product price is higher than auction's rubber product price). Finally the partenership farmer's income is higher than auction farmer's income (4%).

Tablel 3 – The Income Difference between Partnership and Auction in Organized Market System

| Description                 | Market system |            | Difference    |          |
|-----------------------------|---------------|------------|---------------|----------|
|                             | Partnership   | Auction    | Nominal value | Percents |
| Production (kg/ha/year)     | 2,861         | 3,823      | -963          | -25.00   |
| ProductionCost (Rp/ha/year) | 1,367,143     | 3,918,450  | -2,551,307    | -65.00   |
| Fertilizer (Rp/ha/year)     | 530,488       | 1,181,560  | -651,072      | -55.00   |
| Coagulant (Rp/ha/year)      | 189,268       | 957,064    | -767,796      | -80.00   |
| Average Cost (Rp/kg)        | 478           | 1,025      | -547          | -53.00   |
| Marketing Cost (Rp/kg)      | 1,000         | 350        | 650           | 186.00   |
| Price (Rp/kg)               | 10,400        | 8,131      | 2,269         | 28.00    |
| Revenue (Rp/ha/year)        | 29,751,614    | 31,088,473 | -1,336,860    | -4.00    |
| Income (Rp/ha/year)         | 28,384,471    | 27,170,024 | 1,214,447     | 4.00     |

Source: result of farmers's questionair (2017).

Then to test the different populations, used T test parametric statistical. The result shows that t value (0.65) is smaller than t-table (2.0) in 95% confidence level. It means that receive  $H_0$  (zero Hypothesis) or reject  $H_a$  (alternative Hypothesis). Meaningly, both partnership and auction's incomes are not different statistically, or partnership farmer's income is similar to auction farmer's income in organized market channel.

### CONCLUSION

There are significantly income difference between participated farmer and non participated farmer in organized market channel. Meaningly, the farmers as participant of market organized has higher income than non participant of market organized.

There are not significantly farmer's income different between partnership's and auction's participants in organized market system. Meaningly, the farmers as partnership's participant in organized market system has similar to income to auction's participant in organized market system.

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### REFERENCES

1. Food and Agriculture Organization. 2016. Production and Trade. Foostat.org. <http://www.fao.org>.
2. Plantation Government Office of South Sumatera Province. 2017. Plantation Statistic 2017. Plantation Government Office of South Sumatera Province, Palembang.
3. 2014. Pola Pengembangan Pemasaran Komoditi Karet Sumatra Selatan. Plantation Government Office of South Sumatera Province, Palembang.
4. Syaffendi, M.R. 2014. Analisis posisi karet alam Indonesia di pasar karet alam China. Thesis in Graduate School of Bogor Agriculture University, Bogor.
5. Asmara, R., & Hanani, N. 2012. Komparasi transmisi harga karet alam Indonesia dengan Malaysia dan Thailand. Retrieved from <http://nuhfil.lecture.ub.ac.id/files/2012/12/jurnal-karet-perhepi-nuhfil-rosihan-final2.pdf>.
6. Syarifa, L.F., D.S. Agustina and C. Nancy. 2013. Evaluasi pengolahan dan mutu bahan olah karet rakyat (bokar) di tingkat petani karet di Sumatera Selatan. *Jurnal Penelitian Karet*, 31(2):139-148.
7. Malian H and A. Djauhari. 1999. Upaya perbaikan kualitas bahan olah karet rakyat. *FAE*: 17(2):43-50.
8. Tarmizi, A. 2014. Analisis efisiensi saluran pemasaran karet rakyat di Jambi, Studi kasus Desa Panerokan Kecamatan Bajubang Kabupaten Batanghari Provinsi Jambi.
9. Jhonson, R.R. 1982. Jhonson, R.R. 1980. *Elementary Statistics (Third Editoin)*. Duxbury Press, California, USA.
10. Hermansyah, R., Edison and A. Arby, 2014. Analisis komparasi pendapatan usahatani karet petani yang menjual ke pasar lelang dan luar pasar lelang di Kecamatan Sakernan Kabupaten Muaro Jambi. *Sosio Ekonomika Bisnis Jurnal*, 17(2): 21-31.

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## **THE IMPLEMENTATION OF ENVIRONMENTAL COSTS IN COMPANY TO REDUCE ENVIRONMENTAL IMPACT**

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### **ABSTRACT**

The implementation of environmental costs in the company becomes mandatory nowadays to fulfill the concept of sustainable development. Emdeki Utama, Ltd., a carbore-producing company, has implemented environmental costs and shown that the allocation of funds is not only able to effectively reduce the environmental impact (waste content) resulted from the production process, but also to improve the quality of life of the community around the company.

### **KEY WORDS**

Environmental costs, waste content, living quality, community.

Indonesia has ratified the international agreement on sustainable development and become as part of countries that are committed to run programs to reduce the rate of greenhouse gas emissions and environmental damages. The concept of sustainable development has been encouraged, as the concept that aims to create a balance between development dimensions, such as economic, social and environmental developments. This concept is a principled development process meeting current needs without compromising the fulfillment of future generations (Pearce, David 1997). This commitment shall be demonstrated through policies of the countries in development activities.

One of the policies in relation to promote sustainable development is to regulate the activities of companies utilizing natural resources, namely Articles 2 and 3 of Government Regulation Number 47 of 2012 on Social and Environmental Responsibility, explaining that any companies that run on business in the field of natural resources shall be obligated to carry out social and environmental responsibility that should be implemented in the form of environmental costs.

This environmental cost should be allocated to prevent the decline in the quality as well as the quantity of human life and natural resources. This situation encourages the company to run the process of transforming the environment-based business to address the issues related to sustainability of the natural resources.

### **LITERATURE REVIEW**

Environmental costs are the costs specially allocated by the company related to the environmental damage due to business operation and the protection to the environment should be conducted (Susenohaji, 2003). Environmental costs can be categorized into four aspects: prevention costs, detection costs, internal failure costs, and external failure costs.

Environmental prevention costs are costs allocated for any activities undertaken to prevent the waste as the result of production process that may cause environmental pollution, such as supplier evaluation and selection, including studies on environmental impact. Environmental detection costs are incurred to determine whether the products, processes, and other activities at the company have met the applicable standards based on the concept of sustainability, such as audits on environmental activities, pollution testing, and pollution levels,

The cost on internal environmental failure is utilized for activities carried out due to the production of waste, but not disposed of into the external environment. Such activities are processing and disposal of toxic wastes, licensing facilities for producing waste, and

recycling waste materials. The cost on external environmental failure is the costs incurred after releasing company's waste into the environment.

Burnett and Hansen (2008) argue that if a company wants to improve its environmental performance, the environmental costs must be carried out to perform the collection, calculation, analysis and reporting of transactions related to the environment in order to be used by management to manage environmental aspects.

The management of environmental aspects requires data in both physical units and monetary units. Physically, the data relate to the input required in the production process in the form of materials, water and energy as well as data on outputs produced in the form of products and non-products (including waste and emissions). Monetary unit is the data in question, which is the cost data associated with inputs and outputs, issued by the company to reduce the environmental impact.

Physical data are used to determine the level of environmental impact that has been affected so that it can be controlled. Based on the data, the information related to the level of emissions produced might be generated, including the amount of waste produced and the processed, which is needed to determine the target of emission reduction, waste, and other protection.

The monetary data are more widely used in cost control in order that the management has a basis to manage the environmental aspects of the company in order to reduce pollution levels and waste, produce environmentally friendly products, so that environmental performance of the company can be improved (Bosshard, 2003, IFAC, 2005).

## **METHODS OF RESEARCH**

This is a descriptive research with qualitative approach which is intended to describe a certain condition or phenomenon. The data were collected through observation on financial statements of the relevant companies and in-depth interviews with the companies.

The research was conducted in Emdeki Utama, Ltd. located on Jl. Raya Number 294, Driyorejo village, Gresik regency, East Java, Indonesia. The company has been running business to produce carbide. At the same time, the company has implemented a policy on environmental costs as well as corporate social responsibility (CSR) on the environmental aspect as well as on the surrounding communities. The analytical method used in this research was non-statistic method which is suitable if applied with a descriptive research.

## **RESULTS AND DISCUSSION**

Emdeki Utama, Ltd. has produced carbide since 1987. Carbide is a versatile chemical, grain-shaped solid gray. If it is reacted with water, calcium carbide will produce asitelin gas.

Asitelin gas is used for metal cutting, metal welding, fuel lamps and chemical industry raw materials such as PVC seeds and batadinol. Utilization of asitelin gas produced by carbide for welding and cutting metal can be found in almost all construction industry, shipping, and other heavy industries. In the agricultural sector, carbide is used as a bundle of fruits to ripe as planned and together with an interesting color.

In addition to producing carbide, of course, the production process of this material also produces waste, namely in the form of carbide dust, lime powder, water, gas and particles. Carbide dust and lime powder are commonly stored and can be used for building material foundation, while the waste in the form of water needs to be processed first before it is flowed into the river.

The environmental costs make it easier for companies to disclose environmental information financially (Burrill, 2002). For Emdeki Utama, Ltd., the environmental cost covers total investment and production costs, environmental cost report and laboratory test in 2011 and 2012.

Total investment issued by Emdeki Utama, Ltd. in 2011 and 2012 did not increase, but the allocation for total productions increased by IDR 30,000,000,000. The increase in total production costs may indicate an increase in carbide production by Emdeki Utama, Ltd.



The environmental cost report presented in Table 2 underlines the importance of the environmental costs by declaring it in percentage of the total production costs of the company.

Table 1 – Total Investment and Production Costs

| Information            | Total (IDR)     |                 |
|------------------------|-----------------|-----------------|
|                        | 2011            | 2012            |
| Total investment       | 200,000,000,000 | 200,000,000,000 |
| Total production costs | 120,000,000,000 | 150,000,000,000 |

Source: data processed from Emdeki Utama, Ltd.

Table 2 – Environmental Cost Report in 2011 and 2012

| No    | Information   | 2011               |                       | 2012               |                       |
|-------|---|--------------------|-----------------------|--------------------|-----------------------|
|       |   | Environmental cost | % of total investment | Environmental cost | % of total investment |
| I     | Investment cost on machine utilized to environmental cost |                    |                       |                    |                       |
|       | Early development   | 10,000,000,000     |                       | 10,000,000,000     |                       |
|       | Annual  | 50,000,000         |                       | 60,000,000         |                       |
|       | Total   | 10,050,000,000     | 5.03%                 | 10,060,000,000     | 5.03%                 |
|       | Converted into operational costs:                         |                    |                       |                    |                       |
|       | Depreciation of machine (7 years flat)                    | 1,428,571,429      |                       | 1,428,571,429      |                       |
|       | Annual  | 50,000,000         |                       | 60,000,000         |                       |
|       | Total   | 1,478,571,429      | 1.23 %                | 1,488,571,429      | 0.99 %                |
| II    | Operational costs and equipment maintenance               |                    |                       |                    |                       |
|       | Bag filter maintenance                                    | 1,050,624,000      |                       | 1,575,936,000      |                       |
|       | Spare part maintenance                                    | 267,000,000        |                       | 340,000,000        |                       |
|       | Man power maintenance                                     | 46,226,400         |                       | 51,285,600         |                       |
|       | Heavy equipment maintenance                               | 108,000,000        |                       | 129,000,000        |                       |
|       | Operasional operator                                      | 69,339,600         |                       | 76,928,400         |                       |
|       | Total   | 1,541,190,000      | 1.28%                 | 2,173,750,000      | 1.45%                 |
| III   | Environmental settlement costs:                           |                    |                       |                    |                       |
|       | Non-B3 waste disposal of                                  | 500,000,000        |                       | 600,000,000        |                       |
|       | Cleansing   | 231,132,000        |                       | 256,428,000        |                       |
| Total | 731,132,000   | 0.61%              | 856,428,000           | 0.57%              |                       |
| IV    | Social and neighborhood costs:                            |                    |                       |                    |                       |
|       | Provision of public health facilities                     | 59,124,000         |                       | 79,785,600         |                       |
|       | Scholarships for community                                | 8,112,000          |                       | 9,456,000          |                       |
|       | Electricity of local mosques                              | 3,600,000          |                       | 4,800,000          |                       |
|       | Environmental team  | 3,600,000          |                       | 4,800,000          |                       |
|       | Other spending  | 60,000,000         |                       | 72,000,000         |                       |
| Total | 134,436,000   | 0.11%              | 170,841,600           | 0.11%              |                       |
| Total | 3,885,329,429   | 3.24%              | 4,689,591,029         | 3.13%              |                       |

Source: data processed from Emdeki Utama, Ltd.

The allocation of construction cost or purchase of waste handling machine did not increase from 2011 to 2012. In contrast, all components of environmental costs have increased from 2011 to 2012. This shows that the company is paying more attention to the environmental preservation. For example in the maintenance of bag filter, which is a tool to filter the dust from the production process has increased approximately IDR 500,000,000. The company also increased the allocation of social neighborhood costs for local community around the company. This allocation is expected to improve the quality of life of the community around the company.

Table 3 – Results of Ambient Air Test

| Ambient Air   |                                     |                  |                      |        |
|---|-------------------------------------|------------------|----------------------|--------|
| Parking Area of Emdeki Utama, Ltd.                  |                                     |                  |                      |        |
| Number  | Information                         | Quality standard | 2011                 | 2012   |
|   |                                     |                  | Average test results |        |
| 1   | Sulfur dioxide (SO <sub>2</sub> )   | 0.1              | 0.0016               | 0.0086 |
|   | Carbon monoxide (CO)                | 20.0             | < LD                 | < LD   |
|   | Nitrogen dioxide (NO <sub>2</sub> ) | 0.05             | 0.0032               | 0.0197 |
|   | Oxidant (O <sub>3</sub> )           | 0.10             | 0.0014               | 0.0136 |
|   | Dust                                | 0.26             | 0.071                | 0.201  |
|   | Lead (Pb)                           | 0.06             | < LD                 | < LD   |
|   | Hydrogen Sulfide (H <sub>2</sub> S) | 0.03             | 0.0002               | 0.0001 |
|   | Ammonia (NH <sub>3</sub> )          | 2.0              | 0.0027               | 0.0751 |
|   | Noise                               | -                | 62.3                 | 60.2   |
| Power Plant Area of Emdeki Utama, Ltd.              |                                     |                  |                      |        |
| 2   | Sulfur dioxide (SO <sub>2</sub> )   | 0.1              | 0.0015               | 0.0049 |
|   | Carbon monoxide (CO)                | 20.0             | < LD                 | < LD   |
|   | Nitrogen dioxide (NO <sub>2</sub> ) | 0.05             | 0.0019               | 0.0224 |
|   | Oxidant (O <sub>3</sub> )           | 0.10             | 0.0016               | 0.0162 |
|   | Dust                                | 0.26             | 0.124                | 0.112  |
|   | Lead (Pb)                           | 0.06             | < LD                 | 0.0002 |
|   | Hydrogen Sulfide (H <sub>2</sub> S) | 0.03             | 0.0002               | 0.0001 |
|   | Ammonia (NH <sub>3</sub> )          | 2.0              | 0.0036               | 0.0633 |
|   | Noise                               | -                | 58.4                 | 61.8   |
| Chimney Emission of Lime klin of Emdeki Utama, Ltd. |                                     |                  |                      |        |
| 3   | Sulfur dioxide (SO <sub>2</sub> )   | 800              | 2.612                | 93.31  |
|   | Nitrogen dioxide (NO <sub>2</sub> ) | 1000             | 9.388                | 0.52   |
|   | Total particulates                  | 100              | 7.00                 | 44.26  |
|   | Opacity                             | 30               | < 5                  | 5      |
| Chimney Emission of Furnance of Emdeki Utama, Ltd.  |                                     |                  |                      |        |
| 4   | Sulfur dioxide (SO <sub>2</sub> )   | 800              | 52.245               | 2.61   |
|   | Nitrogen dioxide (NO <sub>2</sub> ) | 1000             | 9.388                | 0.48   |
|   | Total particulates                  | 100              | 13.40                | 75.46  |
|   | Opacity                             | 30               | < 5                  | 5      |

Source: Emdeki Utama, Ltd.; <LD = limit detection.

Table 4 – Results of Industrial Water Waste

| Industrial Water Waste Test        |                              |                  |                      |        |
|------------------------------------|------------------------------|------------------|----------------------|--------|
| Parking Area of Emdeki Utama, Ltd. |                              |                  |                      |        |
| Number                             | Information                  | Quality standard | 2011                 | 2012   |
|                                    |                              |                  | Average test results |        |
| 1                                  | Physical                     |                  |                      |        |
|                                    | Temperature                  | 40               | 29                   | 29     |
|                                    | Total dissolved solids (TDS) | 4000             | 1090                 | 921    |
|                                    | Total suspended solids (TSS) | 200              | 7                    | 2      |
| 2                                  | Chemical                     |                  |                      |        |
|                                    | pH                           | 6-9              | 8                    | 7      |
|                                    | Iron                         | 15               | 0.2536               | <LD    |
|                                    | Manganese                    | 5                | < LD                 | < LD   |
|                                    | Barium                       | 3                | -                    | < LD   |
|                                    | Copper                       | 3                | < LD                 | < LD   |
|                                    | Zinc                         | 15               | < LD                 | < LD   |
|                                    | Chromium hexavalent          | 0.5              | < LD                 | < LD   |
|                                    | Total chrome                 | 1                | < LD                 | < LD   |
|                                    | Cadmium                      | 0.1              | < LD                 | < LD   |
|                                    | Mercury                      | 0.005            | < LD                 | < LD   |
|                                    | Lead                         | 1                | < LD                 | < LD   |
|                                    | Nickel                       | 0.5              | < LD                 | < LD   |
|                                    | Ammonia is free              | 5                | 0.0767               | 0.0013 |
|                                    | Nitrate                      | 30               | 9.5071               | 17.398 |
|                                    | Nitrite                      | 3                | 1.2655               | 1.2710 |
| Anionic detergent                  | 10                           | 0.861            | 0.3112               |        |

Source: Emdeki Utama, Ltd.

Furthermore, after the company disclosed the environmental cost report, the next phase is to conduct laboratory tests to test and study whether by the allocation of the environmental costs is able to reduce the level of waste impact resulted from the production process.

The results of the ambient air test in the parking area, power plant area, and the lime chimney emission and furnace emissions of the company above show good results (significantly under the quality standard). This shows that the infrastructure and environmental preservation at Emdeki Utama, Ltd. is operating according to the standard of operation and also the regulation.

All components of wastes generated by Emdeki Utama, Ltd. are significantly below the quality standard. Proper infrastructure development and waste maintenance are primary consideration at the company, so that good results on the waste test can be maintained. The realization of the company's commitment is the construction of infrastructure to preserve waste water first before it is channeled into the river so as it is not to disrupt the river ecosystem.

The final result of this research indicates that as the allocation of the environmental cost Emdeki Utama, Ltd. has proven that it is effective to reduce some components of waste, and the results of waste test were significantly below the quality standard, even though the production costs have increased. Given the increase in production costs, it may indicate that there is also the rise in the total carbide production. Emdeki Utama, Ltd. also consistently conducts three environmental impact management programs namely water quality management, air quality management, and noise pollution management.

## **CONCLUSION**

According to the elaboration, there are some conclusions as follows:

Emdeki Utama, Ltd. has complied with Articles 2 and 3 of Government Regulation Number 47 of 2012 on Social and Environmental Responsibilities by companies, by contributing to the surrounding community in the area of health and education. In addition, the company also incorporates the environmental cost components in the company's operational processes.

The implementation of the environmental costs at Emdeki Utama, Ltd. has proven that it is effective to reduce the environmental impacts (waste content) resulted from the production process.

## **ACKNOWLEDGMENTS**

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## **REFERENCES**

1. Bosshard, R.E. (2003) Environmental Accounting: A Case Study of its Application to a Small Business in Atlantic Canada. Theses, Dalhousie University Halifax, Nova Scotia
2. Burnett, R.D. dan D.R. Hansen. 2008 Ecoefficiency: Defining a role for environmental cost management. Accounting, Organizations and Proceedings SNEB 2014: Hal. 6 Society , Vol. 33, pp. 551 - 581
3. Hansen, D. R. and Mowen, M. M. 2009. Akuntansi manajemen. Edisi Kedelapan. Buku 2. Yogyakarta: Graha Ilmu.

4. Ikhsan, A. 2008. Akuntansi Lingkungan & Pengungkapannya. Edisi Pertama. Yogyakarta: Graha Ilmu.
5. Pearce, David, et al. Sustainable Development, Economics and Environmental on the Third World. Great Britain: Routledge
6. Peraturan Pemerintah No. 47 Tahun 2012 tentang "Tanggung Jawab Sosial dan Lingkungan".
7. Sunu, P. 2001. Melindungi dengan Menerapkan ISO 14.000. Jakarta: PT. Grasindo.
8. Wijaya, M. 2012. Faktor-Faktor yang Mempengaruhi Pengungkapan Tanggug Jawab Sosial pada Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia. Jurnal Ilmiah Mahasiswa Akuntansi. No. 1 ; 26-30
9. Zulganef. 2008. Metode Penelitian Sosial & Bisnis. Edisi Pertama. Yogyakarta: Graha Ilmu.
10. Electronic Source: <http://emdeki.co.id/produk/proses-produksi.html>

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**АНАЛИЗ РЕАЛИЗАЦИИ МУНИЦИПАЛЬНЫХ ПРОГРАММ В ЧАСТИ ИСПОЛНЕНИЯ  
ГОРОДСКОГО БЮДЖЕТА**  
ANALYSIS OF THE IMPLEMENTATION OF MUNICIPAL PROGRAMS IN THE EXECUTION  
OF THE CITY BUDGET

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**АННОТАЦИЯ**

Предназначение бюджета муниципального образования заключается в исполнении органами местного самоуправления расходных обязательств на развитие всех сфер жизнедеятельности. В связи с тем, что расходы бюджета направляются на развитие важных социально-экономических сфер, бюджетные средства должны быть целенаправленно распределены и использоваться с максимальной эффективностью. Анализ исполнения бюджета по расходам дает представление о том, каким образом расходуются средства бюджета на развитие инфраструктуры округа, социальной сферы. Целью исследования является анализ обеспечения финансами социальные и другие направления, реализуемые за счет осуществления муниципальных программ.

**ABSTRACT**

The purpose of the municipal budget is to fulfill expenditure obligations by the local government development of all spheres of life. Due to the fact that budget expenditures are directed to the development of important social and economic spheres, budgetary funds should be purposefully allocated and used with maximum efficiency. An analysis of the implementation of the budget for expenditures provides an idea of how the budget is spent on the development of the district's infrastructure, the social sphere. The purpose of the article is to analyze the financial provision of social and other areas implemented through the implementation of municipal programs.

**КЛЮЧЕВЫЕ СЛОВА**

Городской округ, социально-экономическое развитие, бюджетные средства, муниципальные программы.

**KEY WORDS**

City district, social and economic development, budgetary funds, municipal programs.

Обеспеченность бюджета муниципального образования влияет на социально-экономическое положение округа вследствие того, что расходы бюджета направляются органами местного самоуправления на развитие округа и улучшения качество жизни населения. Городской округ, как и любое муниципальное образование, использует бюджетные средства с целью социально-экономического развития и повышения качества жизнедеятельности своего населения.

Анализ обязательств бюджета городского округа дает представление о ходе финансового обеспечения средствами бюджета нуждающиеся сферы в решении проблем и стоящих задач для развития различных областей. В связи с этим, проведение анализа исполнения расходов бюджета муниципального образования, является целесообразным. Развитие городского округа зависит от эффективности проводимой бюджетной политики в отношении обеспечения его финансовыми

ресурсами, вкладываемые в развитие округа [2; 3]. Расходы бюджета городского округа направлены на реализацию общегосударственных вопросов: национальная экономика, жилищно-коммунальное хозяйство, образование, здравоохранение, культура и кинематография, охрана окружающей среды и физическая культура.

Для выявления наиболее значимых расходов, для развития округа и тенденции изменения финансирования расходных направлений бюджета, проведен анализ исполнения расходов бюджета города Хабаровска. Бюджет Хабаровского городского округа входит в состав бюджетов федеральных округов Российской Федерации и имеет незначительную долю расходов в общем объеме. На сам Хабаровский край по объемам расходов в 2014 году пришлось 1,31% расходов, а во включенный в него Хабаровский городской округ 0,89%. Таким образом, он составлял более половины доли всех округов этого края, и Хабаровск представлял собой более экономически развитый город Хабаровского края. В следующем году доля края снизилась до 1,04%, и самого Хабаровска до 0,7%. 2016 год по объемам расходов доля Хабаровска составила 0,72%, что выше прошлогоднего показателя. Таким образом, в структуре расходов бюджетов федеральных округов доля Хабаровского городского округа имела неустойчивую тенденцию. Большая доля округа была в 2014 году, однако, несмотря на снижение доли расходов города Хабаровска, она стала вновь возрастать [1] (рис. 1).

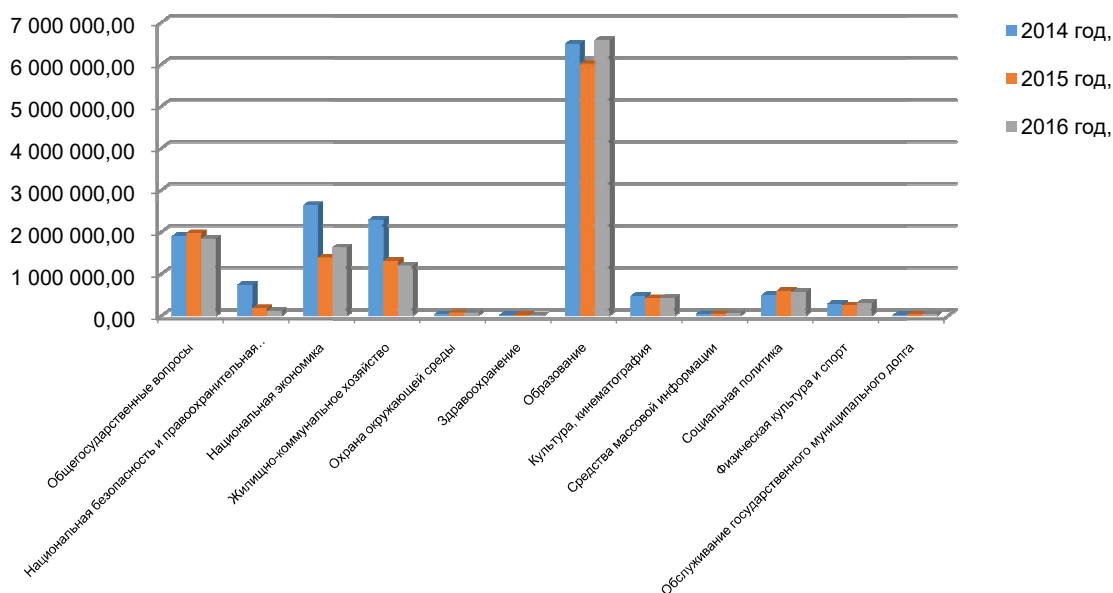


Рисунок 1 – Изменение структуры бюджетного финансирования [4-6]

В 2014 году в Хабаровском городском округе большая доля средств расходовалась на сферу образования. Она достигла 42%. Также Хабаровский бюджет был направлен на расходование национальной экономики, составившие 17%. Общегосударственные вопросы затребовали 12,3% расходов, а на сферу жилищно-коммунального хозяйства 14,8%. На национальную безопасность и правоохранительную деятельность были израсходованы 4,7%, а более 3% составили расходы на социальную политику, культуру и кинематографию.

В 2015 году также как и в предыдущем периоде, большую долю расходов составило образование, его удельный вес увеличился до 48,8%, и расходы составили 5,9 млн. рублей. Расходы на общегосударственные вопросы представляют собой вторую по объему статью расходов в размере 16% возросли до 1,9млн. рублей [7]. Снижился удельный вес национальной экономики в размере 5,7% в виде 1,2 млн. рублей и жилищно-коммунального хозяйства до 10,6% на 980,3 млн. рублей, возросла доля расходования на средства массовой информации, физической культуры и спорта, а также охраны окружающей среды.

В 2016 году, по-прежнему, на расходы в сферу образования в Хабаровском городском округе затрачивались самые большие средства. В течение всего периода происходило увеличение удельного веса, и размер расходов составил 6,5 млн. рублей. Расходы на общегосударственные вопросы составили 14,5%, что ниже, чем в предыдущем периоде на 133,6 млн. рублей. Также снизились показатели национальной экономики в виде 239,6 млн. рублей, которые достигли 12,7%, жилищно-коммунального хозяйства до 9,3%. В этот раз сократились расходы на социальную политику, тогда когда в прошлом периоде наблюдался их рост на 26,1 млн. рублей, а здравоохранение продолжило свое снижение, которое составило 13 млн. рублей [8].

Для развития Хабаровского городского округа в муниципальном образовании был разработан ряд муниципальных программ отнесенных к повышению качества жизни населения, повышению эффективности муниципального управления и устойчивого развития экономики города. Однако не смотря на разработку мер направленных на улучшение качества обслуживания и бесперебойного функционирования различных направлений во всех сферах жизнедеятельности, финансирование реализации всех муниципальных программ осуществляется не в равноценных объемах средств. За период 2014-2016 год в Хабаровском городском округе были разработаны 20 муниципальных программ, большая их часть относилась к социальной сфере округа.

Муниципальная программа «Расширение региональных, федеральных и международных связей городского округа была разработана для того чтобы в Хабаровском городском округе развить сотрудничество города с российскими и зарубежными городами, путем межмуниципального сотрудничества с целью разработки содействия по развитию внешних торгово-экономических связей и увеличение оборота организаций занятых в обслуживании туристических потоков. Также планировалось проведение сотрудничества в области медицины и здравоохранения, экологии и защиты окружающей среды.

Поддержание благоприятной дорожной сети являлось важным явлением. С этой целью была разработана программа «Развитие городской дорожной сети и благоустройства города Хабаровска» для повышения благоустройства. Программа была направлена на восстановление и расширение городской дорожной сети, обеспечение безопасности дорожного движения, развитие городского наземного электрического транспорта и организация диспетчерского управления городским пассажирским транспортом [14].

Муниципальная программа «Доступная среда» была разработана с целью реализацию комплекса мероприятий, которые должны были помочь инвалидам и другим маломобильных групп населения иметь беспрепятственный доступ к различным услугам и совершенствовать условия и порядок предоставления социальных услуг.

Муниципальная программа «Социальная поддержка граждан» направлена на оказание социальной помощи за счет средств бюджета города и частных инвестиций нуждающимся жителям города также она направлена на организацию культурного досуга пожилых людей, родителей с детьми и оказание помощи в воспитании, образовании, формировании здорового образа жизни. Разработанная муниципальная программа «Сохранение и укрепление здоровья» направлена на повышение заинтересованности населения к ведению здорового образа жизни путем пропаганды и просвещении населения о здоровом питании, антитабачном поведении и профилактики заболеваний. Муниципальная программа «Энергосбережение и повышение энергетической эффективности в городе Хабаровске была разработана для повышения энергетической эффективности при производстве, передаче и потреблении энергетических ресурсов.

Для обеспечения доступности качественных образовательных услуг была разработана программа «Обеспечение качества и доступности образования». С ее помощью должно было произойти оснащение муниципальных учреждений образования современными техническими средствами обеспечения безопасности, повышение уровня профессионализма педагогических кадров, создание единого

информационного образовательного пространства, увеличения услуг дополнительного образования, организованными формами отдыха и развития интеллектуальной деятельностью.

Для повышения надежности предоставления услуг по электроснабжению и водоотведению объектов жизнеобеспечения населения было необходимо обновление муниципальной инженерной инфраструктуры. С этой целью была разработана программа «Развитие инженерной инфраструктуры города Хабаровска». Она направлена на уменьшение повреждений на сетях и улучшение условий жизни населения, проживающего в частных домовладениях, с максимальным использованием существующей системы распределительных газопроводов.

Формирование безопасной городской среды для проживания, предупреждение негативных последствий чрезвычайных ситуаций и пожаров являлась важной задачей. В связи с этим была разработана муниципальная программа «Защита населения и территории города от чрезвычайных ситуаций». Она направлена на обеспечение высокой готовности органов управления к предупреждениям о чрезвычайных ситуациях природного характера и техногенного характера.

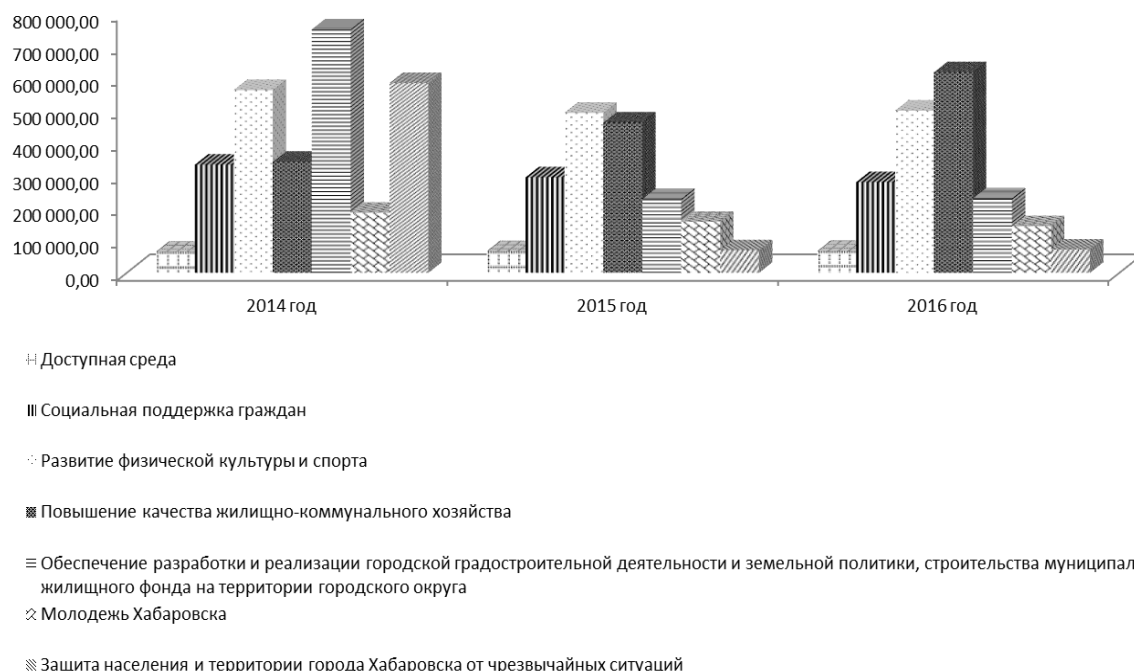


Рисунок 2 – Динамика финансирования программ повышения качества жизни населения за 2014–2016 год

Среди муниципальных программ, реализация которых должна была обеспечить повышение качества жизни населения программа «Обеспечение качества и доступности образования» финансировались в большей степени, чем другие. В 2014 году на ее реализацию было выделено 51% финансовых вложений, а в 2015 году уже 57%, однако в следующем периоде произошло снижение вливаний. Также «Развитие городской дорожной сети и благоустройства» являлась перспективной программой развития и, если изначально на нее было направлено 17,4%, то в 2015 году - 21,9% расходов. «Развитие физической культуры и спорта» реализовывалась за счет 4,5% доли расходов, а в 2015 году уже за счет 4,8%. «Обеспечение разработки и реализации городской градостроительной деятельности и земельной политики, строительства муниципального жилищного фонда на территории городского округа» в 2014 году была финансируема за счет суммы, которая составляла 6%, «Защита населения и территории города Хабаровска от чрезвычайных ситуаций» 4,7%, что являлось наивысшим показателем, а в 2016 году в меньшем объеме средств. «Расширение региональных, федеральных и международных связей городского



округа» и «Сохранение и укрепление здоровья» являлись менее значимыми муниципальными программами [18]. Муниципальная программа «Энергосбережение и повышение энергетической эффективности в городе Хабаровске» была разработана только в 2016 году, и финансировалась в виде 7,2% от объема выделенных средств на повышения качества жизни населения. Динамика финансирования программ повышения качества жизни населения представлена на рисунке 2.

В 2014 году больше средств финансирования в виде 6,2 млрд. рублей было выделено на муниципальную программу «Обеспечение качества и доступности образования» и, несмотря на снижение финансов в следующем году уже в 2016 году объем финансирования увеличился на 597,7 млн. рублей до суммы превысившей финансирование в предыдущих периодах. На «Развитие городской дорожной сети и благоустройства» было выделено изначально 2,1 млрд. рублей, однако увеличиваясь с каждым годом в размере около 8,18 млн. достигло в 2016 году 2,3 млрд. рублей. «Развитие инженерной инфраструктуры города Хабаровска» спонсировалось в 2014 году за счет 1 млрд., рублей, однако этот показатель составил в 2016 году 746,2 млн. рублей.

Снижение финансирования было снижено у программ «Обеспечение разработки и реализации городской градостроительной деятельности и земельной политики, строительства муниципального жилищного фонда на территории городского округа», «Развитие физической культуры и спорта» и «Социальная поддержка граждан» в 2015 году в размере 522,4 млн., 70 млн. и 39 млн. рублей соответственно.

В 2016 году возросло финансирование муниципальных программ «Повышение качества жилищно-коммунального хозяйства» до 617,8 мл, «Развитие физической культуры и спорта» до 499,6 млн. и «Обеспечение разработки и реализации городской градостроительной деятельности и земельной политики, строительства муниципального жилищного фонда на территории городского округа» до 228,6 млн. рублей.

Финансирование реализации муниципальных программ разработанных для повышения качества жизни населения происходило в соответствии с распределением расходов бюджета таким образом, что, как и расходы в наибольшем объеме средств выделялись в 2014 году. Однако, несмотря на снижение в следующем периоде произошел рост финансов в 2016 году. В условиях ограниченных финансовых ресурсов необходимо обеспечение взвешенного подхода к управлению бюджетными средствами и повышение эффективности бюджетных расходов. С этой целью была разработана муниципальная программа «Управление муниципальными финансами». Она направлена на обеспечение динамичного развития экономики и формирование благоприятных условий.

Успешность развития муниципальной службы зависит от разработки и реализации мероприятий, направленных на применение новых технологий муниципального управления. Современная муниципальная служба должна быть открытой, конкурентоспособной, престижной и ориентированной на результативную деятельность муниципальных служащих по обеспечению исполнения полномочий органов местного самоуправления. Для достижения этого была разработана программа «Развитие муниципальной службы в городском округе». С целью повышения эффективности использования муниципального имущества и земель была разработана муниципальная программа «Управление муниципальной собственностью города Хабаровска». В ходе ее реализации должны были произвестись оптимизация количества и состава муниципального имущества, и сформироваться земельный фонд Хабаровского городского округа. Муниципальная программа «Информационный город» была разработана для развития технической основы формирования «электронного правительства», предоставления муниципальных услуг гражданам и организациям на базе современных информационных технологий [19]. Муниципальная программа «Содействие развитию институтов и инициатив гражданского общества в городе Хабаровске» была разработана для развития совершенствование институтов гражданского общества и местного самоуправления. В связи с этим планировалось

вовлечение населения в деятельность социально ориентированных некоммерческих организаций, вовлечение граждан в решение вопросов местного значения и техническое развитие средств массовой информации.

Среди муниципальных программ направленных на повышения эффективности муниципального управления финансировалась в большей степени финансировалась программа «Управление муниципальной собственностью города Хабаровска» и, несмотря на то, что удельный вес снизился в 2015 году, но в 2016 году он возрос до 44,1%, что значительно выше средств на реализацию программы «Управление муниципальными финансами». Объем финансов затраченный на эту программу в 2014 году был равен 24,8%, что выше, чем в других периодах, но произошел рост по сравнению с предыдущим периодом в 2016 году. «Информационный город» также довольно значимая программа для муниципального управления, однако с каждым годом доля ее финансирования снижалась. Менее перспективной программой для данного направления весь период являлась муниципальная программа «Развитие муниципальной службы в городском округе» причем с каждым периодом финансирование снижалось [20].

Динамика финансирования программ повышения эффективности муниципального управления Хабаровска представлена на рисунке 3.

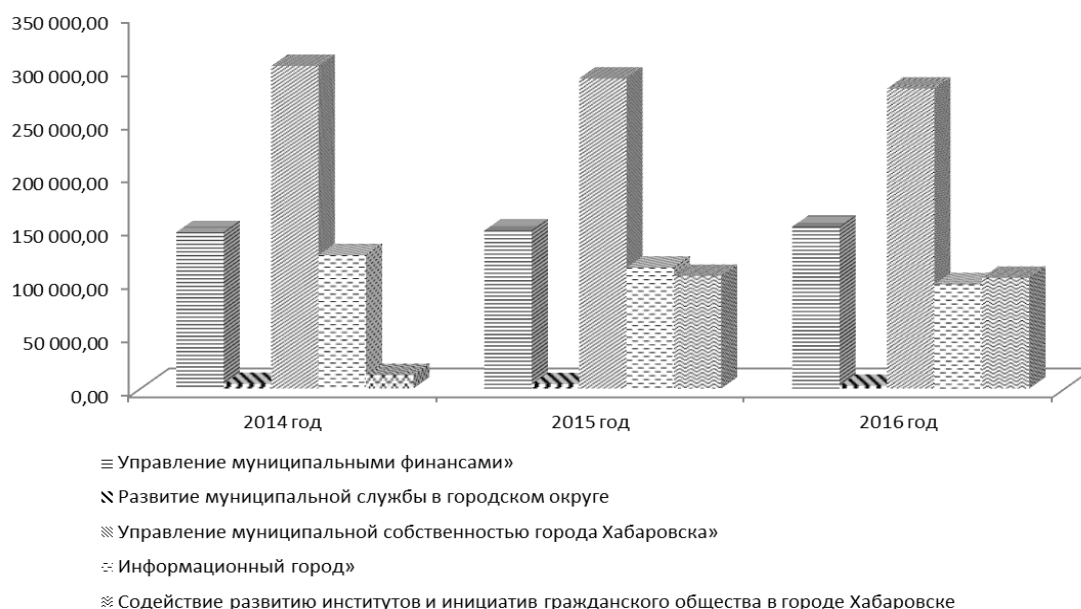


Рисунок 3 – Динамика финансирования программ повышения эффективности муниципального управления за 2014– 2016 год

«Управление муниципальной собственностью города Хабаровска» финансировалось изначально в размере 301,4 млн. рублей, затем финансирование сократилось на 11,7 млн., а затем на 9,4 млрд. Рублей, таким образом, в 2016 году объем направленных финансов составил 280,3 млн. рублей. «Содействие развитию институтов и инициатив гражданского общества в городе Хабаровске» значительно увеличилась в объеме финансирования с 12,4 млн. до 103,4 млн. рублей в 2016 году. Также ежегодно возрастал объем финансирования муниципальной программы «Управление муниципальными финансами» до 151,1 млн. рублей.

В целом на реализацию муниципальных программ связанных с повышением эффективности муниципального управления был затрачен большой объем средств в 2015 году, однако далее наблюдалась отрицательная тенденция. Для устойчивого развития экономики Хабаровского городского округа был разработан также ряд муниципальных программ, направленный и на различные аспекты экономики.

Предпринимательство, занимает важное место в структуре экономики города и с каждым годом усиливает влияние на формирование общих социально-экономических показателей в различных отраслях. Для создания благоприятных условий к занятию предпринимательской деятельности была разработана муниципальная программа «Развитие малого и среднего предпринимательства».

Целью муниципальной программы «Повышение инвестиционной привлекательности городского округа являлось формирование благоприятных условий для привлечения инвестиций, обеспечивающих реализацию приоритетных направлений социально-экономического развития города и повышения эффективности городской экономики. Она была разработана для решения задач по привлечению инвестиций, увеличение товарооборота продукции собственного производства и стимулирование предприятий к производству новых видов продукции с целью увеличения производительности труда. Для формирования благоприятного инновационного климата была разработана муниципальная программа «Инновационное развитие города Хабаровска». Она была направлена на решение задач по стимулированию инновационного спроса, созданию инновационной инфраструктуры и привлечению инвестиций в инновационную сферу, стимулированию создания инновационных предприятий, и увеличение предприятиями города товарооборота инновационной продукции собственного производства.

Среди муниципальных программ, разработанных для обеспечения устойчивого развития экономики наиболее финансируемой программой в течение двух лет являлась программа «Развитие малого и среднего предпринимательства». Однако если в 2014 году ее финансирование составляло 65,5%, то в 2016 году доля финансов снизилась до 32,4%. Противоположную тенденцию финансирования имела программа «Повышение инвестиционной привлекательности городского округа» и за трехлетний период объем вложенных средств возрос с 20 до 63,1%, таким образом, данная программа в 2016 году стала наиболее финансируемой [21] (рис. 4).

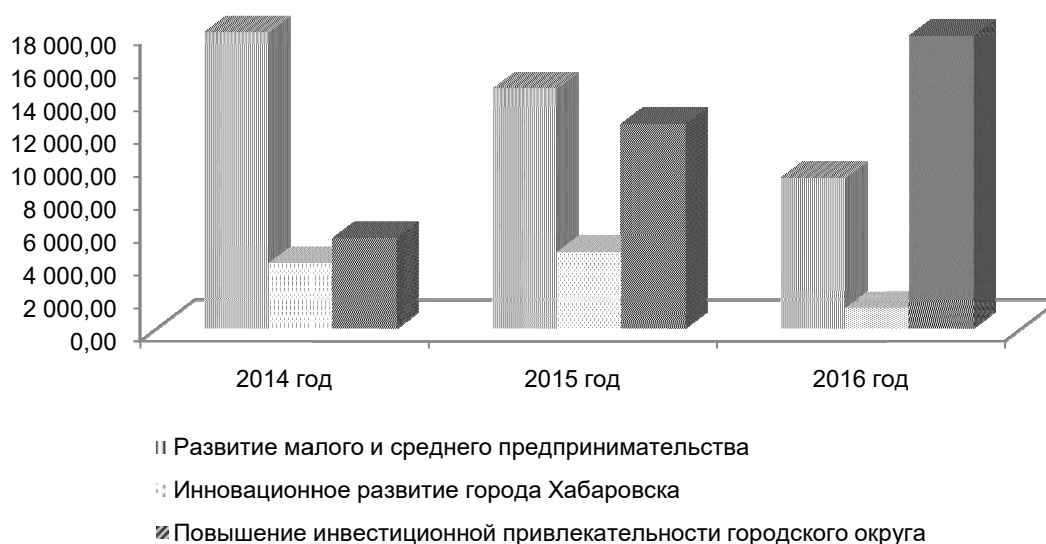


Рисунок 4– Динамика финансирования программ устойчивое развитие экономики за 2014– 2016 год

Финансирование муниципальной программы «Развитие малого и среднего предпринимательства» началось с 18 млн. рублей в 2014 году, но с каждым годом объем финансовых вложений сокращался, до того что в 2016 году было направлено 9,1 млн. рублей. Противоположная тенденция за трехлетний период произошла с программой «Повышение инвестиционной привлекательности городского округа» по сравнению изначально затраченной суммой в 2015 году произошел рост

финансирования на 6,9 млн., а затем на 5,3 млн., таким образом, объем финансирования составил 17,7 млн. рублей. «Инновационное развитие города Хабаровска» начало терять возрастающий объем финансирования с 2016 года, когда снабжение реализации этой программы составило 1,2 млн. рублей.

Наиболее приоритетными муниципальными программами, на реализацию которых делался основной упор муниципальными органами власти Хабаровского городского округа, являлись программы «Обеспечение качества и доступности образования» и Развитие городской дорожной сети и благоустройства. Их доля изменялась, но на их реализацию выделялись наибольшие средства финансирования из бюджета округа. В 2014 году также перспективными программами являлись «Развитие инженерной инфраструктуры города Хабаровска», «Обеспечение разработки и реализации городской градостроительной деятельности и земельной политики, строительства муниципального жилищного фонда на территории городского округа» и «Защита населения и территории города Хабаровска от чрезвычайных ситуаций», однако с каждым годом финансирование их сокращалось.

Таким образом, для осуществления своих полномочий органы власти города использовали бюджетные средства и расходовали их на образование, социальную политику, культуру, спорт, здравоохранение и другие сферы жизнедеятельности с целью развития Хабаровского городского округа, как в экономическом, так и в социальном плане. Наиболее перспективными направлениями развития города за весь период являлись социальные направления. Наиболее важными задачами реализации муниципальных программ, являлись обеспечение качественных образовательных услуг, развитие физической культуры и спорта, культуры, охрана окружающей среды, и обеспечение безопасности дорожного движения. Однако, несмотря на первостепенную задачу, заключающуюся в решении стоящих вопросов социальной сферы, решение других проблем тоже было затронуто в ходе реализации муниципальных программ. Расходы бюджета и финансирование муниципальных программ были направлены на развития не только социальной сферы, но и других направлений городского округа. Финансирование реализации этих программ осуществлялись исключительно из бюджета городского округа, наибольший объем финансирования был выделен на муниципальную программу, ориентированную на развитие образования и так же будет продолжаться в дальнейшем.

Реализация муниципальной программы «Обеспечение качества и доступности образования» оказала эффективное действие. Благодаря ей произошло внедрение технического оснащения в учебные учреждения, проведение текущих ремонтов, была проведена курсовая подготовка и переподготовка педагогических кадров, увеличен фонд оплаты труда педагогов и также были выделены дотации на питание школьников из малообеспеченных и многодетных семей.

## БИБЛИОГРАФИЯ

1. Консолидированные бюджеты субъектов Российской Федерации [Электронный ресурс] // Федеральное казначейство официальный сайт. – Режим доступа: <http://www.roskazna.ru/ispolnenie-byudzhetrov/konsolidirovannye-byudzhety-subektov/>
2. Харисова Е.В. (2016). Роль местных налогов (на примере крупнейших городских округов Нижневартовска и Сургута // Энергия науки сборник VI Международной научно-практической конференции студентов и аспирантов, С. 361-364.
3. Симонова Н.Ю. (2016). Расходные обязательства местных бюджетов // Современная экономика: актуальные вопросы, достижения и инновация сборник статей победителей III Международной научно-практической конференции, С. 81-83.
4. Исполнение бюджета Хабаровска на 2014 год [Электронный ресурс] // Администрация города Хабаровска официальный сайт. – Режим доступа: [https://www.khabarovskadm.ru/munitsipalnye\\_finansy/o-byudzhete/2014/](https://www.khabarovskadm.ru/munitsipalnye_finansy/o-byudzhete/2014/)

5. Исполнение бюджета Хабаровска на 2015 год [Электронный ресурс] // Администрация города Хабаровска официальный сайт. – Режим доступа: [https://www.khabarovskadm.ru/munitsipalnye\\_finansy/o-byudzhete/2015/](https://www.khabarovskadm.ru/munitsipalnye_finansy/o-byudzhete/2015/)
6. Исполнение бюджета Хабаровска на 2016 год [Электронный ресурс] // Администрация города Хабаровска официальный сайт. – Режим доступа: [https://www.khabarovskadm.ru/munitsipalnye\\_finansy/o-byudzhete/2016/](https://www.khabarovskadm.ru/munitsipalnye_finansy/o-byudzhete/2016/)
7. Мещерякова Л.А. (2014). Бюджетные возможности реализации полномочий муниципальных образований: собственные доходы и государственная поддержка // Вестник Белгородского университета кооперации, экономики и права, 3 (51): 167-174.
8. Мосикян М.Р. (2016). Организация финансирования расходов местного бюджета муниципального образования // Новая наука: Стратегии и векторы развития, 5-1 (82): 159-161.
9. Широкова А.И. (2014). Классификация муниципальных целевых программ // Экономика и управление в XXI веке, №6. С. 25-27.
10. Елохов А.М., Елохова Т.А. (2015). Целевые программы как инструмент реализации стратегии развития муниципального образования // ВУЗ. XXI век, №1 (47). С. 141-157.
11. Винницкая О.А. (2015). Приоритетные направления бюджетной политики в системе формирования доходов и расходов местных бюджетов // Актуальные проблемы развития финансового сектора. Материалы международной научно-практической заочной конференции, С. 39-46.
12. Дзобелова В.Б., Олисаева А.В., Магометова М.Ю. (2015). Анализ формирования и исполнения бюджета на примере бюджета города Владикавказа // Фундаментальные исследования, №10-1. С. 156-160.
13. Astakhov V.V., Astakhova E.V., Demin S.S. Instrumental and technological directions to ensure economic security of enterprise // International Review of Management and Marketing. 2016. Т. 6. №S1. С. 172-178.
14. Дугинова А.О. Муниципальная программа по благоустройству города Курска на 2014-2018 годы и проблемы уличного озвещения // Политика, экономика и инновации.-2014. 2 (12): 3.
15. Фитина Л.Н., Хозяинова Т.К.. Особенности разработки стратегической программы развития муниципальной системы физической культуры и спорта // Управление экономическими системами: электронный научный журнал,.- 2015- 4 (76): 41.
16. Астахова Е.В., Айхеле Д.В. Особенности международного бизнеса на приграничных территориях//Азимут научных исследований: экономика и управление.- 2016.- Т. 5.- №3 (16). С. 14-17.
17. Постановление Администрации об утверждении Перечня муниципальных программ городского округа «Город Хабаровск» [Электронный ресурс] // Администрация города Хабаровска официальный сайт. – Режим доступа: <http://docs.cntd.ru/document/465302558>
18. Астахова Е.В., Завальный Т.Д. Иностранные инвесторы и инвестиционный климат приморского края //Азимут научных исследований: экономика и управление.- 2016.- Т. 5.- №4 (17).- С. 164-166.
19. Рукавишникова А.С. Механизмы оптимизации расходов местных бюджетов // Проблемы учета и финансов- 2013. №4. С. 37-40.
20. Илларионова Ю.А., Маврина О.А. Повышение эффективности расходов местных бюджетов на примере Морозовского поселения Ивановской области // Международная научно-техническая конференция преподавателей и студентов посвященной 50-летию университета -2015.- С. 100-102.

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**ПРОГНОЗИРОВАНИЕ СОЦИАЛЬНО-ЭКОНОМИЧЕСКОГО РАЗВИТИЯ  
КАК ОСНОВА ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ И РЕЗУЛЬТАТИВНОСТИ  
РЕАЛИЗАЦИИ ГОСУДАРСТВЕННЫХ ПРОГРАММ РЕГИОНАЛЬНОГО  
ЭКОНОМИЧЕСКОГО РАЗВИТИЯ**

**FORECASTING OF SOCIO-ECONOMIC DEVELOPMENT AS A BASIS  
FOR INCREASING THE EFFICIENCY AND EFFECTIVENESS OF IMPLEMENTATION  
OF STATE PROGRAMS FOR REGIONAL ECONOMIC DEVELOPMENT**

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**АННОТАЦИЯ**

Важнейшим направлением социально-экономической политики государства на современном этапе выступает повышение эффективности социально-экономического развития регионов за счёт имеющихся экономических ресурсов. Большинство регионов на настоящем этапе развития использовали все возможности экстенсивного развития, в связи с чем столкнулись с необходимостью поиска вариантов интенсивного развития за счёт применения инновационных подходов и методов развития. Обозначенные проблемы могут быть решены на основе прогнозирования, которое помогает повысить эффективность и результативность реализации государственных программ регионального экономического развития. В статье определяются основные проблемы, связанные с прогнозированием социально-экономического развития региона, а также предлагаются меры по повышению эффективности и результативности реализации государственных программ регионального экономического развития.

**ABSTRACT**

The most important direction of socio-economic policy at the present stage is the increase of efficiency of socio-economic development of regions due to available economic resources. Most regions on the present stage of development used all possibilities of extensive development, therefore faced with the necessity of finding options intensive development through innovative approaches and methods development. The indicated problem can be solved on the basis of forecasting, which helps to improve the efficiency and effectiveness of implementation of state programs on regional economic development. The article identifies the main problems associated with forecasting socio-economic development of the region and proposes measures to improve the efficiency and effectiveness of implementation of state programs on regional economic development.

**КЛЮЧЕВЫЕ СЛОВА**

Стратегическое планирование, прогнозирование, социально-экономическое развитие, регион, государственные программы.

**KEY WORDS**

Strategic planning, forecasting, socio-economic development, region, state program.

Анализ и прогнозирование социально-экономического развития выступает первоначальным этапом управления региональным развитием. Обоснованный прогноз

является основой для определения целей социально-экономического развития региона, его результаты используются для уточнения программных мероприятий и определения приоритетов в развитии регионального хозяйственного комплекса. Прогнозирование социально-экономического развития региона выступает важным элементом в системе стратегического планирования, при помощи которого можно более точно ориентироваться в сложившейся экономической ситуации, выбирать основные направления перспективного развития региона, определяя место и роль в общероссийском экономическом пространстве. Важнейшей проблемой, возникающей в процессе стратегирования развития региона, является необходимость гибко и быстро реагировать на изменения внешних и внутренних факторов функционирования экономики региона, перестраивая и оперативно пересчитывая прогнозные индикаторы. При этом важно помнить, что стратегия направлена на создание объективных условий долгосрочного социально-экономического развития региона, которое может замедлиться в результате экономических кризисов либо несущественно отклониться от намеченного курса, но целевое направление развития должно остаться неизменным.

Прогнозирование и планирование выступают одной из главных форм осуществления региональной политики и ставят своей целью определение и обоснование перспектив будущего социально-экономического развития региона. Прогнозирование, выступая элементом предвидения социально-экономической ситуации в регионе, дает возможность предсказать вероятную динамику основных показателей в зависимости от сложившихся условий развития внешней и внутренней среды. Планирование делает возможным внедрение в практику государственного управления соответствующих управленческих решений, в основе которых лежат прогнозные варианты развития ситуации, и которые направлены на достижения желаемого состояния социально-экономического развития региона. Таким образом, прогнозирование и планирование социально-экономического развития региона моделируют будущие состояния социально-экономической сферы с учётом независимых от субъектов управления внешних и внутренних факторов.

Прогнозирование является начальным этапом процесса формирования любого плана. Сущность прогнозирования состоит в том, что при помощи какой-либо конкретной методологии определяются тенденции и закономерности в развитии объекта исследования, после чего осуществляется процесс моделирования будущего желаемого состояния социально-экономической системы региона. Базой методологии прогнозирования регионального социально-экономического развития являются исследовательский и целевой подход к прогнозированию (рисунок 1).

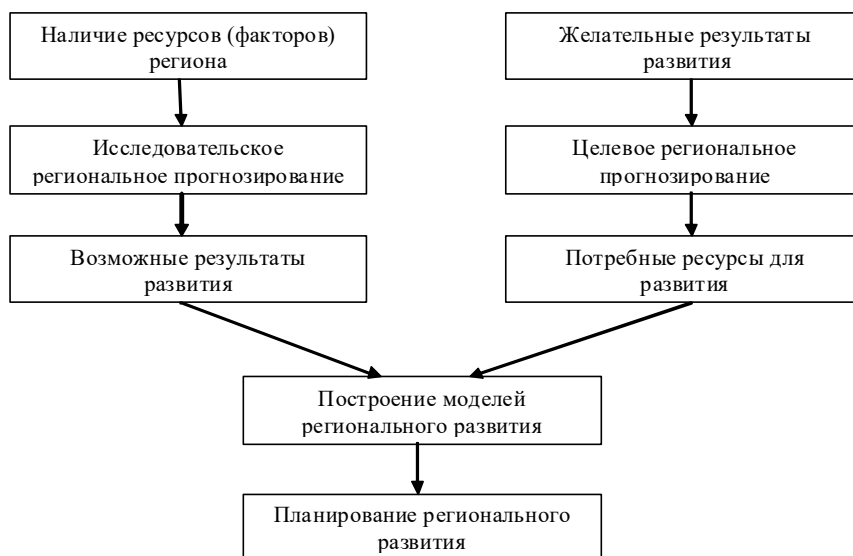


Рисунок 1 – Взаимосвязь целевого и исследовательского подходов к прогнозированию

Результаты, полученные в ходе осуществления прогнозных расчетов социально-экономического развития региона, необходимы органам государственного управления для обоснования целей и задач социально-экономического развития, разработки и обоснования выбора определенных инструментов социально-экономической политики региональных органов власти, повышения эффективности использования ограниченных ресурсов, используемых при производстве частных благ и оказании государственных услуг.

Первой проблемой, возникающей при построении прогнозов, является выбор методологии прогнозирования, которая учитывала бы основные закономерности, характерные для определённых этапов развития региональной экономики.

Прогнозирование уровня регионального социально-экономического развития опирается на объективные закономерности экономического развития, логику, качественные статистические данные и экономико-математические и статистические методы исследования.

Планирование перспектив социально-экономического развития региона с учётом требуемых критериев является обязанностью каждого региона. При целевом подходе к прогнозированию предполагаемая цель и её будущие параметры выступают отправной точкой прогноза, и формируют базу для построения долгосрочных прогнозов регионального развития.

Однако, с другой стороны в основе прогноза лежит база ретроспективных аналитических данных, на основе которых изучается текущее состояние региона в зависимости от имеющихся ресурсов. Данный подход называется исследовательским прогнозированием.

Таким образом, процесс прогнозирования представляет собой ключевой этап развития региональной социально-экономической системы. Достоверность и точность прогнозирования напрямую влияет на эффективность принимаемых решений как на региональном, так и на федеральном уровне.

Нормативными основами прогнозирования социально-экономического развития Российской Федерации и ее субъектов являются различные нормативно-правовые акты федерального и регионального уровней. Основными федеральными нормативными актами, определяющими общие процедуры прогнозирования социально-экономического развития и порядок взаимодействия органов государственной власти, являются: Федеральный закон №115-ФЗ «О государственном прогнозировании и программах социально-экономического развития Российской Федерации» от 20 июля 1995 г.; Постановление Правительства РФ №1 «О прогнозе развития государственного сектора экономики Российской Федерации» от 4 января 1999 г.; Постановление Правительства РФ №596 «О порядке разработки прогноза социально-экономического развития Российской Федерации» от 22 июля 2009 г.; Федеральный закон №172-ФЗ «О стратегическом планировании в Российской Федерации» от 28 июня 2014 г.

Разработка прогнозов социально-экономического развития на уровне регионов регламентируется законодательством соответствующего субъекта Российской Федерации.

В соответствии с нормами федеральных законодательных актов, прогнозы социально-экономического развития Российской Федерации и ее субъектов должны составляться ежегодно по поручениям Правительства РФ в соответствии со схемой процедур разработки прогноза социально-экономического развития РФ, которая устанавливает последовательность, основные этапы подготовки прогнозных документов и состав участников этой работы.

Нормативно-правовые акты субъектов федерации, регламентирующие вопросы прогнозирования, уточняют и конкретизируют деятельность региональных органов власти по разработке прогнозов развития, определяют общие подходы к региональному прогнозированию, координируют и приводят в соответствие друг с другом планово-прогнозные документы муниципальных образований и документы регионального уровня.



28 июня 2014 г. был принят Федеральный закон №172-ФЗ «О стратегическом планировании в Российской Федерации», который вступил в силу 11 июля 2014 г. В соответствии с данным законом, прогнозирование – деятельность участников стратегического планирования по разработке научно обоснованных представлений о рисках социально-экономического развития, об угрозах национальной безопасности Российской Федерации, о направлениях, результатах и показателях социально-экономического развития Российской Федерации, субъектов Российской Федерации и муниципальных образований.

Данный закон предусматривает следующие полномочия органов государственной власти субъектов Российской Федерации в сфере стратегического планирования:

1) определение в пределах полномочий субъектов Российской Федерации приоритетов социально-экономической политики, долгосрочных целей и задач социально-экономического развития субъектов Российской Федерации, согласованных с приоритетами и целями социально-экономического развития Российской Федерации;

2) установление требований к содержанию документов стратегического планирования, разрабатываемых в субъектах Российской Федерации, порядку их разработки, рассмотрению и утверждению (одобрению) с учетом положений настоящего Федерального закона, других федеральных законов, иных нормативных правовых актов Российской Федерации и нормативных правовых актов субъектов Российской Федерации;

3) разработка и утверждение (одобрение) документов стратегического планирования по вопросам, отнесенным к полномочиям субъектов Российской Федерации;

4) мониторинг и контроль реализации документов стратегического планирования, утвержденных (одобренных) органами государственной власти субъектов Российской Федерации;

5) обеспечение согласованности и сбалансированности документов стратегического планирования, разрабатываемых на уровне субъектов Российской Федерации;

6) установление порядка осуществления стратегического планирования в субъектах Российской Федерации в соответствии с нормативными правовыми актами, указанными в статье 2 настоящего Федерального закона;

7) участие в формировании документов стратегического планирования, разрабатываемых на федеральном уровне по вопросам совместного ведения Российской Федерации и субъектов Российской Федерации, реализуемых на территориях субъектов Российской Федерации;

8) иные полномочия в сфере стратегического планирования.

К документам стратегического планирования, разрабатываемым на уровне субъекта Российской Федерации, относятся:

1) документ стратегического планирования, разрабатываемый в рамках целеполагания, - стратегия социально-экономического развития субъекта Российской Федерации;

2) документы стратегического планирования, разрабатываемые в рамках прогнозирования, к которым относятся:

а) прогноз социально-экономического развития субъекта Российской Федерации на долгосрочный период;

б) бюджетный прогноз субъекта Российской Федерации на долгосрочный период;

в) прогноз социально-экономического развития субъекта Российской Федерации на среднесрочный период;

3) документы стратегического планирования, разрабатываемые в рамках планирования и программирования, к которым относятся:

а) план мероприятий по реализации стратегии социально-экономического развития субъекта Российской Федерации;

б) государственные программы субъекта Российской Федерации.

Структура прогноза социально-экономического развития региона включает в себя

определенную совокупность частных прогнозов, которые раскрывают составляющие будущих отдельных социально-экономических сфер регионального развития, и комплексный экономический прогноз, который в укрупненной форме формирует представление о будущем развитии экономики и социальной сферы региона.

Частные прогнозы содержат показатели отражающие: демографическую ситуацию в регионе; характеристики имеющихся производственных ресурсов (например, разведанные запасы полезных ископаемых, земельные, водные и лесные ресурсы, капитал, трудовые ресурсы); состояние инновационной сферы и возможности использования достижений НТП в практической деятельности предприятий; объем потребительского спроса и его динамику; объем платежеспособного потребительского на отдельные товары или услуги; темпы развития отдельных отраслей экономики, территорий и т.п.

Комплексный экономический прогноз отражает будущее социально-экономическое развитие региона как целостного образования. В зависимости от временного интервала прогнозирования комплексные прогнозы социально-экономического регионального развития делятся на долго-, средне- и краткосрочные.

Долгосрочный комплексный прогноз охватывает временной промежуток в десять лет и разрабатывается один раз в пять лет. Он является базой для выработки долгосрочной концепции социально-экономического развития региона. Для того, чтобы обеспечивалась преемственность проводимой экономической политики показатели долгосрочного прогноза ложатся в основу среднесрочных прогнозов, концепции и программ социально-экономического регионального развития. Временной промежуток среднесрочного прогнозирования социально-экономического развития региона составляет от трех до пяти лет с ежегодной корректировкой данных. Он выступает базой при определении концепции развития региона на среднесрочную перспективу. Краткосрочный прогноз социально-экономического развития региона составляется ежегодно и является основой составления проекта бюджета.

Прогноз социально-экономического развития субъекта Российской Федерации на долгосрочный период разрабатывается каждые шесть лет на двенадцать и более лет на основе прогноза социально-экономического развития Российской Федерации на долгосрочный период с учетом прогноза научно-технологического развития Российской Федерации и данных, представляемых органами исполнительной власти субъекта Российской Федерации и органами местного самоуправления. Корректировка прогноза социально-экономического развития субъекта Российской Федерации на долгосрочный период осуществляется в соответствии с решением высшего исполнительного органа государственной власти субъекта Российской Федерации с учетом прогноза социально-экономического развития субъекта Российской Федерации на среднесрочный период. Прогноз социально-экономического развития субъекта Российской Федерации на долгосрочный период разрабатывается на вариативной основе. Прогноз социально-экономического развития субъекта Российской Федерации на долгосрочный период должен содержать:

- 1) оценку достигнутого уровня социально-экономического развития субъекта Российской Федерации;
- 2) определение вариантов внутренних условий и характеристик социально-экономического развития субъекта Российской Федерации на долгосрочный период, включая основные показатели демографического и научно-технического развития, состояния окружающей среды и природных ресурсов;
- 3) оценку факторов и ограничений экономического роста субъекта Российской Федерации на долгосрочный период;
- 4) направления социально-экономического развития субъекта Российской Федерации и целевые показатели одного или нескольких вариантов прогноза социально-экономического развития субъекта Российской Федерации на долгосрочный период, включая количественные показатели и качественные характеристики социально-экономического развития;
- 5) основные параметры государственных программ субъекта Российской Федерации

Федерации;

6) основные показатели развития по отдельным видам экономической деятельности, показатели развития транспортной и энергетической инфраструктур на долгосрочный период с учетом проведения мероприятий, предусмотренных государственными программами субъекта Российской Федерации;

7) иные положения, определенные высшим исполнительным органом государственной власти субъекта Российской Федерации.

Прогноз социально-экономического развития субъекта Российской Федерации на среднесрочный период должен разрабатываться ежегодно на основе прогноза социально-экономического развития Российской Федерации на среднесрочный период, стратегии социально-экономического развития субъекта Российской Федерации с учетом основных направлений бюджетной и налоговой политики субъекта Российской Федерации. Прогноз социально-экономического развития субъекта Российской Федерации на среднесрочный период должен содержать:

1) оценку достигнутого уровня социально-экономического развития субъекта Российской Федерации;

2) оценку факторов и ограничений экономического роста субъекта Российской Федерации на среднесрочный период;

3) направления социально-экономического развития субъекта Российской Федерации и целевые показатели одного или нескольких вариантов прогноза социально-экономического развития субъекта Российской Федерации на среднесрочный период;

4) основные параметры государственных программ субъекта Российской Федерации;

5) иные положения, определенные высшим исполнительным органом государственной власти субъекта Российской Федерации.

В системе регионального прогнозирования, несмотря на то, что определены общие методологические принципы прогнозирования, существует большое количество проблем, часть из которых представлена на рисунке 2.

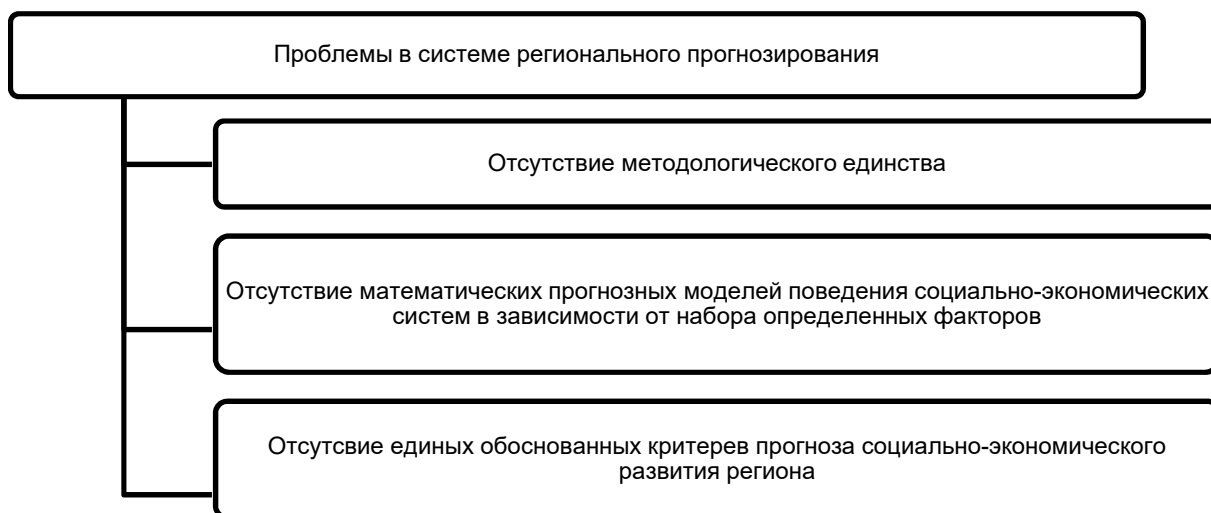


Рисунок 2 – Проблемы прогнозирования социально-экономического развития региона

Имеющиеся проблемы в системе прогнозирования социально-экономического развития региона определяют необходимость методологического и методического совершенствования процедуры прогнозирования.

Прогнозирование социально-экономического развития Липецкой области осуществляется на долгосрочный и среднесрочный период. Долгосрочный прогноз разработан в рамках Стратегии развития Липецкой области на период до 2020 года. Прогнозы социально-экономического развития Липецкой области основываются на

прогнозах социально-экономического развития Российской Федерации на долгосрочный и среднесрочный периоды, при этом принимаются во внимание основные направления бюджетной и налоговой политики Российской Федерации. Разработка осуществляется в нескольких вариантах с учетом вероятностного воздействия внутренних и внешних политических, экономических, социальных и других факторов на социально-экономическое развитие Липецкой области. Прогнозы составляются по видам экономической деятельности в целом по Липецкой области, а также по муниципальным образованиям края. Отдельно выделяются прогнозы развития государственного и муниципального секторов экономики области.

Таблица 1 – Основные проблемы прогнозирования социально-экономического развития Липецкой области и возможные пути их решения

| Проблема  | Возможные пути решения   |
|---|--|
| Неактуальность, неоднородность, противоречивость правового поля в сфере прогнозирования социально-экономического развития   | Доработка законодательства федерального уровня в части определения: понятийного аппарата; перечня, состава и структуры прогнозных документов для каждого уровня государственной власти; ответственности за подготовку документов и их адекватность; критериев оценки качества прогнозов и процедуры контроля качества подготовки прогнозных документов |
| Недостаточное качество, полнота и прозрачность прогнозов социально-экономического развития регионов   | Проведение непрерывного мониторинга экономических показателей в регионе и публикация результатов мониторинга в средствах массовой информации, общественное обсуждение проектов прогнозов с привлечением экспертов  |
| Неоднородность информационно-программного обеспечения прогнозирования социально-экономического развития регионов  | Внедрение на территории всех субъектов РФ единого информационно-аналитического комплекса, разработанного силами коммерческих структур и научно-исследовательских институтов, профессионально занимающихся прогнозированием   |
| Изменение методик расчета ряда показателей социально-экономического развития, что затрудняет проведение качественного глубокого ретроспективного анализа для целей прогнозирования. Не учет показателей теневой экономики | Совершенствование деятельности органов государственной статистики в области устранения проблем несопоставимости данных за разные периоды времени. Использование методик расчета показателей теневой экономики  |
| Отсутствие глубокой системной увязки показателей, используемых при прогнозировании и относящихся к разным группам, что снижает системность, комплексность и гибкость прогнозных расчетов                                  | Использование экономико-математических моделей, позволяющих связать в единую систему показатели социально-экономического развития, что даст возможность адаптировать систему показателей к меняющимся условиям   |
| Небольшое количество коммерческих организаций, занимающихся прогнозированием  | Лицензирование прогнозной деятельности и развитие института коммерческого прогнозирования, в дальнейшем и рассмотрение вопроса о возможном переходе к аутсорсингу в вопросах разработки прогнозов  |
| Отсутствие условий для активного участия в разработке стратегически важных для региона прогнозных документов со стороны представителей науки, бизнеса, гражданского общества  | Консолидация усилий региональных органов власти, высших учебных заведений, представителей ведущих секторов экономики, банковского сектора, направленных на совершенствование социально-экономического прогнозирования путем создания коллегиального независимого органа  |

Прогноз социально-экономического развития Липецкой области на долгосрочный период включается в состав стратегии социально-экономического развития Липецкой области на долгосрочный период, используется при разработке отраслевых стратегий и долгосрочных целевых программ Липецкой области. Среднесрочный прогноз является основой для разработки и корректировки целевых индикаторов программы социально-экономического развития Липецкой области, документов программно-целевого планирования, а также составления проекта областного бюджета на очередной финансовый год и на плановый период. В Постановлении от 19 апреля 2012г. №201 изложен порядок разработки прогноза социально-экономического

развития Липецкой области на среднесрочный период, согласно которому прогнозирование Управлением экономики администрации Липецкой области совместно с заинтересованными органами исполнительной власти области в 3 этапа:

1. На основе сценарных условий функционирования экономики Российской Федерации разрабатывается предварительный прогноз социально-экономического развития Липецкой области на очередной финансовый год и плановый период (предварительный прогноз).

2. С учетом приоритетов, обозначенных в документах стратегического и программно-целевого планирования Липецкой области, разрабатываются сценарные условия социально-экономического развития Липецкой области (сценарные условия) и основные параметры прогноза социально-экономического развития Липецкой области, необходимые для разработки проекта краевого бюджета на очередной финансовый год и плановый период.

3. На основе параметров уточненного прогноза социально-экономического развития Российской Федерации разрабатывается уточненный прогноз социально-экономического развития Липецкой области (уточненный прогноз).

В таблице 1 отражены основные проблемы прогнозирования социально-экономического развития Липецкой области и возможные пути их решения.

Внедрение на практике предлагаемых мер по совершенствованию процедур прогнозирования социально-экономического регионального развития приведет, по нашему мнению, к повышению качества разрабатываемых прогнозов, поможет повысить эффективность использования показателей прогнозных расчетов при принятии управленческих решений региональными органами государственной власти.

Следует отметить также то, что очень часто прогнозирование как важный элемент стратегирования используется региональными органами государственной власти в качестве эффективного инструмента в конкурентной борьбе с другими регионами за привлечение государственной финансовой поддержки и инвестиций. В результате региональные стратегии содержат излишне амбициозные цели и задачи, которые не подкреплены реальным потенциалом, а прогнозные данные подстраиваются под эти задачи.

Для обеспечения качественного прогнозирования регионального социально-экономического развития необходимо выполнение следующих условий.

Во-первых, регион необходимо рассматривать как организационную систему, в которой факторы социально-экономического развития выступают доминирующими. В данном случае цели социально-экономического развития будут опираться на имеющиеся ресурсы и учитывать существующий потенциал региона.

Во-вторых, в процессе прогнозирования следует учитывать закономерности взаимодействия факторов регионального развития и их воздействие на ключевые показатели, характеризующие уровень этого развития.

В-третьих, прогнозные модели развития региональных социально-экономических систем должны быть получены на основании выявленных закономерностей. И эти модели должны быть имитационными, чтобы прогнозировать реакцию региональных систем на изменение факторов развития. В целом это повысит эффективность прогнозирования.

В-четвёртых, при прогнозировании следует закладывать многовариантность экономического роста региональной системы, а также ее возможное качественное изменение.

При выборе соответствующих подходов к прогнозированию необходимо, прежде всего, чётко устанавливать региональные ограничения и допуски, при которых будет выполняться прогнозирование.

Таким образом, прогнозирование социально-экономического развития региона выступает как предвидение будущего состояния экономики и социальной сферы, и представляет собой составную часть государственного регулирования экономики. Прогнозирование призвано очерчивать направления развития регионального комплекса и его отдельных структурных составляющих.

**БИБЛИОГРАФИЯ**

1. О стратегическом планировании в Российской Федерации: Федеральный закон от 28 июня 2014 г. № 172-ФЗ [Электронный ресурс] // Справочно-правовая система «Консультант Плюс». Режим доступа: локальный. Дата обновления 12.01.2015.
2. Алёхин Э.В. Государственный и муниципальный сектор экономики в Российской Федерации: учеб. / Э.В. Алехин. Пенза: Изд-во ПГУ, 2011. 180 с.
3. Алёхин Э.В. Экономика государственного и муниципального сектора: учеб. пособие. / Э.В. Алехин. Пенза: Изд-во ПГУ, 2010. 172 с.
4. Бреусова А.Г. Региональная финансовая политика: учеб. пособие. / А.г. Бреусова. М.: Издательство Омского государственного университета им. Ф.М. Достоевского, 2011. 200 с.
5. Гимазова Ю.В. Государственное и муниципальное управление: учеб. для бакалавров. / Ю.В. Гимазова. М.: Юрайт, 2014. 453 с.
6. Дергачёв В.А., Регионоведение: учеб. пособие. / В.А. Дергачев, Л.Б. Вардомский. М.: Юнити-Дана, 2011. 519 с.
7. Кнорринг В.И. Основы государственного и муниципального управления: учеб. / В.И. Кнорринг. М.: Изд-во «Экзамен», 2005. 476 с.
8. Криворотов В.В., Экономическая безопасность государства и регионов: учеб. пособие. / В.В. Криворотов, Н.Д. Эриашвили, А.В. Калина. М.: Юнити-Дана, 2012. 350 с.
9. Кукарская Л.И. Актуальные вопросы прогнозирования социально-экономического развития региона в контексте стратегирования / Л.И. Кукарская // Вестн. Алтайской акад. экономики и права. 2013. № 1 (28).
10. Орешин В.П. Система государственного и муниципального управления: учеб. пособие. / В.П. Орешин. М.: ИНФРА-М, 2013. 320 с.
11. Охотский Е.В. Теория и механизмы современного государственного управления. / Е.В. Охотский. М.: Юрайт, 2013. 701 с.
12. Региональная экономика: учебник / под ред. Т.Г. Морозовой. – М.: 2012. 526 с.
13. Социальная политика региона: теория и практика: учеб. пособие для вузов по специальности «Соц. работа» / под ред. И. П. Скворцова. – М.: КноРус, 2010. 603 с.
14. Шамарова Г.М. Основы государственного и муниципального управления: учеб. / Г.М. Шамарова. М.: Синергия, 2013. 320 с.
15. Шедько Ю.Н. Система государственного и муниципального управления: учеб. для бакалавров. / Ю.Н. Шедько. М.: Юрайт, 2013. 570 с.

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**ANALYSIS OF ABNORMAL RETURN, STOCK RETURN AND STOCK LIQUIDITY  
BEFORE AND AFTER BUYBACK SHARE: CASE STUDY OF COMPANIES LISTED  
IN INDONESIA STOCK EXCHANGE IN PERIOD OF 2011-2015**

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**ABSTRACT**

This study aims to know the impact of buyback share conducted by companies listed on the Indonesia Stock Exchange (IDX) Period of 2011-2015. The analytical method used to perform the test of this research's hypothesis is parametric t statistic which is by using two different mean tests with paired samples. The population in this study is all listed companies in Indonesia Stock Exchange (IDX) which conduct buyback share from the period of 2011 to the period of 2015. The results of this study include 1) the first hypothesis shows that on average, abnormal share return prior to the implementation of buyback share is greater than after the implementation of buyback share, 2) the second hypothesis, on average, stock return prior to the execution of buyback share is larger compared to after the implementation of buyback share, stock return of the company after the implementation of share buyback, 3) the third hypothesis shows, on average, trading volume activity after implementation buyback share is greater than before implementation, 4) The fourth hypothesis after testing the result shows the bid-ask spread after the implementation of buyback share which is greater than before buyback share.

**KEY WORDS**

Abnormal return, buyback share, stock liquidity, stock return.

Company listed on the Indonesia Stock Exchange (BEI) obtains source of funding through the transaction of financial instruments in the capital market; when the company has entered the capital market, and then the information of the company will be widely disseminated so that investors can assess the condition of the company. An announcement made by company in the capital market that have information content will get reactions from investors, if the information brings reliable and high-quality signals, (Chemmanur and Li, 2014). The quality of the information can be reflected through the conditions of company fundamentals, (Kollmann, 2006). The company that has condition which is fundamentally good and trusted by investors, it will be indistinguishable from companies that have fundamentally less reliable condition, because the signal given by the company can be positive or negative for such investors, resulting in a reaction from investors to the information reveals that investors believe in the condition of the company in the future, (Feeney et al., 1999).

The capital market will react to any information from the company to achieve a new balance price is a very important thing, (Brown, 2007). Because of information, it will result in changes in the company's stock price at company, so the returns will also change as well as the perception of investors are changing and investment decision-making is also changing. While, the reaction to information is usually investigated by using event study. Event study is a study that learns about the market reaction toward an event which its information is published as an announcement in the capital market, so this event study can be used to test the information content of an announcement and it may also be used to test the market efficiency of the half-strong form, especially formal audit information, (Jegadeesh and Titman, 1993; Fama, 1998)

Go-public company that has been registered or listed in Stock Exchange Indonesia (IDX) requires the management of the company to work professionally. In this way, the company will provide information both to the public and to investors, information in the

market capital can be a signal that one of them affects stock prices either positively or negatively in the capital market. If it gives positive impact, then the investors will compete to enter into the capital market and fight over those shares, so that the price of the stock is boosted up, then another company's goal that is improving the welfare for its share-holder will be achieved, Veronica Siregar and Bachtiar, 2010). If the impact is negative, then it is made sure that investors will be doubtful and unwilling to invest more money in the company, as well as investors will sell the shares that they have. Information plays a role important in projecting stock prices in the secondary market; the secondary market in this case is the Indonesia Stock Exchange (IDX). The fast reaction to the information provided by the company to the market can be interpreted that the market has been efficient in receiving such information. The market will react to any information to reach the price of the new balance (Jogiyanto, 2013).

Information regarding to shareholders (stockholders are much utilized by the management in maintaining stock prices to avoid undervalued (stock prices that occur in the market is lower than the fair price or the so-called value fundamental stocks). The increasing stock price is one of the factors supporting the company is considered having good performance. Therefore, the relationship between the rise and the fall of stock prices, one of them, can be influenced by the performance of the company. The role of the influential information in presenting the stock price at market exchange is encouraging the Indonesian government through the Supervisory Board of Capital Market and Financial Institution (BAPEPAM-LK) to issue a regulation related to information openness that must be announced to public.

## **METHODS OF RESEARCH**

The analytical method used to perform the test of this research hypothesis is parametric t statistic that is by using two different mean tests with paired samples (sample t-test paired Ghozali (2012). Statistical analysis used in this research is difference test of paired sample t-test using statistical software. This research is descriptive comparative meaning that looking for differences before and after the company conducts buyback share. According to Nazir (2005), comparative research is a kind of descriptive research that is willing to find answers fundamentally about cause and effect which is by analyzing the factors of the cause or occurrence of a particular phenomenon.

The population in this study is all companies which are listed in the Indonesia Stock Exchange (IDX) conducting buyback share in the period of 2011 to 2015. Determination of sample in this research is done by using method of purposive sampling. By purposive sampling method, it is selected based on predetermined criteria. The criterion used by researchers in this research is a company that is a go-public company which is listed in the Indonesia Stock Exchange (IDX) in the period of 2011 to 2015. The company conducts buyback share based on Bapepam-LK regulation number XI.B.2 and the regulation number XI.B.3 (appendix B and C), and available data on the date of the buyback share announcement. Shares of companies conducting active buybacks traded over the estimated period and window period. Availability of data regarding to the date of buyback share announcement is available on the annual report or [www.idx.co.id](http://www.idx.co.id) in the section of corporate action.

## **RESULTS AND DISCUSSION**

*Abnormal Testing of Return on Buyback Share.* It is the test result of paired sample t test of abnormal return on average for three days before and after the implementation of buyback share. The result calculation using computer SPSS program obtained significance abnormal returns before and abnormal return after implementation of 0,744 which is greater than the 0.05 significance level. Testing on average (mean abnormal return before the implementation of buyback share that is equal to 0,00145 and abnormal return after the implementation stock buyback of -0,00184. It is decided that abnormal average return before



the implementation of buyback share is greater than average abnormal returns after the implementation of buyback share, therefore H1 is rejected and H0 is accepted. The decrease of abnormal share returns is caused by falling stock prices of companies in the post exchange of the implementation of buyback share. It is caused by investors who do not respond maximally to the implementation of buyback share.

Table 1 – Test Result of Paired Samples t test of Abnormal Return in Date around Buyback Share Announcement (On Average)

| Period     | Significance | Mean      |
|------------|--------------|-----------|
| AAR Before | 0,744        | 0,001454  |
| AAR After  |              | -0,001845 |

*Testing Share Return on Buyback Share.* The test results show the results of paired sample t test for share return on average during the observation period is three days before and after the implementation of buyback share published. The calculation results using computer program SPSS obtained the significance of share return before and share return after the implementation of 0,698 which is greater than the level significance of 0.05. On the test results of average share return using paired sample t test mean share return obtained in the period before the buyback share is equal to 0,003213 and after the buyback share is -0,000261. Hence, based on test result of paired sample t-test mean value of share return before and after indicates that the mean prior to the implementation of the buyback share is greater than the mean after the implementation of the buyback share. Thus, the conclusion is that H2 is rejected and H0 is accepted or average return shares before the implementation of buyback share is greater than after the implementation of buyback share. The negative value of stock return is caused by the decrease in stock prices of companies in the share market; it causes continued decrease in the rate of return (return on the company). So the stock returns in the period after the implementation of buyback share is negative.

Table 2 – Test Result of Paired Samples t test of Abnormal Return in Date around Buyback Share Announcement (On Average)

| Period     | Significance | Mean      |
|------------|--------------|-----------|
| ARS Before | 0,698        | 0,003213  |
| ARS After  |              | -0,000261 |

*Testing of Trading Volume Activity on Buyback Share.* Variable testing of trading volume activity shows the test result using paired sample t tests on average during three days before and after the implementation of buyback share published. The calculation results using computer SPSS program obtained value trading volume activity significance before trading volume activity after announcement of 0,397 is greater than the level significance of 0.05. The average test result of trading volume activity using paired test sample t test mean trading volume activity obtained in the period before the buyback share is equal to 0,00153 and after the buyback share is of 0.00200. From the comparison results of the significance value of trading activity volume before and after the implementation of buyback share and according to previous research, it is found that if the value of the paired different test results is significantly greater than 0.05, then it is stated that there is no difference, but from the comparison of mean or average trading volume activity before implementation is 0,001537 and after the implementation is 0,00200. Thus, the mean after the implementation of the buyback share is greater than before the implementation of buyback share, then it is concluded that H<sub>3</sub> is accepted and H<sub>0</sub> is rejected. The increase of share trading volume is caused by the majority of investors buy stocks at the limit price of certain stocks, so that the increase in sales volume increases, but on the abnormal return and share return do not have positive value as well as it cannot provide maximum return post implementation buyback share.

Table 3 – Test Results of Paired TVA Sample Test in Date of Buyback Share Announcement (On Average)

| Period      | Significance | Mean     |
|-------------|--------------|----------|
| ATVA Before | 0,397        | 0,001537 |
| ATVA After  |              | 0,002003 |

*Testing of Bid Ask Spread on Buyback Share.* The data above shows the results of paired sample t of test bid-ask spread on average for three days before and after the implementation of buyback share is published. The calculation results using computer program SPSS obtained significant value of bid-ask spread before and bid ask-spread after the announcement of 0,115 which is greater than the 0,05 significance level. In the calculation of the average value (mean before the implementation of buyback share amounted to 0,021041 and in the period after the implementation of buyback share amounts to 0,028022). When viewed from the mean value after implementation of buyback share is larger than before implementation, it is decided that the average bid ask spread after implementation of buyback share is greater than before buyback share, so  $H_4$  is accepted and  $H_0$  is rejected.

Table 4 – Test Result of Paired Sample t test of Bid Ask-Spread in Date of Buyback Share Announcements (On Average)

| Period      | Significance | Mean     |
|-------------|--------------|----------|
| ABAS Before | 0,115        | 0,021041 |
| ABAS After  |              | 0,028022 |

The value of average positive spread is caused by the increase of company's share trading volume after the implementation of buyback share. It occurs because the investor buy more company' share after the implementation of buyback share, but purchases made by investors still has not improved as expected by the company which is proven by an increase in the spread that occurs only by 0,0069 after the implementation of buyback share.

## DISCUSSION OF RESULTS

This study is conducted to test whether there is a market reaction around the date of publication of corporate action that is buyback share policy, and to see if there are differences in market reaction before and after the publication of the policy. The market reaction intended in this study is the reaction of the abnormal return of stock, trading volume activity and bid ask spread that happened for three days before and after publication of the announcement of buybacks done.

Table 5 – Hypothesis Statement

| Hypothesis | Statement  | Mean Before and After | Information                       |
|------------|--|-----------------------|-----------------------------------|
| H 1        | Average Abnormal Share Return Cumulative is bigger than after buyback share than before buyback share. | 0,0014 > - 0,0018     | Data is not supporting Hypothesis |
| H2         | Average Cumulative Share Return Is bigger than after buyback share than before buyback share.          | 0,0032 > - 0,0002     | Data Is not Supporting hypothesis |
| H3         | Average trading volume activity Cumulatively after buyback share is bigger than before buyback share.  | 0,0015 < 0,0020       | Data is supporting hypothesis     |
| H4         | Average of bid ask spread Cumulatively after buyback share is bigger than before buyback share         | 0,0210 < 0,0280       | Data is supporting hypothesis     |

Abnormal reaction of return share, trading volume activity, and bid ask spread on buyback share in this research is explained as follows:

*Abnormal Reaction of Return on Buyback Share.* From the test, it is found that there is a significant difference tendency in some periods of events that is on period t-3, t-2, t + 2, and t + 3. It reinforces the finding that buyback shares have certain information or signal that can be influencing investor's decision in doing transaction over normal decisions. The existence of significant differences statistically between the average daily abnormal return before and after buyback share announcements on a given day reflects that the capital market in Indonesia as a whole has not anticipated the existence of buyback share information.

Table 5 – Table of Average Abnormal Company's Share Return

| Period | Average   |
|--------|-----------|
| t-3    | -0,012521 |
| t-2    | 0,012050  |
| t-1    | 0,004831  |
| t0     | -0,013092 |
| t+1    | 0,001757  |
| t+2    | -0,000500 |
| t+3    | -0,006792 |

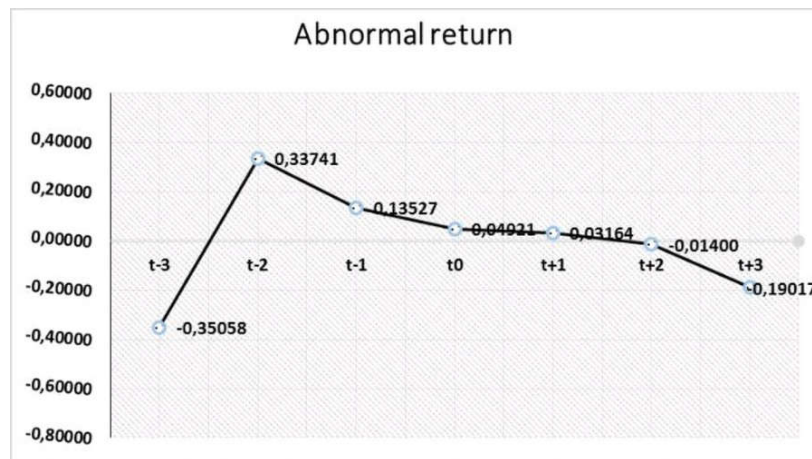


Figure 1 – Average Movement of Abnormal Sample Return during Windows Period of Buyback Share Announcement Year of 2011-2015 (Source: BAPEPAM-LK and BEI that have been reprocessed for this study, 2017)

The movement of the abnormal return in the period figure before and after in the windows period that the reaction of average abnormal returns is larger than before the implementation of significant buyback share in the event period. It happens because of the tendency of the average abnormal return reacts over a period of time not evenly distributed in the observed windows period. The highest abnormal return occurs at t-2 in the observation period, which is up to 0,33741. However, it decreases on t-1 to t + 1 and decreases to abnormal returns which has negative value at t + 2 and t + 3 during the observation period. Positive abnormal return indicates that the level of profit that occurs in the company who do buyback shares are greater than with the profit expected by investors, so investors obtain a share return due to shares bought back by the company experience a price increase due to the event. However, the condition is only on t-2 before the buyback share of corporate action, after t-2 is on t + 2 abnormal return showing negative. It indicates that the level of profit incurred by the event of buyback share is smaller than the profit expected. The decrease in abnormal return is due to negative sentiment with the market caused by the current market conditions, where overall market share prices decreased or in the condition of down trend.

The value of the abnormal return on average showing that before the implementation of buyback share is greater than after the implementation of buyback share explain that the

information brought regarding to the existence of buyback share announcement has not been able to provide a reasonable profit and not yet able to have a good impact to the company's stock price. However, investors still can obtain abnormal return on certain days before and after buyback share announcements made by company.

Abnormal return is a motive of the investor to buy shares when the company will conduct corporate action, (Hackethal and Zdantchouk, 2006). A positive abnormal return will benefit which is great towards investors, because of with the positive abnormal return, then investors who buy shares before the implementation of corporate action, the price of shares purchased after the company took a corporate action will tend to increase. It is very profitable for short-term investors due to rising stock prices companies that have been bought, when stock prices increase and directly on sale, then it will get a big capital gain.

The magnitude of the company's stock price increase after the implementation of corporate action depends on how much information which is absorbed in the market, (Huang and Zhou, 2007). More information obtained by investors and positively charged about the condition of the company, then the increase of the company's stock price will be increasing in accordance with the desired management company.

The graph on the picture also shows a downward trend on  $t-1$  up to  $t + 0$ , the decrease in the graph occurs to a negative value. It is due to the fact that stock prices decrease before and after the implementation of share buyback. Because of the fall in prices of the stock, it resulted in a negative abnormal return. However, although the abnormal return is negative in some days before and after buyback share, on a few days ahead of the implementation of buyback share and one day after the implementation of buyback share, abnormal return is positive so that investors keep enjoying an abnormal profit resulting from buyback share action.

The negative value shown is abnormal return due to the majority of investors who buy shares in the period before the implementation of buyback share, so the stock price boosted up leads to abnormal stock returns. However, after the implementation of buyback share, the interest of investors to buy shares of company that does buyback shares decreases, so the price of the company's stock also decreases to cause abnormal return decline and reach negative value.

The issuer expects the impact of the implementation of buyback share, which is the investor believes in the performance of the company resulting in rising stock prices. But, on condition of Indonesia's economy and viewed from the form of market efficiency, Indonesia is still included into strong-half form, then any investor still cannot get a balanced abnormal share return. If investors are long-term investors, then the implementation of buyback share becomes the consideration in buying the company's stock in the middle of fluctuating economy condition. It is viewed from the comparison of companies that conduct buyback share and publish bonds (obligation), then companies that do buyback share become the right choice. Because of the economic conditions that are getting worse, the company will seek funding sources to keep it operating in the midst of a crisis experienced by the company. But if it is for short-term investors, the decrease of abnormal returns becomes a signal to delay to invest in the company.

*Reaction of Share Returns on Buyback Share.* The value of the average daily share returns previously with the average of abnormal daily return after buyback share during the event period, on a company that has made buyback share in the observation period, i.e. three days before and three days after implementation of buyback share.

Table 6 – Table of Company's Average Share Return

| Period | Average  |
|--------|----------|
| t-3    | -0,00943 |
| t-2    | 0,01124  |
| t-1    | 0,00783  |
| t0     | 0,00737  |
| t+1    | 0,00228  |
| t+2    | 0,00297  |
| t+3    | -0,00603 |

The table above is the value of the average daily stock return before the buyback share by being calculated from the average stock return as well as after buyback share during the period of events. From testing, it is found that there is a significant trend of differences in some period of events that is in period t-3, t-2, and t + 3. This research reinforces the findings that buyback share contain information or specific signals that may influence the decision of investors in making transactions over normal decisions. There is a statistically significant difference between the mean of share return previously, i.e. on t-3 which has negative value of -0,2639. It indicates that there is no benefit to be gained by companies in the period of buyback share in the period before the implementation of buyback share, but when t-2 stock returns increases to form a number of 0,3147008. It shows the existence of a good signal from investors, thereby raising stock prices so the stock return on t-2 goes up significantly. It indicates that investors believe that buyback share is a positive signal given by the company related to the future prospects where the company is in good condition so that it is able to buy its shares back on fluctuating economic conditions.

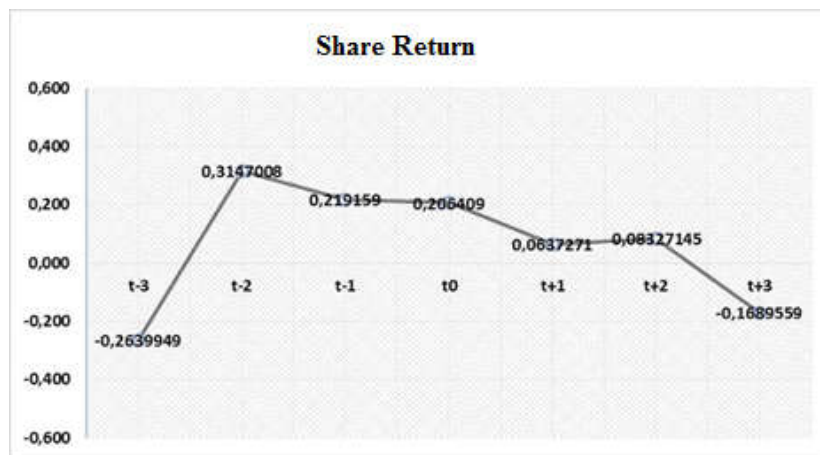


Figure 2 – The Movement of Average Sample Return Share during Windows Period of Buyback Share Announcement in Year of 2011-2015 (Source: BAPEPAM-LK and BEI that have been reprocessed for this study, 2017)

The figure above shows an upward trend on the period before the implementation of buyback share, but after the implementation of buyback share, the trend of the graphic shown tends to decrease until the day t + 3 shows the value of -0,16895. The decrease from graph can be caused by the decrease of investor's interest in the company conducting buyback share. However, when it is viewed from the graph of share return movement in which the initial returns on t-3 is negative then on t + 3, it is back to have negative value. Thus, it is seen the tendency of investors in buying stocks at certain price limits so that when the stock prices have increased, then investors get the excess value of the difference between the stock prices of the purchased company.

Share return on the event of buyback share implementation in which stock returns on average after the implementation of buyback share is smaller when compared to before the buyback share. It explains that the information brought in is in relation to buyback share announcement has not been able to provide a profit more around the date of the implementation of buyback share, especially on period after the implementation of buyback share, (Howe and Lin, 1992). However, investors can still earn returns on certain days before and after buyback share announcement of companies such as on t-2, t-1, t0, t + 1, and t + 2.

The effect of buyback share action is the existence of the company's stock price, because that is the advantage of buyback share action. On the rise of stock prices are causing the occurrence of stock returns, if the interest of the investor is to seek profit from capital gain, then on t-2 before implementation is the right time to sell the stock. It is due to share return reaches the highest value in the observation period. But, if investors who intend to profit from dividends, then it will be long enough to get the dividend. It refers to the

condition of the economy that Indonesia is facing, when cash of companies is quite large, the consideration of the company is to dividend distribution or allocated for expansion of the company, if the company's management considers that the company has not been able to do expansion or other corporate action, then the company will dividend on to investors. However, if the company is willing to do the expansion or willing to stabilize the condition of the company like when price of shares goes down due to worsening economic conditions, then the choice of the company is to conduct buyback share if the company assesses that the stock price is overvalued, then the management parties will do a stock split, or if the company will issue new shares, then the company will offer a right issue to potential investors.

*Trading Reaction Volume Activity above Buyback Share.* Trading volume activity is the sale of each transaction that occurs in the stock exchange at the time and certain shares, and is one of factors that also gives effect towards stock price movements. This share price movement is related to the motivation of investors in buying and selling stocks. Trading volume activity can be used to test the hypothesis of efficient market on the weak form (weak-form efficiency because of the market is not efficient yet or efficient in the weak form, price changes not yet immediately reflects the existing information so that the researcher only can observe the reaction of the capital market through the movement of trading volume inflammation on the researched capital market.

Table 7 – Table of Company's Average Trading Volume Activity

| Period | Average |
|--------|---------|
| t-3    | 0,00128 |
| t-2    | 0,00159 |
| t-1    | 0,00174 |
| t0     | 0,00324 |
| t+1    | 0,00258 |
| t+2    | 0,00186 |
| t+3    | 0,00157 |

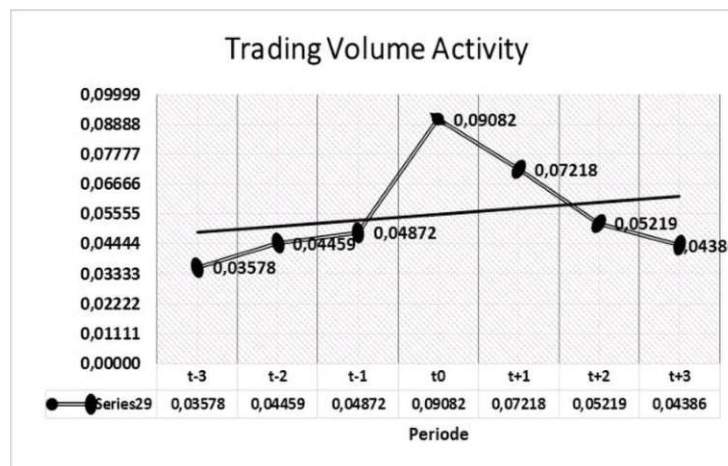


Figure 3 – The Movement of Average TVA Samples during Windows Period of Buyback Share Announcement in Year of 2011-2015 (Source: BAPEPAM-LK and BEI that have been reprocessed for this study, 2017)

Stock trade reaches its peak on the day t-0 or when the company makes a buyback share of 0,09082. In addition, on average, trading volume activity for three days before implementation of 0,004887, and average trading volume activity for three days after the implementation of 0,006008. Therefore, there is an increase in trading volume activity before and after the implementation of buyback share of 0,001121 or an increase amounts to 81,34%. The increase of trading volume activity on  $t_0$  occurs as new markets react to corporate action at the same time, that is, when a company undertakes buyback share. It occurs as the result of uneven information dissemination on the market so investors cannot

anticipate buyback share action by buying the shares of the company; however the increase in  $t_0$  gradually decreases in the period after the implementation of buyback share. It indicates that the majority of investors expects a high abnormal return after the implementation of buyback share, but because the majority of investors buy shares company at the time of buyback share implementation and the minority of investors buys shares in the period after the implementation so that abnormal return is not big as well. It is possible because of the retardation in the information that resulted in slow stock price increases resulting in stock returns and abnormalities of stock returns that should be able to increase and to have positive value after the implementation of buyback share, tends to decrease or even have negative value.

Trading volume activity decreases in the period after the company realizes the buyback shares can also be stated that investors are only looking for abnormal returns after the implementation of the buyback shares, so after getting the abnormal return, investors resell their shares. This is what keeps the value of the company's stock price is not likely to increase on a regular basis maximum. Based on the above conditions, it invites an assumption that investors are less responsive towards the announcement of buyback share previously by not doing stock trading activity so the stock price of the company has not increased significantly and trading volume has not been able to increase in together with the interest of investors to buy the stock.

The difference of daily average trading activity volume before and after this stock buyback can be caused by, due to a positive conveyed through buyback share announcement implicating on the growing volume of stock trading bought by investors in the capital market. Positive signals may be in the form of a stock market price assessed by investors as undervalue because the condition of capital markets which is on the decrease and with the company which realizes buyback share, the investors assume that there are prospects both in the future so that investors buy shares of the company to get an abnormal stock return. The positive signal may also be due to free cash flow in the company. Besides, for testing the average trading volume activity for three days before and after in windows period, it is not found that there is a difference of trading volume activity before and after buyback share. It opens possibility that there has been no major change in trading volume activity during windows period from buyback share.

The investors in the implementation of buyback share are less responsive after the action of the company proven in the period after the implementation of buyback share of trading volume share gradually decreases to  $t + 3$ . It leads to the assumption that decrease in purchases of company shares resulting from returns on stock cannot be maximally returned. It is because one of the motivations of the investor is to profit from the difference in purchase price and the selling price of the company's shares.

#### Reaction of Bid-Ask Spread on Buyback Share.

Bid ask spread is defined as the difference between the price asked to buy (bid price with the price offered for sell (ask price in stock trading at stock exchange). In the study of bid-ask spread related to measuring tools to measure information is not symmetrical (asymmetric information between dealers and investors).

Table 8 – Table of Company's Average Bid Ask Spread

| Period | Average |
|--------|---------|
| t-3    | 0,01839 |
| t-2    | 0,02087 |
| t-1    | 0,02386 |
| t0     | 0,02867 |
| t+1    | 0,02838 |
| t+2    | 0,03002 |
| t+3    | 0,02566 |

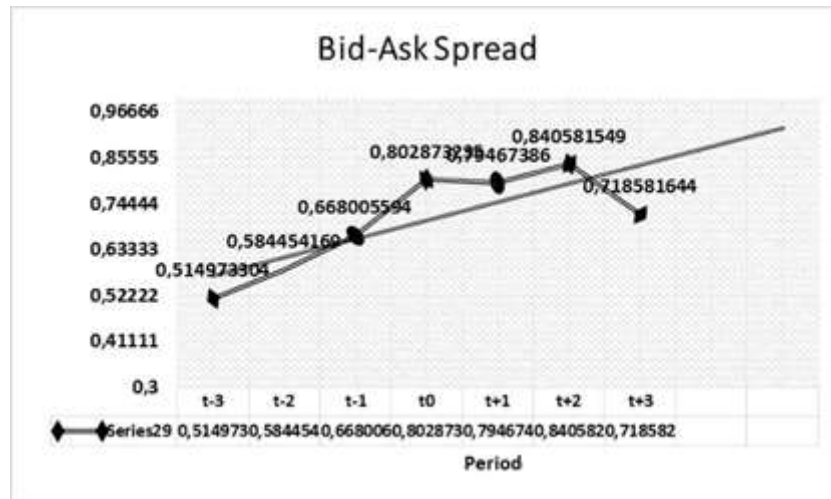


Figure 5 – The Movement of Average BAS Sample during Windows Period of Buyback Share Announcement in Year of 2011-2015 (Source: BAPEPAM-LK and BEI that have been reprocessed for this study, 2017)

The average bid ask spread for three days prior to implementation of buyback share of 0,021041, and average bid ask spread for three days after the implementation of buyback share of 0,028022. Thus, there is a bid ask spread increase after the announcement of buyback shares of 0,006981 or 7.5%. The increase of bid ask spread signs that the stock of the company purchased is greater than from shares of companies sold by investors. It is one of the things desired by the company after the implementation of buyback share done.

Information given by the company regarding to implementation of buyback share that will be performed is a signal to investors that the company is able to survive in that worse economy, after the company provides information to the market through public announcement, the flow of such information will be received by all market players, both investors and dealers of the market reacting positively will buy the shares of the company that will buy shares back, so that before the implementation of buyback share, the price of stocks will go up even though it is not significant.

## CONCLUSION

Based on the results of research, then this study obtains the conclusion that in testing the first hypothesis, it shows that on average abnormal return of shares prior to the implementation of buyback share is greater than after the implementation of buyback share. Abnormal return of shares after the implementation of buyback shares of 0,0018. The negative value of the abnormal return of the stock indicates that the expectation return of the company's shares are much larger than actual return that occur after the implementation of buyback share, but on the period before and after the implementation of buyback share, still there is an abnormal return on certain days before and after buyback share such as on h-2, h-1, h0, and h + 1. The difference of abnormal return is found on certain days around the execution date of buyback share. Thus, the buyback share is still carrying information content or specific signals that may affect the decision of the investor in making transactions over the normal decision. Investors can still get abnormal return from buyback shares that the company does but only on certain days before and after the implementation of buyback share.

The testing on the second hypothesis is not much different, that is on average share returns before buyback share is greater than after the implementation of buyback share, share return of the company after the implementation of buyback share is -0,0002. The decrease in stock returns even has negative value is caused by price of company's shares which keeps decreasing after the implementation of buyback share. It causes the stock returns drop down to negative value, but in the period before and after the implementation of



buyback share, there are still returns on certain days before and after buybacks such as on  $h-2$ ,  $h-1$ ,  $h_0$ ,  $h + 1$ , and  $h + 2$ . The difference on share returns of companies conducting buybacks show that the profit rate resulted by the implementation of buyback share is less in a positive response by investors, although in the observation period there is still average share return on before and after the implementation of buyback share on certain days.

The results of the third hypothesis test show that on average, average trading volume activity after the implementation of buyback share is greater than before the implementation. Therefore, the implementation of buyback share can still increase the volume of stock trading on period after its implementation. Trading volume activity is increasing but not proportional to the increase of abnormal share return and share returns occur because investors buy shares at a certain price limit, so that the increase in share trading volume does not increase maximally as well.

The fourth hypothesis after the test results shows that the bid-ask spread after the implementation of buyback share is greater than before the buyback share. Hence, the implementation of the buyback share brings the information content to investors, so that the implementation of buyback share can reduce information imbalance (asymmetric information among dealers, then it makes bid-ask spread increase.

## REFERENCES

1. Brown, C. (2007). The announcement effects of off-market share repurchases in Australia. *Australian Journal of Management*, 32(2), 369-385.
2. Chemmanur, T. J., & Li, Y. (2014). The role of institutional investors in open-market share repurchase programs. Available at SSRN.
3. Fama, E. F. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of financial economics*, 49(3), 283-306.
4. Feeney, L., Haines Jr, G. H., & Riding, A. L. (1999). Private investors' investment criteria: insights from qualitative data. *Venture Capital: An international journal of entrepreneurial finance*, 1(2), 121-145.
5. Ghozali, I. (2012). *Application of Multivariate Analysis with IBM Program SPSS 20*. Diponegoro University Publishing Agency Semarang.
6. Hackethal, A., & Zdantchouk, A. (2006). Signaling power of open market share repurchases in Germany. *Financial Markets and Portfolio Management*, 20(2), 123-151.
7. Howe, J. S., & Lin, J. C. (1992). Dividend Policy and The Bid-Ask Spread: an Empirical Analysis. *Journal of Financial Research*, 15(1), 1-10.
8. Huang, H., & Zhou, Z. G. (2007). Stock repurchase and the role of signaling: A comparative analysis between US and China. *Journal of Modern Accounting and Auditing*, 3(2), 56-62.
9. Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of finance*, 48(1), 65-91
10. Jogiyanto, H. (2013). *Portfolio Theory and Investment Analysis*. (8th ed.). BPFE UGM: Yogyakarta.
11. Kollmann, T. (2006). What is e-entrepreneurship?—fundamentals of company founding in the net economy. *International Journal of Technology Management*, 33(4), 322-340.
12. Nazir, M. (2005). *Research Method 16*. Jakarta: Ghalia Indonesia.
13. Veronica Siregar, S., & Bachtiar, Y. (2010). Corporate social reporting: empirical evidence from Indonesia Stock Exchange. *International Journal of Islamic and Middle Eastern Finance and Management*, 3(3), 241-252.

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## **ANALYSIS OF BRAND TRUST, BRAND IMAGE, AND BRAND SATISFACTION ON BRAND LOYALTY AND REPURCHASE INTENTION**

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### **ABSTRACT**

This research aimed to examine the influence of brand trust, brand image, and brand satisfaction on brand loyalty and repurchase intention of Jawa Pos newspaper in Surabaya City. According to literature review, the hypothesis of this research stated that brand trust, brand image, and brand satisfaction influenced brand loyalty. In addition, the results of the literature review showed that brand loyalty influenced repurchase intention. The data of this research were collected by using questionnaires from respondents consisting of 210 customers of Jawa Pos newspaper in Surabaya City. Hypothesis testing technique was performed by using structure equation model (SEM) analysis with SmartPLS statistic application. The results of this research indicated that brand trust, brand image, and brand satisfaction had a positive influence on brand loyalty and brand loyalty had positive influence on repurchase intention. Specifically, this research showed that loyal customers will continuously have repurchase intention.

### **KEY WORDS**

Image, trust, satisfaction, loyalty, brand, repurchase intention.

Nowadays, modern life is indirectly formed by the new information and communication technologies. As a key driver of this modern-era transformation, digitalization and interconnection network have created services such as mobile networks and the Internet (Kilian et al., 2012). In recent years, the internet has become a major source in searching for the information and news in which it threatens the future of newspapers around the world. In addition, the distribution of newspapers is also influenced by the availability of information from online news, websites, and social media that finally influences the number of newspaper sales (Alotaibi, 2015).

Readers, in some developed countries, through digital platform, have exceeded the number of readers compared to print media. The World Press Trends analysis estimated that at least 40 percent of global internet users used the Internet to read online newspapers (Henriksson, 2016). A survey of the World Association of Newspapers and News Publishers (WAN-IFRA), conducted in 2013, showed the variations in newspaper distribution. The survey compared newspaper distribution in 2012 and over the last five years. The results of the survey showed that there was a global downturn in newspaper distribution over the past few years of 0.9 percent; the downturn in the last five years had reached 2.2 percent (Kilman, 2013). Meanwhile, a follow-up survey, conducted by WAN-IFRA in 2015, found that the total global newspaper revenue decreased 1.2 percent from a year earlier and decreased 4.3 percent over the past five years (Henriksson, 2016).

The statistics chart showed the heartbreaking result in the development of today's newspaper business. The problem faced was the fact that the decrease of print media revenue for ads in newspapers is slowing down or even has been falling down for years (Gigaom, 2014). Research conducted by Roy Morgan in 2016 to 22 cities in Indonesia, resulted that the Internet penetration was 54 percent and newspapers was 38 percent. At the provincial level of East Java, internet penetration was only 43 percent and newspaper was 39 percent.

The statistics chart showed the heartbreaking result in the development of today's newspaper business. The problem faced was the fact that the decrease of print media revenue for ads in newspapers is slowing down or even has been falling down for years

(Gigaom, 2014). From the results of a survey, it was revealed that the market share of the newspaper was eroded deep enough, so that its total consumers now were only 39.3 percent. In addition, strong indications of the decrease of consumer/public interest in newspapers can also be seen from the lower number of newspaper customers; it was 15.1 percent, or went down about 2 percent compared to last year of 17.7 percent (Siswanto, 2017).

There are many dilemmas felt by newspaper publishers at the moment, such as reader aging, declining revenue and disappearing reader. In addition to this dilemma, another reason for the problems and threats in this business is internet technology that controls most of the young population. The challenges faced by the newspaper industry force them to rethink the idea about business practices, presentations and how to reach customer targets (Frooghi et al., 2015).

If consumers of print newspapers switch to reading newspapers online, newspapers are under great pressure and start thinking to earn money from their own online portals. The struggle of the newspaper industry is still very tough to keep a profit when disruptive technologies bother them; this is a long tradition of the established media industries that are not ready to be adapted and adapted to the new technology (Kueng & Picard, 2010). Liu et al. (2011) stated that brand trust is an important mediator factor influencing consumer behavior before and after product purchase, it will result in long-term loyalty and strengthen the relationship between both parties.

Having the basis in Surabaya, Jawa Pos is one of the largest newspapers network in Indonesia that has 167 newspapers, 21 magazines/tabloids, 23 local TV stations and 20 news sites and more. Jawa Pos claims itself to be the "National News Publication from Surabaya" because on July 1, 1949 Jawa Pos was born with the name of Djawa Post in Surabaya, East Java. Based on a survey conducted by Roy Morgan at Single Source Indonesia in 2016, it was found that Jawa Pos newspaper was one of the most dominant print media in Surabaya, where its readers reached 1,622,000 people. This is of course very surprising, in the middle of the onslaught of online media which are increasingly developed at this time.

The newspaper, which was born in Surabaya, still dominates even though newspapers and other print media began to surrender competing in this business field. The image of the Jawa Pos newspaper that has been firmly rooted to people of Surabaya has given a positive support for Jawa Pos to continue being survive and leaving its competitors. Yet, is the brand image of Jawa Pos newspaper that is well known by the people of Surabaya can make a satisfaction of the people when they become the readers of Java Post newspaper? In addition, how about the repurchase intention of Jawa Pos readers when news search is now easier with the internet? Will the Jawa Pos newspaper still be accepted by the people of Surabaya or abandoned like a newspaper that had been aged because it was not strong enough to face the competition in digital era?

Online media is originally an alternative to traditional media; now it has become an irreplaceable media and begins to change our communication patterns. Therefore, brand trust and image of Jawa Pos newspaper is at stake in facing the global competition in this business field, in the middle of the loss of print media from year to year. Various ways are performed by the company to keep developing the company and create a better future; one of which is by creating customer loyalty. Based on the results of research from Nielsen in Indonesia in 2014 and Roy Morgan in 2016, that have been described above, the researcher wants to know whether there is influence between brand trust, brand image, brand satisfaction on brand loyalty and repurchase intention of Jawa Pos newspaper on the people of Surabaya in the middle of the internet development today.

## **METHODS OF RESEARCH**

The type of the research is explanatory research; a research to explain the relationship between dependent variable and independent variable. In addition, this study is included into one-shot research, according to Sugiyono (2013), one-shot research is a research whose

process of data collection is only performed once. In this research, the data collection was only performed once. After distributing the questionnaires to the customers of Jawa Pos newspaper in Surabaya, the data that had been collected will then be processed by the researcher.

Based on the aim and the object of the research, the population of the research was all customer of Jawa Post newspaper in Surabaya city. Moreover, the sample was part of the overall population which is chosen carefully to represent the population (Sugiyono, 2012). The criteria for determining the sample in this study are as follows: 1) being the customer of Jawa Pos newspaper, at least, has been subscribed for 6 months, 2) aged at least 19 years, 3) domiciled in Surabaya City of East Java

Hair et, al. (2010) stated that a research performing factor analysis, at least have the number of the sample member respondents as many as five times of the number of indicators under research. Actually, a better number of respondents are suggested more than ten times the number of variables. It is also supported by Sugiyono's opinion (2013) which stated that the appropriate sample size used in a study is a number of 30 to 500 samples. The number of samples used in a research is as many as 10 x 21 questions of the indicator = 210 respondents. The research instrument used by the researcher was questionnaire which was developed from the modification of pre-existing measurement indicators; the questions of the questionnaire were arranged by closed question types so that the answers of the respondents were not wider than the questions.

Table 1 – Respondent's Profiles

| Respondent's Profiles | Category          | Frequency | Percentage |
|-----------------------|-------------------|-----------|------------|
| Gender                | Male              | 115       | 54.8       |
|                       | Female            | 95        | 45.2       |
|                       | Total             | 210       | 100        |
| Age                   | <20 years         | 6         | 2.9        |
|                       | 21-30 years       | 46        | 21.9       |
|                       | 31-40 years       | 49        | 23.3       |
|                       | 41-50 years       | 63        | 30         |
|                       | 51-60 years       | 36        | 17.1       |
|                       | >61 years         | 10        | 4.8        |
|                       | Total             | 210       | 100        |
| Education             | High School       | 30        | 14.3       |
|                       | Diploma           | 55        | 26.2       |
|                       | Bachelor          | 83        | 39.5       |
|                       | Magister          | 14        | 6.7        |
|                       | Others            | 28        | 13.3       |
|                       | Total             | 210       | 100        |
| Occupation            | Entrepreneur      | 44        | 21         |
|                       | Private           | 78        | 37.1       |
|                       | Civil servant/SOE | 54        | 25.7       |
|                       | Student           | 29        | 13.8       |
|                       | Other             | 5         | 2.4        |
|                       | Total             | 210       | 100        |
| Subscription Duration | 6 - 12 months     | 53        | 25.2       |
|                       | 13 - 24 months    | 50        | 23.8       |
|                       | 25 - 36 months    | 53        | 25.2       |
|                       | 37 - 48 months    | 35        | 16.7       |
|                       | > 48 months       | 19        | 9          |
|                       | Total             | 210       | 100        |
| Residence             | North Surabaya    | 42        | 25         |
|                       | East Surabaya     | 42        | 25         |
|                       | South Surabaya    | 42        | 25         |
|                       | West Surabaya     | 42        | 25         |
|                       | Central Surabaya  | 42        | 25         |
|                       | Total             | 210       | 100        |

Based on the results of data collection that had been done before, it was obtained the data on respondent's identity to complete the research information. The questionnaire was distributed in 5 administrative regions of Surabaya city: North Surabaya, East Surabaya, South Surabaya, West Surabaya and Central Surabaya; 42 questionnaires for each region. The data of the respondents being identified were based on gender, age, education, residence, occupation, and duration of Jawa Pos newspaper subscription.

Based on gender, the respondents were dominated by female by 115 people or 54.8% and the rest were male respondents by 95 persons or 45.2%. For age profile, the respondents were dominated by customers aged 41-50 years by 63 people with a percentage of 30%. Respondents aged <20 years were 6 people or 2.9%, respondents aged between 21-30 years were 46 people or 21.9%, respondents aged between 31-40 years were 49 people or 23.3%, respondents aged between 51-60 years were 36 people or 17.1% and respondents aged over 61 years were 10 people or 4.8%.

In addition, the results of data collection based on the level of education, the respondents were dominated by Bachelor's degree customers by 83 people or 39.5% percentage, followed by respondents who have Diploma education by 55 people or 26.2%. In addition, respondents of high-school education were 30 people or 14.3% while the respondents who educated Masters as many as 14 people or 6.7% and the rest were respondents whose education were other than high school, Bachelor, Diploma and Master by 28 people or 13.3%. For the data of respondents' occupation, the respondents were dominated by private employees by 78 people or 37.1%, the respondents who worked as civil servants/SOEs were 54 people or 25.7%, the respondents of entrepreneur were 44 people or 21% and the respondents who work other than entrepreneur, private and civil servants/SOEs as were 29 people or 13.8% and the respondents of students were 5 people or 2.4%.

Based on the subscription duration, the respondents were dominated by customers who had subscribed to Jawa Pos newspaper for 6-12 months and 25-36 months by 53 people or 25.2%, the respondents who had subscribed for 13-24 months were 50 people or 23.8%, the respondents who had subscribed for 37-48 months were 35 people or 16.7% and the respondents who had subscribed for more than 48 months were 19 people or 9%. According to the location of residence, the customers live in west Surabaya, central Surabaya, south Surabaya, east Surabaya and north Surabaya, each were 42 people with the percentage of 20%.

## RESULTS AND DISCUSSION

*Testing Results of Convergent Validity.* The first evaluation of the measurement model was convergent validity. To see the testing results of convergent validity, it was performed by looking at the results of the measurement instruments (questionnaires) in the output of combined and cross loadings. The assessment of the convergent validity itself was based on the feasibility of the model whether the model was valid and met the convergent validity. In addition, the feasibility of a model could also be seen from the value of t-statistics in which the t-statistics must be greater than t-count of 1.96 at the significance level of 0.05. In addition, the testing result of convergent validity from the measurement instrument (questionnaire) in this research could be seen in the following table:

Table 2 – Testing Results of Convergent Validity of Brand Trust

| Questions    | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|--------------|---------------------|------------------------|--------------------------|
| BT1 <- Trust | 0.579               | 0.103                  | 5.595                    |
| BT2 <- Trust | 0.717               | 0.068                  | 10.505                   |
| BT3 <- Trust | 0.422               | 0.165                  | 2.560                    |
| BT4 <- Trust | 0.658               | 0.122                  | 5.393                    |
| BT5 <- Trust | 0.667               | 0.086                  | 7.762                    |

Table 3 – Testing Results of Convergent Validity of Brand Image

| Questions    | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|--------------|---------------------|------------------------|--------------------------|
| BI1 <- Image | 0.727               | 0.135                  | 5.371                    |
| BI2 <- Image | 0.787               | 0.082                  | 9.547                    |
| BI3 <- Image | 0.749               | 0.159                  | 4.713                    |

Table 4 – Testing Results of Convergent Validity of Brand Satisfaction

| Questions          | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|--------------------|---------------------|------------------------|--------------------------|
| BS1<- Satisfaction | 0.746               | 0.135                  | 5.519                    |
| BS2<- Satisfaction | 0.746               | 0.135                  | 5.519                    |
| BS3<- Satisfaction | 0.443               | 0.121                  | 3.655                    |
| BS4<- Satisfaction | 0.433               | 0.165                  | 2.629                    |
| BS5<- Satisfaction | 0.790               | 0.073                  | 10.793                   |

Table 5 – Testing Result of Convergent Validity of Brand Loyalty

| Questions      | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|----------------|---------------------|------------------------|--------------------------|
| BL1 <- Loyalty | 0.599               | 0.106                  | 5.674                    |
| BL2 <- Loyalty | 0.714               | 0.051                  | 13.944                   |
| BL3 <- Loyalty | 0.475               | 0.098                  | 4.836                    |
| BL4 <- Loyalty | 0.652               | 0.076                  | 8.605                    |
| BL5 <- Loyalty | 0.727               | 0.071                  | 10.243                   |

Table 6 – Testing Results of Convergent Validity of Repurchase Intention

| Questions        | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|------------------|---------------------|------------------------|--------------------------|
| RI1 <- Intention | 0.793               | 0.052                  | 15.334                   |
| RI2 <- Intention | 0.792               | 0.052                  | 15.177                   |
| RI3 <- Intention | 0.652               | 0.091                  | 7.166                    |

The five indicators of brand trust variable were valid and statistically significant in measuring brand trust variable. It could be seen from the loading value ( $\lambda$ ) of all indicators; they were more than 0.50 with the T-statistics more than 1.96. Meanwhile, the three indicators of the brand image variable were valid and statistically significant in measuring the brand image variable. It could be seen from the loading value ( $\lambda$ ) of all its indicators; they were more than 0.50 with T-statistic more than 1.96. For the convergent validity, it could be concluded that the five indicators of the brand satisfaction variable were valid and statistically significant in measuring the brand satisfaction variable. It could be seen from the loading value ( $\lambda$ ) of all its indicators; they were more than 0.50 with T-statistic more than 1.96. In addition to the testing conclusion of convergent validity of 5 indicators, it could be concluded that the five indicators of brand loyalty variables were valid and statistically significant in measuring brand loyalty variable. It could be seen from the loading value ( $\lambda$ ) of all its indicators; they were more than 0.50 with T-statistic more than 1.96.

In addition, from the presented test results, the conclusion could be drawn that the three indicators of repurchase intention variable were valid and statistically significant in measuring the repurchase intention variable. It could be seen from the loading value ( $\lambda$ ) of all its indicators; they were more than 0.50 with T-statistic more than 1.96.

Based on the value of cross loading, it could be seen that all the indicators that make up each variable in this research (the value in bold) had met the discriminant validity because it had the largest value of cross loading; for the variables it formed and not for other variables. Thus, all indicators in each variable of this research had met the discriminant validity.

*The Influence of Brand Trust on Brand Loyalty.* The influence of brand trust on brand loyalty of Jawa Pos newspaper to the people of Surabaya was tested by using SmartPLS. From the result of data analysis, it was known that path coefficient value at brand trust variable was equal to 0.180 with t-statistic value of 2.124. Due to the result of t-statistic value more than 1.96, H0 was rejected and H1 was accepted.

According to the results of this research, it could be seen that the brand trust has a significant positive influence on brand loyalty, so this hypothesis could be accepted. The results of this research was in line with the research conducted by Upamannyu and Mathur (2013), they showed that brand trust had a positive influence on brand loyalty.

In addition, research conducted by Richard Chinomona (2016), Abdullah Alhaddad (2015), Riyan Hadi Widjaja (2015), Kha, Ching Wee, et al. (2012) also supported and strengthened the results of the research conducted by Upamannyu and Mathur (2013), in which proved that brand trust influenced positively to brand loyalty.

Table 7 – Discriminant Validity Test

| Variable | Image        | Intention    | Trust        | Satisfaction | Loyalty      |
|----------|--------------|--------------|--------------|--------------|--------------|
| BI1      | <b>0.727</b> | 0.272        | 0.208        | 0.063        | 0.180        |
| BI2      | <b>0.787</b> | 0.187        | 0.232        | 0.147        | 0.219        |
| BI3      | <b>0.749</b> | 0.162        | 0.195        | 0.177        | 0.164        |
| BT1      | 0.076        | 0.030        | <b>0.579</b> | 0.172        | 0.144        |
| BT2      | 0.370        | 0.198        | <b>0.717</b> | 0.262        | 0.222        |
| BT3      | 0.062        | 0.026        | <b>0.422</b> | 0.039        | 0.104        |
| BT4      | 0.097        | 0.228        | <b>0.658</b> | 0.100        | 0.205        |
| BT5      | 0.144        | 0.180        | <b>0.667</b> | 0.143        | 0.230        |
| BS1      | 0.112        | 0.093        | 0.141        | <b>0.746</b> | 0.171        |
| BS1      | 0.112        | 0.093        | 0.141        | <b>0.746</b> | 0.171        |
| BS3      | 0.126        | 0.123        | 0.069        | <b>0.443</b> | 0.180        |
| BS4      | 0.100        | 0.003        | 0.061        | <b>0.433</b> | -0.006       |
| BS5      | 0.127        | 0.233        | 0.269        | <b>0.790</b> | 0.425        |
| RI1      | 0.214        | <b>0.793</b> | 0.259        | 0.117        | 0.391        |
| RI2      | 0.192        | <b>0.792</b> | 0.143        | 0.227        | 0.334        |
| RI3      | 0.218        | <b>0.652</b> | 0.099        | 0.165        | 0.231        |
| BL1      | 0.094        | 0.280        | 0.103        | 0.420        | <b>0.599</b> |
| BL2      | 0.125        | 0.297        | 0.229        | 0.348        | <b>0.714</b> |
| BL3      | 0.107        | 0.157        | 0.259        | 0.109        | <b>0.475</b> |
| BL4      | 0.214        | 0.227        | 0.103        | 0.147        | <b>0.652</b> |
| BL5      | 0.264        | 0.382        | 0.284        | 0.156        | <b>0.727</b> |
| BI1      | <b>0.727</b> | 0.272        | 0.208        | 0.063        | 0.180        |
| BI2      | <b>0.787</b> | 0.187        | 0.232        | 0.147        | 0.219        |
| BI3      | <b>0.749</b> | 0.162        | 0.195        | 0.177        | 0.164        |
| BT1      | 0.076        | 0.030        | <b>0.579</b> | 0.172        | 0.144        |
| BT2      | 0.370        | 0.198        | <b>0.717</b> | 0.262        | 0.222        |
| BT3      | 0.062        | 0.026        | <b>0.422</b> | 0.039        | 0.104        |
| BT4      | 0.097        | 0.228        | <b>0.658</b> | 0.100        | 0.205        |
| BT5      | 0.144        | 0.180        | <b>0.667</b> | 0.143        | 0.230        |
| BS1      | 0.112        | 0.093        | 0.141        | <b>0.746</b> | 0.171        |
| BS2      | 0.112        | 0.093        | 0.141        | <b>0.746</b> | 0.171        |
| BS3      | 0.126        | 0.123        | 0.069        | <b>0.443</b> | 0.180        |
| BS4      | 0.100        | 0.003        | 0.061        | <b>0.433</b> | -0.006       |
| BS5      | 0.127        | 0.233        | 0.269        | <b>0.790</b> | 0.425        |
| RI1      | 0.214        | <b>0.793</b> | 0.259        | 0.117        | 0.391        |
| RI2      | 0.192        | <b>0.792</b> | 0.143        | 0.227        | 0.334        |
| RI3      | 0.218        | <b>0.652</b> | 0.099        | 0.165        | 0.231        |
| BL1      | 0.094        | 0.280        | 0.103        | 0.420        | <b>0.599</b> |
| BL2      | 0.125        | 0.297        | 0.229        | 0.348        | <b>0.714</b> |
| BL3      | 0.107        | 0.157        | 0.259        | 0.109        | <b>0.475</b> |
| BL4      | 0.214        | 0.227        | 0.103        | 0.147        | <b>0.652</b> |
| BL5      | 0.264        | 0.382        | 0.284        | 0.156        | <b>0.727</b> |

Table 8 – Test the Influence of Brand Trust on Brand Loyalty

| Variable                     | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|------------------------------|---------------------|------------------------|--------------------------|
| Brand Trust -> Brand Loyalty | 0.180               | 0.085                  | 2.124                    |

*The Influence of Brand Image on Brand Loyalty.* The influence of brand image on brand loyalty of Jawa Pos newspaper to the people of society was tested by using

SmartPLS. The value of path coefficient on the brand image variable was 0.146 with the t-statistic value of 2.173. Due to the result of t-statistic value more than 1.96 then H0 was rejected and H1 was accepted. From these results, it could be concluded that brand image had a significant positive influence on brand loyalty; so this hypothesis could be accepted. According to the results of this research, it could be seen that brand image had a significant positive influence on brand loyalty, so this hypothesis could be accepted. The results of this research was in line with the result of the research conducted by Upamannyu and Mathur (2013), they indicated that brand image had a positive influence on brand loyalty.

In addition, a research conducted by Habib & Aslam (2014) and Alhaddad (2015) also supported and strengthened the results of research conducted by Upamannyu and Mathur (2013) which proved that brand image had a positive influence on brand loyalty.

Table 9 – Test of Brand Image Effect on Brand Loyalty

| Variable                     | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|------------------------------|---------------------|------------------------|--------------------------|
| Brand Trust -> Brand Loyalty | 0.146               | 0.067                  | 2.173                    |

*The Influence of Brand Satisfaction on Brand Loyalty.* The influence of brand satisfaction on brand loyalty of Jawa Pos newspaper to the people of Surabaya was tested by using SmartPLS. The value of path coefficient on brand satisfaction variable was 0.321 with a t-statistic value of 4.619. Due to the result of t-statistic value more than 1.96, then H0 was rejected and H1 was accepted. From these results, it could be concluded that brand satisfaction had a significant positive influence on brand loyalty, so this hypothesis could be accepted. The result of this research was in line the result of the research conducted by Marist et al. (2014), they indicated that brand satisfaction had a positive influence on brand loyalty. In addition, research conducted by Widjaja (2015) also supported and strengthened the results of this research, in which it proved that brand satisfaction positively influenced brand loyalty.

Table 10 – The Test of the Influence of Brand Satisfaction on Brand Loyalty

| Variable                            | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|-------------------------------------|---------------------|------------------------|--------------------------|
| Brand Satisfaction -> Brand Loyalty | 0.321               | 0.070                  | 4.619                    |

*Brand Satisfaction on Brand Trust of Jawa Pos Newspaper to the People of Surabaya.* The influence of brand satisfaction on brand trust of Jawa Pos newspaper to the people of Surabaya was tested by using SmartPLS. The value of path coefficient on brand satisfaction variable was 0.259 with a t-statistic value of 4.208. Due to the result of t-statistic value more than 1.96, then H0 was rejected and H1 was accepted. From these results, it could be concluded that brand satisfaction had a significant positive influence on brand loyalty, so this hypothesis could be accepted. The results of this research was in line with the result of the research conducted by Marist et al. (2014), they showed that brand satisfaction had a positive influence on brand loyalty.

Table 11 – The Test of the Influence of Brand Satisfaction on Brand Trust

| Variable                          | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|-----------------------------------|---------------------|------------------------|--------------------------|
| Brand Satisfaction -> Brand Trust | 0.259               | 0.061                  | 4.208                    |

Table 12 – The Test of Influence of Brand Loyalty on Repurchase Intention

| Variable                              | Original Sample (O) | Standard Error (STERR) | T-Statistics ( O/STERR ) |
|---------------------------------------|---------------------|------------------------|--------------------------|
| Brand Loyalty -> Repurchase Intention | 0.438               | 0.058                  | 7.539                    |

*Brand Loyalty on Repurchase Intention.* The influence of brand loyalty to the repurchase intention of Jawa Pos newspaper to the people of Surabaya was tested by using SmartPLS. The value of path coefficient on brand loyalty variable was 0,438 with t-statistic



value equal to 7,539. Due to the result of t-statistic value more than 1.96, then  $H_0$  was rejected and  $H_1$  was accepted.

From these results, it could be concluded that brand loyalty had a significant positive influence on repurchase intention, so this hypothesis could be accepted. The results of this research was in line with the result of the research conducted by Habib and Aslam (2014), they indicated that brand loyalty had a positive influence on repurchase intention. In addition, research conducted by Feng and Yanru (2013) and Kha et al (2012) also supported and strengthened the results of the research conducted by S Habib and Aslam (2014), in which proved that brand loyalty had a positive influence on repurchase intention.

### CONCLUSION AND SUGGESTIONS

Based on the results of the research and discussion that had been described, it could be concluded that brand trust, brand image, and brand satisfaction had a positive influence on brand loyalty; brand loyalty have a positive influence on repurchase intention. Based on these result, it is suggested that the next researcher develop this research by examining other factors that could influence customer's loyalty and repurchase intention of the newspapers. Moreover, the addition of the number of samples is also necessary to be taken into account considering the large number of Jawa Pos newspaper customers in Surabaya City. The research area is also necessarily to get more attention so that the research can be conducted to the smallest scope in Surabaya City; for instance, the scope of the village, with the aim that the results obtained will represent all customers of Surabaya City. The future researcher can further consider other methods of examining customer's loyalty, for example, by using in-depth interviews with the customers, so that the information can be more varied rather than using the questionnaire as the research instrument; in which the answers are available in the sheet.

### REFERENCES

1. Alhaddad, A. (2015). A structural model of the relationships between brand image, brand trust and brand loyalty. *International Journal of Management Research and Reviews*, 5(3), 137.
2. Alotaibi, S. (2015). How saudis who use the internet see the future of print newspapers in the digital age. *Arkansas State University*.
3. Feng, J., & Yanru, H. (2013). Study On The Relationships Among Customer Satisfaction, Brand Loyalty And Repurchase Intention. *Journal Of Theoretical & Applied Information Technology*, 49(1).
4. Frooghi, R., Waseem, S. N., Afshan, S., & Shah, Z. (2015). Effect of offline parent brand dimension on online trust, satisfaction and loyalty: In Context of Newspaper Industry. *Journal of Management Sciences*, 2(2), 223-254.
5. Gigaom. (2014). Everything you need to know about the future of newspapers is in these two charts. *Newstex Trade & Industry Blogs*. Chatham: Newstex.
6. Habib, S., & Aslam, S. (2014). Influence of Brand Loyalty on Consumer Repurchase Intentions of Coca-Cola. *European Journal of Business and Management*, 6(14), 168-174.
7. Hair, Joseph F, Jr., William C. Black., Barry J. Babin., Rolph E. Anderson., and Ronald L. Tatham., 2010, *Multivariate Data Analysis 7th Edition*, Pearson Prentice Hall.
8. Henriksson, T., 2016. WAN-IFRA. Tersedia: <http://www.wan-ifra.org/articles/2016/06/12/full-highlights-of-world-press-trends-2016-survey> [Diakses Tanggal 5 Februari 2017]
9. Kha, C. W., Goh, E. K., Goh, W., Chin, J. K. P., & Shim, P. P. (2011). Modelling repurchase intention of Proton automobile using SEM technique, Doctoral dissertation, UTAR.

10. Kilian, T., Hennigs, N., & Langner, S. (2012). Do Millennials read books or blogs? Introducing a media usage typology of the internet generation. *Journal of Consumer Marketing*, 29(2), 114-124.
11. Kilman, L. 2013. WAN-IFRA. Tersedia: <http://www.wan-ifra.org/press-releases/2013/06/02/world-press-trends-Increasing-audience-engagement-is-future-for-news-media> [Diakses Tanggal 5 Februari 2017]
12. Kueng, L., & Picard, R., 2010. Organizational origins of the media industries' troubled response to new technology. In IX World Media Economics and Management Conference, Bogota, Columbia.
13. Liu, C. T., Guo, Y. M., & Lee, C. H. (2011). The effects of relationship quality and switching barriers on customer loyalty. *International Journal of Information Management*, 31(1), 71-79.
14. Marist, A. I., Yulianti, L. N., & Najib, M. (2014). The Role of Event in Building Brand Satisfaction, Trust and Loyalty of Isotonic Drink. *International Journal of Marketing Studies*, 6(6), 57.
15. Siswanto, S. (2017). Efek Perkembangan Teknologi Informasi Komunikasi (Ict) Pada Media Cetak Di Era Konvergensi. *Prosisko: Jurnal Pengembangan Riset dan Observasi Sistem Komputer*, 4(1).
16. Sugiyono. 2012. *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung: Alfabeta.
17. Sugiyono. 2013. *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta
18. Upamannyu, N. K., & Mathur, G. (2013). Effect of brand trust, brand affect and brand image on customer brand loyalty and consumer brand extension attitude in FMCG sector. In *PRIMA* (Vol. 3, No. 2, p. 1). Publishing India Group.
19. Widjaja, R. H., 2015. *Studi Explanatory Brand Experience, Brand satisfaction dan Brand Trust Terhadap Brand Loyalty Pada Global Automobile Brand Jenis MPV di Surabaya*. Undergraduate thesis, UBAYA.

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## **WIFE'S STRATEGY IN MAINTAINING THE STABILITY OF RELATIONSHIP WITH HUSBAND THROUGH COMMUNICATION PRIVACY MANAGEMENT THEORY**

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### **ABSTRACT**

The discussion on interpersonal communication between husband and wife has become a widely interesting issue. Communication between husband and wife in everyday life is important to maintain the stability of the relationship. By that, this study aims to find the wife's strategy in managing its private information and to find the act which violates and does not violate the privacy of the husband to maintain the stability of the relationship. This research uses the interpretive approach with phenomenology method. The subjects of this research are wives from the conventional type of couple located in Malang. The findings indicate that wife as the owner of private information limits the private information so that the access of the husband to such information is not similar in every subject, thereby reducing the potential of conflict and the relationship becomes more stable. The preventive action taken by the wife when violating the privacy of the husband is to confirm the information in order to eliminate potential conflicts that will occur.

### **KEY WORDS**

Communication, privacy, management, conventional type of couple, phenomenology.

Communication in everyday life is a form of interaction between someone and another. In married life, a couple will engage in a marital relationship in which they constantly interact and communicate interpersonally. Interpersonal communication is a form of communication that occurs between people in the form of face to face and in private settings (Littlejohn, 2002). Furthermore, there is a phenomenon in terms of interpersonal communication between husband and wife which is a communication strategy to keep the harmony of the relationship. The study of *family communication* done by Farbod, Ghamari, and Majd (2014) found that good communication skills in a couple could generate more explicit message thus creating a good understanding. By that, this can improve the quality of the relationship. Furthermore, Petronio (in Berger, 2014) stated that the act of sharing can enhance family relationship by showing closeness, intimacy, and trust.

On the contrary, the research conducted by Afifi et al., (in Berger, 2014) suggested that the decision to split a message or information on family members can reduce the quality of the relationship especially when the information potentially gives negative effects to the family. Along with the advancement of information technology, other researchers in the field of Communication Privacy Management (CPM) have conducted a development which discussed private communication in the use of social media (Trepte, 2015; Suh & Hargittai, 2015; Ukung, 2013). Most CPM research on social media deals with how the owners of social media protect their private information while interacting with other social media users. Besides that, Petronio (2000) explained that gender gives influence to the level of someone's openness. The results of Lerner et al., (2016) give an influence on the direction of this research. The findings from Lerner, Streicher, Sachs, Raue, and Frey (2016) proved that women choose to take less risk than men. The finding indicates that there is an influence on the communication behavior made by the wife to the husband. The author also found that married couples are not always open to one another. Not all topics or issues are communicated openly by the couple. In fact, lying also committed by the couple in conveying information. Related to the act of lying, Burgoon & Buller stated that in some interpersonal communication activity, lying can be used as a way to keep each other's feelings (Griffin,

2014). This is actually the gap found by the author that becomes the underlying background to do a research in concern to strategies undertaken by the wife to keep the harmony of the relationship with the husband.

Based on the theme of the research, Communication Privacy Management Theory is considered as the most suitable theory for the study analysis. The Theory of Communication Privacy Management (CPM) proposed by Sandra Petronio points out that CPM is a map to describe how a person delivers its private information (West & Turner, 2003). This theory talks about the limits of privacy in directing the information but remain unknown to others. In more detail, CPM is able to describe the way a person organizes private information for him/herself and in concern to other parties which they are deemed to meet the criteria to access the private information (Afifi & Afifi, 2009).

The research performed on some wives from the conventional type of couple. According to Fitzpatrick (in Berger, 2014), the characteristics of the conventional or traditional type of couples deeply respect the stability of the relationship and follow cultural rules as well as the role of gender. They are the type of couple who are dependent on each other, physically bonded, and spend a lot of time together. Couples of this type are very expressive and pay more attention to issues that lead to conflict. The reason the author chose this type of couples as research subjects is because they have a good quality of family relationship as illustrated by Petronio in terms of closeness, intimacy, and trust. In addition, they also have a way of communication as described by Farbod, Ghamari, and Majd (2014) which is explicit and open. Within the conventional type of couples, the experience of the wives in communicating with the husband becomes the reason of the author to conduct more research focusing on how the wives arrange private information to the husband and the actions that violate or not violate the privacy of the husband in order to maintain the stability of the relationship.

## LITERATURE REVIEW

*Communication Privacy Management Theory.* According to Sandra Petronio in Afifi & Afifi (2009) Communication Privacy Management Theory is a framework that is very useful to provide an understanding that confidentiality requires us to see that: 1) privacy and confidentiality works as a pressure, 2) simultaneously, the need for privacy and access (openness) will have an effect on someone's decision-making process whether to keep it as secret or confess. The dialectic between pressures to push and pull has caused a person to open its private issues or to keep things in order so that others will not know its private information. Frequently, a person becomes open by considering the risk-benefit factors because of some motivation to achieve goals or some cultural expectations. Furthermore, the decision to become open provides the potential in influencing the confidant assessment whether to inform or to keep private information to others (Petronio, 2000). Through the use of boundary metaphors, CPM describes how someone manages its privacy privately and its correlation to confidant (Petronio, 2000).

In the process of managing one's privacy and making choices about the flow of private information, CPM theory recommends six principles: 1) people believe that they have private information (owner), 2) because they believe that they have private information, they feel to have the right to set their private information, 3) to regulate the flow of private information, people use the rules of privacy based on the criteria they considered important, 4) once they open their private information, the authenticity of the information is changed into a joint ownership of confidant, 5) ideally, once the information is shared, a collective negotiation to formulate the rules of privacy and approval by both sides will occur, 6) because someone is not always consistent, effective, or active in the collective negotiation, there is a possibility of "*boundary turbulence*" which means a reduction in the way of *co-owner* to control and regulate the flow of information to third parties (Afifi & Afifi, 2009).

According to the theory of CBM (Boundary Communication Management), how individuals organize private information depend on the structural limitations and management systems. Structural limitations as private information controller stand alone because they

realize once they share the information, they will become prone because the confidant can divulge their information to other parties. There are four important points of structural limitations, such as a) boundary ownership, b) boundary control, c) the level of boundary openness, and d) boundary permeability.

*Boundary Ownership.* Once an information is shared with other parties in an interaction, means that the information belongs to both parties. Each party has the obligation to organize such information (Petronio in Mattson and Brann, 2002). The limits of communication not only cover the confidentiality of information but also the arrangements in sharing or closing the information to others.

*Boundary Control.* Limitations are based on rules that govern the pressure between privacy and openness. The rules will govern the sharing of classified information into categories, ranging from loose to tight (Petronio in Mattson & Brann, 2002). Within that scale, the control over information is varied. This considerably depends on whom the information is opened, on the relationship between the communicator and the communicant, and on the sensitivity of the information being discussed.

*Levels of Boundary Openness.* Levels of boundary openness mean the accessibility degree of private information allowed to be exceeded. The degree of openness, as well as boundary control, is categorized on a scale ranging from very open to completely closed (Mattson & Brann, 2002). It is often found that there are similarities between the boundary control with levels of boundary openness.

*Boundary Permeability.* Based on the theory of CPM/CBM, more sensitive information will be guarded by more boundaries. This also leads to stronger sanctions if there is a leak of information. On the contrary, the lower the sensitivity of the information, the limitation will be easier to penetrate. This, of course, will result in weaker sanctions (Petronio, 2000).

*Types of Couple According to Fitzpatrick.* There are three types of couples formulated by Fitzpatrick such as traditional/conventional type, independent type, and separate type (Berger, 2014). The following sections are the characteristics of each type.

Traditional/conventional is a type of couples who deeply appreciate the stability of the relationship and adhere to cultural and gender roles. Couples of this type are interdependent to each other. They are physically bonded because they give priority to togetherness and spend a lot of time together. They also very expressive and pay more attention to the issues of conflict.

Independent is the type of couples that is contrary to the traditional pair. This type believes that a relationship does not have to inflame individual freedom and does not require novelty. They are closely related emotionally even though they are physically separated and have little time to gather together. This kind of couple is very expressive, supportive, and open to conflict.

Separate is the type of couple that has an unclear ideology in the relationship. It often applies the traditional ideology in the relationship but also apply the ideology of individual freedom in it. Sometimes they show a conventional relationship when dealing with the public, but when it is in the private sphere, they will act in an independent manner.

## **METHODS OF RESEARCH**

This study is a qualitative research with an interpretive paradigm or approach. The method used is phenomenology, which Hegel in Moustakas (1994) stated that phenomenology is a knowledge emerged in consciousness to be seen, felt, and known by one's consciousness and experience. The purpose of this phenomenological method is to find the essence of an experience and to provide a systematic and disciplined methodology in order to find the authenticity of a knowledge (Husserl in Moustakas, 1994).

By using phenomenology, the author will focus on how the limit of privacy within marital interactions are built and controlled. This study will use the theory of Communication Privacy Management (Petronio, 2000) as the point of view to analyze research problems. The steps undertaken by the author in this research are: 1) find the topic and problems, 2) conduct a literature review towards related studies, 3) prepare questions for interview, 4) perform deep

interviews and record the whole conversation during the interview, 5) do the data analysis by using phenomenology technique.

This research was conducted in Malang with three wives from the traditional type of couple as informants. These informants are selected because each informant represents different family background. Informant I represents a family with different beliefs, informant II represents a family with busy working hours, and informant III represents a family with different tribe and ethnicity. Furthermore, in-depth interviews were conducted to obtain necessary information. Further analysis was also done to obtain the results of research.

## **RESULTS AND DISCUSSION**

Here are the results of the interview that has been done. It is found that in maintaining the stability of the relationship, the wife which owns a number of private information makes an adjustment to limit private information so that the access of the husband to such information is not the same in every subject. Each type of information has its own set of constraints based on the factors that influence it. The main purpose of arranging such information is to avoid conflicts or reduce the potential for conflict so that the couple's relationships become more stable and in harmony.

The information arranged consciously by the wife are a financial topic, wife's past romantic relationship topic, and family relationship topic. The discussion of the financial topic is regulated by using open, semi-open, closed, and lying arrangements. On the other hand, the delivery of wife's past romantic relationship topic is governed by a semi-open setting. It differs as for the submission of family relationship/wife family issues. The message is arranged in the half-open and closed setting. Unconsciously, wives often violate the privacy of their husbands because of the confirmation of information heard through third parties that have not been assured. This happens because of the urge to eliminate the potential conflict with the actual information to obtain clarification of the husband. The encouragement of the wife to immediately know the truth is the influence of the emotional nature of the woman (Lenz in Papalia and Olds, 1998).

The choice of the wives whether or not to find the information deliberately is part of the strategy to maintain the stability of the relationship. A wife who chooses to respect the privacy of her husband by not trying to find out the private information of her husband feels that it is one of the ways to maintain the stability of her relationship.

## **CONCLUSION AND SUGGESTIONS**

Based on the findings of the research, some propositions which refer to the theory of Communication Privacy Management (CPM) are found:

In general, there are similarities when the wife (conventional type) decided to limit the privacy of certain topics without affected by the background of the husband such as financial topic, past romantic relationship topic and family relationship topic.

This type of wife is open on issues that influenced the lives of the couple, as for an instance, financial problems.

Conventional type of wife prefers to be covered or not fully open to the problems that potentially bother the couple and can trigger conflicts. This is related to the statement of Petronio (2000) in which gender gives an influence to the decision-making of someone whether to share or not to share private information.

Lying is not the main selection of the conventional type of wife to avoid conflict with the husband.

An open attitude towards all the problems in marriage does not guarantee the stability of the relationship.

*Suggestions.* A couple should carefully consider the topics to be discussed or delivered. They must carefully calculate the potential that will arise when an issue is raised to be discussed. In addition, they should consider certain ways when they convey a sensitive issue so as not to get carried away by emotion in between two sides.

## REFERENCES

1. Afifi, T. A., and Afifi, W. A. (2009). *Uncertainty, Information Management and Disclosure Decisions: Theories and Applications*. NY: Routledge.
2. Berger, Charles R. (2014). *Interpersonal Communication*. Berlin: De Gruyter.
3. Farbod, Elnaz, Ghamari, Mohammad, Majd, Mojtaba Amiri. (2014). Investigating The Effect of Communication Skills Training for Married Women on Couple's Intimacy and Quality of Life. *Sage Open*, 1-4.
4. Griffin, Em. (2014). *A First Look At Communication Theory* (9th ed). NY: McGraw Hill.
5. Lerner, Eva, Streicher, Bernhard, Sachs, Rainer, Raue, Martina, & Frey, Dieter. (2016). The Effect of Abstract and Concrete Thinking on Risk-Taking Behavior in Women and Men. *Sage Open*, 1-4.
6. Littlejohn, Stephen W. (2002). *Theories of Human Communication* (5th ed). NY: Wardsworth.
7. Mattson, Marifran and Brann, Maria. (2002). Managed Care And The Paradox Of Patient Confidentiality: A Case Study Analysis From A Communication Boundary Management Perspective. *Communication Studies*, 53(4), 337-357. Diakses dari Proquest Research Library: Social Sciences.
8. Moustakas, Clark E. (1994). *Phenomenological Research Methods*. Thousands Oaks, California: Sage Publications.
9. Papalia, Diane E., and Olds, Sally Wendkos. (1998). *Human Development* (2nd ed). NY: McGraw-Hill.
10. Petronio, S. (2000). *The Boundaries of Privacy: Praxis Of Everyday Life*. Mahwah, NJ: Lawrence Erlbaum.
11. Suh, Jennifer Jiyoun & Hargittai, Eszter. (2015). Privacy Management On Facebook: Do Device Type And Location Of Posting Matter?. *Social Media Society*, 1-11.
12. Trepte, Sabine. (2015). *Social Media, Privacy, And Self-Disclosure: The Turbulence Caused By Social Media's Affordances*. *Social Media Society*, 1-2.
13. Ukung, Anneke Mathilda. (2013). Communication Privacy Management Penderita HIV di Media Facebook. *Jurnal E-Komunikasi*, 1(3), 70-79.
14. West, Richard & Turner, Lynn H. (2003). *Introducing Communication Theory* (2nd ed). NY: McGraw Hill.

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## **COMPENSATION ANALYSIS IN RELATIONSHIP MODERATION BETWEEN TRANSFORMATIONAL LEADERSHIP STYLE AND WORK ENVIRONMENT ON THE EMPLOYEE PERFORMANCE**

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### **ABSTRACT**

The objectives of the research were: 1) to know the influence of transformational leadership style on employee performance, 2) to know the influence of work environment on employee performance, 3) to know the influence of compensation on employee performance. The research used non-hierarchical analysis method or cell means method by using between-subject of 2x2 and applied Univariate General Linier Model (GLM) procedure. The findings of the research were 1) transformational leadership style does not improve employee performance, 2) work environment improves employee performance, 3) in a good transformational leadership style, low-compensated employee groups improve employee performance, 4) in a poor transformational leadership style, high-compensated employee groups have better performance than low-compensated employee groups, 5) in a good work environment, low compensation does not improve employee performance than high compensation, 6) in a good work environment high compensation does not improve employee performance than a poor work environment.

### **KEY WORDS**

Compensation, transformational leadership style, work environment, employee.

In an organization, leadership is very important. Because organization with a good leadership will be easily to build the foundation of trust in their members, while an organization that does not have a good leadership will find it difficult to gain the trust of their members. In addition, leadership qualities can encourage someone to get a successful and happy career. Job satisfaction comes from leadership. However, many employees feel that many leaders fail to develop leadership skills and the main reason for employee failure is the weak leadership.

In leadership relationship, one respects others in two ways. *First*, a leader respects their employees unconditionally. The appreciation is not based on outward traits, such as position, education, or economic status but acknowledges one's contribution, both actual and potential contribution. It does not mean that the achievement of a person in particular position or level of education is not appreciated, but it does not let the respect/appreciation to a person is hindered because of particular position or level of education. *Second*, some people think individuals with certain educational qualifications are the most worthy of respect/appreciation. It is an example of an award based on the outward traits. A leader is fully aware that this situation may lead to a change of role, which places the leader in an employee/being-led position.

*Transformational Leadership Style on Employee Performance.* According to Shea (1999), in an article entitled *The Effects of Leadership Style on Performance Improvement on a Manufacturing Task*, with a sample of 65 operation management students, the result of the research showed that individuals work under caring leader outperform to individuals qualitatively work under charismatic leader and leadership structure in the first experiment. Those who work under the caring leader also outperform to individuals qualitatively work under the leadership structure in the second experiment. This study supports that leadership style does affect the improvement of performance time over time.

Anit (2006), in a research entitled *The Effects of Leadership Style and Team Process on Performance and Innovation in Functionally Heterogeneous Teams*, focused on



participative leadership style with a sample of 140 nurse teams, and the result of the research indicated a positive influence of participative leadership style, which subsequently may encourage team innovation. However, this leadership style decreases team's performance role. Fernandes and Awamleh (2009), in an article entitled *The Impact of Transformational and Transactional Leadership Style on Employee's Satisfaction and Performance: An Empirical Test in a Multicultural Environment* asserted that the transformational leadership style of the managers will improve employee job satisfaction. As the managers operationalize charisma and take advantage of inspiration, individual considerations, and intellectual stimulation, they get positive reactions from the employees. It seems that such transformational qualities certainly stimulate higher levels of employees' needs and result in a higher sense of satisfaction. Biswas (2009), in an article entitled *HR Practices as a Mediator between Organizational Culture and Transformational Leadership: Implications for Employee Performance* presented the results of research in which culture and leadership are significant predictors of employee performance and their intents to quit. The results also show that the practice of human resources is an important mediator in transmitting the influence of predictor variables to the criterion variable.

*Work Environment on Employee Performance.* Ganapathi and Prasad (2008), in an article entitled *Effects of Working Environment on the Performance of Executives*, with a sample of 200 executive employees working in various organizations, affirmed that the work environment positively affects the employee performance and plays an important role in improving individual performances and organizations as a whole. Meanwhile, according to Malik, et al. (2011) in an article entitled *A Study of Work Environment and Employees' Performance in Pakistan*, examining the object of 115 employees of telecommunication companies in Pakistan, also explained the positive influence between work environment and employee performance.

*Compensation on Employee Performance.* Sinclair (2004) in the article entitled *The Effect of Director Compensation on Firm Performance* explained the relationship between the compensation of the stock-based director and the performance of the company. Generally, stock compensation is negatively related to the performance of the company. However, to a higher extent, stock compensation has a positive effect on the performance of the company which indicates that if the directors are adequately compensated, it will have a positive effect on the performance of the company. Guo, et al. (2006) in the article entitled *Stock Bonus Compensation and Firm Performance in Taiwan* explained the evidence of positive findings in Taiwan between the number of stock bonuses and the performance of the company. It is also found in large companies with high growth opportunities; they tend to adopt stock bonuses. Companies with well-designed bonus compensations can produce better performance as well.

Shieh (2008) in the article entitled *Effect of Corporate Compensation on Organizational Performance*, with a sample of 600 employees in Taiwan, explained the significant relationship between the company's compensation and organizational performance. While Blazovich (2013) in the article entitled *Team Identity and Performance-Based Compensation Effects on Performance* explained that combinations based on individuals and teams in which based on performance results comparable to strong and weak team identities, showed that lower productivity levels—related to weak team identity—can be overcome with performance-based compensation.

*The Research Gap of Transformational Leadership Style on Employee Performance.* Started from Warrick (1973) showed that democratic leaders are more effective than other leaders in terms of Employee Performance Effectiveness and leaders with high adaptive skills tend to be more effective than low leadership adaptability. Finally, the findings revealed that Professional Leaders are consistently more effective in terms of the Employee Performance Effectiveness of all leaders. Followed by Shea (1999) explained that individuals work under caring leader outperform to individuals qualitatively work under charismatic leader and leadership structure in the first experiment. Those who work under the caring leader also outperform to individuals qualitatively work under the leadership structure in the

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Meanwhile, Blazovich (2013) revealed that combinations based on individuals and teams in which based on performance results comparable to strong and weak team identities, showed that lower productivity levels—related to weak team identity—can be overcome with performance-based compensation. Another model, developed by Akhter, et al. (2016), explained that compensation plays an important role in training recruitment and retention; the research revealed that in some industries, there are findings or discrimination on the appointment of employees. In fact, it is possible for *Engro Food* practitioners and employees. Industry leaders reduce turnover rates and improve employee performance. Because retaining experienced employees is much better than hiring new people and training them.

## METHODS OF RESEARCH

*Mean-Cells Model.* This research used non-hierarchical or mean-cells method analysis by using between-subject of 2x2 and applied the procedure of Univariate General Linear Model (GLM). In data analysis, basically it aimed to study the difference of mean of response variable or indicator of certain problem between individual groups including in conducting hypothesis testing about the difference in population under review. The mean-cells function has a reciprocal relationship with the mean-cells table, namely the table which presents the mean (average) of the dependent variable or indicator of a particular problem by a factor or multifactor (Kuludong, 2010).

*General Linear Model (GLM) Univariate Method.* This mean-cells test applies the General Linier Model (GLM) procedure to perform a null hypothesis testing in which some groups of data samples have the same average grade/score. The application of the General Linier Model (GLM) Univariate procedure aimed to conduct hypothesis testing on: 1) homogeneity; 2) the difference or similarity of all the observed mean-cells parameters; 3) the differences in some pairs of certain mean-cells parameters; 4) the influence of the main and interaction factors on response variables, especially those that cannot be tested by applying the *One-Way ANOVA* procedure (Kuludong 2016). Univariate General Linear Model Procedure (GLM), in the use of statistical software, is necessarily to analyze General Linear Model Univariate, then the dependent variable and fixed factor are included which are the coding of transformational leadership style, work environment and compensation variable, then it is analyzed in an estimate parameter in statistical calculations.

*Sampling and Data Collection Techniques.* In this research, the researcher used simple random sampling. The sampling process is conducted by giving equal opportunity to each member of the population to become a sample member. So, the process of selecting the n sample from the N population is conducted randomly. There are two ways: using *Cointoss* or using *Random Numbers*. When the population is small, it can be conducted by drawing "Cointoss". But if the population is large, it is necessary to use the label of "Random Numbers". In this research, the sampling technique used simple random sampling; the number of respondents who were going to be sample is 120 respondents. In this study, the researcher used the questionnaire as a data collection technique. Questionnaire is a technique of collecting data from consumers with a set of questions or statements that must be answered by respondents; in this case the respondents are the employee of PT. Seliu Multi Persada. In answering these statements and questions, Likert scale was used as the level of importance; according to Sugiyono (2013), Likert scale is used to measure attitude, opinion and perception of a person or group of social phenomena that occur. In Likert scale, the measured variables are elaborated by sub-variables. The sub-variables are used as indicators and then these indicators become the starting point for the preparation of the instrument items in the form of statements and questions.

## RESULTS AND DISCUSSION

*Median Split of Transformational Leadership Style and Compensation.* The determination of median split values of transformational leadership style, work environment, compensation, and employee performance variables aims to divide groups within cells of the respondents being studied. Determining the median split was obtained from 120 respondents being studied with valid results and the note of each respondent value; transformational leadership style variable is abbreviated to GKT, work environment is abbreviated to LK, compensation variable is abbreviated to KOMP, and employee performance variable is abbreviated to KK; and then median split calculation was performed by using statistical software. After the median split number is obtained from the transformational leadership style and the compensation variables, it can be seen that the respondent may be included into a good leadership style with the number 1; or if the value of the respondent variable is lower than the median split or the transformational leadership style is poor, the number is 2. As for compensation variable, to know the respondents being studied to be included in the group of high compensation perception with the number 1 if the value of the respondent variable is higher than the median split and low compensation with the number 2 if the value of the respondent variable is lower than the median split.

In this study, from 120 respondents, 60 respondents were found having a good leadership style and 60 respondents having poor leadership style. It is followed by 60 respondents having high compensation and 60 respondents having low compensation as shown in table 1.

The results of this test indicate that the variables being studied have no influence in determining the level of employee performance. Hypothesis testing uses the F test statistic at "GKTCODE" line, where  $F_0 = 0.042$  (Sig. 0.838) with the free degree of 1/116. It indicates

the rejection of H1, so it can be concluded that the data do not support the proposed hypothesis. It shows that a good transformational leadership style does not affect employee performance.

Table 1 – Statistics of Median Split

|   |         |           |           |          |
|---|---------|-----------|-----------|----------|
|   | -       | GKT code  | KOMP code | KK code  |
| N | Valid   | 120       | 120       | 120      |
|   | Missing | 0         | 0         | 0        |
|   | Median  | -.0291278 | -.0876468 | .1148187 |

Table 2 – Between-Subject Factors

|             |      |  |             |    |
|-------------|------|--|-------------|----|
|             | -    |  | Value Label | N  |
| GKT MEDIAN  | 1,00 |  | Good        | 60 |
|             | 2,00 |  | Poor        | 60 |
| KOMP MEDIAN | 1,00 |  | High        | 60 |
|             | 2,00 |  | Low         | 60 |

Table 3 – Parameter Test of Between-Subject Effects

Dependent Variable: Employee Performance

| Source              | df  | F       | Sig. |
|---------------------|-----|---------|------|
| Corrected Model     | 3   | 40.432  | .000 |
| Intercept           | 1   | .040    | .842 |
| GKTCODE             | 1   | .042    | .838 |
| KOMP CODE           | 1   | 112.938 | .000 |
| GKTCODE * KOMP CODE | 1   | .738    | .392 |
| Error               | 116 |         |      |
| Total               | 120 |         |      |
| Corrected Total     | 119 |         |      |

Table 4 – Estimate Parameter Design A (AB)

Dependent Variable: Employee Performance

| Parameter                        | Description | B              | $\beta$   | t      | Sig. |
|----------------------------------|-------------|----------------|-----------|--------|------|
| Intercept                        | -           | -.676          | $\beta_0$ | -5.809 | .000 |
| [GKTCODE=1.00]                   | GKT = 1     | -.087          | $\beta_1$ | -.463  | .645 |
| [GKTCODE=2.00]                   | GKT = 2     | 0 <sup>a</sup> | -         | -      | -    |
| [KOMPCODE=1.00]                  | KOMP = 1    | 1.299          | $\beta_2$ | 6.907  | .000 |
| [KOMPCODE=2.00]                  | KOMP = 2    | 0 <sup>a</sup> | -         | -      | -    |
| [GKTCODE=1.00] * [KOMPCODE=1.00] | -           | .228           | $\beta_3$ | .859   | .392 |

Based on the above table, can be obtained the following equation of regression model:

$$Y = \beta_0 + \beta_1 (GKT = 1) + \beta_2 (KOMP = 1) + \beta_3 (GKT = 1) (KOMP = 1) + \epsilon.$$

Description:

GKT = 1 is a good transformational leadership style;

GKT = 2 is a poor transformational leadership style;

KOMP = 1 is high compensation;

KOMP = 2 is low compensation.

Table 5 – Intercept Parameter  $\beta_i$  Design A (AB)

| -               | GKT = 1 (Good)                          | GKT = 2 (Poor)      | Difference          | Hypothesis |
|-----------------|---|---------------------|---------------------|------------|
| KOMP = 1 (High) | $\beta_0 + \beta_1 + \beta_2 + \beta_3$ | $\beta_0 + \beta_2$ | $\beta_1 + \beta_3$ | -          |
| KOMP = 2 (Low)  | $\beta_0 + \beta_1$                     | $\beta_0$           | $\beta_1$           | H3a        |
| Difference      | $\beta_2 + \beta_3$                     | $\beta_2$           | $\beta_3$           | -          |
| Hypothesis      | -                                       | H3b                 | H3c                 | -          |

The contents of each cell are the intercepts so that the difference is the difference between the intercepts.

Table 6 – Intercept Value

| $\beta_0$ | $\beta_1$ | $\beta_2$ | $\beta_3$ |
|-----------|-----------|-----------|-----------|
| -0.676    | -0,087    | 1.299     | 0.288     |

Table 7 – Intercept Value Calculation

| -          | GKT = 1 | GKT = 2 | Difference |
|------------|---------|---------|------------|
| KOMP = 1   | 0.824   | 0.623   | 0.201      |
| KOMP = 2   | -0.763  | -0.676  | -0.087     |
| Difference | 1.587   | 1.299   | 0.288      |

Description:

GKT = 1 is a good transformational leadership style;

GKT = 2 is a poor transformational leadership style;

KOMP = 1 is high compensation;

KOMP = 2 is low compensation.

Table 8 – Summary Results, Significant Effect between Subjects

Dependent Variable: Employee Performance

| Parameter                        | $\beta$   | Sig. |
|----------------------------------|-----------|------|
| Intercept                        | $\beta_0$ | .000 |
| [GKTCODE=1.00]                   | $\beta_1$ | .645 |
| [KOMPCODE=1.00]                  | $\beta_2$ | .000 |
| [GKTCODE=1.00] * [KOMPCODE=1.00] | $\beta_3$ | .392 |

Table 9 – Results of  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$

|           | Description  |
|-----------|--|
| $\beta_1$ | Especially for groups of employees with a perception of a good transformational leadership style, even with low compensation, it will improve employee performance. The intercept calculation table shows that there is a difference between [COMP = 1] [GKT = 2] and [KOMP = 2] [GKT = 2] on employee performance; the result is $\beta_1$ .<br>The significant level at $\beta_1$ is 0.645; it means the significant value > 0.05 so $\beta_1$ is not significant.   |
| $\beta_2$ | Especially for groups with a perception of a poor transformational leadership style, highly compensated groups perform better than the low compensated groups. The intercept calculation table shows that there is a difference between [KOMP = 2] [GKT = 1] and [KOMP = 2] [GKT = 2] on employee performance; the result is $\beta_2$ .<br>The significant level at $\beta_2$ is 0.000. So, $\beta_2$ is significant.   |
| $\beta_3$ | Especially for a group with a perception of a good transformational leadership style, high compensation is no more satisfied than those who receive low compensation. The intercept calculation table shows that there is a difference between [COMP = 1] [GKT = 1], [KOMP = 1] [GKT = 2] and [KOMP = 2] [GKT = 1], [KOMP = 2] [GKT = 2] on employee performance; the result is $\beta_3$ .<br>The significant level of $\beta_3$ is 0.392; it means the significant value > 0.05. So, $\beta_3$ is not significant. |

Source: Test results on data analysis tool.

**Median Split Variable of Work Environment and Compensation.** Determination of the mean or median split value of work environment and compensation variables aims to divide the group in the cells of the respondents being studied. The determination of median split was obtained from 120 respondents with valid results and the value of each respondent. Work environment variable is changed to LK, compensation is changed to KOMP, and employee performance is changed to KK. Then median split calculations was conducted by using statistical software.

After the median split is obtained from work environment and the compensation variables, it can be seen that the respondents are included in a good work environment group with number 1 (if the value of respondent's variable is higher than the median split) or included in a poor work environment with number 2 (if the value of respondent's variable is

lower than the median split); and for compensation variable, the respondents being studied are included in high compensation perception group with number 1 (if the value of respondent variable is higher than median split) and low compensation perception with number 2 (if the value of respondent variable is lower than median split).

From 120 respondents of the research, 60 respondents were at good work environment, 60 respondents were at bad work environment, and 60 respondents with high compensation, and 60 respondents with low compensation as shown in the following table:

Table 10 – Statistics of Median Split

|        |         | Lkcode   | KOMPcode  | KKcode   |
|--------|---------|----------|-----------|----------|
| N      | Valid   | 120      | 120       | 120      |
|        | Missing | 0        | 0         | 0        |
| Median |         | .1059118 | -.0876468 | .1148187 |

Table 11 – Between-Subjects Factors

|          |      | Value Label | N  |
|----------|------|-------------|----|
| LKCODE   | 1,00 | Good        | 60 |
|          | 2,00 | Poor        | 60 |
| KOMPCODE | 1,00 | High        | 60 |
|          | 2,00 | Low         | 60 |

Table 12 – Parameter Test of Between-Subject Effects

*Dependent Variable: Employee Performance*

| Source            | df  | F      | Sig. |
|-------------------|-----|--------|------|
| Corrected Model   | 3   | 55.534 | .000 |
| Intercept         | 1   | .765   | .384 |
| LKCODE            | 1   | 21.515 | .000 |
| KOMPCODE          | 1   | 28.182 | .000 |
| LKCODE * KOMPCODE | 1   | 1.561  | .214 |
| Error             | 116 |        |      |
| Total             | 120 |        |      |
| Corrected Total   | 119 |        |      |

The results of this test indicate that the variables being studied have an influence in determining the level of employee performance. Hypothesis testing by using the F-Test statistic at LKCODE row where  $F_0 = 21,515$  (Sig. 000), with degrees of freedom of 1/116. It indicates a rejection of  $H_0$ , so it can be concluded that the data support the proposed hypothesis. It shows that a good working environment affects employee performance. It means that the better a work environment, the higher the employee performance.

Table 13 – Estimate Parameter Design A (AB)

*Dependent Variable: Employee Performance*

| Parameter                      | Description | B      | $\beta$   | t      | Sig.  |
|--------------------------------|-------------|--------|-----------|--------|-------|
| Intercept                      | -           | -0.856 | $\beta_0$ | -9.423 | 0.000 |
| [LKCODE=1.00]                  | LK = 1      | 0.977  | $\beta_1$ | 4.163  | 0.000 |
| [LKCODE=2.00]                  | LK = 2      | 0      | -         | -      | -     |
| [KOMPCODE=1.00]                | KOMP = 1    | 1.088  | $\beta_2$ | 4.637  | 0.000 |
| [KOMPCODE=200]                 | KOMP = 2    | 0      | -         | -      | -     |
| [LKCODE=1.00]* [KOMPCODE=1.00] | -           | -0.414 | $\beta_3$ | -1.249 | 0.214 |

Based on the above table, can be obtained the following equation of regression model:

$$Y = \beta_0 + \beta_1 (LK = 1) + \beta_2 (KOMP = 1) + \beta_3 (LK = 1) (KOMP = 1) + \varepsilon$$

Description:

LK = 1 is a good working environment;

LK = 2 is a poor work environment;  
 KOMP = 1 is high compensation;  
 KOMP = 2 is low compensation.

Table 14 – Intercept Parameter  $\beta_i$  Design A (AB)

| -                  | LK = 1<br>(Good)                        | LK = 2<br>(Poor)    | Difference          | Hypothesis |
|--------------------|---|---------------------|---------------------|------------|
| KOMP = 1<br>(High) | $\beta_0 + \beta_1 + \beta_2 + \beta_3$ | $\beta_0 + \beta_2$ | $\beta_1 + \beta_3$ | -          |
| KOMP = 2<br>(Low)  | $\beta_0 + \beta_1$                     | $\beta_0$           | $\beta_1$           | H4a        |
| Difference         | $\beta_2 + \beta_3$                     | $\beta_2$           | $\beta_3$           | -          |
| Hypothesis         | -                                       | H4b                 | H4c                 | -          |

The contents of each cell are the intercepts so that the difference is the difference between the intercepts.

Table 15 – Intercept Value

| $\beta_0$ | $\beta_1$ | $\beta_2$ | $\beta_3$ |
|-----------|-----------|-----------|-----------|
| -0.856    | 0.977     | 1.088     | -0.414    |

Source: Test results on data analysis tool.

Table 16 – Calculation Intercept Value

| -          | LK = 1 | LK = 2 | Difference |
|------------|--------|--------|------------|
| KOMP = 1   | 0.795  | 0.232  | 0.563      |
| KOMP = 2   | 0.121  | -0.856 | 0.977      |
| Difference | 0.647  | 1.088  | -0.414     |

Source: Test results on data analysis tool.

Notes: LK = 1 is a good working environment; LK = 2 is a poor work environment; KOMP = 1 is high compensation; KOMP = 2 is low compensation.

Table 17 – Summary Results, Significant Effect between Subjects

Dependent Variable: Employee Performance

| Parameter                       | $\beta$   | Sig.  |
|---------------------------------|-----------|-------|
| Intercept                       | $\beta_0$ | 0,000 |
| [LKCODE=1,00]                   | $\beta_1$ | 0,000 |
| [KOMPCODE=1,00]                 | $\beta_2$ | 0,000 |
| [LKCODE=1,00] * [KOMPCODE=1,00] | $\beta_3$ | 0,214 |

Source: Test results on data analysis tool.

Table 18 – Results of  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$

| -         | Description  |
|-----------|--|
| $\beta_1$ | Especially for a group of employees with a perception of good work environment, getting poor compensation does not improve employee performance than a well-compensated group of employees. The intercept calculation table shows the difference between the [COMP = 1] [LK = 2] and [KOMP = 2] [LK = 2] on the employee performance; the result is $\beta_1$ . The significant level at $\beta_1$ is 0.000; it means that the significant value < 0.05. So, $\beta_1$ is significant. |
| $\beta_2$ | Especially for groups of employees with a perception of high compensation, poor work environment improves the employee performance more than the group of low compensated employee. The intercept calculation table shows that there is a difference between [KOMP = 2] [LK = 1] and [KOMP = 2] [LK = 2] on employee performance; the result is $\beta_2$ . The significant level at $\beta_2$ is 0.000; it means that the significant value < 0.05. So, $\beta_2$ is significant.     |
| $\beta_3$ | Especially for a good working environment, a group of employees with good compensation does not improve the employee performance than in a poor work environment. The intercept calculation table shows there is a difference between [KOMP = 1] [LK = 1], [KOMP = 2] [LK = 2] on employee performance; the result is $\beta_3$ . The significant level at $\beta_3$ is 0.214; it means that the significant value > 0.05. So, $\beta_3$ is not significant.                           |

Table 19 – Hypothesis Testing of Research Model

| Hypothesis | Hypothesis Statements   | Value of Sig. | Description                            |
|------------|---|---------------|--|
| H1         | The transformational leadership style improves employee performance.  | 0.838         | The data do not support the hypothesis |
| H2         | Work environment improves employee performance.   | 0.000         | The data support the hypothesis        |
| H3a        | Especially for a good transformational leadership style, the group of employees who get low compensation will improve their employee performances.    | 0.645         | The data do not support the hypothesis |
| H3b        | Especially for a poor transformational leadership styles, high-compensated employee groups perform better than low-compensated employees.             | 0.000         | The data support the hypothesis        |
| H3c        | Especially for a good transformational leadership style, high-compensated employee groups are no more satisfied than low-compensated employee groups. | 0.392         | The data do not support the hypothesis |
| H4a        | Especially for a good work environment, low compensation does not improve employee performance compared with high compensation.                       | 0.000         | The data support the hypothesis        |
| H4b        | Especially for high compensation, poor working environment improves performance compared to low compensation.   | 0.000         | The data support the hypothesis        |
| H4c        | Especially for a good working environment, high compensation does not improve employee performance compared with poor work environment.               | 0.214         | The data do not support the hypothesis |

## DISCUSSION OF RESULTS

*Transformational Leadership Style Improves Employee Performance.* In the results of hypothesis testing, it is found that the analysis does not support H1 hypothesis; transformational leadership style improves employee performance with Sig. value of 0.838 ( $>0.05$ ). The results of this study are not in line or inconsistent with the result of the research conducted by Fernandes and Awamleh (2009) where they asserted that when a manager/leader makes use of inspiration, individual consideration, and intellectual stimulation, they will get a positive reaction from the employees. It seems that such transformational qualities do stimulate a higher level of employee's demand and result in a sense of satisfaction and a high level of performance. So, in this hypothesis, even though an employee has a high level of performance, it does not guarantee that the employee will be rewarded. With the results of the above hypothesis, the researchers concluded that in the manufacturing industry, employees do not require leadership style from their leaders, but employee performance is more required on the skill or ability of the employee.

*Work Environment Improves Employee Performance.* In the results of hypothesis testing, it is found that the analysis supports H2 hypothesis; the work environment improves employee performance with Sig. value of 0.000 ( $<0.05$ ). The results of this study are in line with the research conducted by Ganapathi and Prasad (2008), they confirmed that the work environment plays an important role in improving the performance of individual employees and the organization as a whole.

The conclusion of this hypothesis is that an employee who is in a good and comfortable work environment and is supported by colleagues and other supported facilities will improve the performance of the employees.

*Especially for a Good Transformational Leadership Style, Group of Employees Getting Low Compensation Improves Employee Performance.* In the hypothesis testing of 3<sub>a</sub>, it is found that the result of analysis does not support H<sub>3a</sub> hypothesis, especially for a good leadership style; group of employees getting low compensation will improve employee performance, with Sig. value of 0.645 ( $>0.05$ ). Although a leader applies a transformational leadership style to the employees, it does not affect the employee performance. Because employees expect more high compensation rewards, because with higher compensation will further improve the employee's performance. Leaders are expected to pay more attention



and review the level of compensation given to employees in accordance with employee performance and to have a different style of leadership to the employees.

*Especially for a Poor Transformational Leadership Style, Highly Compensated Employees are better than Low-compensated Employees.* In the result of hypothesis testing of 3<sub>b</sub>, it is found that the result of analysis supports H<sub>3b</sub> hypothesis, especially for poor transformational leadership style; high compensation employee performs better than low compensation employee, with Sig. value of 0.000 (<0.05). The results of this hypothesis support the research conducted by Yukl (2009) stated that by having transformational leadership, the employees will have trust, admiration, and respect for the leadership, and they will do more than what is expected. Leaders with transformational leadership styles transform and motivate the employees by making them more aware to the importance of the end result of a job, encouraging them to transcend their own personal interests for the benefit of the organization or team, and activating their higher order needs. By providing high compensation, it will make the employees more motivated in improving their performances, even though transformational leadership style is run by poor leaders, it does not affect the level of employee performance.

*Especially for a Good Transformational Leadership Style, highly compensated employees are no more satisfied than low-compensated employees.* In the result of hypothesis testing of 3<sub>c</sub>, it is found that the analysis result does not support H<sub>3c</sub> hypothesis, especially for a good leadership style; employees getting high compensation is no more satisfied than employees who get low compensation, with the Sig. value of 0.392 (> 0.05). The results of this hypothesis are in contrast to the results of the research conducted by Fernandes and Awamleh (2009), they asserted that the transformational leadership style applied by leaders will improve employee work satisfaction, and it seems that such transformational qualities stimulate higher levels of employees' higher satisfaction. In this research, there is dissatisfaction experienced by the employees even though they get high compensation.

*Especially for a Good Work Environment, Low Compensation Does Not Improve Employee Performance Compared with Higher Compensation.* In the result of hypothesis testing of 4<sub>a</sub>, it is found that the analysis result supports H<sub>4a</sub> hypothesis, especially for a good work environment; low compensation does not improve employee performance compared with high compensation, with Sig. value of 0.00 (<0.05). The results of this hypothesis are in line with the research conducted by Milkovich and Newnan (2005), stated that the payroll system can translate strategy into practice to achieve the basic objectives of the company, including efficiency, fairness and compliance with government and legal requirements. Efficiency is expressed as performance improvement, quality improvement, satisfying the consumers and stakeholders as well as cost control. Meanwhile, the performance of an employee plays an important role for an organization because it contributes to the achievement of the company objectives.

*Especially for a High Compensation, Poor Work Environment Improves Employee Performance Compared with Low Compensation.* In the result of hypothesis testing of 4<sub>b</sub>, it is found that the result of the analysis supports H<sub>4b</sub> hypothesis, especially for a high compensation; poor work environment improves employee performance more than low compensation with Sig. value of 0.00 (<0.05). This hypothesis supports the research conducted by Philip, et al. (2010) who revealed that a fair compensation can spur the employee participation so that employees can work with full responsibility and have work participation towards the company. An employee who has worked with full responsibility and high dedication to the company will certainly expect the award, no matter how small the award will be very beneficial for these employees in motivating other employees in improving their performances.

*Especially for a Good Work Environment, Higher Compensation Does Not Improves Employee Performance Compared with Poor Work Environment.* In the result of hypothesis testing of 4<sub>c</sub>, it is found that the result of the analysis does not support H<sub>4c</sub> hypothesis, especially for a good work environment; high compensation does not improve employee performance compared with poor work environment, with Sig. value of 0.214 (>0.05). The

results of this hypothesis support the statement of Carnahan, et al. (2010), said the lack of attention of the companies in providing fair and reasonable compensation to employees and inadequate work environment will impact on the declining performance of the employees. Higher compensation provided by the company does not necessarily improve the employee performance. In addition, a work environment that does not support these employees in doing their work will further make the employee performance even worse.

## CONCLUSION

This study examines the influence of leadership style and work environment on employee performance that is moderated by compensation at PT. Seliu Multi Persada Tangerang. This research used non-hierarchical method or mean-cells method analysis by using between-subject of 2x2 and applied the procedure of Univariate General Linier Model (GLM). The transformational leadership style does not improve employee performance (the first hypothesis is not supported). Because, the transformational leadership style that is shown or implemented by the leadership of PT. Seliu Multi Persada does not affect employee performance. Work environment will improve employee performance. The better work environment will further enhance employee performance (second hypothesis is supported). The work environment gives a big impact on employee performance. A good working environment will provide a sense of security for employees in performing or carrying out their duties. A third conclusion from the results of this research found that especially for a good transformational leadership style groups, groups of employees getting low compensation will improve employee performance (the third hypothesis is not supported). Even though a leader has a good transformational leadership style, it does not improve employee performance; in addition, with low compensation.

For a poor transformational leadership style, high-compensated employee groups perform better than low-compensated employees (the fourth hypothesis is accepted). Employees at PT. Seliu Multi Persada do not measure their level of performance loyalty from the leadership style implemented by a leader, but they measure with a high level of compensation. The fifth conclusion of the results of this research found that especially for good transformational leadership styles, high-compensated employee groups are not satisfied more than low-compensated employee groups (the fifth hypothesis is rejected). The higher levels of compensation the company provides to employees, it will improve the employee's performance.

In a good work environment, low compensation does not further improve employee performance compared to high compensation (the sixth hypothesis is accepted). By having a good working environment provided by the company, providing a sense of security to employees in the work and giving a low compensation, it will not necessarily improve the performance of employees in the company. The seventh conclusion from the results of this research found that especially for high compensation, poor work environment further improves employee performance compared to low compensation (the seventh hypothesis is accepted). In spite of poor work environment, when the compensation provided by the company is high it will improve employee performance. In a good work environment, high compensation does not improves performance more than a poor work environment (the eighth hypothesis is rejected). The employee performance is measured not by how high the level of compensation, but with how a poor work environment will improve employee performance.

## REFERENCES

1. Akhter, N., Ijaz, M., Siddiqi, U. I., Shouqat, U., & Raza, A. (2016). Impact of Compensation Discrimination on Employees Performance in Engro Food Limited, Alhamd Food Limited and Leader industry Sahiwal of Pakistan. *International Review of Management and Business Research*, 5(2), 547.

2. Anit, S. (2006). The effects of leadership style and team process on performance and innovation in functionally heterogeneous teams. *Journal of Management* 32: 132.
3. Biswas, S. (2009). HR Practices as a Mediator Between Organizational Culture and Transformational Leadership: Implications for Employee Performance.
4. Blazovich (2013). Team identity and performance – based compensation effects on performance. *Team Performance Management*, Vol. 19, No.3/4, 153-184.
5. Carnahan Seth, Agarwal, Campbell, and Franco. (2010). The Effect of Firm Competition Structures on Employee Mobility and Employee Entrepreneurship of Extreme Employers. *CES*. 10(06): 1-40.
6. Fernandes, C., & Awamleh, R. (2009). The Impact of Transformational Leadership Style on Employee's Satisfaction and Performance: An Empirical Test in a Multicultural Environment. *International Business & Economics Research Journal*.
7. Ganapathi and Prasad. (2008). Effects of working environment on the performance of executives. *Asia-Pacific Business Review*, Vol. IV, No.3, 117-123.
8. Ganapathi and Prasad. (2008). Effects of working environment on the performance of executives. *Asia-Pacific Business Review*, Vol. IV, No.3, 117-123.
9. Guo, W. C., Shiah-Hou, S. R., & Yang, Y. W. (2006). Stock bonus compensation and firm performance in Taiwan. *Managerial finance*, 32(11), 862-885.
10. Kuludong, F. (2016). Pengaruh Communication Skill Dokter Terhadap Kepuasan Pasien yang dimoderasi oleh Implicit Self Theorist (Studi Mayapada Hospital Jakarta Selatan). Tesis. Jakarta: Universitas Esa Unggul.
11. Malik, M. I., Ahmad, A., Gomez, S. F., & Ali, M. (2011). A study of work environment and employees' performance in Pakistan. *African Journal of Business Management*, 5(34), 13227.
12. Philip, Stacey & Ling Tsai. (2010). The Impact of Job Mobility, Hourly Compensation, & Work Hours on Job Satisfaction. Institute for Research in Training & Development.
13. Shea, C.M. (1999). The effects of leadership style on performance improvement on a manufacturing task. *The Journal of Business*, Vol.72, No.3, 407-422.
14. Shieh. (2008). Effect of corporate compensation design on organizational performance. *Social Behavior and Personality*, 36 (6), 827-840.
15. Shieh. (2008). Effect of corporate compensation design on organizational performance. *Social Behavior and Personality*, 36 (6), 827-840.
16. Sinclair (2004). The effect of director compensation on firm performance. Temple University, Doctoral Dissertation Approval on Behalf of the Graduate Board.
17. Sugiyono. (2013). *Statistika Untuk Penelitian*. Bandung: Alfabeta.
18. Warrick, D. D. (1973). The effect of leadership style and adaptability on employee performance and satisfaction.
19. Yukl, G. (2009). *Kepemimpinan dalam Organisasi*. Jakarta : PT Indeks Kelompok Gramedia.

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**ПРОБЛЕМЫ ПРОФЕССИОНАЛИЗАЦИИ В УПРАВЛЕНИИ И ПЛАНИРОВАНИИ  
УСТОЙЧИВОГО РАЗВИТИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ  
ПРЕДПРИНИМАТЕЛЬСКИХ СТРУКТУР**

**PROBLEMS OF PROFESSIONALIZATION IN THE MANAGEMENT AND PLANNING  
OF SUSTAINABLE DEVELOPMENT OF AGRICULTURAL BUSINESS STRUCTURES**

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**АННОТАЦИЯ**

В статье рассматриваются вопросы профессионализации в управлении и планировании устойчивого развития сельскохозяйственных предпринимательских структур. Решение проблем профессионализации предусматривает подбор кадров, распределение полномочий и ответственности, разработку стратегических планов. Обосновано формирование стратегии устойчивого развития для сельхозпроизводителей на основе планирования преемственности и профессионализации. Определены принципы эффективного стратегического планирования для решения проблем профессионализации.

**ABSTRACT**

The article deals with the issues of professionalization in the management and planning of sustainable development of agricultural entrepreneurial structures. Solving the problems of professionalization involves recruitment, distribution of powers and responsibilities, development of strategic plans. The formation of sustainable development strategy for farmers based on succession planning and professionalization is grounded. The principles of effective strategic planning for solving the problems of professionalization are defined.

**КЛЮЧЕВЫЕ СЛОВА**

Индикативное планирование, корпоративное управление, профессионализация, преемственность, сельскохозяйственные товаропроизводители, труд.

**KEY WORDS**

Indicative planning, corporate governance, professionalization, continuity, agricultural producers, labor.

Сельскохозяйственные товаропроизводители в последние годы наблюдают положительные изменения в системе государственной поддержки предпринимательских структур, которые связаны с объективными причинами введения продовольственного эмбарго на ввоз отдельных видов сельскохозяйственной продукции. Эти меры касаются доступности кредитных ресурсов, субсидирования сельхозпроизводителей, развития системы страхования, развития племенного животноводства и элитного семеноводства, роста производства продукции животноводства, обеспечение закладки многолетних насаждений, осуществление обновления основных средств сельскохозяйственных товаропроизводителей, обеспечение мероприятий по повышению плодородия почв; формирование механизмов устойчивого развития сельских территорий. Ощутимую поддержку

испытывают не только крупные сельхозпроизводители продукции, но и в частности крестьянские фермерские хозяйства и индивидуальные предприниматели – представители малых и средних предпринимательских структур в сфере агропромышленного комплекса. Данные тенденции складываются во всех регионах Российской Федерации, в том числе и в аграрно-ориентированных областях.

К примеру, Орловская область по итогам последних лет показывает устойчивые темпы роста объемов продукции сельского хозяйства, что демонстрируют статистические данные Территориального органа государственной статистики по Орловской области [1]. Положительные качественные и структурные сдвиги наблюдаются как по всем категориям хозяйств, производящим продукцию растениеводства и животноводства, так и по кругу крупных сельхозорганизаций, хозяйств населения и малых фермерских хозяйств (таблица 1).

Таблица 1 – Объем продукции сельского хозяйства по категориям хозяйств Орловской области за 2014-2016 гг. (в фактически действовавших ценах; миллионов рублей)

| Вид продукции   | 2014                |                      | 2015                |                      | 2016                |                      |
|---|---------------------|----------------------|---------------------|----------------------|---------------------|----------------------|
|   | по сумме, млн. руб. | по удельному весу, % | по сумме, млн. руб. | по удельному весу, % | по сумме, млн. руб. | по удельному весу, % |
| <b>Хозяйства всех категорий</b>   |                     |                      |                     |                      |                     |                      |
| Продукция сельского хозяйства в том числе                                   | 52317,1             | 100,00               | 64624,4             | 100,00               | 70932,1             | 100,00               |
| растениеводства   | 35350,6             | 100,00               | 44780,8             | 100,00               | 50262,2             | 100,00               |
| животноводства  | 16966,5             | 100,00               | 19843,6             | 100,00               | 20669,9             | 100,00               |
| <b>Сельскохозяйственные организации</b>                                     |                     |                      |                     |                      |                     |                      |
| Продукция сельского хозяйства в том числе                                   | 35056,6             | 67,00                | 44014,2             | 68,10                | 50414,0             | 71,07                |
| растениеводства   | 24878,6             | 70,38                | 30627,4             | 68,39                | 36276,8             | 72,18                |
| животноводства  | 10178,0             | 59,98                | 13386,8             | 67,46                | 14137,2             | 68,40                |
| <b>Хозяйства населения</b>  |                     |                      |                     |                      |                     |                      |
| Продукция сельского хозяйства в том числе                                   | 12776,2             | 24,42                | 14607,8             | 22,60                | 13112,2             | 18,49                |
| растениеводства   | 6373,8              | 18,03                | 8703,8              | 19,44                | 7144,4              | 14,21                |
| животноводства  | 6402,4              | 37,74                | 5904,0              | 29,75                | 5967,8              | 28,87                |
| <b>Крестьянские (фермерские) хозяйства и индивидуальные предприниматели</b> |                     |                      |                     |                      |                     |                      |
| Продукция сельского хозяйства в том числе                                   | 4484,3              | 8,57                 | 6002,4              | 9,30                 | 7405,9              | 10,44                |
| растениеводства   | 4098,2              | 11,59                | 5449,6              | 12,17                | 6841,0              | 13,61                |
| животноводства  | 386,1               | 2,28                 | 552,8               | 2,79                 | 564,9               | 2,73                 |

Причем доля объемов производства крестьянских фермерских хозяйств значительно возрастает в отличие от развития хозяйств населения (рисунок 1).

Представители предпринимательства, пользуясь государственной поддержкой, ставят перед собой и бизнесом амбициозные цели, направленные на формирование устойчивых индикативных планов развития, внедрение цифровых технологий, планирование преемственности, глобализацию для обеспечения продовольственной безопасности, инновации в сфере сельхозтехнологий [2,3]. Основой реализации стратегии развития в бизнесе является кадровая политика, которая должна базироваться на мерах, обеспечивающих профессиональное соответствие и освоение профессиональных компетенций в процессе всей профессиональной деятельности. И решение данной проблемы актуально не только для малых крестьянских фермерских хозяйств, но и для крупных производителей продукции растениеводства и животноводства. Первостепенного решения требуют проблемы профессиональной работы агрофирм. Каждая фирма в процессе жизненного цикла достигает рубежа,

когда ей необходимо выйти на новый, профессиональный уровень ведения деятельности за счет внедрения более эффективных процессов, применения четких принципов корпоративного управления, а также найма высококвалифицированных специалистов [4].

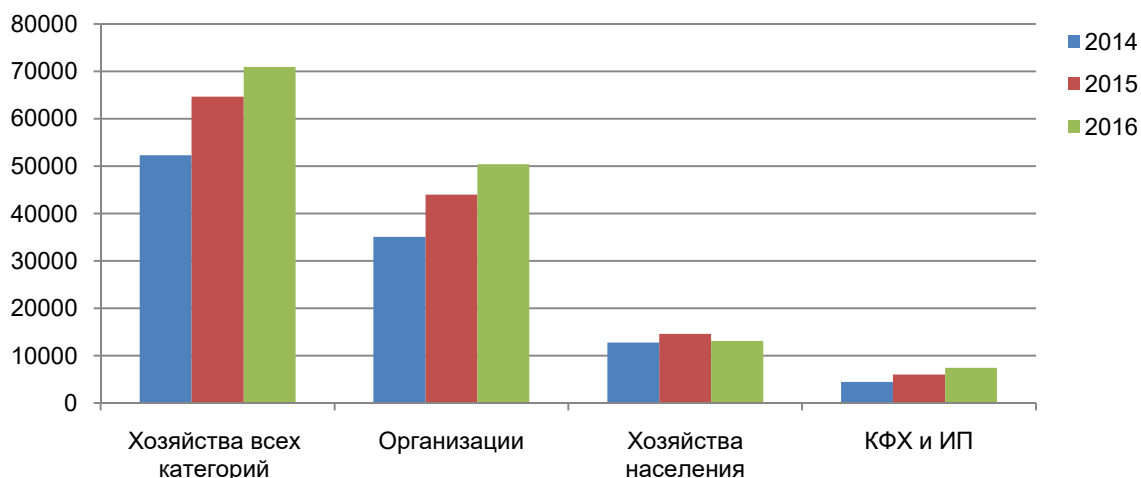


Рисунок 1 – Динамика изменения доли объемов производства сельскохозяйственной продукции различными типами хозяйств



Рисунок 2 – Проблемы развития предпринимательских структур

При проведении исследования семейного бизнеса группой компаний PricewaterhouseCoopers (PwC) было доказано, что перед малыми предпринимательскими структурами в ближайшие пять лет стоят следующие проблемы (рисунок 2) [5].

Процессы постоянного совершенствования профессионального уровня подготовки специалистов и управления получили новое название профессионализация. Профессионализация требует не только эффективных рычагов воспитания специалиста, но и текущих системных мер формирования профессионального пространства внутри фирмы.

Области профессионального пространства замыкают решение проблем подбора специалистов в соответствии с заявленными бизнес процессами и распределение ролей в бизнесе и обязанностей [6,7].

Внедрение инновационных технологий и методов работы диктует необходимость пересмотра политики управления кадрами в сфере агробизнеса, которые ориентированы на хозяина и обеспечение преемственности поколений.

Ключевым фактором, обеспечивающим эффективное развитие сельскохозяйственного производства и реализацию кадровых вопросов в подборе и расстановке персонала, является стратегическое планирование. Приоритеты начинают расставляться в пользу долгосрочного эффективного планирования преемственности. Каждому субъекту сельскохозяйственного производства необходим стратегический план, учитывающий особенности сектора, в котором работает предприятие, специфику рынка и этапы развития. Целесообразно выделить несколько базовых принципов, лежащих в основе любого эффективного плана преемственности, позволяющих решить проблемы профессионализации (рисунок 3).

Понимание сущности принципов эффективного стратегического планирования позволяет успешно решить проблемы кадрового характера.

Постановка целей для руководства хозяйства в вопросах подбора персонала предполагает разработку стратегических планов или бизнес-планов с определением направлений устойчивого развития предпринимательской деятельности, в том числе на основе проработки кадровых вопросов, расчета затрат на подготовку и повышение квалификации сотрудников, формирование социального пакета, привлекательности профессии и места работы.

Планирование будущего видения развития агробизнеса на перспективу основано на формировании стратегии сельскохозяйственного производства на основе обеспеченности бизнес-процессов специалистами, распределении центров ответственности согласно организационной структуре фирмы и корпоративной культуре.



Рисунок 3 – Принципы эффективного стратегического планирования для решения проблем профессионализации

Оценка наличия конкурентных преимуществ у бизнеса и сотрудников, вероятность появления новых конкурирующих агрофирм на рынке может быть дана при планировании на основе объективной оценки текущего состояния финансово-хозяйственной деятельности и создания надлежащих условий труда и отдыха для сотрудников, постановки процессов подбора кадров, мотивации, стимулирования,

поощрения. При разработке стратегического плана развития устойчивости бизнеса, который был бы ориентирован на преемственность и профессионализацию, может быть проведен PESTLE-анализ для рассмотрения внешних факторов, влияющих на рынок и объемы сельскохозяйственного производства. В числе влияющих факторов выделяют политические, экономические, социальные, технологические, правовые, экологические. Результаты анализа позволят сделать вывод о том, сможет ли профессиональная подготовка сотрудников обеспечить достижение целей роста объемов производства, получения прибыли [8,9], развития инноваций и выполнения целей стратегии.

Координирование работы по подготовке стратегического плана руководителем и участие всех сотрудников в разработке плана. Руководитель хозяйства, имеющий профильное профессиональное образование должен координировать работу по подготовке стратегического плана устойчивого развития, привлекая к процессу планирования специалистов, экспертов, консультантов из числа сотрудников фирмы. Специалисты обеспечивают охват всех уровней управления. Таким образом обеспечивается должный уровень ответственности за разработку и реализацию плана, прослеживается достоверное и объективное обоснование индикаторов плана, и гарантируется получение эффекта.

Корректировка и определение личной роли в ведении бизнеса и профессиональных методов ведения деятельности. Эффективный процесс стратегического планирования подразумевает постановку под сомнение тех методов и приемов работы и планирования, которые могут быть применимы в будущем. Глобализация мировой экономики, выполнение совместных производственно-инвестиционных проектов, политические реалии, накладывают свой отпечаток на выполнение стратегии планирования, отвечающего современным требованиям повышения конкурентоспособности, продовольственной безопасности и автономности отечественной экономики. Поэтому необходимо рассматривать различные альтернативные варианты и новые подходы [10], а также учитывать то, что руководству и сотрудникам фирмы, возможно, потребуются скорректировать свою собственную роль и методы ведения профессиональной деятельности.

Существенное значение имеет разграничение функций и ответственности за подготовку стратегии устойчивого развития и выполнение показателей. Руководитель хозяйства, совет директоров должны взять на себя главную ответственность за подготовку плана, однако за отдельные разделы и их разработку должны отвечать соответствующие менеджеры, и этим менеджерам необходимо выделить бюджет и ресурсы, которые им потребуются для успешного выполнения поставленной перед ними задачи. Фирма может обеспечить профессиональное сопровождение индикативного планирования. Сотрудники могут участвовать в вебинарах, экономических форумах, инвестиционных площадках, профильных программах переподготовки и дополнительного обучения.

Политика преемственности и профессионализации в развитии и обеспечении конкурентных преимуществ предпринимательских структур агропромышленного комплекса формируется при активном вовлечении в профессиональную деятельность молодых специалистов [11], так называемых «миллениалов». Молодые сотрудники профессионально владеют цифровыми технологиями, необходимым и альтернативным аналитическим инструментарием, личностными и профессиональными навыками и компетенциями. Их ожидания и ценности соразмерны тем амбициям и планам развития, которые ставят современные руководители при выполнении государственных программ, дорожных карт, стратегий.

Таким образом, в статье дан обзор и выделены основные проблемы планирования преемственности и профессионализации для обеспечения эффективности и устойчивости деятельности сельскохозяйственных товаропроизводителей.



## БИБЛИОГРАФИЯ

1. Официальный сайт Территориального органа Федеральной службы Государственной статистики по Орловской области / [Электронный ресурс] // Режим доступа: <http://orel.gks.ru/>
2. Ефимова О.В. Стратегия устойчивого развития компании: аналитический аспект // Сибирская финансовая школа. 2011. №3 (86). С. 36-40.
3. Чеглакова С.Г. Анализ инвестиционных возможностей в сельском хозяйстве // Аграрная наука. 2003. №6. С. 22-24.
4. Прока Н.И. Механизм реализации системы индикативного планирования в аграрном секторе экономики / Н.И. Прока, И.В. Страшко // Экономика сельского хозяйства России. 2010. №6. С. 20-26.
5. Официальный сайт аудиторской сети PricewaterhouseCoopers (PwC) / [Электронный ресурс] // Режим доступа: <http://www.pwc.ru/>
6. Симченко Н.А., Цёхла С.Ю., Подсмашная И.Н. Эволюция теорий мотивации в условиях экономической модернизации общества // Вопросы новой экономики. 2015. №4 (36). С. 66-70.
7. Симченко Н.А., Цёхла С.Ю., Павленко И.Г. Институциональные аспекты формирования мотивационного механизма управления трудозанятостью // Российское предпринимательство. 2015. Т. 16. №22. С. 4135-4144.
8. Воробьев Ю.Н. Теоретические основы формирования и использования финансовых ресурсов в социально-экономической системе государства // Научный вестник: финансы, банки, инвестиции. 2009. №4 (5). С. 16-24.
9. Воробьева Е.И., Воробьев Ю.Н. Определение стоимости финансовых ресурсов субъектов предпринимательства в системе финансового менеджмента // Научный вестник: финансы, банки, инвестиции. 2013. №5 (24). С. 6-12.
10. Паршутина И.Г. Национально-государственные экономические системы: институциональный аспект глобализации // Вестник ОрелГИЭТ. 2010. №1 (11). С. 21-24.
11. Меркулов П.А., Елисеев А.Л. К вопросу о разработке концепции государственной молодежной политики // Среднерусский вестник общественных наук. 2015. Т. 10. №3. С. 72-81.

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## **CUSTOMER SATISFACTION IN AN SME: A CUSTOMER PERSPECTIVE IN PERCEIVED VALUE AND LOCAL BRAND IMAGE**

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### **ABSTRACT**

This study is aimed to understand the relationship of perceived quality and brand image on customer satisfaction of Sasirangan Consumer. The study were taken at Banjarmasin, South Kalimantan Province, Indonesia. The object of this study is SME's Sasirangan (Kain Sasirangan). The object was taken since it has a deep local wisdom and deep meaning for Banjarmasin society (Banua). The subject taken in this research is youngsters at college. This group of subject taken since today's youngsters has a unique characteristics that also affecting their taste on certain product. The sample was as many as 139 people involved, and executed by using Partial-Least-Square SEM (PLS-SEM). The results of the study shows that either perceived quality or brand image positively increasing the customer satisfaction. Based on the model examination, the perceived value are able to directly affecting the customer satisfaction rather than that affected by brand image. However the indirect effect also indicate that the brand image are also able to mediate the effect of perceived quality on customer satisfaction. The limitation of this study is the object is a single object that may affect the degree of generality against another research.

### **KEY WORDS**

Brand image, perceived quality, customer satisfaction, millennial.

SMEs is growing significantly as a result of an easy trend to start new businesses. Improved market and purchasing power of society makes an SMEs increasingly popular as an alternative to purchase necessity while at the same time attract to start their own SMEs. Indonesian SMEs will face new challenges in the future. The free trade market in the ASEAN Economic Community (AEC) will be a new challenge for Indonesian SMEs. Along with the many types of overwhelming products in the Indonesian market, local SMEs need to compete with imported products. Therefore, innovation is important for SMEs to maintain its market. The role of government to encourage SMEs to be more competitive is also a crucial thing in order to face the free trade market.

Increased competition and consumer expectations encourage SME's to focus on maintaining existing customers. Maintaining an existing market through customer loyalty development is the firm's strategic goal to sustain their business and profits (Tjahyadi, 2006). Understanding the factor influencing customer satisfaction becoming crucial today's especially in this era which mainly dominated by youngster.

When customer thinking about products quality and service quality it will come to several perception such as products quality, since product quality assure product reliability. Focusing on product is basically rely on the finding that states if it has a positive relationship between quality and customer satisfaction which leads to purchase intention (Chaudhuri & Holbrook, 2001).

Brand itself becoming an antecedent of customer satisfaction (Tu, Wang, & Chang, 2012). In a local brand, brand image remain a primary consideration against particular products purchasing intention (Johnson & Bruwer, 2007). The company's brand image is a valuable intangible capital that is difficult to replicate and can help the organization achieve sustainable and superior financial performance (Roberts & Dowling, 2002).

## LITERATURE REVIEW

Products are all things that can be offered in the market to get attention, demand, consumption or consumption that can satisfy the needs of consumers. Products consist of quality, features, choice or choice, style, brand name, packaging, size, product line, product item, warranty, service (Kotler, P., Keller, K. L., Brady, 2016). Basically there are five levels of products, namely core benefits, basic products, expected products, additional products and potential products (Kotler & Keller, 2006). High quality of products, give a brand image value through several ways such as high quality give customers a good reason to buy certain products and differs from another competitors while applying a premium price and great power on customer mind. Good perceived quality is inseparable with good brand positioning in customer mind and proved by its functionality (Babakus, Bienstock, & Van Scotter, 2004).

To achieve customer satisfaction, an organization should ignore about market reviews and advertising and focusing on providing appropriate production facilities and service infrastructure to provide adequate products and services (Gustafsson, Johnson, & Roos, 2005). Prior studies has indicates that several aspect affecting the customer satisfaction are perceived quality and brand image (Olsen & Johnson, 2003; Ranjbarian, Sanayei, Kaboli, & Hadadian, 2012).

There are two perceived quality based on the products and services namely perceived service quality and perceived products quality (Babakus et al., 2004). Some studies have shown that perceived value have a direct impact on customer satisfaction (Snoj, Pisnik Korda, & Mumel, 2004; Sweeney, Soutar, & Johnson, 1999; Tam, 2004; Yoo & Park, 2007). Newest study stated that perceived quality of social enterprise products has positive effects on perceived value. That is, the higher the perception of quality is, the higher the perceptions of functional, emotional and social value are (Choi & Kim, 2013). Study conducted in automotive industry also indicates that both perceived service quality and perceived product quality increasing the customer satisfaction (Jahanshahi, Gashti, Mirdamadi, Nawaser, & Khaksar, 2011).

*H1: Perceived Quality increases the Customer Satisfaction.*

Perceived quality was defined as consumers' judgment about products' excellence or superiority. Prior study proposed that perceived service quality is determined by the difference between expected services and perceived services (Parasuraman, Zeithaml, & Berry, 1985). In many research, a brand image can be positively affected by perceived quality (Ranjbarian et al., 2012; Selnes, 1993; Zins, 2001).

*H2: Perceived Quality Increase Brand Image on Customer.*

Brand image could be defined as depicting process of a brand that is brought to the consumer's mind by the brand association (Kotler, P., Keller, K. L., Brady, 2016; Kotler & Keller, 2006). Brand image can be also defined as consumer's thoughts and feelings about the brand (Roy & Banerjee, 2008). Many Prior studies found that there is close relationship from brand image on customer satisfaction (Hussain, Nasser, & Hussain, 2014; Michaelidou, Siamagka, & Christodoulides, 2011; Sondoh, Omar, Wahid, Ismail, & Harun, 2007).

*H3: Brand Image Increase Customer Satisfaction.*

## METHODS OF RESEARCH

According to the research nature, this research is a quantitative research by using explanatory approach. Quantitative research is may simply defined as the research techniques associated with data gathering, analysis, interpretation and presentation of numerical information (Creswell, 2013). This current research goes beyond a descriptive approach and categorized as explanatory research since it tries to explain causal relationship among variables through some hypotheses testing in an empirical setting (Singarimbun & Effendi, 2011).

Based on the data collection techniques, this research is a survey research. Survey is used to gather any information from respondent by using questionnaire as the primary data gathering instrument (Singarimbun & Effendi, 2011). Since the population of customers was

unknown, this research employ Campbell sample formula drawn as many as 139 sample. The whole sample was measured by using 5 point likert scale.

Data analysis employed in this study was using Partial Least Square based on Structured Equation Modeling (PLS-SEM) to reveal the causal relationship among variables. PLS-SEM is a causal modeling approach aimed at maximizing the explained variance of the dependent latent construct (Hair, Gabriel, & Patel, 2014). Another finding suggest that PLS is a regression based analysis with fewer data assumption and more accurate coefficient results (Mayfield & Mayfield, 2012). Compared to Covariance Based SEM (CB-SEM), PLS is robust with fewer identification issues (fewer Goodness of fit criteria). In examining the PLS-SEM this research employ PLS software namely SmartPLS v. 2.0 to examine the model.

The object of this research is Sasirangan SME's industries that produce the local motive fabric that also called as "Kain Sasirangan" Sasirangan Fabrics in Banjarmasin, South Kalimantan, Indonesia. The subject of this study is youngsters in Banjarmasin city. Youngsters were chosen since their characteristics that are called as a millennial life style in today's modern living. Do the youngsters still aware on the local products particularly which have a local wisdom identity.

## RESULTS AND DISCUSSION

After the data has been completely collected, the next step is examining descriptive statistics and the structural model. According to descriptive frequencies, the largest grand mean of three variable is respectively started from perceived quality (3.85), customer satisfaction (3.84), and brand image (3.74). From this descriptive explanation this descriptive finding, the customer is relatively have a high perceived quality on Sasirangan SME's product. The customer is also shows a great satisfaction on Sasirangan SME's product. And customer also feels that Sasirangan SME's product have a great image on their mind

According to the model running in PLS-SEM employing SmartPLS V2.0 by using 2 steps. First step is the evaluation of construct reliability and validity assessment. Based on the Table 1 below the Cronbach's alpha has met the cut-off value which from those three variable indicates high reliability above 0.9 (cut-off >0.7). Validity was examined using both convergent and discriminant validity. Convergent validity was reflected by AVE (Average Variance Extracted) that should be higher than 0.50, in which all of three variable indicates high validity (Hair, Ringle, & Sarstedt, 2013). Discriminant validity was examined based on the Fornell-Larcker criterion. The formula was the square root of each construct's AVE which results should be greater than its highest correlation with any other construct (Hair et al., 2014). According to Table 1 below the diagonal elements (Bold) are the square root of AVE and the off diagonal are the latent variable correlations (Roldán & Sánchez-Franco, 2012).

Table 1 – Reliability and Validity Assessment

|    | AVE   | Composite Reliability | R Square | Cronbachs Alpha | BI    | CS    | PQ    |
|----|-------|-----------------------|----------|-----------------|-------|-------|-------|
| BI | 0.855 | 0.959                 | 0.490    | 0.943           | 0.925 |       |       |
| CS | 0.862 | 0.949                 | 0.612    | 0.919           | 0.708 | 0.928 |       |
| PQ | 0.794 | 0.975                 |          | 0.971           | 0.699 | 0.732 | 0.891 |

Source: SmartPLS Output.

After all of the Reliability Results has met its cutoff value, the next step is assessing the structural model both directly and indirectly. Based on the Statistics calculation below the results support for hypothesis 1, hypothesis 2, and hypothesis 3 since the t-calculated is smaller than t-table.

Based on Table 2 Hypothesis 1 proposed a positive relationship between perceived quality and customer intention and it is supported (7.668>1.96). Hypothesis 2 proposed positive relationship between perceived quality and brand image and it is supported

(13.596>1.96). Hypothesis 3 proposed positive relationship between brand image and Customer Satisfaction and it is supported (6.679>1.96).

Table 3 shows the indirect effect which is calculated by using sobel formula employing sobel calculator to find out the significance level of construct between perceived quality on customer satisfaction mediated by brand image and it is supported (5.995>1.96). The final Structural model was shown in figure 1 below.

Table 2 – Direct Effect

| Hypothesis  | Direct Effect |        |            |
|---|---------------|--------|------------|
|   | Path          | t      | Conclusion |
| H1: Perceived Quality increases the Customer Satisfaction | 0.462         | 7.668  | Supported  |
| H2: Perceived Quality Increase Brand Image on Customer    | 0.699         | 13.596 | Supported  |
| H3: Brand Image Increase Customer Satisfaction            | 0.385         | 6.679  | Supported  |

Sources: PLS Output.

Table 3 – Indirect Effect

| Hypothesis                                    | Indirect Effect |       |            |
|---|-----------------|-------|------------|
|   | Path            | t     | Conclusion |
| Perceived Quality → Brand Image → Brand Image | 0.790           | 5.995 | Supported  |

Sources: PLS Output.

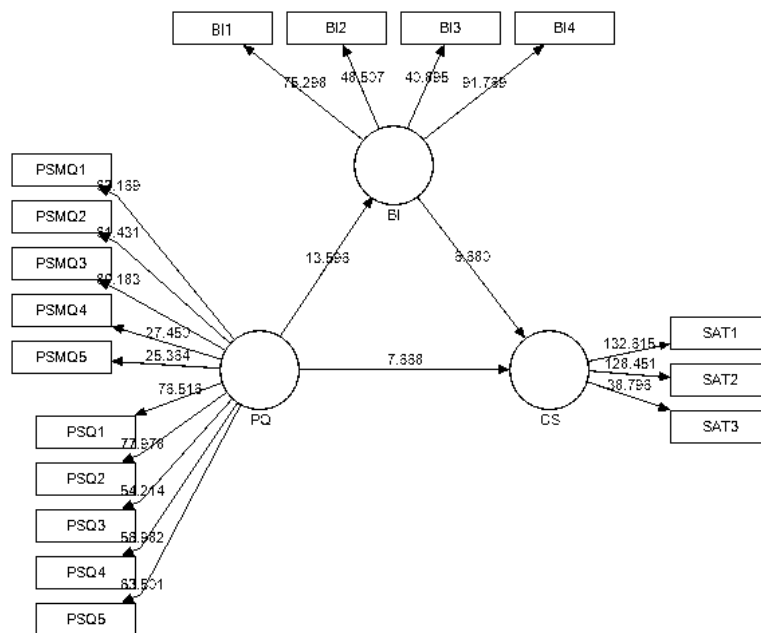


Figure 1 – Structural Model (Sources: PLS Output)

### CONCLUSION AND RECOMMENDATION

This research investigates the effect of perceived value and brand image on customer satisfaction in SME's particularly by the youngster customer. Research model was proposed various prior study that coming with different object. Both of the exogenous variables namely perceived quality and brand image affecting the customer satisfaction in Sasirangan SME's. Between those two exogenous variable, perceived qualities have a dominant effect on customer satisfaction rather than brand image. However the PLS-SEM model examination shows that the indirect effect between perceived quality, brand image and customer satisfaction are greater than direct effect which indicates that by improving either the product

quality or service quality will increase the brand image on customer mind which leads to customer satisfaction.

Based on the discussion above it is proven that the perceived quality is remain becoming a central consideration rather than the brand image. Which means that the products quality of sasirangan fabric in Banjarmasin city is relatively having a same quality of products and services. This argument is also supported by the grand mean on descriptive statistics above. Most of the customer is satisfied enough with the products from Sasirangan SME's. Though brand image is also have a smaller mean, doesn't mean that brand image become less considerable variable rather than the perceived quality. It can be caused by reversed variable interaction. Prior research also indicates that there is a positive relationship from brand image on perceived quality (Johnson & Bruwer, 2007; Ranjbarian, Sanayei, Kaboli, & Hadadian, 2012).

However there is no research without limitation, so does with this study. There are several limitation on this research that can be recommendation for future research. This research is limited on certain industry, so the degree of generality against another research may be limited. Thus the wider the industry and larger amount of respondent with a wider span of respondent characteristic may able the research to generate better conclusion This research is conducted only using a non-recursive model which in another theory it could be designed as a recursive model.

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### REFERENCES

1. Babakus, E., Bienstock, C. C., & Van Scotter, J. R. (2004). Linking Perceived Quality and Customer Satisfaction to Store Traffic and Revenue Growth\*. *Decision Sciences*, 35(4), 713–737. <https://doi.org/10.1111/j.1540-5915.2004.02671.x>
2. Chaudhuri, A., & Holbrook, M. B. (2001). The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty. *Journal of Marketing*, 65(2), 81–93. <https://doi.org/10.1509/jmkg.65.2.81.18255>
3. Choi, E. J., & Kim, S.-H. (2013). The Study of the Impact of Perceived Quality and Value of Social Enterprises on Customer Satisfaction and Re-Purchase Intention. *International Journal of Smart Home*, 7(1). Retrieved from <https://pdfs.semanticscholar.org/92cc/0c0b44de7daf932dc94f6052d66aa14df5f1.pdf>
4. Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Research design Qualitative quantitative and mixed methods approaches. <https://doi.org/10.1007/s13398-014-0173-7.2>
5. Gustafsson, A., Johnson, M. D., & Roos, I. (2005). The Effects of Customer Satisfaction, Relationship Commitment Dimensions, and Triggers on Customer Retention. *Journal of Marketing*, 69(4), 210–218. <https://doi.org/10.1509/jmkg.2005.69.4.210>
6. Hair, J. F., Gabriel, M. L. D. da S., & Patel, V. K. (2014). AMOS Covariance-Based Structural Equation Modeling (CB-SEM): Guidelines on its Application as a Marketing Research Tool. *Revista Brasileira de Marketing*, 13(2), 44–55. <https://doi.org/10.5585/remark.v13i2.2718>
7. Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. *Long Range Planning*, 46(1–2), 1–12. <https://doi.org/10.1016/j.lrp.2013.01.001>
8. Hussain, R., Nasser, A. Al, & Hussain, Y. K. (2014). Service quality and customer

- satisfaction of a UAE-based airline: An empirical investigation. <https://doi.org/10.1016/j.jairtraman.2014.10.001>
9. Jahanshahi, A. A., Gashti, M. A. H., Mirdamadi, S. A., Nawaser, K., & Khaksar, S. M. S. (2011). Study the Effects of Customer Service and Product Quality on Customer Satisfaction and Loyalty. *International Journal of Humanities and Social Science*, 1(7), 253–260. Retrieved from [https://www.researchgate.net/profile/Seyed\\_Mohammad\\_Sadegh\\_Khaksar/publication/235791092\\_Study\\_of\\_the\\_effects\\_of\\_customer\\_service\\_and\\_product\\_quality\\_on\\_customer\\_satisfaction\\_and\\_loyalty/links/57a096fb08ae94f454eb4c9d.pdf](https://www.researchgate.net/profile/Seyed_Mohammad_Sadegh_Khaksar/publication/235791092_Study_of_the_effects_of_customer_service_and_product_quality_on_customer_satisfaction_and_loyalty/links/57a096fb08ae94f454eb4c9d.pdf)
  10. Johnson, R., & Bruwer, J. (2007). Regional brand image and perceived wine quality: the consumer perspective. *International Journal of Wine Business Research*, 19(4), 276–297. Retrieved from [https://www.researchgate.net/profile/Johan\\_Bruwer/publication/235278261\\_Regional\\_brand\\_image\\_and\\_perceived\\_wine\\_quality\\_The\\_consumer\\_perspective/links/5440c1f10cf21227a11bb674/Regional-brand-image-and-perceived-wine-quality-The-consumer-perspective.pdf](https://www.researchgate.net/profile/Johan_Bruwer/publication/235278261_Regional_brand_image_and_perceived_wine_quality_The_consumer_perspective/links/5440c1f10cf21227a11bb674/Regional-brand-image-and-perceived-wine-quality-The-consumer-perspective.pdf)
  11. Kotler, P., Keller, K. L., Brady, M. (2016). *Marketing management*. Pearson Education Ltd.
  12. Kotler, P., & Keller, K. L. (2006). *Marketing Management. Organization* (Vol. 22). <https://doi.org/10.1080/08911760903022556>
  13. Mayfield, J., & Mayfield, M. (2012). The Relationship Between Leader Motivating Language and Self-Efficacy: A Partial Least Squares Model Analysis. *Journal of Business Communication*, 49(4), 357–376. <https://doi.org/10.1177/0021943612456036>
  14. Michaelidou, N., Siamagka, N. T., & Christodoulides, G. (2011). Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands. *Industrial Marketing Management*, 40(7), 1153–1159. <https://doi.org/10.1016/j.indmarman.2011.09.009>
  15. Olsen, L. L., & Johnson, M. D. (2003). Service Equity, Satisfaction, and Loyalty: From Transaction-Specific to Cumulative Evaluations. *Journal of Service Research*, 5(3), 184–195. <https://doi.org/10.1177/1094670502238914>
  16. Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A Conceptual Model of Service Quality and Its Implications for Future Research. *Journal of Marketing*, 49(4), 41. <https://doi.org/10.2307/1251430>
  17. Ranjbarian, B., Sanayei, A., Kaboli, M. R., & Hadadian, A. (2012). An Analysis of Brand Image, Perceived Quality, Customer Satisfaction and Re-purchase Intention in Iranian Department Stores. *International Journal of Business and Management*, 7(6), 40–48. <https://doi.org/10.5539/ijbm.v7n6p40>
  18. Roberts, P. W., & Dowling, G. R. (2002). Corporate reputation and sustained superior financial performance. *Strategic Management Journal*, 23(12), 1077–1093. <https://doi.org/10.1002/smj.274>
  19. Roldán, J. L., & Sánchez-Franco, M. J. (2012). Variance-Based Structural Equation Modeling: Guidelines for Using Partial Least Squares in Information Systems Research. In *Research Methodologies, Innovations and Philosophies in Software Systems Engineering and Information Systems* (pp. 193–221). <https://doi.org/10.4018/978-1-4666-0179-6.ch010>
  20. Roy, D., & Banerjee, S. (2008). CARE-ing strategy for integration of brand identity with brand image. *International Journal of Commerce and Management*, 17(1/2), 140–148. <https://doi.org/10.1108/10569210710776512>
  21. Selnes, F. (1993). An Examination of the Effect of Product Performance on Brand Reputation, Satisfaction and Loyalty. *European Journal of Marketing*, 27(9), 19–35. <https://doi.org/10.1108/03090569310043179>
  22. Singarimbun, M., & Effendi, S. (2011). *Metode Penelitian Survei* (4th ed.). Jakarta: Pustaka LP3ES.
  23. Snoj, B., Pisnik Korda, A., & Mumel, D. (2004). The relationships among perceived quality, perceived risk and perceived product value. *Journal of Product & Brand*

- Management, 13(3), 156–167. <https://doi.org/10.1108/10610420410538050>
24. Sondoh, S. L., Omar, M. W., Wahid, N. A., Ismail, I., & Harun, A. (2007). THE EFFECT OF BRAND IMAGE ON OVERALL SATISFACTION AND LOYALTY INTENTION IN THE CONTEXT OF COLOR COSMETIC. *Asian Academy of Management Journal*, 12(1), 83–107. Retrieved from [http://web.usm.my/aamj/12.1.2007/AAMJ 12-1-6.pdf](http://web.usm.my/aamj/12.1.2007/AAMJ%2012-1-6.pdf)
  25. Sweeney, J. C., Soutar, G. N., & Johnson, L. W. (1999). The role of perceived risk in the quality-value relationship : a study in a retail environment. *Journal of Retailing*, 75(1), 77–105. [https://doi.org/http://dx.doi.org/10.1016/S0022-4359\(99\)80005-0](https://doi.org/http://dx.doi.org/10.1016/S0022-4359(99)80005-0)
  26. Tam, J. L. M. (2004). Customer Satisfaction, Service Quality and Perceived Value: An Integrative Model. *Journal of Marketing Management*, 20(7–8), 897–917. <https://doi.org/10.1362/0267257041838719>
  27. Tjahyadi, R. A. (2006). Brand Trust Dalam Konteks Loyalitas Merek : Peran Karakteristik Merek , Karakteristik Perusahaan , Dan Karakteristik Hubungan. *Jurnal Manajemen*, 6(1), 65–78. Retrieved from <http://cls.maranatha.edu/khusus/ojs/index.php/jurnal-manajemen/article/view/187>
  28. Tu, Y.-T., Wang, C.-M., & Chang, H.-C. (2012). Corporate Brand Image and Customer Satisfaction on Loyalty: An Empirical Study of Starbucks Coffee in Taiwan. *Journal of Social and Development Sciences*, 3(1), 24–32. Retrieved from <https://pdfs.semanticscholar.org/00b4/46b1a605c29326690d8c038c30030b7342cd.pdf>
  29. Yoo, D. K., & Park, J. A. (2007). Perceived service quality. *The International Journal of Quality & Reliability Management*, 24(9), 908–926. <https://doi.org/http://dx.doi.org/10.1108/02656710710826180>
  30. Zins, A. H. (2001). Relative attitudes and commitment in customer loyalty models. *International Journal of Service Industry Management*, 12(3), 269–294. <https://doi.org/10.1108/EUM0000000005521>



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**СТРАТЕГИЯ ОПТИМИЗАЦИИ СИСТЕМЫ УПРАВЛЕНИЯ ПЕРСОНАЛА  
ДЛЯ ФОРМИРОВАНИЯ КОНКУРЕНТНЫХ ПРЕИМУЩЕСТВ ИННОВАЦИОННОГО  
АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА**

**STRATEGY OF OPTIMIZATION OF PERSONNEL MANAGEMENT SYSTEM  
FOR FORMATION OF COMPETITIVE ADVANTAGES OF INNOVATIVE AGRO-  
INDUSTRIAL COMPLEX**

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**АННОТАЦИЯ**

Актуальность приобретает проблема оптимизации системы управления персоналом и разработка стратегии ее формирования, которая является ключевой и приоритетной функцией субъектов аграрного бизнеса. В данной статье предлагается создание высокоэффективного подхода к управлению системой персоналом для формирования конкурентных преимуществ инновационного АПК. Новизна, состоит в возможности установления должностных окладов с одновременным сопоставлением производительности труда и оценки работников системы управления персоналом. При этом преимущество предлагаемой стратегии является возможность получать информацию об уровне профессионального развития работника, применение методики оценки управленческого персонала с учетом критериев оценки профессиональных знаний, умений и навыков, что позволит повысить эффективность и имидж организации.

**ABSTRACT**

The problem of optimizing the personnel management system and developing a strategy for its formation becomes a topicality, which is the key and priority function of agribusiness entities. This article proposes the creation of a highly effective approach to the management of personnel by the system in order to form the competitive advantages of an innovative agro-industrial complex. Novelty consists in the possibility of establishing official salaries with a simultaneous comparison of labor productivity and evaluation of employees in the personnel management system. At the same time, the advantage of the proposed strategy is the ability to receive information about the level of professional development of the employee, the application of the method of assessing management personnel, taking into account the criteria for assessing professional knowledge, skills and skills, which will improve the efficiency and image of the organization.

**КЛЮЧЕВЫЕ СЛОВА**

Аграрная экономика, имидж, инновации, оптимизация, персонал, сельское хозяйство, система управления персоналом, стратегия.

**KEY WORDS**

Agrarian economy, image, innovation, optimization, personnel, agriculture, human resources management system, strategy.

В условиях возобновления роста аграрной экономики и перехода ее на инновационный путь развития особую актуальность приобретает проблема оптимизации системы управления персоналом и разработка стратегии ее формирования. Целью создания высокоэффективного подхода к управлению системой персоналом является повышение адекватности качеств рабочей силы, обеспечение

развития работников и более эффективное использование их потенциала, расширение кругозора и повышение удовлетворенности трудом, обеспечение продвижения по службе за счет внутреннего рынка труда воспроизводства кадров, острый дефицит которых ощущают многие сельскохозяйственные организации. Достижению этого может способствовать разработка и оптимизация системы управления персоналом, подлежащая реализации на практике. Все это предопределило актуальность научной статьи.

Инновационные процессы, позволяющие вести непрерывное обновление производства на основе освоения достижений науки и техники или непрерывное совершенствование - естественная форма существования человеческой деятельности [5]. Важным звеном здесь должно стать подготовка конкурентоспособных кадров, научные исследования по актуальным вопросам [6] и создание эффективного механизма государственного регулирования [17] АПК. Говоря о необходимости перехода на инновационный путь развития, отметим, что инновационная деятельность на любом уровне хозяйственного управления, как крупных организаций, так и малых форм хозяйствования в агробизнесе требует финансовых вложений [7, 13], с последующим увеличением объемов производства и материальной заинтересованности работников в конечных результатах труда [11].

Остановившись на проблемах поддержания и повышения конкурентоспособности организаций АПК, стоит отметить, что данный показатель обеспечивает тот персонал, который заинтересован не только в достижении максимальных индивидуальных и коллективных результатов, но и в более полной реализации своего личного потенциала.

Изучив проблемы системы управления персоналом в одной из сельскохозяйственных организаций АПК, считаем, что менеджеру высшего звена следует концентрировать внимание на способах управления персоналом в двух аспектах: выявлении и оценке потребности в персонале и построении эффективной системы оплаты труда с целью оптимизации всей структуры затрат на персонал.

Таким образом, на подготовительном этапе разработки стратегии оптимизации системы управления персоналом необходимо определить потребности в персонале. В связи с этим при актуализации информации руководство организации предпринимает шаги по установлению контактов с будущими работниками. Первой ступенью является рассмотрение возможности привлечения персонала, существующие внутри самой организации. Соответственно, следующий шаг - установление контактов с требуемыми работниками производится и подбор соответствующих кандидатов. Предпосылкой для этого является анализ предъявляемых требований к вакантным должностям и квалификации претендентов, включая возможности роста персонала организации.

Таким образом, конечной целью подготовительного этапа стратегии оптимизации системы управления персоналом является определение потребности в персонале и установление его количества, необходимого для надежного выполнения своих должностных и профессиональных обязанностей.

Для эффективной работы и способности организации занимать прочные позиции в аграрном секторе экономики необходима системно выстроенная кадровая политика, в этой связи остановиться на анализе экономически активного населения региона (таблица 1).

За исследуемый период численность экономически активного населения снизилась на 3,3%, что естественно повлекло сокращение числа безработных. При этом у мужчин уровень экономической активности был выше, чем у женщин, соответственно выше как уровень занятости, так и безработицы.

Заметим, что количество вакансий появляющихся в аграрной сфере Орловской области растет год от года, в связи с ростом количества организаций и увеличением объемов производства. В соответствии с программой стратегии современного развития АПК до 2020 г. и порядка применения профессиональных стандартов, необходимо иметь представление общей картины профессиональной подготовки кадров сельского хозяйства на территории Орловской области. В связи со спецификой

сезонных работ аграрного сектора и постоянного изменения кадрового состава численность персонала меняется [9]. На рисунке 1 отображены доли вакансий отдельных видов деятельности в Орловской области в 2016 году. Так на производство приходится 20,3% вакансий в области, на втором месте торговля с долей в 14,3%.

Таблица 1 – Экономически активное население Орловской области в возрасте 15-72 лет

| Годы                 | Экономически активное население, тыс. чел. | из них: |             | Уровень, %               |           |             |
|----------------------|--|---------|-------------|--------------------------|-----------|-------------|
|                      |  | Занятые | Безработные | Экономической Активности | Занятости | Безработицы |
| всего                |  |         |             |                          |           |             |
| 2010                 | 397,8                                      | 362,3   | 35,5        | 64,5                     | 58,7      | 8,9         |
| 2011                 | 389,2                                      | 364,7   | 24,4        | 64,0                     | 60,0      | 6,3         |
| 2012                 | 391,1                                      | 370,2   | 20,9        | 65,1                     | 61,6      | 5,3         |
| 2013                 | 394,1                                      | 371,1   | 23,0        | 65,6                     | 61,8      | 5,8         |
| 2014                 | 388,3                                      | 368,3   | 20,0        | 65,6                     | 62,3      | 5,1         |
| 2015                 | 385,3                                      | 361,4   | 23,9        | 65,9                     | 61,8      | 6,2         |
| 2016                 | 384,5                                      | 359,8   | 24,7        | 66,5                     | 62,2      | 6,4         |
| в том числе: мужчины |  |         |             |                          |           |             |
| 2010                 | 199,3                                      | 177,2   | 22,1        | 69,9                     | 62,2      | 11,1        |
| 2011                 | 192,9                                      | 179,1   | 13,9        | 68,7                     | 63,7      | 7,2         |
| 2012                 | 195,6                                      | 182,7   | 12,9        | 70,4                     | 65,8      | 6,6         |
| 2013                 | 195,8                                      | 182,2   | 13,6        | 70,5                     | 65,6      | 6,9         |
| 2014                 | 195,6                                      | 185,1   | 10,8        | 71,6                     | 67,6      | 5,5         |
| 2015                 | 192,8                                      | 178,6   | 14,1        | 71,2                     | 66,0      | 7,3         |
| 2016                 | 195,5                                      | 179,6   | 15,9        | 73,0                     | 67,0      | 8,1         |
| в том числе женщины  |  |         |             |                          |           |             |
| 2010                 | 198,4                                      | 185,1   | 13,3        | 59,8                     | 55,7      | 6,7         |
| 2011                 | 196,2                                      | 185,7   | 10,5        | 60,0                     | 56,7      | 5,4         |
| 2013                 | 195,5                                      | 187,5   | 8,0         | 60,5                     | 58,0      | 4,1         |
| 2013                 | 198,3                                      | 188,9   | 9,4         | 61,4                     | 58,5      | 4,7         |
| 2014                 | 192,4                                      | 183,2   | 9,1         | 60,5                     | 57,6      | 4,7         |
| 2015                 | 192,5                                      | 182,8   | 9,7         | 61,3                     | 58,2      | 5,0         |
| 2016                 | 189,0                                      | 180,2   | 8,9         | 60,9                     | 58,1      | 4,7         |



Рисунок 1 – Распределение доли вакансий по видам деятельности в Орловской области в 2016 году

Сельское хозяйство по уровню вакантных мест для набора персонала находится на 3 месте, что говорит о недостаточной обеспеченности данной отрасли персоналом, а как следствие растущими возможностями организаций к повышению производительности труда более высокими темпами. Немаловажно выявить потребность, но вначале проведем анализ среднегодовой численности занятых в сельском хозяйстве Орловской области (рисунок 2).

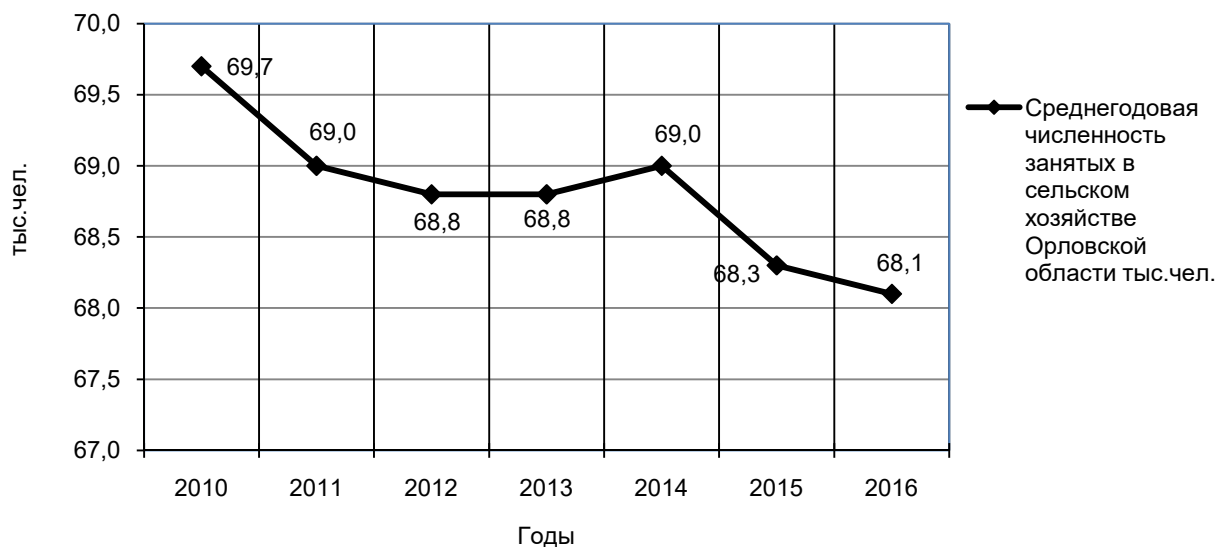


Рисунок 2 – Среднегодовая численность занятых в сельском хозяйстве Орловской области [14]

Тенденция к развитию сельского хозяйства повышается, а следовательно с ней происходит увеличение конкуренции в аграрной сфере экономики, к этому приводит и потребность в качественном составе персонала организаций. Нестабильность экономической ситуации приводит к потребности максимального увеличения внимания к качеству выпускаемой продукции, а для этого необходимы высококвалифицированные специалисты, способные максимально быстро и эффективно реагировать на изменения. Поэтому увеличивается тенденция и потребности подготовки таких специалистов.

В связи с не стабильной экономической ситуацией в стране в целом и по региону воспроизводство кадров резко снизилось. Этот скачек связан с сокращением рабочих мест, в сфере аграрного и промышленного сектора, а так же с закрытием дополнительных мест, потребность в которых была вызвана сезонными работами (рисунок 3).

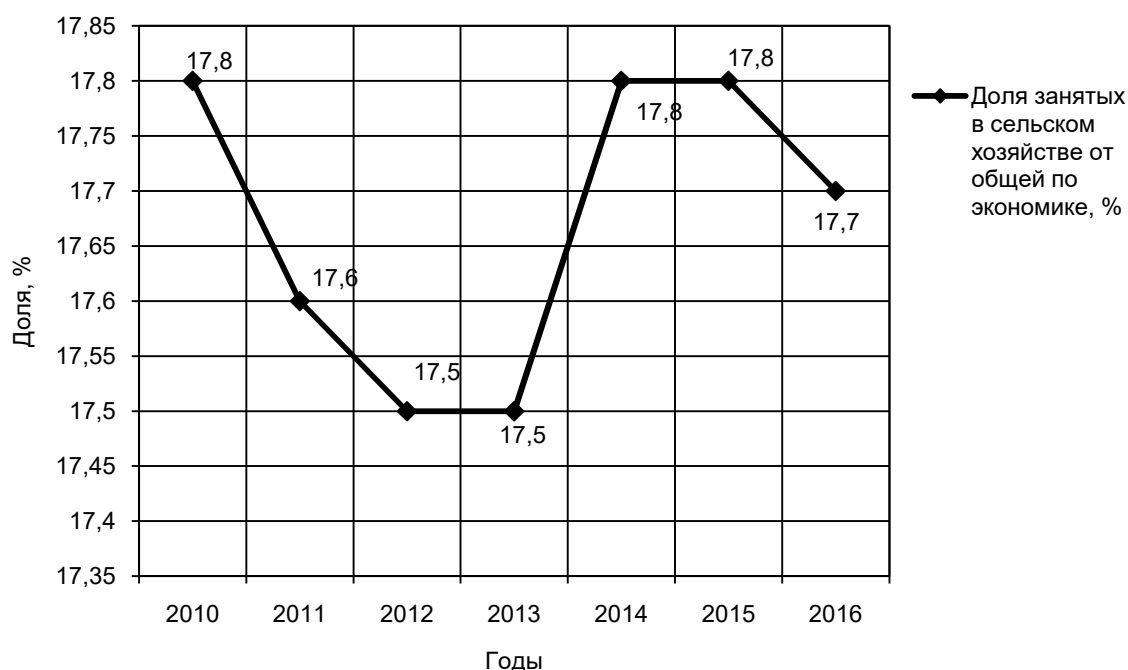


Рисунок 3 – Доля занятых в сельском хозяйстве от общего числа по экономике [14]

И так, численность занятых в сельском хозяйстве Орловской области имеет тенденцию на снижение, что обуславливает необходимость качественного улучшения состава сотрудников, однако в процентном отношении к общему числу занятых мы видим относительно небольшие изменения, что говорит так же о снижении общего числа занятых в экономике Орловской области.

На наш взгляд, для достижения стратегических целей в контексте привлечения и удержания ценных претендентов на должность необходимо построение эффективной системы оплаты труда. Изучив теоретические подходы различных авторов к формулированию основных принципов, на которые опирается система оплаты труда: соответствие целей оплаты труда целям организации; учет мотивационных факторов, ожиданий, потребностей персонала; выявление и устранение демотивирующих факторов; понятность и прозрачность системы вознаграждения; справедливость системы оплаты труда; вознаграждение за индивидуальные и коллективные результаты; своевременность выплаты вознаграждения; вовлеченность персонала в проведение изменений; учет этапа жизненного цикла организации; соответствие системы компенсации корпоративной культуре, считаем необходимым совершенствовать систему затрат на персонал по следующим позициям: оптимизировать формирование постоянной части заработной платы; скорректировать формирование переменной части заработной платы; оценить изменение дополнительных затрат при изменении основных затрат на персонал.

Следовательно, для того чтобы добиться внутренней справедливости в системе оплаты труда в организации необходима корректировка постоянной части заработной платы с учетом ценности занимаемой должности и ее влияния на эффективность работы.

Среднемесячная заработная плата в целом по экономике на конец 2015 года составляет 34029,5 руб., что выше, чем в строительстве (29960 руб.) и сельском хозяйстве (19721,1 руб.), это говорит о низком уровне заработной платы в данных видах экономической деятельности и возможных перспективах роста. Среднемесячная заработная плата в целом по экономике на конец 2015 года составляет 34029,5 руб., что выше, чем в строительстве (29960 руб.) и сельском хозяйстве (19721,1 руб.), это говорит о низком уровне заработной платы в данных видах экономической деятельности и возможных перспективах роста.

Для сравнения показателей региона по данным критериям оценки необходимо представить информацию о среднемесячной начисленной заработной плате по некоторым видам экономической деятельности в Орловской области.

Таблица 2 – Среднемесячная номинальная начисленная заработная плата работников по видам экономической деятельности в Орловской области, руб. [12]

| Показатель              | Годы    |         |         |         |         |         | Январь-август 2017 |
|-------------------------|---------|---------|---------|---------|---------|---------|--------------------|
|                         | 2010    | 2011    | 2012    | 2013    | 2014    | 2015    |                    |
| В среднем по экономике  | 13174,2 | 14528,6 | 16888,0 | 19272,5 | 20885,0 | 21772,1 | 23863              |
| Транспорт и связь       | 17096,6 | 19651,5 | 21579,7 | 23471,4 | 24252,9 | 25409,8 | 27532,6            |
| Строительство           | 15624,5 | 16133,5 | 19625,9 | 22205,6 | 23234,4 | 22335,1 | 20549              |
| Финансовая деятельность | 30723,7 | 31434,4 | 36603,5 | 36538,6 | 40899,5 | 40362,1 | 42639              |
| Химическое производство | 15409,0 | 20854,2 | 25143,4 | 28334,1 | 34106,3 | 35614,1 | 37981,7            |
| Сельское хозяйство      | 9661,6  | 11684,5 | 13395,2 | 15005,1 | 17483,9 | 20003,8 | 24061              |

Следовательно, из приведенных видов экономической деятельности, сельское хозяйство занимает последнее место по среднемесячной номинальной начисленной заработной плате работников и данный показатель ниже уровня в целом по экономике, что говорит о низком уровне оплаты труда работников сельского хозяйства в регионе.

Считаем, что в целях оптимизации системы управления персоналом необходимо

сконцентрировать внимание на выполнение следующих условий: заинтересованность и поддержка со стороны руководства; наличие специалистов, реализующих данную систему; разработка документов, регламентирующих оценочную деятельность; своевременное информирование, заинтересованность и мотивация персонала; соотношение результатов оценки с системой оплаты; возможность карьерного роста. При этом, оптимизация способов стимулирования персонала должна быть направлена на достижение стратегических целей организации: формирование высокого профессионализма и культуры управленческих и технологических процессов, достижение укомплектованности высокопрофессиональным персоналом, с возможностью использования интеллектуально-кадрового потенциала, его сохранение и приумножение, что позволит обеспечить переход экономики региональной экономической системы в режим устойчивого экономического роста [10]. Также немаловажным является создание благоприятных условий и гарантий для проявления каждым работником его способностей, реализации позитивных интересов и личных планов, всемерного стимулирования его профессионального роста и служебного продвижения, повышения эффективности трудовой деятельности.

Заметим, что для многих сельскохозяйственных организаций приоритетными направлениями оптимизации системы управления персоналом являются: формирование эффективного механизма отбора кадрового состава и работы с ним; повышение престижа организации; совершенствование программ подготовки и профессионального развития персонала; оптимизация способов оценки персонала [15].

Выработка критериев оценки представляет собой процесс выбора системы факторов, повлиявших на достижение целей (т. е. важнейших для той или иной должности умений, навыков, знаний, других профессиональных характеристик самого работника) с точки зрения того, как они повлияли на деятельность работника и отразились на ее результатах в данный период времени. Причем оцениваются не возможности (потенциал) работника, а реальные проявления этих профессиональных качеств на отрезке времени, рассматриваемом в ходе оценки с учетом возможности совершенствования системы взаимодействия, как важнейшей составляющей устойчивого развития организаций АПК [16].

Стратегия оптимизации системы управления персоналом для формирования конкурентных преимуществ инновационного АПК требует первоначально тщательно сформировать систему критериев оценки и только тогда по мере необходимости проводить ее корректировки. Для достижения этой цели необходимо отобрать критерии, наиболее значимые и в большей мере отражающие всю совокупность требований, предъявляемых к конкретной должности. Профессиональная структура персонала определяется составом и соотношением профессиональных групп специалистов и рабочих [4].

Изучив теоретические подходы оптимизации системы управления персоналом, заметим, что система оценки, может исходить из бальных критериев (таблица 3).

По результатам полугодовой оценки может быть принято решение о том, что сотрудник будет продолжать развитие в соответствии с целями по развитию, определенными после Ежегодной оценки эффективности деятельности. В этом случае дополнительные цели по развитию не ставятся. Результаты исследования качеств персонала представлены в таблице 4.

Высокий уровень заработной платы может оказать благотворное влияние на экономику в целом, обеспечивая высокий спрос на товары и услуги. И, наконец, высокая оплата труда стимулирует усилия руководителей предприятий рачительно использовать рабочую силу, модернизировать производство [3, 16]. Следовательно, посредством разработанной системы оценки персонала можно оценить качество работников, их профессиональный уровень, имеющие возможности, пределы развития их деятельности. Используя новые критерии оценки работников и кандидатов на вакантные должности можно выявить качественные характеристики соискателей на первой ступени - найме персонала, отсеять тех, чьи качества не подходят для работы,

выявить наиболее перспективных соискателей. Кроме этого руководству организации можно порекомендовать провести сплошную оценку персонала как уже работающего, так и тех, кто только ищет работу, конечно, это займет достаточно много времени, но таким образом организация сможет выявить причины снижения темпов развития, что в настоящий момент особенно актуально для сельскохозяйственных организаций для формирования субъектами агробизнеса конкурентных преимуществ и повышения конкурентоспособности [2].

Таблица 3 - Оценка профессиональных знаний, умений и навыков работников системы управления персоналом

| Действия   | Полугодовая оценка                       | Ежегодная оценка |
|--|--|------------------|
|  | «+»- присутствует                        | «-»- отсутствует |
| Оценка результатов работы (на основе выполнения Бонусных планов)             | +  | +                |
| Оценка компетенций   | -  | +                |
| Рекомендация в Кадровый резерв   | -  | +                |
| Определение целей по развитию  | +  | +                |
| Оценка уровня достижения целей по развитию                                   | +  | +                |
| Учет уровня выполнения целей по развитию в выставлении оценки                | +  | +                |
| Выставление оценки   | +  | +                |
| Проведение личной встречи по оценке, обратная связь                          | +  | +                |
| По результатам оценки может быть пересмотрена заработная плата               | -  | +                |
| Оценка директоров по показателям «Индекс вовлеченности» и «Качество команды» | + (не включено в расчет итоговой оценки) | +                |

Таблица 4 – Оценка профессиональных знаний, умений и навыков работников в сельскохозяйственной организации

| Должность  | Профессиональные знания | Профессиональные умения и навыки | Способности к накоплению и обновлению профессионального опыта | Степень реализации опыта на занимаемой должности | Способности к творческому применению профессионального опыта | Итого средняя балльная оценка |
|--|-------------------------|----------------------------------|---|--|--|-------------------------------|
| Генеральный директор                                   | 5                       | 4,5                              | 4,5   | 5  | 4,5  | 4,7                           |
| Заместитель руководителя системы управления персоналом | 5                       | 5                                | 5   | 5  | 5  | 5                             |
| Главный бухгалтер                                      | 4                       | 4,5                              | 4,5   | 4,5  | 2  | 3,9                           |
| Менеджер по продажам                                   | 3,5                     | 2,5                              | 3   | 3,5  | 2  | 2,9                           |
| Бухгалтер  | 3                       | 4                                | 3   | 3,5  | 4  | 3,5                           |
| Главный агроном  | 4,5                     | 4,5                              | 5   | 5  | 4  | 4,6                           |
| Главный инженер  | 4,5                     | 3,5                              | 3,5   | 4  | 3,5  | 3,8                           |
| Экономист  | 4                       | 3,5                              | 4,5   | 4  | 4  | 4                             |
| Техник   | 4,5                     | 4                                | 4   | 4  | 3  | 3,9                           |
| Инспектор по кадрам                                    | 4                       | 4,5                              | 4,5   | 4,5  | 2  | 3,9                           |

Современные преобразования в аграрной экономике в качестве важнейшей выдвигают проблему обеспечения сельскохозяйственных организаций квалифицированными кадрами [8]. Таким образом можно оптимизировать затраты на персонал – постоянную часть заработной платы (таблица 5).

Подводя итог, отметим, что после оценке персонала оклады необходимо скорректировать. Общее изменение составит 15,7 %. Предположим, что процент изменения не изменится и весь тарифный фонд оплаты труда и объем премий также

изменим на 15,7%. При этом экономическая эффективность будет выражаться в снижении доли общих затрат на оплату труда в себестоимости произведенной продукции и повышении рентабельности производства.

Таблица 5 – Оптимизация постоянной части заработной платы работников управления персоналом с учетом критериев оценка профессиональных знаний, умений и навыков

| Должность  | Производительность, % | Оклад по штатному расписанию, руб. | Оптимизированный оклад, руб. | Изменение, % |
|--|-----------------------|------------------------------------|------------------------------|--------------|
| Генеральный директор                                   | 94                    | 65000                              | 61100                        | 6,0          |
| Заместитель руководителя системы управления персоналом | 100                   | 45000                              | 45000                        | 0,0          |
| Главный бухгалтер                                      | 78                    | 35000                              | 27300                        | 22,0         |
| Менеджер по продажам                                   | 58                    | 19000                              | 11020                        | 42,0         |
| Бухгалтер  | 70                    | 23000                              | 16100                        | 30,0         |
| Главный агроном  | 92                    | 42000                              | 38640                        | 8,0          |
| Главный инженер  | 76                    | 37000                              | 28120                        | 24,0         |
| Экономист  | 80                    | 19000                              | 15200                        | 20,0         |
| Техник   | 78                    | 18000                              | 14040                        | 22,0         |
| Инспектор по кадрам                                    | 78                    | 16000                              | 12480                        | 22,0         |
| Затраты на основную оплату труда (тарифный ФОТ)        |                       | 3828                               | 3228                         | 15,7         |

При этом конкретные размеры окладов этих специалистов могут определяться по коэффициентам относительно гарантированного минимума руководителей хозяйств.

Проведем прогнозирование уровня доходов в целом по экономике и в сельскохозяйственных организациях Орловской области.

Одним из способов является регрессионный анализ с помощью линии тренда. С помощью данного метода и произведем прогноз уровней доходов работников.

Различают тенденцию роста, снижения и стабилизации. Рассмотрим методику прогноза заработной платы работников на перспективу, основываясь на фактических данных за ряд лет. Прогнозирование уровней доходов работников в зависимости от выполняемой деятельности были представлены нами в таблице 6.

Таблица 6 – Определение тренда среднемесячного заработка работников экономики Орловской области

| Годы (X) | Среднемесячный заработок, руб. (Y) | Произведение показателей (XY) | Квадрат года (X <sup>2</sup> ) | Выравнивание заработка (a+bx) |
|----------|------------------------------------|-------------------------------|--------------------------------|-------------------------------|
| 1        | 20885,0                            | 20885,0                       | 1                              | 20724,9+724,25 *1=21449,15    |
| 2        | 21772,1                            | 43544,2                       | 4                              | 20724,9+724,25 *2=22173,4     |
| 3        | 23863,0                            | 71508,0                       | 9                              | 20724,9+724,25 *3=22897,65    |
| 6        | 66520,1                            | 135937,2                      | 16                             | 66520,2                       |

Как видно из таблицы 6 среднемесячный заработок работников изменяется за анализируемый период более-менее равномерно.

Следовательно, формой тренда может служить уравнение прямой линии:

$$Y(t)=a+bt \quad (1)$$

где Y(t) – выровненные (теоретические) уровни среднемесячной платы, руб.; a - средний заработок за период, руб.; b -среднегодовой абсолютный прирост, руб.; t - обозначение времени.

Показатель «b» рассчитывается по формуле:

$$b = \frac{n \cdot \sum xy - \sum y \cdot \sum x}{n \cdot \sum x^2 - \sum x \cdot \sum x} \quad (2)$$



Расчеты показывают, что для работников сельскохозяйственных организаций уравнение тренда имеет вид:

$$y=14998,3 + 1249,7x$$

Тренд среднемесячного заработка работников сельского хозяйства в представлен в таблице 7.

Таблица 7 - Определение тренда среднемесячного заработка работников сельскохозяйственных организаций Орловской области

| Годы (X) | Среднемесячный заработок, руб. (Y) | Произведение показателей (XY) | Квадрат года (X <sup>2</sup> ) | Выравнивание заработка (a+bx) |
|----------|------------------------------------|-------------------------------|--------------------------------|-------------------------------|
| 1        | 17483,9                            | 17483,9                       | 1                              | 18872                         |
| 2        | 20003,8                            | 40007,6                       | 4                              | 20516,3                       |
| 3        | 24061,0                            | 72183,0                       | 9                              | 22160,6                       |
| 6        | 61548,7                            | 129674,5                      | 16                             | 61548,9                       |

Так, к концу году ожидаемый заработок работников экономики должен незначительно сократиться и составить 21449,15 рублей, в 2018 г. – 22173,4 рублей. Заметим, что в 2017 г. среднедушевые денежные доходы населения Орловской области за январь-август 2017 г. составили 22675 руб. Среднемесячная заработная плата работников в целом по экономике в 2019 г. предполагает остаться на прежнем уровне. Ожидаемый заработок работников сельского хозяйства в 2017 г. по предварительным прогнозам также сократится. Среднемесячная заработная плата работников, занятых в сельском хозяйстве за январь-август 2017 г. составила 24,1 тыс. руб.

Следовательно, была выявлена необходимость корректировки окладов управленческого персонала, увязав их с производительностью труда. Кроме этого для того, чтобы система экономических стимулов за результаты работы была действительно эффективной, управленческий персонал должен не только точно знать, за что он получает надбавки или премии, но и причины по которым возникает разница в окладах. В этой связи доказана необходимость формирования новой, учитывающей сложившиеся в регионе экономические и социальные условия [1].

Стратегия оптимизации системы управления персоналом для формирования конкурентных преимуществ инновационного АПК позволит организациям стимулировать работу персонала при установлении справедливого соотношения между количеством и качеством труда и денежным содержанием работника. При этом преимуществом предлагаемой стратегии является возможность получать информацию об уровне профессионального развития работника, применение методики оценки управленческого персонала с учетом критериев оценки профессиональных знаний, умений и навыков, что позволит повысить эффективность и имидж организации.

## БИБЛИОГРАФИЯ

1. Бураева Е.В., Гришаева О.Ю. Система обеспечения сельского хозяйства кадровым потенциалом: основные направления совершенствования // Национальные интересы: приоритеты и безопасность. 2013. №27. С. 53-61.
2. Грудкина Т.И. Формирование субъектами агробизнеса конкурентных преимуществ на основе инноваций: региональный опыт, стратегия // Креативная экономика. 2014. №10(94). С. 22-31.
3. Ефремова Н.А. Реформирование заработной платы как фактор роста благосостояния работников АПК // В сборнике: Государственное регулирование территориального развития и региональных экономических систем 2003. С. 90-91.

4. Кравченко Т.С., Сухочева Н.А., Суровцева Е.С. Учебно-методическое пособие по разработке бизнес-планов в отраслях сельского хозяйства / учебно-методическое пособие //Орел, 2015. – 270 с.
5. Кравченко Т.С. Стратегические направления развития инновационной деятельности в отрасли растениеводства // Региональная экономика: теория и практика. 2014. №21. С. 46-57
6. Кравченко Т.С. Перспективы малого агробизнеса в современном секторе экономики // Аграрная Россия. 2014. №5. С. 27-30.
7. Кравченко Т.С., Сухочева Н.А. Инновационные процессы в контексте обеспечения агропродовольственной безопасности // Вестник АПК Ставрополя. 2017. №2(26). С. 218-224
8. Ловчикова Е.И. Анализ состояния использования трудовых ресурсов села как основы обеспечения сельского хозяйства квалифицированными кадрами // Вестник Орловского государственного аграрного университета. 2012. Т.38. №5. С.85-89.
9. Орлова Е.А., Сухочева Н.А. Анализ необходимости подготовки кадров к инновационному развитию АПК // Сборник Инновационная наука: прошлое, настоящее, будущее: сборник статей международной научно-практической конференции: в 5 частях. 2016. С. 123-125.
10. Осипов А.Э. Сухачева Н.А. Механизм формирования взаимоотношений субъектов региональных экономических систем инвесторов // Инновационный Вестник Регион. 2011. №4. С. 26-32.
11. Рыбалко Т.С. Эффективные инновационные технологии производства продукции растениеводства в Орловской области // Современные проблемы науки и образования. 2007. №4. С. 13
12. Сельское хозяйство, охота и лесное хозяйство. Официальный сайт Федеральной службы государственной статистики [электронный ресурс]. Режим доступа:[http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/enterprise/economy](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/economy).
13. Суровцева Е.С., Кравченко Т.С. Оценка современного состояния и тенденции развития крестьянских (фермерских) хозяйств Орловской области в условиях формирования инновационного сельского хозяйства // Экономический анализ: теория и практика. 2017. Т. 16. №4 (463). С. 622-636
14. Суровцева Е.С., Сухочева Н.А. Бизнес-планирование развития К(Ф)Х на грантовой основе // Экономика сельского хозяйства России. 2017. №7. С.12-19.
15. Турчинов А.И. Управление персоналом. Учебник. Изд. 2-е, доп. и перераб.- М.: Изд-во РАГС, 2009. - 488 с.
16. Шестаков Р.Б. Институциональные особенности взаимодействия малого и крупного бизнеса в современных условиях //Вестник Орловского государственного университета. Серия: Новые гуманитарные исследования. 2013. №2 (31). С. 214-217.
17. Kravchenko T.S., Volchyonkova A.S., Esina Y.V. Small business development as a factor of higher competitiveness of agricultural production // Вестник Орловского государственного аграрного университета. 2014. Т. 49. №4. С. 74-82.
18. Suhocheva N.A., Plygun S.A., Glinushkin A.P. Forming the price policy of marketable rape grain considering the market of oil and fat products» / N.A. Suhocheva, S.A. Plygun, A.P. Glinushkin // Вестник Орловского государственного аграрного университета. - 2014. Т. 49. №4. - С. 83-89.

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**МЕТОДИЧЕСКИЕ АСПЕКТЫ СИСТЕМАТИЗАЦИИ ИНВЕСТИЦИОННЫХ ПРОЕКТОВ  
РАЗВИТИЯ РЫБОХОЗЯЙСТВЕННОЙ ДЕЯТЕЛЬНОСТИ**  
METHODICAL ASPECTS OF THE SYSTEMATIZATION OF INVESTMENT PROJECTS  
FOR THE DEVELOPMENT OF FISHERIES MANAGEMENT

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**АННОТАЦИЯ**

В России активно применяется государственно-индикативный экономический механизм управления рыбохозяйственной деятельностью. Анализ показывает, что эффективность развития отрасли отстает от задаваемых индикаторов. Первым шагом по преодолению такого негативного явления может стать масштабная систематизация проектов инвестиционного развития. В работе разработаны методические аспекты данного процесса. Идентифицированы принципы систематизации. Определены критерии классификации проектов на всех уровнях государственного управления. Названы положительные результаты от систематизации. В частности, указано о возможности в режиме реального времени соотносить направления расходования инвестиционных средств, увязывать планы развития на уровне федерации, субъекта и предпринимательства.

**ABSTRACT**

In Russia, the state-indicative economic mechanism of fishery management is actively used. The analysis shows that the efficiency of the industry development lags behind the given indicators. The first step to overcome such a negative phenomenon can be a large-scale systematization of investment development projects. The methodical aspects of this process have been developed. The principles of systematization have been identified. Criteria for the classification of projects at all levels of government have been determined. Positive results from systematization are named. In particular, it is indicated about the possibility in real time to correlate the directions of spending of investment funds, to link development plans at the level of the federation, subject and entrepreneurship.

**КЛЮЧЕВЫЕ СЛОВА**

Россия, рыбохозяйственная деятельность, государственно-индикативный механизм управления, систематизация, проекты, принципы систематизации, критерии.

**KEY WORDS**

Russia, fishery activity, state-indicative management mechanism, systematization, projects, principles of systematization, criteria.

Мировой практикой доказано, что рыбное хозяйство в системе рыночных отношений не может самостоятельно обеспечить стабильный экономический рост. Значительное количество участников рынка, сезонность производства, капиталоемкий

характер деятельности, влияние неблагоприятных природно-климатических условий, медленный оборот капитала делают необходимым постоянное регулирование рыбохозяйственных предпринимательских структур со стороны государства в целях обеспечения их устойчивости. В нашей стране государственная поддержка также воспринимается обществом как естественная компенсация неизбежных потерь отрасли.

Одним из направлений государственно-индикативного экономического механизма управления отраслью являются разработка ориентированных комплексных программ развития рыбохозяйственной деятельности (РХД) на национальном и региональном уровнях. Так, в рамках федеральной целевой программы «Стратегия развития рыбохозяйственного комплекса до 2020 года» предусмотрена реализация большого количества разнонаправленных инвестиционных проектов [1]. Основные направления инвестиционных программных вложений - это наполнение сырьевой базы путем строительства и реконструкции заводов по воспроизводству ВБР, строительства научных центров по созданию технологий аква- и марикультуры, строительства научных судов для исследований запасов в Мировом океане; создание инфраструктуры приемы уловов водных биоресурсов путем строительства и реконструкции портовых сооружений федеральной собственности; а также научные исследования и разработки в рыбохозяйственной сфере [1].

Современный этап развития системы государственной поддержки РХД в рамках реализации Стратегии развития рыбохозяйственного комплекса до 2020 года характеризуется следующими положительными результатами [2]:

- достижение рекордного вылова в 4,8 млн. тонн по результатам 2016 года;
- в условиях кризиса были удержаны положительные темпы роста экономических показателей отрасли – валового оборота, налоговых поступлений, вклада в ВВП РФ;
- практически полное искоренение браконьерства в наиболее ценных видах водных биологических ресурсов (ВБР);
- выполнение предписания доктрины продовольственной безопасности по обеспечению доли собственной рыбной продукции на рынке РФ не менее 80%.

В июне 2017 года на заседании Комиссии правительства Российской Федерации по вопросам развития рыбохозяйственного комплекса была представлена новая прорывная стратегия развития рыбохозяйственного комплекса России до 2030 года, разработанная Росрыболовством. В условиях новых угроз со стороны глобальной политики, торговых ограничений и рыночных барьеров, борьбы за природные ресурсы, достижения «потолка» добычи и растущего предложения аквакультуры, новая Стратегия включает пять масштабных комплексных инвестиционных программ, реализация которых потребует свыше 600 млрд рублей частных инвестиций в период 2018-2025 годов.

Вместе с тем на федеральном уровне реализуются и другие неотраслевые федеральные целевые программы (ФЦП), которые в числе иных специфических задач предусматривают развитие РХД в отдельных регионах и аспектах (это касается двух программ «Развитие водохозяйственного комплекса РФ в 2012-2020 годах», ФЦП «Экономическое и социальное развитие Дальнего Востока и Байкальского региона на период до 2018 года») [3, 4].

Помимо проектов, включенных в программу, существует дополнительное количество инвестиционных решений, которые выполняются вне программных мероприятий, исключительно частными инвесторами.

Несмотря на то что развитие РХД носит системообразующий характер для экономики Приморского края, а также Дальнего Востока и Российской Федерации (экспортные поставки свежемороженой рыбы являются одной из существенных статей экспорта), единой региональной или национальной системы агрегирования предлагаемых к реализации и/или уже реализуемых проектов не существует.

Конечно, при стопроцентной самостоятельности хозяйственных субъектов в условиях рыночной экономики создание такой систематизированной базы данных скорее всего невозможно. Вместе с тем она могла бы быть создана для

разноуровневых инвестиционных проектов развития рыбохозяйственной деятельности в масштабах всей страны.

Цель работы – разработка методических аспектов систематизации инвестиционных проектов РХД как для федерального, так и для регионального уровней.

Необходимость систематизации инвестиционных проектов РХД, на наш взгляд, обусловлена следующими причинами:

- консолидация инвестиционных проектов позволит в последующем оценить объем и направления ресурсов в РХД, что в итоге даст понимание, какие направления развития уже получили достаточную поддержку, какому аспекту развития требуются дополнительные средства;
- необходимость увязки целей, задач и критериев процессов государственного, регионального и частного инвестирования в РХД;
- систематизация дает основания для последующей публично-профессиональной оценки и сопоставления эффективности проектов;
- изменение макроэкономической ситуации и условий развития финансовой и бюджетной системы зачастую порождает необходимость корректировки инвестиционной программы как на государственном (федеральном и региональном), так и на корпоративном уровне.

Систематизация инвестиционных проектов РХД как для федерального, так и для регионального уровня управления может быть выполнена на основе следующих принципов [5]:

- значимость (система должна основываться на той информации, которая определяет принятие объективного управленческого решения, влияет на его скорость, соотносится с базовыми стратегическими установками развития комплекса в масштабах региона или всего национального межотраслевого комплекса);
- полнота (завершенность круга показателей);
- достоверность (адекватное отражение реального состояния и результатов инвестиционной деятельности);
- своевременность (соответствует информационной потребности лиц, принимающих решения);
- понятность (простота построения, соответствие определенным стандартам представления информации, доступность в использовании);
- релевантность (определяется достаточно высокой степенью использования формируемой информации в процессе управления реализацией инвестиционных проектов);
- сопоставимость (определяет возможность сравнительной оценки хода и результатов реализации проектов);
- эффективность (затраты на привлечение и получение показателей не должны превышать эффектов, получаемых в результате их использования).

Признаки и критерии, на основе которых может быть основана систематизация проектов развития РХД, должны перекликаться с критериями, которые представлены на рисунке 1.

Вместе с тем каждый критерий классификации должен быть дополнен государственным пониманием целесообразности претворения в жизнь инвестиционного проекта, так как государственные органы несут ответственность не столько за реализацию отдельного проекта, сколько за увязанную по целям и задачам программу развития РХД. Специфика программно-целевого метода, применяемого на государственном уровне, состоит в комплексном решении задач рыбного хозяйства.

Таким образом, в основу систематизации могут быть положены критерии влияния на достижение стратегической цели или отдельных задач (блоков) программы, а также территориальной принадлежности инвестиционного проекта: рыбохозяйственная деятельность не относится к числу локально концентрированных, что характерно для

национального уровня, но даже в условиях Приморского края территориальная схема размещения производительных сил выглядит достаточно «пёстро» [6, 7].

На наш взгляд, также целесообразно в качестве одного из дополнительных критериев систематизации указывать вид собственности, к которой принадлежит организация, реализующая проект [8].

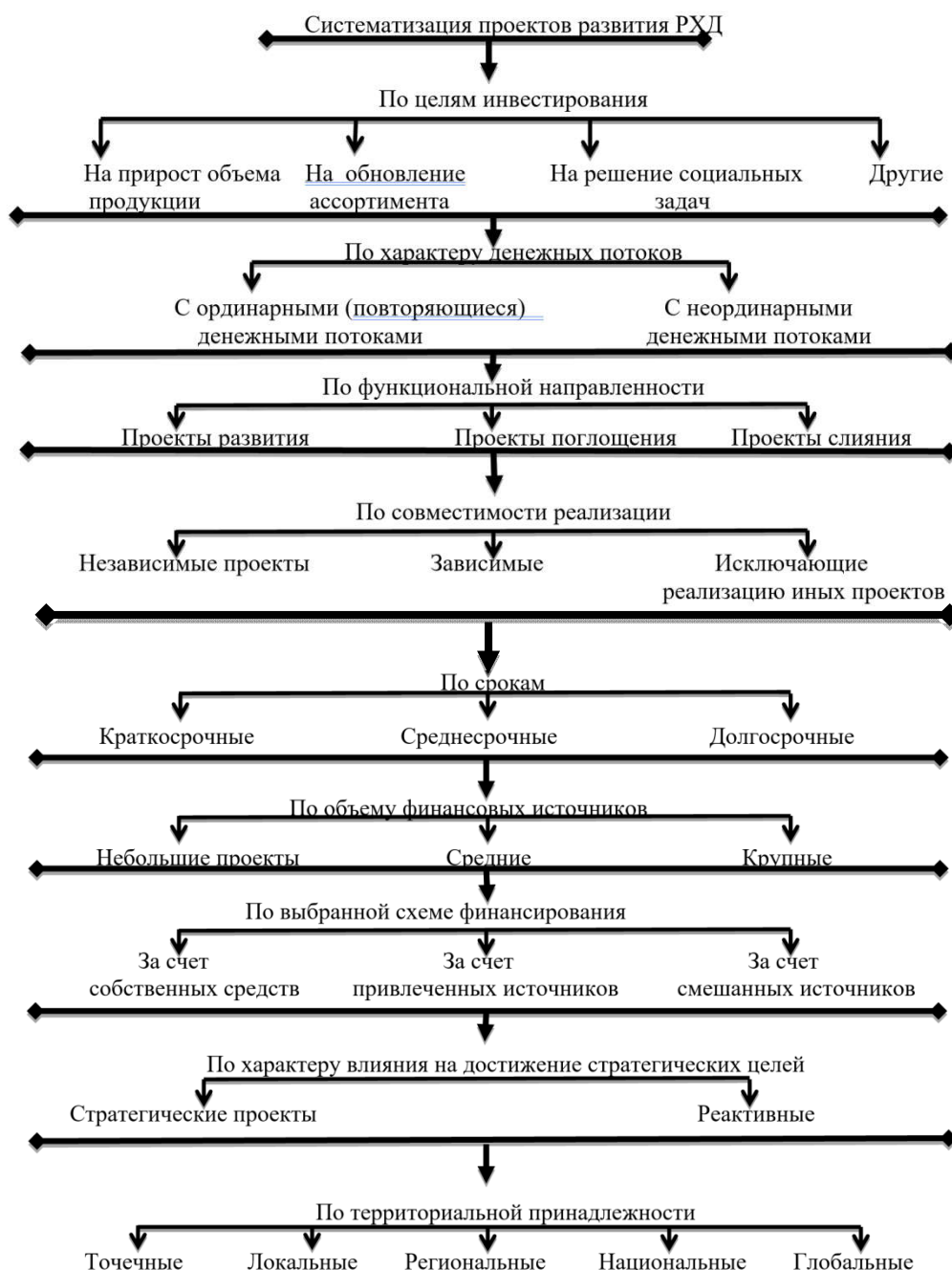


Рисунок 1 – Систематизация проектов развития в РХД

Выше мы в основном коснулись «выгод» от систематизации инвестиционных проектов РХД для нужд государственного управления. Эффективность использования такой систематизированной базы данных для корпоративного сектора и сектора малого и среднего бизнеса заключается в том, что предприниматели в публичном доступе будут видеть ту систему целей, которую задают государственные органы с целью развития отрасли и региона, и систему уже реализуемых проектов. На этой

основе предпринимательский сектор сможет гораздо быстрее встроиться в реализацию единой государственной политики.

Систематизация проектов на государственном и региональном уровне должна формироваться по единым принципам и критериям, это вызвано как принципом сопоставимости отражения информации, так и общими экономическими и бюджетными подходами к управлению финансами, экономической деятельностью. Такой единый общегосударственный подход в последующем позволит в короткие сроки проводить оценку эффективности инвестиционных проектов.

В связи с тем, что систематизация будет проводиться с включением проектов государственного сектора, применение к ней критериев эффективности инвестиционных проектов, стандартно применяемых к инвестпроектам предпринимательского сектора, не даст всей полноты картины.

В связи с этим всякий проект характеризуется несколькими видами показателей (интегральные показатели, показатели, связанные с потоком и балансом наличности и т.д.). В каждый из видов показателей могут входить несколько конкретных показателей. Некоторые из них дополняют друг друга, другие (например, различные интегральные показатели) в известной степени независимы. Показатели, относящиеся к разным видам, также могут образовывать различные сочетания.

Нередко для отбора вариантов проекта и принятия решения о его осуществлении приходится использовать экспертные (неформальные) процедуры для учета значений всех факторов и их взаимосвязей.

В целом же следует составить комбинированную шкалу оценки с включением следующих характеристик:

- общественная значимость проекта;
- соответствие целям и задачам инвестора;
- соответствие финансовым возможностям инвестора;
- соответствие организационным возможностям инвестора;
- рыночный потенциал создаваемого продукта;
- период окупаемости проекта;
- прибыль;
- уровень риска;
- экологичность и безопасность проекта;
- соответствие законодательству;
- влияние на имидж инвестора.

Можно использовать в качестве критерия некоторую свертку показателей по этим приоритетам.

*Заключение.* Сегодня существует несколько «разрывов» в части управления инвестиционным процессом РХД, несмотря на достаточные инвестиционные и финансовые расходы эффективность развития отстает от задаваемых критериев. Первым шагом по преодолению такого негативного явления может стать масштабная систематизация проектов инвестиционного развития РХД. Это позволит в режиме реального времени соотносить направления расходования инвестиционных средств, эффективность достижения поставленных стратегических задач, учесть весь объем ресурсов в РХД, увязать планы развития на уровне федерации, субъекта и предпринимательства. В итоге будет получен действительно комплексный синергетический эффект в управлении.

## **БИБЛИОГРАФИЯ**

1. Приказ Федерального агентства по рыболовству от 30.03.2009 № 246 «Об утверждении Стратегии развития рыбохозяйственного комплекса Российской Федерации на период до 2020 года» [Электронный ресурс]– Режим доступа: <http://npb.fishcom.ru/>
2. Шестаков И.В. Стратегия развития рыбохозяйственного комплекса до 2030 года –

- новые вызовы и возможности [Электронный ресурс]/ Доклад на панельной сессии Международного рыбопромышленного форума (Санкт-Петербург, 14-16 сентября 2017 г.) – Режим доступа: [ <http://fish.gov.ru/press-tsentr/vystavki-i-konferentsii>
3. Федеральная целевая программа «Развитие водохозяйственного комплекса РФ в 2012-2020 годах»: [Электронный ресурс]: ФЦП России: [сайт]. – М. Режим доступа: [ <http://www.programs-gov.ru/sitemap/vodokhoz>
  4. Федеральная целевая программа «Экономическое и социальное развитие Дальнего Востока и Байкальского региона на период до 2018 года»: [Электронный ресурс]: Перечень федеральных целевых программ, предусмотренных к финансированию из федерального бюджета на 2017 год. – М. Режим доступа: [ <http://fcp.economy.gov.ru/cgi-bin/cis/fcp.cgi/Fcp/FcpList/Full>
  5. Латкин А.П., Корнейко О.В. Особенности государственного регулирования предпринимательства в рыбохозяйственной деятельности (на примере Приморского края) монография / А. П. Латкин, О. В. Корнейко; М-во науки и образования Российской Федерации, Владивостокский гос. ун-т экономики и сервиса. Владивосток, 2011.
  6. Korneyko O.V., Latkin A.P. Integration of fishery enterprises in the Primorsky region: economic rationales and ways of their realization // *Mediterranean Journal of Social Sciences*. 2015. Т. 6. № 5 S3. С. 118-125.
  7. Vorozhbit O., Korneyko O. Freeport of Vladivostok as the Competitiveness Increase Tool for Russian Fish Export // *Social Sciences*. 2016. Vol 11. Issue 16. PP. 3962-3968
  8. Кузубов А.А., Шашло Н.В., Чжан Ю. Функциональная роль экономического анализа в условиях инвестиционно-инновационного развития аграрной экономики // *Научное обозрение: теория и практика*. 2017. № 8. С. 76-85.



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## **ASSESSMENT FEATURES OF THE FISHERIES COMPANIES' FINANCIAL STABILITY IN THE PRIMORSKY REGION, RUSSIA**

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### **ABSTRACT**

The relevance of the research is determined by the fact that the fishing industry is one of the leading sectors of the economy of Primorsky Region. Its effective development is an important governmental objective, as it is reflected in the state program "Development of Fishery Complex in Primorsky region for 2013-2020". One of the manifestations of the sustainable functioning of the Fishery Complex is the achieving of a high level of financial stability of organizations in fishing industry. The aim of the research was the developing of recommendations for improving the assessment of financial stability taking into consideration specific characteristics of fishery management organizations.

### **KEY WORDS**

Financial stability, assessment, methodology, fisheries enterprises, integral indicator, Primorsky region.

Issues of assessment of financial stability of the entity was reflected in the works of many scientists-economists, among which there are such as L.T. Gilyarovskaya [3], V.V. Kovalev [4], E. V. Konvisarova [2, 5], M.G. Lapusta [8], A.D. Sheremet [13] and others. The most popular methods of assessing financial stability of the organization are: three-factor model, characterizing the type of financial stability; models based on the calculation of financial ratios; methods and techniques of forecasting of bankruptcy. Based on the content analysis of these techniques, it is possible to highlight their specific drawbacks:

1. There is no single estimated figure, which gives a complex picture of the financial activity of economic entity.

2. Used as one of the main tools of analysis, financial ratios typically do not take into account specific features of the object of analysis, and as a result, their value does not always reflect the real situation in the organization.

3. Most of the existing techniques are used as an information base only for accounting data and do not take into consideration the record of management, which greatly impoverishes the range of the resulting estimates.

4. Assessment of the probability of bankruptcy, to the greatest extent, takes into account the development of the organization at the stage of the decline, but its use is not fully adequate in other phases of the life cycle of a business entity.

These shortcomings require the development of a technique, which could solve at least some of the mentioned problems, in particular, the lack of special accountancy of the specific industry.

For the Far East of Russia and for Primorsky region one of the leading sector traditionally was the fishing industry. The works of O.Y. Vorozhbit [14-16], O.V. Korneyko, A.P. Latkin [6, 7], E.V. Levkina [9], T.A. Levchenko [1, 10] and others are dedicated to the study of aspects of the development of the fisheries companies in Primorsky region, evaluating their financial condition and competitiveness.

However, despite the wide range of researches, the problem of taking into consideration the specific industry features is not sufficiently explored while assessing the financial sustainability of the companies of the fisheries industry.

Assessment of financial stability is impossible without revealing of general tendencies of industry development. The results of the analysis of economic indicators, using the data of Administration of the Primorsky region [11], are presented in table 1.

Table 1 – Economic indicators of fishery in the Primorsky region in 2014-2016

| Indicator   | 2014    | 2015    | 2016    | 2015 / 2014, % | 2016 / 2015, % |
|---|---------|---------|---------|----------------|----------------|
| The catch of fish and non-fish species, thousands tons  | 778,0   | 739,3   | 836,9   | 95,0           | 113,2          |
| The share of fishery sector in the shipment of goods of own production in industrial enterprises of the region, % | 14,6    | 21,9    | 23,1    | 150,0          | 105,5          |
| The organizations turnover in fishery and fish-farming, mln. RUB  | 29985,7 | 42508,5 | 43613,7 | 141,8          | 102,6          |
| Export, thousands tons  | 549,5   | 529,6   | 568,3   | 96,4           | 107,3          |
| The share of exports in total amount of products, %   | 80,5    | 77,5    | 73,2    | 96,3           | 94,5           |
| Export (the cost), mln. dollars USA   | 967,9   | 885,2   | 938,7   | 91,5           | 106,0          |
| The number of employed, thousands   | 10,4    | 10,4    | 10,6    | 100,0          | 101,1          |
| The average salary for 1 working person, RUB  | 37660   | 56729   | 65295   | 150,6          | 115,1          |
| Paid taxes and other obligatory payments, mln. RUB  | 1556,8  | 2260,0  | 3187,7  | 145,2          | 141,0          |
| Balanced financial result, mln. RUB   | 2732,4  | 9394,3  | 12052,9 | in 3,4 times   | 128,3          |
| The share of profitable enterprises, %  | 71,6    | 91,7    | 90,5    | 128,1          | 98,7           |

The analysis allowed to make the following conclusions: the total catch of aquatic biological resources and turnover of organizations is increasing; last two years, the share of fishery sector in the shipment of goods of own production in industrial enterprises was increasing on the background of general growth of production volumes, however, this growth in 2016 was slowed down considerably; companies in the industry are focused mainly on foreign trade activities; for 2 years balanced financial result of activity was increased at 4.4%, which led to higher profitability.

The trends were mainly developed on the background of the influence of factors of external environment (direct and indirect) that may affect financial stability. The most significant of them are: peculiarities of consumer demand in the domestic and foreign markets, high risks in the fishery because of existing administrative barriers, the inertia of the production-technological model and not enough rate of productivity growth of the industry, the existence of a "quota rentiers" and the lack of investments.

For more profound conclusions the estimation of the financial stability of specific companies was carried out. The companies were selected on the basis of the rating of the largest organizations of fishery industry in Primorsky region. They are PJSC "Dalryba", PJSC "Nakhodka's Base of Active Sea Fishing" (PJSC "NBAMR"), PJSC "Preobrazhenie's Base of trawling fleet" (PJSC "PBTF"). The evaluation was carried out using the three-factor model, characterizing the type of financial stability, based on the calculation of financial ratios, as well as using methods of bankruptcy forecasting. The results are presented in table 2.

Table 2 – Summary results of financial stability evaluation of companies of fishery industry in the Primorsky region

| Company        | Three-factor model of financial sustainability                                  | Ratio analysis  | Models, estimated the probability of bankruptcy |
|----------------|---|---|---|
| PJSC "Dalryba" | Financial stability had positive dynamics, reaching the absolute values in 2016 | The calculated coefficients had positive dynamics and they were at the recommended level                      | it is impossible to do unmistakable conclusion  |
| PJSC "NBAMR"   | Financial stability had positive dynamics, reaching the absolute values in 2016 | The calculated coefficients had valid (recommended) level, dynamics of the most of them is positive           | it is impossible to do unmistakable conclusion  |
| PJSC "PBTF"    | Financial condition was unsustainable   | The most of coefficients had a positive trend but they did not reach the generally accepted recommended level | it is impossible to do unmistakable conclusion  |

The data in table 2 allow us to make the following conclusions: financial stability has a positive trend in most organizations and it generally corresponds to the main trends in the development of the fisheries industry; there are contradictions in the assessment of financial stability by various methods; method of coefficient calculation is suitable to the greatest extent for the assessment of financial stability when using ratio analysis, the tempo and direction of changing the separate indicators may be different; recommended values of financial coefficients are generalized and does not take into account the specific character of the industry and thus may not reflect the real situation.

Consequently, there is a need to develop such methods of financial stability assessment, which could resolve the identified contradictions and problems. According to the authors, the most consistent with the requirements of the criteria of financial sustainability is an integrated indicator, based on the comparison of the values of a specific set of indicators with the recommended industry-specific values (formula 1):

$$I = \left( \sum_{i=1}^n \frac{P_{i1}}{P_{i0}} \right) / n, \quad (1)$$

Where:  $P_{i1}$  – the value of the  $i$ -indicator for the given company;  $P_{i0}$  – recommended value of  $i$ -indicator for fisheries complex;  $n$  – number of indicators.

This indicator can be used to assess the financial sustainability of the entity of the fisheries industry in accordance with the following rating parameters [12]: above 1,5 – absolutely stable (excellent) financial condition; 1,0-1,5 – relatively stable (good) financial condition; 0,5-1,0 – relatively unstable (satisfactory) financial condition; below 0,5 is absolutely unstable (poor) financial state.

On the basis of the assessment of closeness of correlation between the various indicators of financial stability and the gross profit of organization, the structure of the integrated-rate was determined: the autonomy ratio, financial leverage, flexibility ratio, coefficient of coverage by own floating funds, ratio of financing, ratio of financial stability, day-to-day liquidity ratio and quick ratio. A comparison of indicators is proposed to implement together with those, which are recommended for agriculture, as fishing industry (including fishing, aquaculture and fish processing) is referred to this industry.

The results of the evaluation of financial stability of the studied fishery companies of the Primorsky region (using the integrated indicator) are presented in table 3.

Table 3 – Assessment of the level of financial stability of the fishery companies of the Primorsky region (using the integrated indicator)

| Company        | 2014   | 2015  | 2016                                      |
|----------------|--|---|---|
| PJSC "Dalryba" | -4,02<br>Absolutely unstable financial state | 2,19<br>Absolutely stable financial state   | 3,15<br>Absolutely stable financial state |
| PJSC "NBAMR"   | 1,75<br>Absolutely stable financial state    | 1,73<br>Absolutely stable financial state   | 2,13<br>Absolutely stable financial state |
| PJSC "PBTF"    | -0,72<br>Absolutely unstable financial state | 0,83<br>Relatively unstable financial state | 1,49<br>Relatively stable financial state |

The results of testing of the proposed method showed that it gives more accurate result, taking into account the specific industry features. Especially clearly the data of JSC "PBTF" demonstrate it (the result is fully consistent with the trends in the financial state of the company), while using the traditional methods, the contradictions were observed.

Thus, it is possible to formulate the following conclusions using the results of the research:

1. The fishing industry is an important sector of the economy of Primorsky Region. To increase the efficiency of its functioning, it is necessary to make complex analysis of the

achieved results, including the assessment of financial stability of organizations in the industry.

2. The assessment of financial stability must be done taking into account industry features. For this purpose, the using of integrated indicator is the most suitable, as it takes into account the aggregated financial ratios and their comparison with recommended industry values.

3. The use of this method facilitates the solution of problems of analytical substantiation in process of management of financial state of the company and allows to develop a strategy to ensure its financial stability.

## REFERENCES

1. Chipovskaya I.S., Levchenko T.A. The formation of synergies in the operation of the fishery cluster. *Ekonomika i predprinimatelstvo*. 2015. No. 4-2 (57-2). Pp. 291-296.
2. Danilovskih A.A., Konvisarova E.V. Financial aspects of ensuring the information security of an enterprise. *Mezhdunarodnyy studencheskiy nauchnyy vestnik*. 2015. No. 4-3. Pp. 398-399.
3. Gilyarovskaya L.T. Analysis and assessment of financial sustainability of commercial organizations. Moscow: Yuniti-Dana, 2012. 159 p.
4. Kovalev V.V., Volkova O.N. Analysis of the economic activity of the enterprise. Moscow: Prospekt, 2014. 239 p.
5. Konvisarova E.V., Neprokin A.V., Konvisarov A.G. The ways of improvement of financial state of small construction company. *Vektor nauki Toliattinskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravleniye*. 2016. No. 2 (25). Pp. 22-27.
6. Korneyko O.V., Latkin A.P. Integration of fishery enterprises in the Primorsky region: economic rationales and ways of their realization. *Mediterranean Journal of Social Sciences*. 2015. T. 6. No. 5 S3. Pp. 118-125.
7. Korneyko O.V., Latkin A.P. Theoretical approaches to management of fishing industry development. *Rybnoye khozyaystvo*. 2014. No. 3. Pp. 35-37.
8. Lapusta M.G., Mazurina T.Yu., Skamay L.G. Finance of organizations (enterprises). Moscow: INFRA-M, 2017. 575 p.
9. Levkina E.V., Vorozhbit O.Yu. Influence of external factors on the efficiency of the fish industry of Primorsky Krai. *Mezhdunarodnyy studencheskiy nauchnyy vestnik*. 2015. No. 4-3. Pp. 416-419.
10. Levchenko T.A., Chipovskaya I.S. Towards the issue of customs regulation of the Primorsky territory fishing industry. *Vestnik Moskovskogo gosudarstvennogo oblastnogo universiteta. Seriya: Ekonomika*. 2014. No. 1. Pp. 67-76.
11. General results of the work of the Primorsky Krai fisheries complex for 2014-2016. – Access mode: <http://www.primorsky.ru/authorities/>
12. Saakyan T.G. Development of methodical bases for forecasting financial stability of economic entities. Rostov-na-Donu, 2014. 161 p.
13. Sheremet A.D. Analysis and diagnostics of financial and economic activity of the enterprise. Moscow: «IPB – BINFA», 2012. 310 p.
14. Vorozhbit O.Yu., Danilovskikh T.E., Kuzmicheva I.A. Theoretical and methodological aspects of ensuring competitiveness of fishery activities in the Far East of Russia. Moscow: Kreativnaya ekonomika, 2013. 280 p.
15. Vorozhbit O.Yu., Zhuk A.P., Latkin A.P. Maintenance of competitive management for enterprises of fishery industry in the Far East of Russia in conditions of Russia entrance into WTO. *Izvestiya TINRO (Tikhookeanskogo nauchno-issledovatel'skogo rybokhozyaystvennogo tsentra)*. 2013. T. 173. Pp. 293-301.
16. Vorozhbit O.Yu., Terentyeva T.V., Titova N.Yu. Sustainable development of fishing complex in Primorsky krai via formation of territorial-sectoral industrial cluster. *Azimut nauchnykh issledovaniy: ekonomika i upravleniye*. 2016. T. 5. No. 2 (15). Pp. 53-57.

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**ФИНАНСОВО-ИНВЕСТИЦИОННОЕ ОБЕСПЕЧЕНИЕ ВОСПРОИЗВОДСТВЕННЫХ  
ПРОЦЕССОВ В АГРОПРОМЫШЛЕННОМ КОМПЛЕКСЕ**  
FINANCIAL AND INVESTMENT SUPPORT OF REPRODUCTION PROCESSES  
IN THE AGRO-INDUSTRIAL COMPLEX

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**АННОТАЦИЯ**

Инвестиции выступают движущей силой развития любого сектора экономики, что в полной мере распространяется и на АПК. В статье рассмотрено современное состояние инвестиционных вложений в различные отрасли экономики, в том числе сельское хозяйство, в разрезе регионов ЦФО. Особое внимание уделено Орловской области. Предложены направления стимулирования инвестиций в АПК.

**ABSTRACT**

Investments are the driving force behind the development of any sector of the economy, which fully applies to agriculture. The article considers the modern state of investments in various sectors of the economy, including agriculture in different regions of CFD. Special attention is paid to the Orel region and suggested ways of agro-investment stimulation.

**КЛЮЧЕВЫЕ СЛОВА**

Агропромышленный комплекс, инвестиции, льготный режим налогообложения.

**KEY WORDS**

Agro-industrial complex, investments, preferential tax treatment.

Устойчивое развитие экономики России на сегодняшний день является одной из первоочередных задач, однако ее решение нельзя обеспечить без восстановления и расширения производства, которое требует вложения значительных инвестиционных ресурсов для совершенствования материально-технической базы.

Аграрный сектор является ключевым в развитии любой страны мира и обеспечении ее безопасности в продовольственном плане. Введение продовольственных санкций западными странами и принятие ответных мер со стороны России наиболее остро поставило вопрос развития сельскохозяйственного производства на территории нашего государства. Однако, развитие сельского хозяйства не возможно без осуществления значительных объемов инвестирования, как в данную сферу, так и в смежные с ними отрасли, носящих долгосрочный характер.

Наблюдающийся в российской экономике рост инвестиционных вложений в основные фонды положительно характеризует происходящие здесь процессы. Однако в одних регионах инвестиционная активность выше, а в других она незначительна. Регионы-локомотивы в данном направлении показывают, как может идти развитие. В ЦФО одним из лидеров по инвестированию являются Белгородская и Воронежская области (если не брать во внимание Москву и Московскую область, в которых сосредоточены финансовые ресурсы). Изучая динамику объемов инвестиционных вложений в основной капитал в Орловской и расположенных близко к ней регионах Центрального федерального округа можно отметить их увеличение в 2015 г. относительно предыдущих периодов (рис. 1).

Таблица 1 – Динамика объема инвестиций в основные фонды, млрд. руб.

| п/п                  | 2011 г. | 2012 г. | 2013 г. | 2014 г. | 2015 г. | Среднегодовой темп роста | 2015г в % к 2014г |
|----------------------|---------|---------|---------|---------|---------|--------------------------|-------------------|
| РФ                   | 11035,7 | 12586,2 | 13450,2 | 13557,5 | 14555,9 | 107,2                    | 107,4             |
| ЦФО                  | 2458,3  | 2961,6  | 3331,6  | 3435,9  | 3672,9  | 110,6                    | 106,9             |
| Белгородская область | 126,0   | 136,8   | 129,4   | 120,7   | 146,4   | 103,8                    | 121,3             |
| Брянская область     | 48,0    | 46,6    | 60,8    | 66,8    | 61,7    | 106,5                    | 92,4              |
| Калужская область    | 77,4    | 95,9    | 98,1    | 99,8    | 92,5    | 104,5                    | 92,7              |
| Курская область      | 58,5    | 66,6    | 71,5    | 71,7    | 70,4    | 104,7                    | 98,2              |
| Липецкая область     | 112,5   | 93,3    | 101,1   | 110,1   | 116,6   | 100,9                    | 105,9             |
| Орловская область    | 34,1    | 40,4    | 43,7    | 44,9    | 52,3    | 111,3                    | 116,5             |
| Тульская область     | 94,3    | 80,5    | 80,5    | 74,5    | 105,6   | 102,9                    | 141,7             |
| Воронежская область  | 155,2   | 182,3   | 217,0   | 240,3   | 263,6   | 111,1                    | 109,7             |

Так, объемы инвестиций в основной капитал в Белгородской области почти в 3 раза превышают инвестиции в Орловской области, а в Воронежской - более чем в 5 раз. Кроме этого Орловская область среди расположенных рядом с ней регионов ЦФО находится на последнем месте по объемам вложений, хотя и отслеживается тенденция их увеличения, причем темпы роста инвестиций в области превышают среднегодовые показатели как по ЦФО, так и в среднем по России. Но даже при этом остаются ниже, чем в граничащих с областью регионах. Так, объем инвестиций в Орловской области в 2015 г. вырос на 16,5%, тогда как в 2014г. – всего лишь на 2,72 % по сравнению с 2013 г. Тем не менее, с 2011г. среднегодовой темп роста инвестиций в Орловской области составил 111,3%, а это выше, чем по Российской Федерации и Центральному федеральному округу, в которых среднегодовой прирост инвестиций составил 7,2 и 10,6%.

В то же время, в расчете на душу населения инвестиции в основной капитал в регионе составляют 68,6 тыс. руб. в 2015г., что больше чем в расположенных рядом Брянской, Курской и Смоленской областях и занимает 43 место среди субъектов РФ.

При этом часть из вложенных средств направляется на реконструкцию и модернизацию машин, оборудования, транспортных средств.

Таблица 2 – Доля инвестиций в машины, оборудование, транспортные средства в общем объеме инвестиций в основной капитал, направленных на реконструкцию и модернизацию, по некоторым субъектам ЦФО

| п/п                           | 2012г. | 2013г. | 2014г. | 2015г. | 2016г. | Отклонения, 2016 г. от 2012 г. |
|-------------------------------|--------|--------|--------|--------|--------|--------------------------------|
| Российская Федерация          | 32,3   | 32,5   | 29,0   | 27,9   | 29,2   | -3,1                           |
| Центральный Федеральный округ | 30,8   | 32,8   | 25,4   | 26,9   | 27,1   | -3,7                           |
| Белгородская область          | 38,4   | 30,9   | 30,0   | 30,5   | 28,1   | -10,3                          |
| Воронежская область           | 36,3   | 26,5   | 23,8   | 52,9   | 31,1   | -5,2                           |
| Костромская область           | 39,0   | 29,6   | 42,5   | 45,6   | 56,2   | 17,2                           |
| Курская область               | 48,1   | 44,7   | 40,3   | 31,7   | 38,8   | -9,3                           |
| Липецкая область              | 37,3   | 35,4   | 30,5   | 32,5   | 41,0   | 3,7                            |
| Московская область            | 32,5   | 21,4   | 22,5   | 21,3   | 22,8   | -9,7                           |
| Орловская область             | 11,2   | 13,0   | 21,2   | 15,2   | 11,4   | 0,2                            |
| Тульская область              | 33,0   | 48,0   | 39,3   | 40,0   | 35,4   | 2,4                            |

Доля инвестиций в Орловской области направляемых на реконструкцию и модернизацию машин, оборудования, транспортных средств находится в 2,5 раза ниже, чем в среднем по России и в 2,4 раза ниже, чем по ЦФО. Причем Орловская область занимает последнее место в 2016г. во всем ЦФО по доле таких вложений, а в 2015г. при доле 15,2% она находилась на предпоследнем месте.

На сельское хозяйство при этом из общего объема инвестиций в основные фонды направлено в 2015г. лишь 3,6%, к 2016г. эта доля увеличилась до 4,2%, однако она по-прежнему невысока для стратегически важной отрасли экономики.

К тому же в сельском хозяйстве на долю инвестиций направляемых на реконструкцию и модернизацию по России приходится в 2016г. 8,8%, а на долю машин и оборудования в общем объеме основных фондов в 2016г в сельском хозяйстве, охоте и лесном хозяйстве приходится 37,6%.

Рассмотрим динамику распределения инвестиционных вложений в основные фонды за 2013-2015 гг. в зависимости от источника финансирования (табл. 3).

Таблица 3 – Распределение инвестиций в основной капитал по источникам финансирования, %

| Регион                        | 2013 г.              |                       | 2014 г.              |                       | 2015 г.              |                       |
|-------------------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|
|                               | Собственные средства | Привлеченные средства | Собственные средства | Привлеченные средства | Собственные средства | Привлеченные средства |
| Российская Федерация          | 45,2                 | 54,8                  | 45,7                 | 54,3                  | 50,2                 | 49,8                  |
| Центральный Федеральный округ | 44,1                 | 55,9                  | 44,6                 | 55,4                  | 47,7                 | 52,3                  |
| Орловская область             | 42,3                 | 57,7                  | 40,7                 | 59,3                  | 53,2                 | 46,8                  |

В целом по Российской Федерации наблюдается снижение доли привлеченных средств в сумме инвестиций в основной капитал. Такая же тенденция наблюдается и в ЦФО и в Орловской области. Среди привлеченных средств снижается доля кредитов и бюджетных средств, хотя по ЦФО доля кредитов за 2014- 2015 гг. выше, чем в среднем по России.[11]

В России доля вложений в основной капитал сельского хозяйства, охоты и лесного хозяйства за счет собственных источников в 2014г. составила 51,8%, тогда как в 2013г. на собственные источники приходилось в долевом выражении на 7,9% меньше. Привлеченные средства в 2014г. составили 48,2% в общем объеме инвестиций в основной капитал сельского хозяйства из них 5,6% -представлено бюджетными источниками (3,9% приходится на средства федерального бюджета, а 1,5% -из бюджетов субъектов РФ) [4].

При существующей аграрной ориентированности Орловской области и наблюдающемся снижении объема инвестиций в основные фонды на сельское хозяйство здесь направляется всего лишь 14,97% от общего объема вложений.

Структура инвестиций в Орловской области в 2016 г. представлена на рисунке 1.

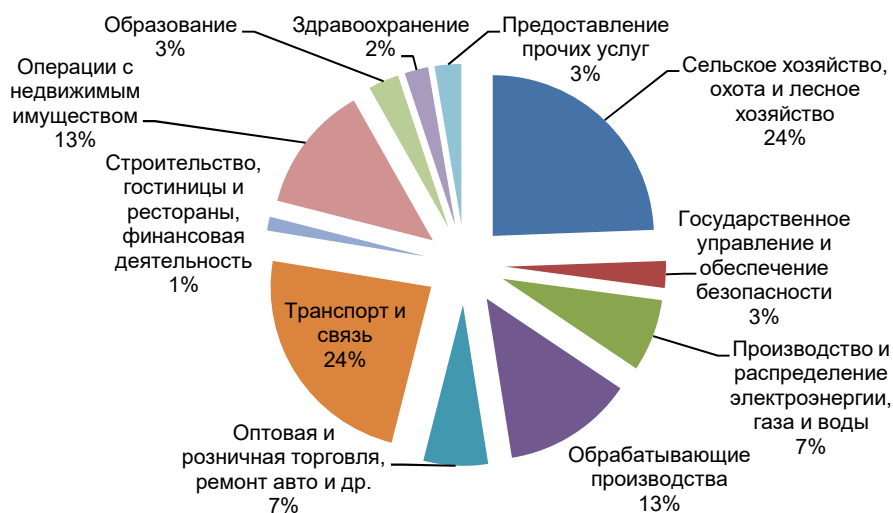


Рисунок 1 – Структура инвестиций в основной капитала по видам экономической деятельности в 2016 г.

Наблюдающаяся динамика вложений за последние годы свидетельствует о повышении инвестиционной активности в АПК. Это обуславливается ростом притока инвестиций в данную сферу экономики, однако этот рост связан в основном с увеличением краткосрочных вложений, что является негативной тенденцией, поскольку обновление фондов при этом не происходит, а это не позволит в будущем обеспечить рост в данной сфере производства.

Таблица 4 – Динамика финансовых вложений в сельское хозяйство Орловской области за 2012-2016 гг.

| Показатели   | 2012г. | 2013г. | 2014г.  | 2015г. | 2016г.  | 2016г. в % к 2012г. |
|--|--------|--------|---------|--------|---------|---------------------|
| Финансовые вложения в сельское хозяйство, охоту и лесное хозяйство, млн.руб. | 2923,4 | 4695,4 | 10117,5 | 7695,4 | 35591,4 | 12,2 раза           |
| в т.ч. долгосрочные  | 47,3   | 755,7  | 1086,4  | 333,8  | 364,1   | 7,7 раза            |
| краткосрочные  | 2876,1 | 3939,7 | 9031,1  | 7361,7 | 35227,3 | 12,2 раза           |

По данным таблицы 4 можно отметить, что за 2012-2016гг. наблюдается тенденция увеличения финансовых вложений в сельское хозяйство, охоту и лесное хозяйство, причем максимальная сумма вложений наблюдается в 2016г., когда инвестиции составили 35,6 млрд. руб. [9]. В 2016г. отмечается значительный рост по сравнению с 2015г. краткосрочных вложений в сельское хозяйство региона, который составил 4,8 раза.

Долгосрочные вложения тоже увеличиваются, но не столь значительно.

Безусловно, рост финансовых вложений в сельское хозяйство является положительной тенденцией, однако вопрос, касающийся привлечения долгосрочных инвестиций в сельское хозяйство стоит наиболее остро, что обусловлено отраслевыми особенностями и длительным производственным циклом, высокими рисками и соответственно не скорой окупаемостью вложений. Однако именно долгосрочные инвестиции способны обеспечить будущий экономический рост за счет увеличения сельскохозяйственного производства.

Такая ситуация во многом связана со сложившимся в регионе инвестиционным климатом, от которого также зависит привлечение средств. По расчетам, проведенным известным рейтинговым агентством Эксперт РА Орловская область отнесена к регионам с незначительным потенциалом и умеренным риском, что и обуславливает существующую довольно низкую инвестиционную активность здесь [5]. В 2016г. по оценке данного агентства Орловская область находится на 62 месте среди субъектов РФ по уровню инвестиционного потенциала, что на 2 пункта выше, чем в 2015г., и на 58 месте по уровню рисков, а это на 7 позиций ниже, чем в предшествующем периоде.

Низкий инвестиционный рейтинг не позволяет в необходимых объемах привлекать инвестиции в такую рисковую отрасль, какой является сельское хозяйство с необходимыми вложениями долгосрочного характера.

В 2015г. общий объем государственной поддержки АПК Орловской области составили 2,68 млрд. руб., большая часть которых (около 93%) поступила из средств федерального бюджета и меньшая доля (всего 7% или 0,19 млрд. руб.) была получена из бюджета субъекта.

Орловская область принимает участие в реализации ряда программ, касающихся развития АПК, по которым в 2016г. было получено государственное финансирование в размере 2,49 млрд. руб., в том числе по программе «Развитие сельского хозяйства и регулирования рынков сельскохозяйственной продукции, сырья и продовольствия в Орловской области на 2013-2020 г.г.» - 2, 33 млрд. руб., по программе «Развитие приоритетных подотраслей агропромышленного комплекса Орловской области 2014 - 2020 годы» – 0,05 млрд. руб. и по программе «Устойчивое развитие сельских территорий Орловской области на 2014-2017 годы и на период до 2020 года» – 0,11 млрд. руб. [8].

Конечно, реализация целевых программ благоприятно отражается на развитии



аграрного сектора Орловской области, однако бюджетных средств не достаточно, чтобы решить все проблемы АПК, в связи с чем, особое внимание необходимо направить на стимулирование привлечения частных инвесторов в данную отрасль.

В заключение можно отметить, что даже при наблюдающейся положительной динамике увеличения инвестиционных вложений в сельское хозяйство Орловской области, которые в 2016г. составили по данным статистики 47,87 млрд. руб. в аграрную сферу направляется не достаточно ресурсов, чтобы в перспективе обеспечить возможности для импортозамещения, например, по плодовым культурам. В связи с чем, считаем целесообразным стимулирование привлечения частного капитала на долгосрочной основе путем предоставления льготного режима налогообложения для организаций-инвесторов этих средств.

### БИБЛИОГРАФИЯ

1. Богачев А.И. Развитие регионального аграрного сектора в условиях ВТО // Международный научно-исследовательский журнал. 2013. №10-3 (17). С. 13-14.
2. Дударева А.Б., Кравченко Т.С. Условия повышения инвестиционной привлекательности России // Экономика и предпринимательство. 2014. №4 ч.1. С.26-31.
3. Дударева А.Б., Полякова А.А., Сидорин А.А. Финансирование инвестиционных процессов на региональном уровне // Вестник ОрелГАУ. 2017. №3(66). С.149-157.
4. Инвестиции в России. 2015: Стат. сб. / Росстат. - М., 2015. – 190с.
5. Инвестиционная привлекательность регионов – 2016: области повышенного риска [Электронный ресурс] //Официальный сайт рейтингового агентства «Эксперт РА». URL <http://raexpert.ru/docbank//3a5/7de/1be/dc6c62e7da29a4faa8c961b.pdf>
6. Кожанчиков О.И., Кожанчикова Н.Ю. Налоговые методы стимулирования инвестиционной деятельности на региональном уровне. /Актуальные проблемы формирования инвестиционного потенциала и управления инвестиционными рисками в Орловской области Сборник научных трудов по материалам научно-практической конференции. 2012. С. 82-86.
7. Кожанчиков О.И., Кожанчикова Н.Ю. Упрощенная система налогообложения для сельскохозяйственных товаропроизводителей //Экономика: вчера, сегодня, завтра. 2016. №3. С.48-57.
8. Кожанчикова Н.Ю. Инвестиции в аграрный сектор региона //Вестник сельского развития и социальной политики. 2017. № 3 (15). С. 63-65.
9. Орловская область в цифрах. 2011-2016: краткий стат. сб./ Территориальный орган Федеральной службы государственной статистики по Орловской области. – Орел, 2017. –249с.
10. Полякова А.А. К вопросу об устойчивом развитии сельских территорий // Вестник сельского развития и социальной политики. 2016. №1 (9) С.44-46
11. Регионы России. Социально-экономические показатели. 2016: Стат. сб. / Росстат. М., 2016. 1326с.
12. Чистякова М.К. Малый бизнес в сфере АПК: проблемы развития на современном этапе //Вестник сельского развития и социальной политики. 2017. № 3 (15). С. 97-99.
13. Чистякова М.К., Дударева А.Б., Плахов А.В. Роль прямых иностранных инвестиций в финансировании воспроизводственных процессов российских предприятий // Вестник ОрелГИЭТ. 2016. № 4 (38). С. 137-145.
14. Dudareva A.B., Polyakova A.A., Kozhanchikova N.Y. Priority directions of Russia's financial policy //Russian Journal of Agricultural and Socio-Economic Sciences. 2017. T. 64. № 4. С. 26-34.
15. Dudareva A.B., Polyakova A.A., Sidorin A.A. Problems of financing investment processes using foreign capital // Russian Journal of Agricultural and Socio-Economic Sciences. 2017. T. 63. № 3. С. 42-52.

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## THE EFFECT OF SOCIAL RESPONSIBILITY TOWARDS THE CORPORATE IMAGE OF TELKOM KANDATEL OF EAST SURABAYA, INDONESIA

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### ABSTRACT

This research measured Social Responsibility as the independent variable and Company's Image as the dependent variable. The population of this study involved 104 members of environment development conducted by Community Development Center as a part of social responsibility program of *Telkom* in East Surabaya. In this research, census technique was used to determine the sample of this study since 104 members were taken as the sample. The data obtained in this research were then analyzed using Structural Equation Modelling. Hypothesis testing, causal relationship and direct relationship (path coefficient) were measured from the standard regression value by comparing the critical ratio or similar probability to the t-value. The significance effect was shown by t-value that was higher than the t-table. Based on the result and the discussion of this study, it can be concluded that there was no significant effect from social responsibility toward company's image.

### KEY WORDS

Social responsibility, company's image, social impact, corporate study.

Economic development in Indonesia has started to grow after great economic crisis which can be seen from the massive development of economic sectors. However, the development triggers competition among institutions. Today's regulation forces companies to show their transparency, allowing anyone to find out any information related to the companies including companies' social responsibility programs, regardless of time and places.

The tight competition often lured companies from their function as social organizations in addition to their function as business institutions. Some challenges appear related to the business since companies are required to maintain good interaction with the surrounding social environment in order to perform their operational activities.

Companies that have high motivation to improve their corporate social responsibility role should grow awareness on the current social issues. Corporate social responsibility also functions as protection for the companies in case some unexpected problems occur.

Social duties are important to create good image of the companies, which also give strong contribution to the sustainable development of the companies. Hence, it is obvious that social contribution affects the image of a company. The company image itself is regarded valuable.

It is important that companies show good social attitude to maintain their images. Companies should not only focus on earning profit, but they also have to give positive contribution to the surrounding environment and society. Companies that activate their social responsibility show that they care about the society and the environment.

Problems related to CSR of companies in Indonesia should not be merely investigated from the pros and cons debate as stated by Friedman (1970) and Roddick (2004). On the other hand, social problems such as high number of poverty and illiteracy, difficult access to health services, low quality of education sector, natural disasters, poor system of public transportation are waiting to be solved by the government.

Unfortunately, the requirement for companies to activate their corporate social responsibility rises a contra-productive debate. The regulation gives an impression that the government hand over the responsibility to the companies. On the other side, companies

object to regarding CSR as a duty. As the result, companies tend to see CSR as a new entity that is expected to give positive contributions to solve social problems in Indonesia.

Nation's social responsibility can be illustrated as a big meal, while CSR is the vitamin. The needs of the Indonesians are under governments' responsibility which should not be handed over to other parties. The main necessities of the society should be fulfilled by the government at the first place.

According to the World Bank, corporate social responsibility contains several fundamental components; environmental protection, safety insurance, human rights, interaction between the companies and the society, standard operational procedure, economic development, business orientation, health care, leadership, education, and disaster aids.

The theories and the principles of CSR might seem complete and promising, its feasibility is still debatable. CSR should not only be charged to industrial companies that have some negative impacts to the environment and the society, but CSR should also be charged to other companies such as financial companies, bank and non-bank. Unfortunately, some companies are known to perform various violations such as damaging the environment, violating the human rights, termination of employment, and keep receiving loans from strong companies in the world.

Based on those facts, TELKOM has made an attempt to put CSR as a part of its business strategies. The management of CSR in TELKOM is officially written in a decision made by the directors.

Through a unit called Telkom Community Development Center (Telkom CDC) which was established in 2007, PT. Telkom run a program called *Program Kemitraan dan Bina Lingkungan (PKBL)* as a realization of the CSR. Telkom had been managing an affiliate program since 2007 – 2012 which has involved 30.908 affiliates, and has spent 356.54 billion rupiah to provide loans for the society. Meanwhile, Telkom also had been running an environmental program since 2009-2013 in which it has spent 51.56 billion rupiah for the charity program. The environmental program included aids for education and training in the forms of scholarship, laboratory improvement, facilitation of school tools (computer, books, etc), internships, teacher development program and the Internet Goes to School program.

The affiliate programs run by State-Owned Companies (*BUMN*) with micro enterprises are aimed at improving the capability of the micro businesses to grow stronger and independent using the fund from the companies. Micro business refers to small-scale business run by the society which fulfills certain criteria including the criteria related to the yearly sales and ownership set by the companies. Micro-scale enterprises that fulfilled the criteria were chosen to receive loans from the companies.

The lack of information provided in the official website of Telkom ([www.pkbl-telkom.com](http://www.pkbl-telkom.com)) and the lack of exhibitions were probably the factors that make the society have few information related to the procedure to apply for the loans as affiliate partners of Telkom CDC East Surabaya.

The low interest shown by the society to affiliate with Telkom CDC East Surabaya was also triggered by the uncertainty about the exact time to receive the loan. Thus, the society tends to apply for loans from banks or cooperatives which have clearer procedures. .

Table 1 shows the decrease in the number of affiliates of CDC East Surabaya.

Tabel 1 – The Segmentation of Affiliates in CDC East Surabaya

| Year/Segmentation | Segmentation |         |         |         |             |           | Sum |
|-------------------|--------------|---------|---------|---------|-------------|-----------|-----|
|                   | Industry     | Service | Trading | Fishery | Agriculture | Husbandry |     |
| 2007              | 1            | 5       | 6       |         |             |           | 12  |
| 2008              | 46           | 49      | 67      |         |             | 4         | 166 |
| 2009              | 40           | 33      | 61      | 5       |             | 16        | 155 |
| 2010              | 35           | 43      | 32      | 2       |             | 28        | 140 |
| 2011              | 100          | 260     | 236     | 9       | 5           | 45        | 655 |
| 2012              | 77           | 131     | 130     | 2       | 2           | 26        | 368 |
| 2013              | 37           | 24      | 41      | 1       |             | 1         | 104 |

Source: CDC East Surabaya.

Some enterprises had successfully fulfilled the criteria to receive the loan in CDC East Surabaya, yet some problems occurred including:

1. The evaluation process took too much time and there was no certain schedule for the affiliates to receive the fund.
2. When surveys toward affiliates' enterprises were done outside Surabaya, the service of Telkom CDC East Surabaya was disturbed since there were only 3 officers-in charges for taking care of the affiliates all around the area of Telkom CDC East Surabaya including Mojokerto, Jombang, Trawas, Sidoarjo and East Surabaya.

In addition, affiliates often paid their installment late, which forced the officers to conduct home visit.

Corporate social responsibility can be used as a business strategy to improve the competitiveness of the company by creating good images and building customers' loyalty. Those aspects can become a great strength for a company to win the business competition. On the other hand, the tendency of the customers to buy goods based on certain criteria, values and ethics is expected to modify the customers' behavior in the future. The development of CSR is a continuum process that should be developed continuously. Thus, a good ecosystem that gives benefit for the customers in the forms of good quality and eco-friendly products, and the companies also receive high profit, which profit is then indirectly distributed back to the society (Daniri, 2007: 1).

A theory on the companies imaging taps on the importance of the goal determination as proposed by Gene Broadwater (Stephen P. Robbins, 2001: 177) in which he stated that the main target of a companies is to build better performance and good image. Generally, companies with good images have these six characteristics: good relationship with society leaders, positive relationship with local government, lower business risks, pride of being a part of an organization and the society, mutual understanding among members of the organization and the society, and high loyalty of the employees (Anggoro, 2002: 21).

## THEORETICAL FRAMEWORK

*The Definition of Marketing.* Marketing is one of the main activities performed by businessman in running a business to earn higher profit. Marketing holds a crucial role in reaching the target of a company. Kotler (1997: 8) mentioned that marketing is a social and managerial processes in which (either individuals or groups) members get their necessities and their expectations fulfilled by producing, offering and exchanging valuable products with other parties.

Based on the definition above, one should firstly determine their necessities before they start some attempts to fulfill them by maintaining good relationship with other individuals. Marketing activity is started from the identification of what the customers want and need, determination of the products to fulfill customers' needs, determination of the proper price of the product, determination of the promotion method and media, and determination of the effective distribution procedure to reach the goals. Hence, marketing should not be regarded as an easy activity that only aims at earning money.

A set of interrelated marketing attempts are done to reach the exchange target as expected in the target market which is generally called marketing management.

*Social Responsibility.* Social responsibility is a basic theory on the importance of a company to maintain harmonious relationship with the surrounding environment. Theoretically, social responsibility is defined as a moral contribution of a company to its stakeholders including communities and the society around it. Social responsibility makes a company become a moral agent. Regardless of the presence of any law on the matter, a good company should always care about the morality. The parameter of a company's success seen from its ability in managing the social responsibility is how far the company regard moral and ethical principles within their attempts to obtain the best result without any negative impacts to the society. One of the famous moral principles is the golden rules which teach how to treat other person the way we want to be treated. Therefore, companies that highly regard moral and ethical principles are able to give strong contribution to the society.

In fact, Corporate Social Responsibility (CSR) is often neglected by some companies. Unfortunately, companies that fulfill their CSR obligation are often given negative labels by other companies. There were also some companies that successfully give real contribution to the society, yet the companies failed at obtaining society's sympathy. Some companies also failed in their attempts to do some charity work in order to build up good images at the same time. Those failures occurred because companies tend to simply set the CSR into immature programs without adequate planning (Badri, 2007). The practice of CSR is not as easy as its concepts for it requires deep understanding and comprehension on the integrated social aspects considering the fact that any decision related to CSR might affect the society. Companies are motivated to seek for a balance point between implementing an effective CSR program and earning profit.

CSR emphasizes logic and objective consideration of social welfare and it also function as a control upon human behavior as well as to prevent companies from causing damages. Therefore, the implementation of CSR should not focus on the return, yet it should put more concern on how strong it gives positive contribution to the social welfare.

The implementation of CSR is more challenging than it may look. This is due to the requirement of deep and fundamental comprehension on the its contribution toward any social aspect since the change on the concept also affect the society. Companies should find a threshold point between a good concept of CSR and the return (Steiner and Miner, 1998: 54).

*The Indicator of Corporate Social Responsibility.* Siltaoja (2006: 98) highlights the strong relationship between CSR and sustainable development which suggests that a company should not only focus on the financial aspects in making certain decision, but it should also concern on the contribution to the social and environmental aspects in the future. In order to put it into a good practice, a company is suggested to use these indicators proposed by Anggraini, 2007: 5 which are: a. Transparency, b. Knowledge, c. Sustainability.

*Companies' Image.* Soemirat and Ardianto (2004: 14) state that company image refers to how other parties see a company. The number of a company's image goes equally with the number of the society, customers, potential consumers, bankers, staffs, competitors, distributors, suppliers, affiliates, and retailer who might have diverse views about the company. Generally, companies obtain good images have these six characteristics: good relationship with society leaders, positive relationship with the government, lower risks of crisis, pride of being the part of the society, mutual understanding between the company and the society, and loyalty of the staffs (Anggoro, 2002: 44).

Jenkins (2003:45) mentioned some types of image as follows:

a. Mirror Image

Refers to the image attached to members of an organization especially leaders and how the society sees the organization.

b. Current Image

Refers to how others create certain images of an organization.

c. Wish Image

Refers to the images expected by a corporate management.

d. Corporate Image

Refers to the whole and hollistic image of an organization, not only the images about the product and service offered by a company.

e. Multiple Image

High number of employees and their heterogeneity create different images which do not always go in line with the corporate image.

*Corporate Image Indicators.* Corporate images deals with how other parties view the company which is mostly affected by these following factors (Anggraini, 2007: 6): a. the quality of product and service, b. the orientation to the customers, c. environmental responsibility, d. the implementation of good corporate governance.

*The Effect of Corporate Social Responsibility toward Corporate Image.* Good management of CSR in a company creates strong trust which enhances employees' motivation and commitment. Consumers, investors, suppliers, stakeholders and other parties

also tend to give more positive support to companies that they consider maintaining good social responsibility. As the result, companies that implement good CSR management tend to show better performance and earn higher profit which later also improves the corporate image.

The basic theory of social responsibility is the theory of group creation proposed by Homans (2003: 80) which emphasizes on the activities, interaction, and sentiments among a society. The more frequent interaction is made with other individual, the more diverse the type of interaction and the stronger the sentiment among a society. More interaction leads to more sentiment, and more sentiment leads to modifications on the activities and the interaction itself. A theory on the grouping was proposed along with the theory of social balance by Newcomb which were constructed based on the similar behavior shown in facing certain relevant goals among each others (Homans, 2003: 80). Any action related to CSR affects the corporate image. In addition, the theory of institution suggests that a company run a good management of CSR in order to maintain its sustainability. Good management of CSR is believed to drive good intention and legitimation to the external constitution which is a key determinant to the betterment of corporate image and its sustainability (Handoko, 1992: 262).

## METHODS OF RESEARCH

Variables and operational definitions in this study include:

Social Responsibility (X) which refers to a commitment made by a company in maintaining harmonious relationship with the society shown by these indicators:

1. Transparency refers to the how a company provide accessible information about its progress in implementing the social responsibility.
2. Knowledge refers to the adequate insights built by a company related to the proper subjects to receive CSR aids.
3. Sustainability refers to the commitment of a company in implementing a sustainable CSR program.

Corporate Image (Y), which refers to how others view a company which can be measured from these indicators:

- The quality of product and service offered by a company from the quality aspect up to the hospitality.
- The priority given to the customers upon other considerations.
- Social responsibility as a real action of corporate's concern on social matters.
- The practice of good corporate governance

The population of this study involved 104 members of *Program Kemitraan dan Program Bina Lingkungan* under the management of a unit called the Community Development Center (CDC) which was appointed to manage the social responsibility duties of PT. Telkom in East Surabaya. Survey technique was employed to determine the samples of this study since this study involved all of the population as the samples.

## RESULTS AND DISCUSSION

*One-Step Approach Test.* In the context of SEM model, measurement model and the structural model of each parameter is administered at once. Thus, to fulfill the requirement of the fit model is a challenging task. The possibility of interaction between the measurement model and the structural model should be estimated at once using the One Step Approach to SEM. The One Step Approach to SEM technique is generally used when the model has been supported by adequate theory and it has high validity and reliability (Hair, et.al., 1998).

The result of the estimation and the fit model using the one step approach to SEM technique using application program Amos 4.01 are presented in the following Goodness of Fit Figures and Tables.

The result of the one step base model evaluation shows that each goodness of fit criteria has reached good values, which implies that the model has been suitable with the

data. In another word, the conceptual model that was constructed based on the theories used in this study is supported by the facts obtained in this study. Reliability test result indicates an internal consistency in which some indicators were eliminated that results a modification on the model as follows.

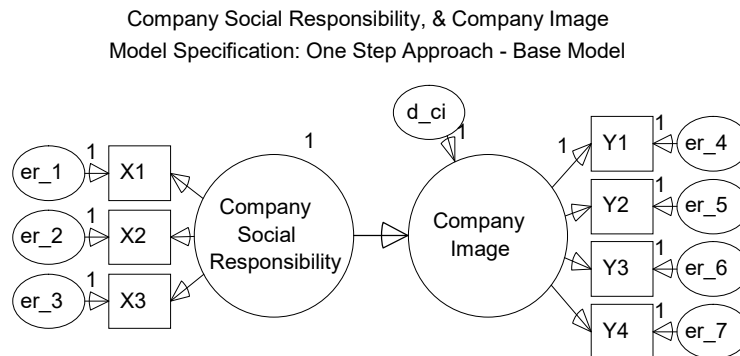


Figure 1 – The Measurement of Causality Model using One Step Approach

Table 2 – The Criteria of *Goodness of Fit Indices*

| Criteria    | Result | Critical Value | Evaluation |
|-------------|--------|----------------|------------|
| Cmin/DF     | 0.837  | ≤ 2.00         | Low        |
| Probability | 0.620  | ≥ 0.05         | Low        |
| RMSEA       | 0.000  | ≤ 0.08         | Low        |
| GFI         | 0.970  | ≥ 0.90         | Low        |
| AGFI        | 0.935  | ≥ 0.90         | Low        |
| TLI         | 1.010  | ≥ 0.95         | Low        |
| CFI         | 1.000  | ≥ 0.94         | Low        |

Source: Data Analysis.

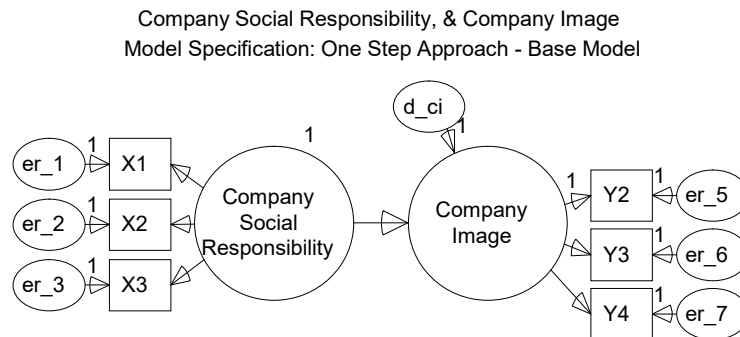


Figure 2 – Measurement and structural model

Table 3 – Evaluation Criteria of *Goodness of Fit Indices*

| Criteria    | Result | Critical Value | Evaluation |
|-------------|--------|----------------|------------|
| Cmin/DF     | 0.671  | ≤ 2.00         | Good       |
| Probability | 0.718  | ≥ 0.05         | Good       |
| RMSEA       | 0.000  | ≤ 0.08         | Good       |
| GFI         | 0.983  | ≥ 0.90         | Good       |
| AGFI        | 0.955  | ≥ 0.90         | Good       |
| TLI         | 1.014  | ≥ 0.95         | Good       |
| CFI         | 1.000  | ≥ 0.94         | Good       |

Source: Data analysis.

The result of the evaluation on the one step elimination model shows that each criteria of the goodness of fit used in this study obtained good result which means the data have been suitable with the model. It means that the design of the conceptual model based on the

related theories has been supported by the facts obtained in this study. Therefore, it can be drawn into a conclusion that the developed model appears as the best model to explain the intercorrelation among some variables in the model as follows.

Regarding the determinant of sample covariance matrix value at  $4.022.779.399 > 0$ , it does not indicate any presence of multicollinearity or singularity in the data which implies that the assumption of the study has been fulfilled. Hence, the coefficient regression of each factor is valid, proven by the result of the causality test as follows.

*The Hypothesis and Causal Relationship Tests.* Direct influence (path coefficient) can be observed from the score of the standardized regression through critical ratio test (CR) or p (probability) equal to the  $t_{value}$ . The value is regarded significant if  $t_{value}$  is greater than the  $t_{table}$ .

Table 4 – Result of the Causality Test

|                    | Factors                       | Ustd Estimate | Std Estimate | Prob.       |
|--------------------|-------------------------------|---------------|--------------|-------------|
| Company Image      | Company Social Responsibility | 0.1           | 0.154        | 0.197       |
| Significance limit |                               |               |              | $\leq 0.10$ |

Source: Data analysis.

Seen from the probability of the causal relationship orientation, the hypothesis which stated that the factor of the company social responsibility has a positive influence on the factor company image cannot be accepted [causal probability at  $0.197 > 0.10$  [insignificant [positive]].

## DISCUSSION OF RESULTS

The results of this study show that the social responsibility does not significantly affect corporate image. The result of the data analysis indicates that social responsibility has no significant influence on corporate image. Thus, it can be implied that the company has not yet applied an effective and efficient CSR management due to the limited number of staffs and lack of information received by the society which caused the program did not optimally run. This problem has resulted inadequate impact given by the company to the society. Moreover, the society shared a believe that good CSR practice means higher job opportunities offered by a company to the society in a certain area in order to improve the welfare of the people living around it. In fact, the true substance of the CSR is the sustainability of the company itself which can be maintained from the enhancement of team work among stakeholders and the facilities given by a company for the social development.

At the present time, CSR has not yet appeared as a general idea. Yet, in the era of advance information and technology, as well as the rapid growth of globalization, the requirement to run the CSR is greater. In addition, there has been a prediction that in 2009, ISO 26000 on CSR will be issued which will emphasize on the importance of the corporate social responsibility for the sustainability of the companies and to create good corporate image.

The result of this study goes contradictory to the theory on social grouping proposed by Homans based on the activities, interactions, and sentiments of the society. This theory states that more activities done by an individual that involve other individual leads to more diverse interactions and stronger sentiments. More interaction also triggers more sentiment which makes the probability of imitation of certain activities and interaction stronger. The theory on social grouping was constructed from an idea proposed by Newcomb based on the similarity of behavior in achieving certain relevant goal among a society (Homans, 2003 : 80). Similarly, social responsibility held by a company significantly affects its corporate image. Furthermore, the institutional theory urges that a company should create a good management of CSR in order to run its external constitution. This action is believed to have strong trigger in driving good intentions and legitimation of the external constitution, which later ensures the sustainability of a company and uplifts its corporate images (Handoko, 1992: 262).



## CONCLUSION AND SUGGESTIONS

Based on the result of this study, it can be concluded that there is no significant influence of corporate social responsibility on the corporate image. This result implies that the implementation of the corporate social responsibility performed by the company has not yet effective and precise due to the lack of accessible information and the limited number of staffs to take care of this matter. Consequently, the management of CSR could not run optimally, and the company was regarded having low contribution to the society since the society measures the contribution of a company from company's ability to provide broader job opportunity and how the company is able to improve the society welfare.

Based on the findings of this study, companies are recommended to precisely measure the fund needed to run their social responsibility duties for the society. This problem should be taken into account considering the fact that CSR gave a negative effect to the development of a company. Companies, especially PT. Telkom East Surabaya should improve the corporate image since the image reflects internal trust in the company, emotional and intellectual relationship among employees, the target related to the consumers and stakeholders, besides it also shows the credibility of the company.

## REFERENCES

1. Ferdinand, Augusty, 2002, Structural Equation Modeling Dalam Penelitian Manajemen, Penerbit BP Undip, Semarang.
2. Fitri Ismiyanti, 2006, "Corporate Citra melalui pendekatan corporate Social responsibility di lingkungan PT.PERKEBUNAN NUSANTARA X"
3. Hair, J.F. et. Al, 1998, Multivariate Data Analysis, Fifth Edition, Prentice-Hall International, Inc., New Jersey.
4. Hartline, Michael D. and O.C. Ferrell, 1996, "The Management of Customer-Contact Service Employees : An Empirical Investigation", Journal of Marketing.
5. Kotler, Philip, 1997, Manajemen Pemasaran : Analisis, Perencanaan, Implementasi, Dan Kontrol, Penerbit Prenhallindo, Jakarta.
6. 2000, Marketing Management: Analysis, Planing, Implementation and control, The Millenium Edition, Prectice Hall International, Inc. New Jersey.
7. Peggy Simcic Brønn, 2006, "Tanggung Jawab Sosial Korporat Dan Pemasaran Yang Berhubungan Dengan Penyebab: Sebuah Tinjauan".
8. Robbins, Stephen P. 2001, Organization Behavior: Concepts, Controversies Aplication, Sevent Edition, Pretice Hall, Inc., New Jersey.
9. Tabachnick B.G., 1996, Using Multivariate Statistics, Third Edition, Harper Collins College Publisher.

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## **TRMM 3B43 RAIN DATA INFORMATION IN DETERMINING LONG WET AND DRY PERIODS IN FARMING BUSINESS IN MOONSON AREA**

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### **ABSTRACT**

Based on the observation towards climate station in several agriculture production centers, there is an increase temperature. Temperature rise due to greenhouse effect is very clearly visible, e.g., in Banjarbaru Indonesian Agency of Meteorological, Climatology, and Geophysics (BMKG), misal di stasiun BMKG Banjarbaru, Banjarmasin Sei Tabuk Special Farm Meteorology Station (SMPK), and South Kalimantan Kotabaru BMKG. This temperature rise impacted to plant's respiration increase that led to the reduction of photosynthesis result. Adaptation strategy with plants water balance analysis to determine the correct planting time and surplus period and water deficit, in various growth phases, is one of water permanent strategic measures to know water sufficiency in the field. Material used in this research is TRMM from 3B43 type in the form of grid with monthly temporal resolution and spatial resolution  $0.25^{\circ} \times 0.25^{\circ}$  with data from 1998 – 2015 period. Data format in the form of binary from [ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B43\\_V7](ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B43_V7). Reanalysis surface temperature data is grid data from European Centre for Medium-Range Weather Forecasts (ECMWF) from 1998 -2015 period in netcdf format. Water balance analysis used Thornthwaite and Mather (1957) method. Water balance analysis shown groundwater in sufficient category (>60%) happens during November – July period, meanwhile water surplus happens during December – June period. Whereas during August – October period is in less period (<40%). This information can be used in the formulation of one season planting pattern both in wet or dry field.

### **KEY WORDS**

TRMM, water balance analysis, surplus, deficit, rainy season, dry season.

Since 1980s, it is predicted that the global warming has become reality, like what happened to several research results related directly with global and local climate change or climate aberrations. Based on the observation towards severa climate stations in several agriculture centers, it shows that there is temperature rise. Temperature rise due to greenhouse effect is very clearly visible, e.g., in Banjarbaru BMKG, Banjarmasin Sei Tabuk SMPK, and South Kalimantan Kotabaru BMKG. This temperature rise resulted in the increase of plant's respiration that led to photosynthesis result reduction.

Yonny *et al.* (1999) who stated that the most important impact of climate change is not in gradual warming but instead in the occurance of extreme, e.g., long drought, thunder storm, flood, or landslide with rising frequency and magnitude. The meteorology researchers in CNRM believe that the rising rainfall quantity is the impact of temperature rise that will trigger water loss in the form of evaporation.

Anticipative measure towards climate change and its impact, analysis towards climate parameter in various observation scales must be improved, especially the one related with

the ability of weather forecast. The ability upgrade for accurate weather forecast can be conducted up to the poured water volume and availability and storing in ground for certain length of countable time. Therefore correct planting time can be predicted to anticipate extreme climate change, and able to give information or early warning to farmer communities on drought and flood. If rain characteristics or rainfall in certain place in the future is unknown, then the conducted analysis can only be rain evaluation.

Technology development in remote sensing, e.g., satellite and radar, rainfall measuring conducted by that technology until enabling it for rainfall observation in large areas even area that unreachable by conventional equipment. The advantages of remote sensing should be utilized further to learn weather and climate in an area for the interest of water resource management and its utilization for society welfare (Syaifulah, 2014). Especially for tropical area, at the moment there is remote sensing equipment that able to conduct rainfall measurement mission in tropical area by Tropical Rainfall Measurement Mission (TRMM) satellite. TRMM satellite can measure rainfall intensity from three hours, daily, to monthly scale.

Climate information is highly needed in disaster mitigation as a reference in policy making. Climate information advantages in agriculture are the availability of ground water for plants. Based on the capability to conduct climate analysis both in macro or micro scale able to generate product that can be used to support prospective farming and highly competitive farming, e.g., through plants water balance analysis to determine the correct planting time and water surplus and deficit period in various growth phase.

Based on the explained background, the formulation of the research problem is how to utilize TRMM satellite for agroclimate zonation based on water balance analysis? The scope of problem are (1) Research study area is South Kalimantan, (2) TRMM Satellite data used is TRMM 3B43 data which is monthly rainfall estimation data with spatial resolution 0.25 x 0.25 degree, and (3) field water balance calculation based on Thornthwaite and Mather method. Field Capacity Value (KL) and Permanent Wilting Point (TLP) based on field water balance technical guide from BMKG. This research purpose is to make agroclimate zonation based on field water balance based on TRMM satellite data in South Kalimantan.

## METHODS OF RESEARCH

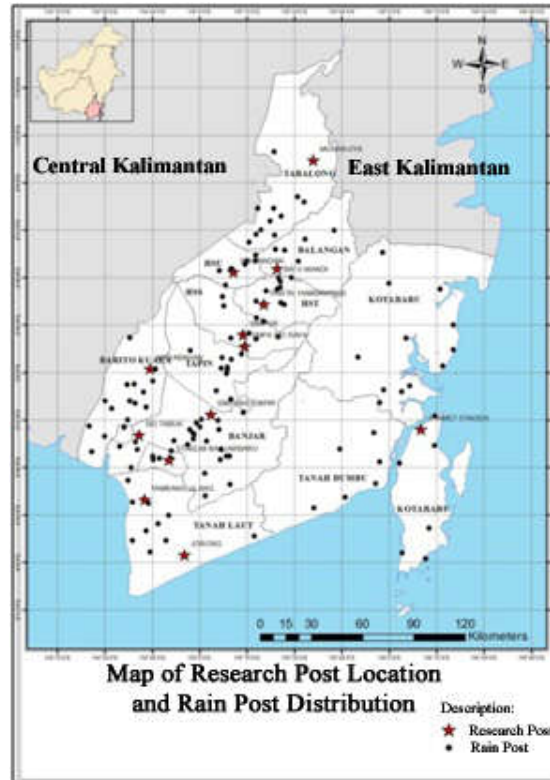
This research is conducted in South Kalimantan Province which is located between 1°20' S – 4°10' S and 114°19'E - 116°33'E. The research is conducted in six months from March to August 2016. For research location and rain observation post in South Kalimantan can be viewed in detail in

Graphic 1.

Research instrument consisted of computer, GrADS Open Software version 2.0, Matlab software version 7.8, Arc GIS 10.2, and Microsoft Excel for RMSE value and calculation and correlation. Material used is TRMM satellite type 3B43 in the form of grid data with monthly temporal resolution and spatial resolution 0.25° x 0.25° with 1998 – 2015 data period. Data format in the form of binary data and downloaded from [ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B43\\_V7](ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B43_V7). Surface temperature data in the form of grid data from European Centre for Medium-Range Weather Forecasts (ECMWF) 1998-2015 periods in netcdf format downloaded from <http://www.ecmwf.int/en/research/climate-reanalysis/browse-reanalysis-datasets>.

Surface rainfall data 1998-2015 period from 13 observation spot locations sourced from South Kalimantan BMKG, i.e., (1) Muara Uya, Tabalong Regency 1.88°S and 115.60 °E, (2) Batu Mandi, Balangan Regency 2.45 °S and 115.41 °E, (3) Sei Pandan, Hulu Sungai Utara 2.47 °S and 115.18 °E, (3) Hambawang Beach, Hulu Sungai Tengah Regency 2.64°S and 115.34°E, (4) Simpung, Hulu Sungai Selatan 2.80 °S and 115.23 °E, (5) Sungai Raya SMPK, Hulu Sungai Selatan Regency 2.86 °S and 115.24 °E, (6) Banjarbaru, 3.46 °S and 114.84°E, (7) Simpang Empat, Banjar Regency 3.22 °S and 115.06 °E, (8) Sei Tabuk, Banjar Regency 3.33 °S and 114.68 °E, (9) Marabahan, Batola Regency 2.98 °S and 114.74°E, (10) Jorong, Tanah Laut Regency 3.96 °S and 114.92°E, (10) Tambang Ulang, Tanah Laut Regency

3.67°S and 114.71 °E, (11) Stagen Kotabaru Regency 3.30 °S and 116.17°E, (12) Tambang Ulang, Tanah Laut Regency 3.67 °S and 114.71 °E, and (13) Stagen Kotabaru Regency 3.30°S and 116.17°E.



Graphic 1 – Research location and rain post in South Kalimantan

*Research Procedure.* The stages in this research are:

1. Determining Input Data. Main data used is monthly rain data from TRMM satellite type 3B43 1998 - 2015 data period in the form of grid with spatial 0.25° x 0.25°. Data format in the form of binary data downloaded from [ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B43\\_V7](ftp://disc2.nascom.nasa.gov/data/TRMM/Gridded/3B43_V7). Supporting data in the form of monthly surface rainfall data 1998 – 2015 period from BMKG observation spot in South Kalimantan for TRMM data validation. Monthly surface temperature data from ECMWF reanalysis data in netcdf format 1998 – 2015 periods.
2. TRMM Satellite Data Extraction. Binary format of TRMM Satellite Data extracted to certain grid (research domain area) by using GRADS software. Next data binary converted into numerical data with Matlab software. Data from conversion result compiled as monthly data series from 1998 to 2015.
3. TRRM Satellite Rainfall Data and Surface Rainfall Data Validation. TRRM rainfall data and surface rainfall data validation applied correlation analysis (r). Correlation coefficient calculated by using equation (Wilks, 1995):

$$r_{\hat{Y}\hat{Y}} = \frac{\sum_{i=1}^n (Y_i - \bar{Y})(\hat{Y}_i - \bar{\hat{Y}})}{\sqrt{\sum_{i=1}^n (Y_i - \bar{Y})^2} \sqrt{\sum_{i=1}^n (\hat{Y}_i - \bar{\hat{Y}})^2}}$$

Where:  $r_{\hat{Y}Y}$  = correlation coefficient between TRMM satellite data with surface observation rainfall data;  $Y_i$  = TRMM satellite data in data satelit TRMM in  $i$  period with  $i=1, 2, \dots, n$ ;  $\bar{Y}$  = average TRMM satellite data values;  $\hat{Y}_i$  = observation rainfall data in  $i$  period with  $i=1, 2, \dots, n$ ;  $\bar{\hat{Y}}$  = observation rainfall average value;  $n$  = period length.

Water balance analysis stages are:

- ECMWF reanalysis surface temperature data extraction on set grid.
- Calculating surface temperature value in 1998 – 2015 period for every set grid.
- Calculating Potential Evapotranspiration (ETP) value by using Thornthwaite and Mather method (1957).
- Calculating ground water avalaibility with this equation:

$$\text{Ground water avalaibility (ATI)} = \frac{KAT - TLP}{KL - TLP} \times 100\%$$

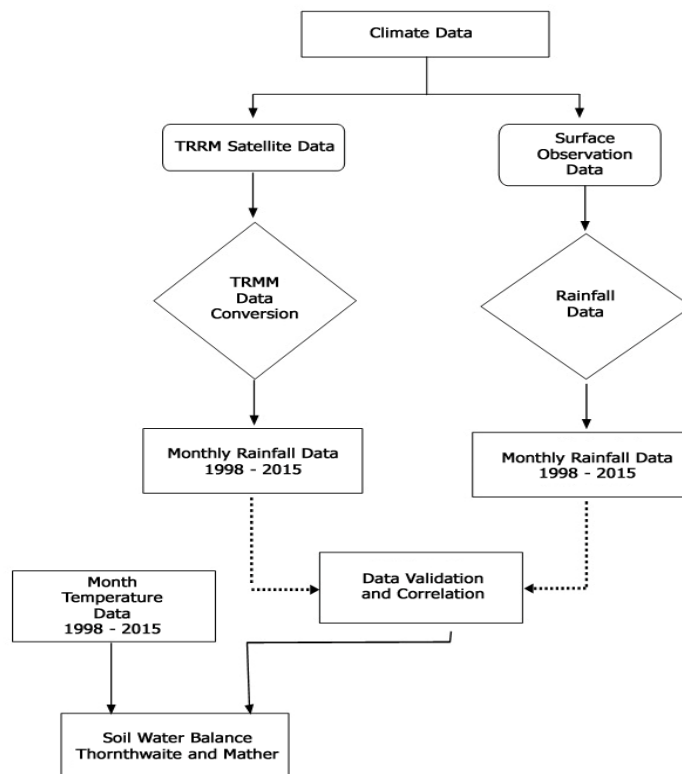
Where: KAT= ground water level; TLP = permanent wilting point; KL = field capacity and available water.

What categorized into three parts are:

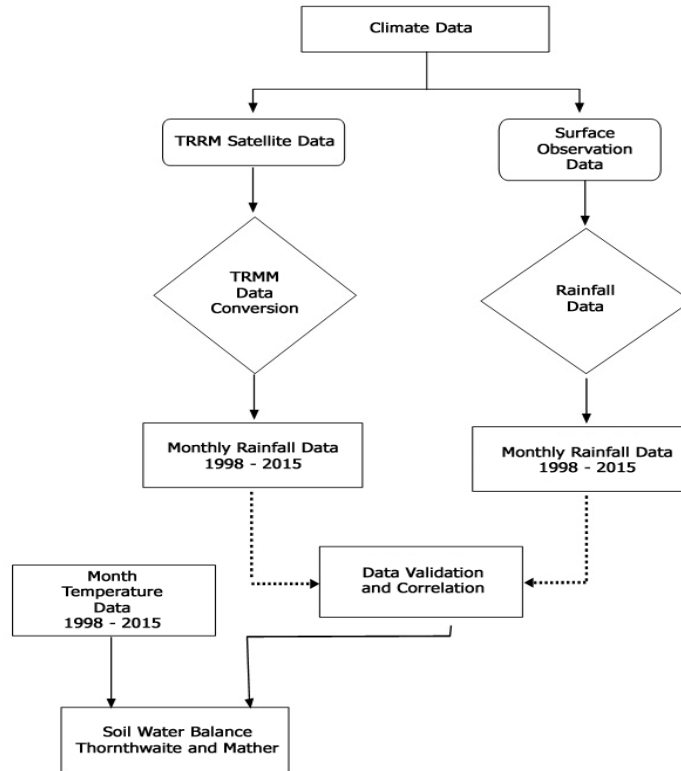
- Lack, if ground water avalaibility < 40%;
- Medium, if ground water avalaibility 40% - 60%;
- Sufficient, if ground water avalaibility > 60%.

A month experience rainy season rainfall ratio (CH) and ETp of related month has value > 0.75. Dry season happen when the ratio of Deficit (D) and ETp of related month has value > 0.5, meanwhile if the ratio is between 0 – 0.5 then it is called transition season or time.

This research procedure flow is presented in



Graphic 2.



Graphic 2 – Procedure Flow Diagram

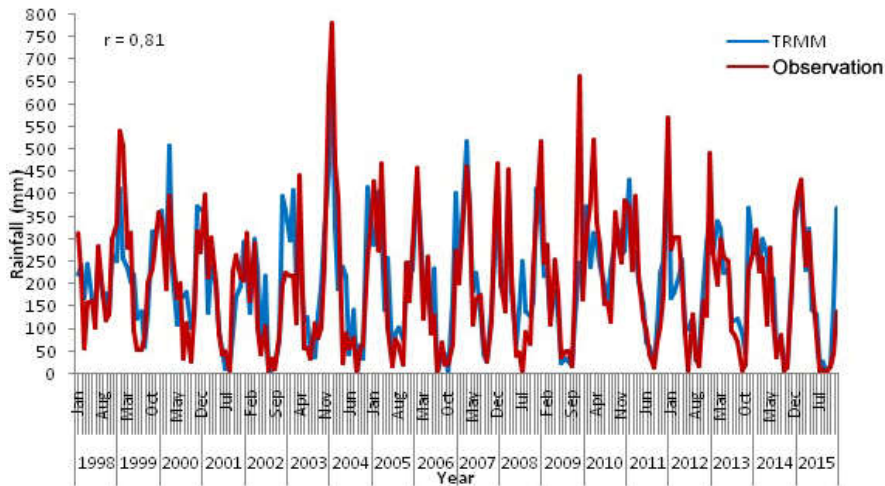
### RESULTS AND DISCUSSION

*TRRM Satellite Data Validation and Surface Rainfall Data.* TRRM data and surface rainfall data validation in this research is conducted by taking 13 rainfall observation spots sample and the distribution of data representing all research areas. Rainfall data samples taken are adjusted with TRRM grid data. Relation level of those two data is analysed with (r) correlation value.

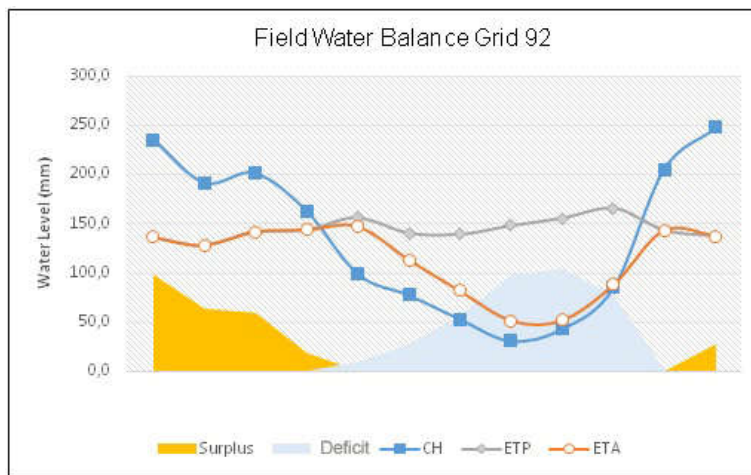
Table 1 – Correlation Value and TRMM Satellite RMSE and Surface Rainfall

| No | Observation Spots   | Monthly Series     |        |                    | Monthly Average    |       |                    |
|----|---------------------|--------------------|--------|--------------------|--------------------|-------|--------------------|
|    |                     | r <sub>count</sub> | RMSE   | P <sub>value</sub> | r <sub>count</sub> | RMSE  | P <sub>value</sub> |
| 1  | Banjarbaru          | 0.86               | 67.70  | 0.00               | 0.99               | 19.46 | 0.00               |
| 2  | Muara Uya           | 0.79               | 86.70  | 0.00               | 0.97               | 43.78 | 0.00               |
| 3  | Sei. Pandan         | 0.75               | 93.60  | 0.00               | 0.99               | 41.90 | 0.00               |
| 4  | Marabahan           | 0.78               | 115.20 | 0.00               | 0.99               | 0.00  | 0.00               |
| 5  | Stagen              | 0.80               | 86.10  | 0.00               | 0.94               | 21.35 | 0.00               |
| 6  | Sei Raya SMPK       | 0.79               | 77.90  | 0.00               | 0.97               | 23.17 | 0.00               |
| 7  | Batu Mandi          | 0.74               | 80.08  | 0.00               | 0.97               | 27.68 | 0.00               |
| 8  | Hambawang Beach     | 0.80               | 84.40  | 0.00               | 0.98               | 22.08 | 0.00               |
| 9  | Simpur              | 0.73               | 77.60  | 0.00               | 0.97               | 19.49 | 0.00               |
| 10 | Simpang Empat       | 0.82               | 94.20  | 0.00               | 0.97               | 26.29 | 0.00               |
| 11 | Sungai Tabuk        | 0.81               | 84.30  | 0.00               | 0.98               | 30.22 | 0.00               |
| 12 | Tambang Ulang       | 0.85               | 86.90  | 0.00               | 0.99               | 23.92 | 0.00               |
| 13 | Cindai Alas Selatan | 0.80               | 100.30 | 0.00               | 0.92               | 0.00  | 0.00               |
|    | Average             | 0.79               |        |                    | 0.97               |       |                    |

TRRM satellite monthly data and surface rainfall data series (r) correlation value has good correlation between 0.73 - 0.86 with sample overall correlation average value as much as 0.78. Calculation Result of correlation value and TRRM satellite rainfall and surface rainfall pattern comparison shows that TRRM highly capable to be used as surface rainfall data which is indicated by strong correlation value. r Value in calculation result table can also be viewed in the following graphic:



Graphic 3 – TRRM Satellite Data Series and Sei Tabuk SMPK Surface Rainfall Graphic *South Kalimantan Area Water Balance Analysis*. Based on TRRM 3B43 satellite data and reanalysis temperature data on every set grid spot analysis and field water balance calculation as illustrated by Graphic 4 is conducted. The graphic shows water surplus and deficit grid spot 92 (Sei Tabuk, Banjar Regency 3.33 °S and 114.68 °E). Water surplus period happen during five months, i.e., December to April, meanwhile water deficit period happen during six months, i.e., May to September.

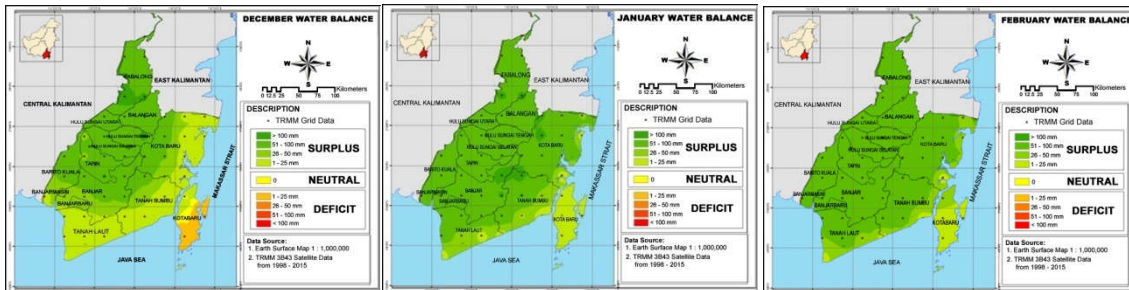


Graphic 4 – Field water balance graphic on grid 92 (Sei Tabuk, Banjar Regency 3.33°S and 114.68°E)

Since November CH > ETP but water surplus or deficit condition is the same with 0 (zero), this shows that rain water surplus condition is utilized to fill groundwater availability through infiltration and the rest of it released in the surface. Water surplus condition happened if ground water condition has become saturated or reached field capacity. Water surplus period can be optimized for rain fed agriculture and stock water storage in the form of irrigation making or retention basin building for dry season period. In wet field, last month surplus, April started rice seedlings plantation in the field (transplanting).

*Field Water Balance in December, January, and February (DJF)*. Ground water availability level analysis in South Kalimantan in December, January, and February, shows

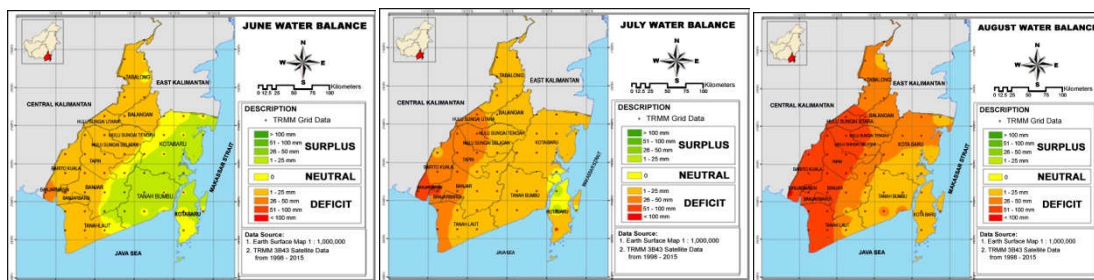
general sufficient condition. The area in less and medium water availability consisted of Kotabaru regency's Laut Island. Water balance analysis in this month shows general water sufficiency except some areas of Laut Island (Kotabaru Regency) which still suffer from water deficit. Water surplus area with 50 – 100 mm value consisted of Tabalong Regency, Tabalong, Balangan, Hulu Sungai Utara, Hulu Sungai Tengah, Hulu Sungai Selatan, Tapin, Northern Barito Kuala and Northern part of Banjar Regency. Water surplus with 25 – 50 mm values consisted of Tanah Laut regency, Tanah Bumbu and northern part of Kotabaru.



Graphic 5 – Surplus Map/December, January, and February Surplus

Ground water availability level analysis in South Kalimantan in July has started to varied from less to sufficient category. Water availability in less category shown with red colored legend with percentage < 40% consisted of Barito Kuala regency, Banjarmasin, western part of Banjarbaru, western part of Banjar Regency, western part of Tapin Regency, nad western part of Hulu Sungai Selatan. The variety of ground water availability in July shown from "less" category to highly varied from West to East. Areas with sufficient ground water consisted of Tabalong regency, Tanah Bumbu, Kotabaru, some parts of eastern part of Tanah Laut and some parts of eastern side of Banjar.

*Field water balance analysis in June, July, and August (JJA).* Water deficit has extended to almost to entire areas of South Kalimantan with values around 1 – 25 mm. Water deficit is around 50 – 100 mm comprised of southern part of Barito Kuala and Banjarmasin. Water deficit with values of 20 – 50 mm comprised of Hulu Sungai Utara, western part of Hulu Sungai Selatan, western part of Tapin, western part of Banjar regency, western part of Tanah Laut coast, Banjarbaru and Barito Kuala. Groundwater availability and water balance volume is varied from west to east.



Graphic 6 – Surplus/ Defisit Map in June, July, and August

Based on South Kalimantan area water balance spatial analysis the groundwater availability period is in sufficient category (> 60%) berkisar 5 – 9 bulan, meanwhile water surplus period is around 4 – 7 months. In detail, ground water availability level period is in sufficient period and water surplus period in South Kalimantan in tabulation for each regency shown in Table 2.

Table 2 – South Kalimantan area field water balance analysis

| No | Regency / City   | Water Availability (>60%) | Water Surplus | Rainy Season Period (CH/ETP) | Dry Season Period (D/ETP) | Transition Period (D/ETP) <0.5 |
|----|------------------|---------------------------|---------------|------------------------------|---------------------------|--------------------------------|
| 1. | Tabalong Regency | 8 – 9 months              | 6 months      | Nov-Jun                      | 0                         | Jun-Oct                        |



|     |                             |              |              |         |         |                 |
|-----|-----------------------------|--------------|--------------|---------|---------|-----------------|
| 2.  | Balangan Regency            | 8 – 9 months | 5 – 6 months | Nov-May | 0       | May-Oct         |
| 3.  | Hulu Sungai Utara Regency   | 8 months     | 5 months     | Oct-Jun | Sep     | May-Agt and Oct |
| 4.  | Hulu Sungai Tengah Regency  | 8 – 9 months | 5 months     | Nov-Jun | 0       | May-Oct         |
| 5.  | Hulu Sungai Selatan Regency | 7 – 8 months | 5 months     | Nov-May | Agt-Sep | May-Jul and Oct |
| 6.  | Tapin Regency               | 7 – 8 months | 5 – 6 months | Nov-Apr | Sep     | May-Jul and Oct |
| 7.  | Banjar Regency              | 7 – 9 months | 5 – 7 months | Nov-Apr | Agt-Sep | May-Jul and Oct |
| 8.  | Tanah Laut Regency          | 7 – 8 months | 5 months     | Nov-Apr | Agt-Sep | May-Jul and Oct |
| 9.  | Tanah Bumbu Regency         | 7 – 8 months | 5 – 7 months | Nov-Jul | 0       | Jun-Oct         |
| 10. | Kota Baru Regency           | 6 – 7 months | 5 – 7 months | Nov-Jul | 0       | Agt-Oct         |
| 11. | Barito Kuala Regency        | 6 months     | 5 months     | Nov-Apr | Agt-Sep | May-Jul and Oct |
| 12. | Banjarbaru City             | 5 – 7 months | 5 months     | Nov-May | Agt-Sep | May-Jul and Okt |
| 13. | Banjarmasin City            | 6 months     | 5 months     | Nov-Apr | Agt-Sep | May-Jul and Oct |

Water balance analysis above is early information that can be used as advice in agricultural activity planning in South Kalimantan. Generally ground water availability period with sufficient category happen in November - May, meanwhile water surplus period also happen during November – May period. Water balance analysis result in South Kalimantan also gives early information on the potential of drought or drought-prone areas. From water balance analysis, the level of ground water availability is in less category (< 40%) and water deficit happen during August to September (two months).

Period information of drought-prone area can be suggestion to anticipate and solve drought disaster. South Kalimantan almost every year in dry season suffers from smoke disaster due to field fire. Climate resource utilization has important role as one of useful information in planning and managing natural resources and as basic reference in policy planning and policy making.

Local agribusiness that sensitive to photo periodism in South Kalimantan generally started on October, both direct planning in dry field or stages planning in wet field as explained as following:

| Activity                             | Month |     |     |   |   |   |     |   |   |   |       |   |
|--------------------------------------|-------|-----|-----|---|---|---|-----|---|---|---|-------|---|
|                                      | 10    | 11  | 12  | 1 | 2 | 3 | 4   | 5 | 6 | 7 | 8     | 9 |
| 1 <sup>st</sup> Seedling (dry field) | SW    |     |     |   |   |   |     |   |   |   |       |   |
| 2 <sup>nd</sup> Seedling (wet field) |       | TP1 |     |   |   |   |     |   |   |   |       |   |
| 3 <sup>rd</sup> Seedling (wet field) |       |     | TP2 |   |   |   |     |   |   |   |       |   |
| Main Rice (wet field)                |       |     |     |   |   |   | TP3 |   |   |   | Panen |   |

*SW = sowing, TP=transplanting*

Source: Hasegawa et al (2004).

Based on Table 2, month amounts to conduct planting pattern business above still possible, but based on Graphic 6 there is a shift in rainy season that previously in April shifted to May. That time shift affected to result reduction because vegetative time around one month in April (above graphic). Meanwhile, local rice planted is photo-periodism sensitive which affected to flowering in June. This will reduce the time for carbohydrate accumulation which left around one month (May). Rainy season end time shift become more regressed, and this is almost spread evenly in South Kalimantan Monsoon area. This is need to be anticipated, one of it is by looking for short time varieties, therefore after the transplanted rice has enough time for active vegetative and seedlings. Some varieties with shorter age from the elders have been assembled like what have been done by Wahdah, Rusmayadi and Zulhidiani (2016) towards photo-periodism sensitive local variety Siam Unus mutant M6 with 111 – 115 days age after transplanting.

## CONCLUSION

Field water balance analysis mapping based on TRMM satellite data shows ground water availability with sufficient category happen during November – July period, meanwhile water surplus period happen during December – June period. Water balance analysis gave more detail information to determine agriculture planting pattern. Water balance analysis gave information on planting potential time available and gave information on drought-prone areas which is very useful to be used for the basis of planting planning and management.

## REFERENCES

1. Hasegawa, T. 2004. Grain yield and its variation of local rice varieties grown on acid sulfate soil in South Kalimantan. *Jpn. J. Crop Sci.* 73 (1), 220-221.
2. Oldeman, R.L. 1980. The agro-climatic maps of Kalimantan, Maluku, Irian Jaya, and Bali West and East Nusa Tenggara. *Contrib. Centr. Res. Inst. Agrc. Bogor.*
3. Raihani Wahdah. 2016. Performing of agronomic characters of M6 of local rice mutant lines of South Kalimantan. *International Journal of Biosciences*, 9(6): 114-124.
4. Rusmayadi, G. 2012. *Pertanian Dalam Bayang-Bayang Iklim Ekstrim*. P3AI Universitas Lambung Mangkurat Banjarmasin.
5. Syaifullah, M.D. 2011. Validasi Data TRMM Terhadap Data Curah Hujan Aktual di Tiga DAS di Indonesia. *Jurnal Meteorologi and Geofisika*. 15: 109-118.
6. Simpson, J. (Edt.), 1998, Report of the Science Steering Group for a Tropical Rainfall Measuring Mission (TRMM), GSFC (Goddard Space Flight Center).
7. Thornthwaite. 1957. *Instruction and tables for computing potential evapotranspiration and the water balance*. Drexel Institute of technology. Laboratory of Climatology. USA.
8. Wilks, D.S. 1995. *Statistical Methods in the Atmospheric Sciences*. Academic Press Inc.

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## THE STORAGE EFFECT ON SALAK SUWARU POLLEN VIABILITY

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### ABSTRACT

*Salak* is a cross-pollinated plant, where the presence of pollen is required for pollination and fertilization process. The availability of *Salak* pollen is very fluctuating, at times pollen is excessively available, and otherwise at certain times the pollen is unavailable. Such circumstance affects the production of *Salak Suwaru*. The solution in pollen tentative availability is required in order to achieve the continuity of *Salak Suwaru's* production. Research about pollen storage is expected to achieve practical result as the solution of *Salak Suwaru* pollen tentative availability. The purpose of this research is to identify the effect of storage method on the viability of *Salak Suwaru* pollen has been done from May to July 2017. The result shows that the storage method influenced *Salak Suwaru* pollen viability. The viability of *Salak Suwaru* pollen stored in freezer up to 8 weeks is adequately high; it is more than 70%. The *Salak Suwaru* pollen storage in freezer can be used to overcome the pollen's unavailability at certain times.

### KEY WORDS

Pollen, freezer, *exicator*, viability.

In Indonesia, *Salak* is one of the fruit clusters considered to have a competitive advantage prioritized in the fruit development program, in which expected to be able to play an important role in regional economic development (Directorate General of Horticultural Production and Various Plants, 2001). One of the superior *Salak* developed in East Java is *Salak Suwaru* which comes from Malang Regency. *Salak Suwaru* as one of East Java's superior fruit has been released as a superior variety through Ministry of Agriculture Decree No: 120 / Kpts / TP / 240/3/1991. The superiorities of *Salak Suwaru* are thick meat, ripe, sweet, sharp-flavored and weight per fruit is between 70 -120 g (Widyastuti and Paimin, 1993).

*Salak* (*Salacca edulis Reinw*) *syn Salacczalacca* (Gaertner) Voss (Schuiling and Mogeia, 1992) belongs to the growing family of Palmae. Based on sex, *Salak* included in dioecious plants, male and female flowers are in different plants (Mogeia, 1978). On the basis of the nature of such flowers, *Salak* plants are generally cross-pollinated (Frankel and Galun, 1977; Fisher and Mogeia, 1980). Based on the cross-pollination nature of *Salak* plants, the presence of male *Salak* as a source of pollen is very important.

Naturally, *Salak* sprouts appear every 2 – 3 months along with the emergence of new sprout (Purnomo, 1993). According to this fact *Salak* harvest season should not be only twice as occurred currently. In line with the flowers arise periodicity; harvest should be obtained in the off-season which can occur in March - May or August - October.

The absence of off-season harvests is caused by many factors, in particular at certain times female *Salak* plants do not produce flowers or the presence of male *Salak* plants as a source of pollen and the availability of non-continuous pollen (Sudaryono, et al., 1999).

The availability of non-continuous pollen indicates that at certain times there are female *Salak* flowers that are plummeting due to non-pollination. A possible approach to overcome pollen incontinence is the preservation or storage of pollen. Therefore, it is required to find the appropriate storage method of *Salak Suwaru* pollen.

The aim of this research is to identify the effect of storage method on the pollen viability and to acquire the proper way of storing *Salak Suwaru's* pollen.

## METHODS OF RESEARCH

The study was conducted from May to July 2013 at the Plant Breeding and Culture Breeding Laboratory, Agricultural Technology Assessment Institute of East Java, Malang. The research material is *Salak Suwaru* male pollen. The study was conducted using a completely randomized design with the treatment of storing pollen, which is stored in an *exicator* at room temperature, and stored in a freezer. Freezers are used as a way of storing pollen with the consideration that every farm household has a refrigerator equipped with a freezer. Pollen collecting procedure is according to Akihima and Omuru method (1986) and Shivanna and Rangaswamy (1992).

The viability of pollen observation was at 1-week intervals. The pollen viability test was conducted using in vitro media according to Hengki and Gaghaube (1999). The growing media of each Petridis is made of 0.3 g gelatin, 375 g sucrose or sugar, 3 mg boric acid and 25 ml of distilled water. The ingredients are heated in a beaker glass until boiling, and then poured into Petridis with 2-2.5 mm thickness evenly. After the media is cold (about 5 minutes), the pollen is sown evenly onto the surface of the media with the help of a small quartz, then left for two hours and the pollen viability is observed under a microscope. The calculation of pollen viability is by dividing the media into five parts of the area. In each field is observed 1 time, therefore the number of observations in a Petridis are 5 times. The level of pollen viability in each field by using the formula as follows:

$$\text{Pollen Viability} = \frac{\sum \text{germinated pollen in the relevant plane}}{\sum \text{pollen that is observed in the relevant field}} \times 100\%$$

## RESULTS AND DISCUSSION

*SalakSuwaru* pollen viability observation was conducted during 1 to 8 weeks storage, along with 1 week interval observation. Based on the formula, pollen viability is a comparison between the amount of germinated pollen which is characterized by the formation of pollen tube (Figure 1) with the amount of observed pollen which is the accumulation from non-germinated pollen (Figure 2) and germinated pollen.

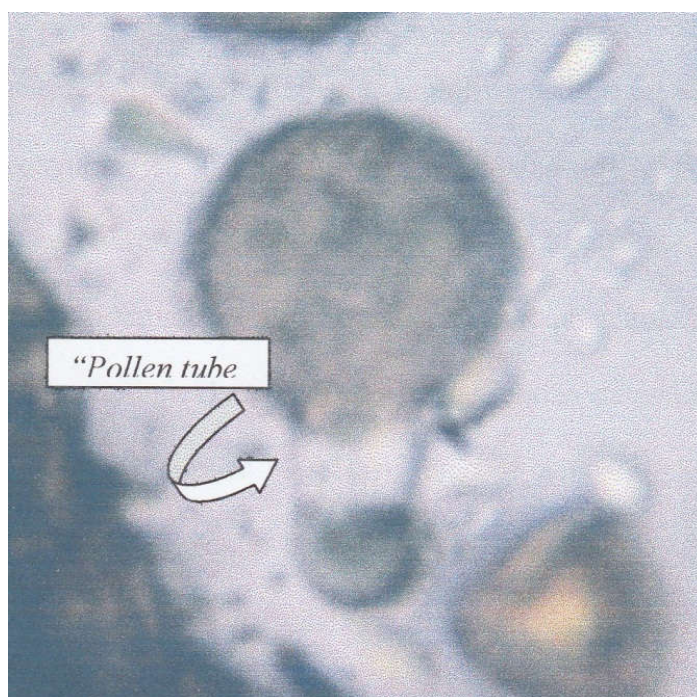


Figure 1 – Germinated *Salak* pollen which is characterized by the formation of pollen tube

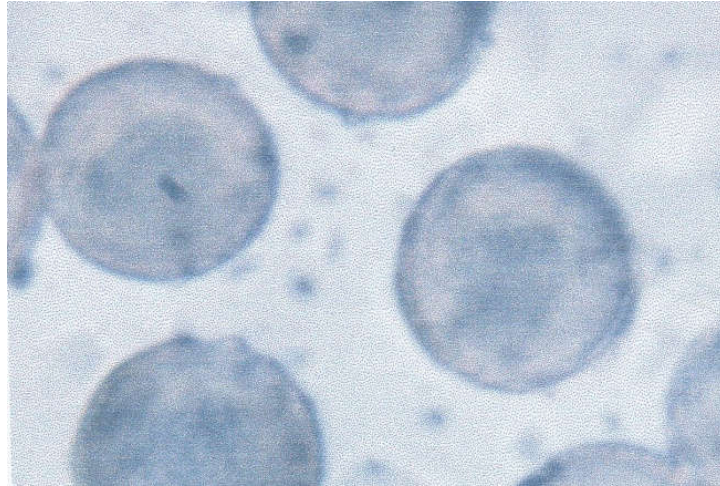


Figure 2 – Non-germinated *Salak* pollen which is characterized by the non-formation of pollen tube

Statistical analysis indicates that the storage method influenced the viability of *Salak* pollen. *Salak Suwaru* pollen stored in the freezer decreased their viability more gradually than those stored in the *exicator* (Figure 3).

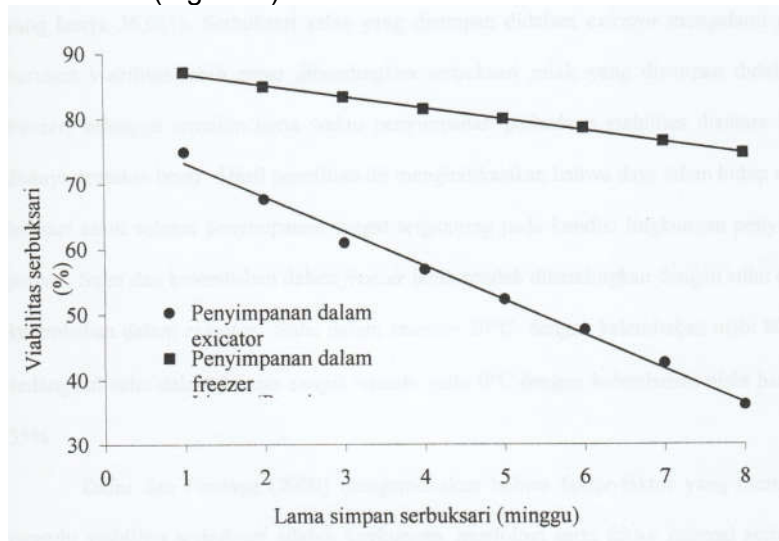


Figure 3 – The relationship between the old save with the viability of *Salak Suwaru* pollen stored in the *exicator* and freezer

In Figure 3 it shows that during 1 to 8 weeks storage, *Salak Suwaru* pollen stored in the freezer always shows higher viability compared to pollen's viability stored in the *exicator*. At 8 weeks storage, *Salak Suwaru* pollen viability stored in the freezer is still adequately high; it is about 74.59% two times greater than *Salak Suwaru* pollen viability stored in the *exicator* which is only 36.02%. Based on these observations, *Salak Suwaru* pollen stored in the freezer for 8 weeks can still be used in pollination. Hengki and Gaghaube (1999) from the results of their research on coconut plants suggested that pollen which has sprouts strength above 40% can still be used as pollination material.

*Salak Suwaru* pollen stored in the *exicator* has faster viability decrease than *Salak Suwaru* pollen stored in the freezer, therefore the longer the storage time, the greater difference between the viability of both. The results of this study indicate that the survival rate of *Salak Suwaru* pollen during storage is highly dependent on the environmental of storage conditions. The temperature and humidity in the freezer are lower than the temperature and humidity inside the *exicator*. The temperature inside the *exicator* is about 30°C with 80% relative humidity, whereas the temperature inside the freezer is very low, it is 0°C with only 35% relative humidity. Dafni and Firmage (2000) stated that the affecting factors of pollen

viability are the environment, morphology and the internal pollen itself. The main environmental factors affecting the life-sustenance of pollen are moisture and temperature (Akihima and Omura, 1986; Dafni and Firmage, 2000). The temperature influence on pollen viability has been proven by Pool and Bermawie (1986). Storage of clove pollen for 48 weeks in the temperature range  $-20^{\circ}\text{C}$  to  $-25^{\circ}\text{C}$  can maintain 2.2% pollen viability. While the moisture influence on pollen viability can be perceived in this study's results. Up to 8 weeks-storage, the viability of *Salak Suwaru* pollen stored in the *exicator* reaches only half of the pollen viability stored in the freezer. This relates to the existing moisture in the *exicator* and freezer. The humidity in the *exicator* is twice bigger compared to the humidity in the freezer. Stanley and Linskens (1974) stated that pollen survival during storage is generally negatively correlated with relative humidity. Furthermore, it is argued that the best life of pollen is achieved in the relative humidity of 6 - 60%.

The results of this study can be used by *Salak Suwaru* farmers to provide pollen throughout the season. When the male *Salak* flowers are plentiful, pollen is collected and inserted into small clear glass bottles. Furthermore, bottles containing the pollen are stored in the freezer inside the refrigerator. This method can easily be done by farmers, assumed that almost every farmer's house has a refrigerator. In this way, the farmers of *Salak Suwaru* will get the certainty of pollen availability throughout the seasons.

### CONCLUSION

The storage method influences *Salak Suwaru* pollen viability. *Salak Suwaru* pollen stored in the freezer up to 8 weeks viability is still adequately high, that is more than 70%. Storage of *Salak Suwaru* pollen in the freezer can be used to overcome pollen unavailability at certain times.

### REFERENCES

1. Akihima, T. and M. Omuru. 1986. Preservation of fruit tree pollen. P. 101 – 112. In: Y. P. S. Bajaj (ed.). Biotechnology in agriculture and forestry. Vol. I Springer-Verlag.
2. Dafni, A. 2000. Pollen viability and longevity: practical, ecological and evolutionary implications. p. 113 – 132. In: Dafni, A. (ed.). pollen and pollination. Springer.
3. Directorate General of Horticulture Production and Multifarious Plants. 2001. Hortikultura dan Aneka Tanaman. Memerlukan kontinuitas suplai sesuai selera konsumen. Agribisnis Indonesia. P. 8 -11.
4. Fisher, J. B. and J. P. Mogeia. 1980. Intrapetalular inflorescence buds in *Salacca* (Palmae): development and significance. Bot. J. Linnean Soc. 81: 47 – 59.
5. Frankel, R. and E. Galun. 1977. Pollination mechanism reproduction and plant breeding. Springer-Verlag Berlin Heidelberg New York.
6. Hengki, N. dan K. Gaghaube. 1 999. Teknik prosesing dan keragaman hasil polen dari beberapa kultivar kelapa dalam. Buletin Plasma Nutfah 5(1): 16 – 23.
7. Mogeia, J. P. 1978. Pollination in *Salacca edulis*. Principes 22 (2): 56 – 63.
8. Pool, P. A. and N. Bermawie. 1986. Pollen storage in clove (*Syzygium aromatic* (L.) Merr and Perr. Indonesian J. Crop Sci. 2(2): 53 – 58.
9. Purnomo, S. 1993. Biologi bunga dan pembungaan salak (*Salacca edulis* Reinw). Sub Balai Penelitian Hortikultura, Malang.
10. Schuiling, D. L. 1992. *Salacca zalacca* (Gaertner) Voss. p. 281 – 284. In: Verheij, E. W. (ed.). Plant resources of South East 2: Edible Fruit and nuts. Pudoc/Prosea.
11. Shivanna, R. 1992. Pollen biology. A laboratory manual. Springer-Verlag.
12. Stanley, R. G. and H. F. Linskens. 1974. Pollen: biology biochesmitry management. Springer-Verlag Berlin Heidelberg, New York.
13. Sudaryono, T. 1999. Perakitan Teknologi peningkatan frekuensi panen salak unggulan Jawa Timur. p. 122–128.
14. Widyastuti, Y. E. dan F. R. Paimin. 1983. Mengenal buah unggul Indonesia. PT Penebar Swadaya, Jakarta.

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**CONTRIBUTION OF GREEN FERTILIZER (*CLOTARIA JUNCEA* L.) ON EFFICIENCY OF ABSORPTION ARTIFICIALS FERTILIZER (NPK) ON SUNAN CANDLENUT GROWTH (*REUTEALIS TRISPERMA* (BLANCO) AIRY SHAW) IN DRY LAND WITH DRY CLIMATE**

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**ABSTRACT**

Candlenut (*Reutealis trisperma* (Blanco) Airy Shaw) is a part of timber plant stand that has a width dense canopy. The ability to absorb CO<sup>2</sup> is very high because of the large photosynthetic rate, therefore it is classified as a plant that is environmentally friendly. Furthermore Candlenut can be used as conservation of degraded or marginal land. In dry areas, *Sunan candlenut* can grow well, because the carbon's system tracks type C4 is more efficient than the trajectory Carbon C3 in water use. On dry land is generally the main problem, in addition to the water is the availability of low organic matter, resulting in the plants cultivated by farmers is less encouraging production. Candlenut at that time is always blooming and deciduous, contains quite large biomass and can be used to add organic substantial. The research was conducted during the growing season in 2016 at the experimental station Asembagus Situbondo, Crops Research Institute for sweetener and Fiber. The research location at coordinates 7° 45'18,39 "LS (south latitude) and 114° 15'27,63" longitude (east longitude), regosol soil type with D3 climate type. The planting material used KS 1 candlenut varieties coming from the middle of the dial. Rootstock (rootstock) used is 1 *Sunan candlenut* varieties derived from the seeds. Average planting materials for the upper stem (entrees) were taken from candlenut varieties of seeds 1 and 2 but which has ripe fruit. Seeds planted in polybag after 5-months-old moved into the field. Spacing 5 m x 5 m with a planting hole, the hole size is 50 cm x 50 cm to 50 cm into the plant. In the field polybag seedlings planted during the rainy season. 5 kg fertilizer to each planting hole. *Clotaria Juncea* seeds planted from seed among candlenut, spacing 20 cm x 20 cm, after 3-months-old *Clotalaria Juncea* it will be cut. 5 kg to each candlenut tree *Clotaria Juncea*, by way of embedded around the plant. The treatment design used Randomized Block Design (RBD) factorial which repeated 3 times. First Factor green fertilizer (*Clotaria Juncea* L.), which consists of two doses: 1). C0 without being given *Clotaria Juncea* L.; 2). C1 given *Clotaria Juncea* L. 5kg / candlenut tree. The second factor with a dose of inorganic fertilizer; 1). P0 without fertilizer; 2). P1 70 g urea + 25 gr SP-36 + 60 gr KCl; 3). P2 140 g of urea + 50 g SP-36 + 120 gr KCl; and 4). P3 280 gr Urea + 100 gr SP-36 + 240 gr KCl. In total there are 24 treatments research plot size: 40 m x 20 m. The observed parameters (plant height, stem diameter, number of branches, and the width of the canopy. The results of the research, the provision of green fertilizer (*Clotaria Juncea* L.) with 5 kg dose and a combination of inorganic Urea fertilizer 140 gr + 50 gr SP-36 + 120 gr KCl / trees provide optimum growth for Candlenut (plant height, stem diameter, canopy width and the number of branches). Giving *Clotaria Juncea* can increase the land and the plants resonant capacity and reduce the use of inorganic fertilizer. The research objective of this green fertilizer is organic material in the soil, therefore the location of research activities has increased and nutrients required candlenut is provided for the growth and increase the land resonant capacity.

**KEY WORDS**

Candlenut, *Clotaria Juncea*, green fertilizer.

Before the green revolution on 1850, the farmers used organic substantial fertilizer. However, after the discoveries of inorganic fertilizer, there is basic revolution in agricultural

sector. The farmers are dealing with natural resources which are not a concept of environmentally sustainability. But, they only want high production without concerning agro-ecological friendliness. Local wisdom should be maintained in order to achieve renewable and sustainable natural resources. Organic substantial as a solid base for maintaining soil strength, both in terms of physically, chemical, and soil biology. Soil health is habitually categorized as soil quality (Doran and Zeiss, 2000). The result of Abbott and Murphy (2003) research indicates that the optimal soil strength is highly dependent on the equivalence between physically, chemical, and biological fertility. According to Djajadi (2015) examined that the decreasing of soil organic substantial content negatively affect the physical, chemical and soil's biological properties. The decreasing of soil health instigated production and the environmental damage caused by global warming (Rees *et al.*, 2005; Schulze and Freibauer, 2005). The further explanation examined that this was due to excessive inorganic fertilizers result's underground which pollute the ground water. The condition of the research field has an organic substantial content of only about 0.25% which is categorized as very low. Therefore, the addition of organic substantial from green fertilizer (*Clotaria Juncea* L.) is necessary, thus the nutrients in soil is adequately available for *sunan* candlenut's growth. The provision of organic substantial in addition to its role as a source of energy and soil microbial food can also increase microbial activity. According to Andiningsih (2005), the ideal organic substantial for plant growth is about 3-5%.

*Sunan* candlenut (*Reutealis trisperma* (Blanco) Airy Shaw) is an environmentally friendly biofuel producer because it has low free greasy acids, thus when being used for diesel-fueled diesel engines it is virtually non-acidic and free of heavy metals. According to Pranowo *et al.*, 2015, stated that biofuel plants such as *jarak pagar* (*Jatropha curcas* L.), *Kepuh* (*Sterculia foetida*) and *Bintaro* (*Cerbera manghas*), *Yamplung* (*Calophyllum inophyllum* L.), *Kosambi* (*Schlechera oleosa*) and *Pongamia* (*Pongamia pinnata*) have only about 10-30% oil content. Meanwhile, *sunan* candlenut oil can reach about 50-54%. Besides, candlenut oil cannot be used for food necessities; therefore it is safe from the competition of the source of food supply. Another advantage of candlenut has a wide and lush canopy shape and a large photosynthesis process; therefore it is not surprising that it can absorb high CO<sup>2</sup>. Each *sunan* tree that is more than 25 years old can absorb CO<sup>2</sup> of 1.60 tons / tree (Herman, 2011). At the blossoming time in the dry season, *sunan* candlenut is experiencing leaf miscarriage; therefore it can add litter to the soil and can increase soil fertility.

Oil necessity as fuel continues to increase in line with the development pace. While the oil refineries exploration is undergoing difficulties, there is nothing new, just continuing on the old wells. Formerly, Indonesia which initially became an oil exporter turned into an oil importer. World concerns about the fuel oil availability begin to appear. It is estimated that 75 years from now the source of fossil fuel reserves will no longer available. Therefore, alternative and renewable fuels are required. By 2050 it is expected that the new and renewable energy role will increase by at least 31% while the role of petroleum is less than 20% (Perpres 2014). The approach through vegetable oil as new and renewable energy is the most appropriate step, because the oil source comes from a plant that is certainly renewable and sustainable.

The objective of this green fertilizer addition research is to keep the index of organic substantial on the soil in the research location activities and the nutrients required by *sunan* candlenut are more available for growth and increase the land resonant capacity.


## MATERIALS AND METHOD OF RESEARCH

The research was conducted at the Asem Bagus Experimental Garden of Indonesian Sweetener and Fiber Crops Research Institute. The research location is on coordinates 7° 45'18,39" LS (South Latitude) and 114° 15'27,63" BT (East Longitude), starting on the beginning of 2016. Type of regosol soil with D3 climate type is in Situbondo regency. *Sunan* candlenut KS 1 variety is used as planting materials which comes from central relations. The variety of *sunan* candlenut 1 is used as rootstock which originates from seeds. Meanwhile, the planting material for the top stem (entrees) is taken from the varieties of candlenut herbs



1 and 2 of the seeds which only have been fruitful. The seeds are grown in polybags after 5 months-old moved to the field. 5 m x 5 m spacing with one planting hole. The hole size is 40 cm x 50 cm with planting depth about 50 cm. Seedlings in polybags planted on the field during the rainy season. Each planting hole is given fertilizer as much as 5 kg. *Clotaria Juncea* is grown with seeds between the seeds of *sunan* candlenut. 20 cm x 20 cm spacing. After *Clotaria Juncea* turns into 3 months old, it will be cut. Each candlenut tree is given 5 kg *Clotaria Juncea*, embedded around the plant.

Randomized Factorial Randomized Design (RAK) is used as the treatment design which was factorial within 3 times repeating. The first factor of green fertilizer (*Clotaria Juncea L.*) consisting of 2 doses: 1). C0 without being given *Clotaria Juncea L.*; 2). C1 was given *Clotaria Juncea L.* as much as 5 kg / *sunan* candlenut tree. The second factor is inorganic fertilizer with dose; 1). P0 without fertilizer; 2). P1 70 gr Urea + 25 gr SP-36 + 60 gr KCl; 3). P2 140 gr Urea + 50 gr SP-36 + 120 gr KCl; 4). P3 280 gr Urea + 100 gr SP-36 + 240 gr KCl. Total treatment was 24. The size of study plot: 5 m x 5 m. The application of artificial fertilizer is being buried into the soil. The observed parameters included diameter, number of branches, number of leaves, and width of the canopy. The before and after soil analysis was done on experimental soil. The results of soil analysis before the research are presented in Table 1. The tools used were sit-scale, term slot, and prism. Each plot is given a number according to the treatment being attempted. The treatment placement in plots is randomized to each replication.

| Cross Section Profile  | Horizon Symbol | Depth (cm) | Description  |
|--|----------------|------------|--|
|  | Ap             | 0-7        | Dark brown (10 YR3/3); sand; loose structure<br>Smooth pores, medium, bumpy enough<br>Various, medium fine root, medium, bumpy<br>Zero; border limit and wavy                            |
|  | AC             | 7-35       | Dark brown (10 YR3/3); sand; loose structure<br>Smooth pores, medium, bumpy enough<br>Numerous fine root, medium, coarse, there is no clear<br>contour and wavy.                         |
|  | C1             | 35-50      | Black (10 YR2/1); sand, loose grain structure, smooth<br>pores, medium, coarse many fine roots, medium enough.<br>No pebbles, clear contour and wavy                                     |
|  | C2             | 50-71      | Very dark brown (10YR2/1); sand, single grain structure;<br>loose; a few fine root, medium, bumpy enough, medium<br>fine roots, coarse no rocks, diameter >10 cm medium,<br>wavy contour |
|  | C3             | 71-82      | Very dark brown (10YR 2/2) sand, single grain structure,<br>loose, smooth pores, no medium coarse, bumpy rock<br>diameter 0,5-2 cm numerous, clear contour                               |
|  | C4             | 80 ->      | Very dark brown (10 YR 4/2);sand structure<br>Mono bead; smooth pores, quite bumpy, numerous fine<br>root, medium, bumpy not clear contour.  |

Source: Budi Hariyono (2016).

*Description of the soil profile at the location of the research activity:*

- Seri: Asembagus Situbondo
- Observation method: *Minipit*
- Elevation: 46 dpl
- Physiography: Lower land
- Angles: 3%
- Position: Valley
- Mainstay base: Medium
- Drainage: Rapid
- Flood: Zero
- Erosion Damage: Light
- Land-use: Mixed garden
- Effective depth: >120n cm
- Vegetation: *Jatropha Curcas*, cotton plant, corn, cane, *Ricinus Communis*, sesame
- Ingredients: Volcanic
- Description by: Kustani Wahyu Utami

*Classification*

- Soil moisture regime: *Ustik*
- Soil temperature regim: Isotherm
- Epipedon: *Okrik*
- Endopedon: -
- Ordo: *Entisol*
- Sub ordo: *Ustipsemments*
- Sub group: Typical *Ustipsamments* (soil Survey Staff, 2010)

Table 1 – The analysis of Asembagus ground attempt result before research

| No  | Analysis Type                          | Score | Category      |
|-----|--|-------|---------------|
| 1.  | pH 1:1 H <sub>2</sub> O                | 6,50  | A little sour |
| 2.  | pH 1:1 HCl                             | 6,05  |               |
| 3.  | C-Organic (%)                          | 0,25  | Very Low      |
| 4.  | N-total (%)                            | 0,05  | Very Low      |
| 5.  | C/N                                    | 4,50  | Very Low      |
| 6.  | P. Bray 2 (mg/kg)                      | 30,46 | High          |
|     | NH <sub>4</sub> OAc 1N pH 7 (me/100 g) |       |               |
| 7.  | K                                      | 1,32  | Very Low      |
| 8.  | Na                                     | 2,22  | Very High     |
| 9.  | Ca                                     | 4,77  | Low           |
| 10. | Mg                                     | 1,59  | Average       |
| 11. | KTK                                    | 13,18 | Low           |
| 12. | Number of bases                        | 9,90  |               |
| 13. | KB (%)                                 | 76,00 | Very High     |
| 14. | Sand                                   | 91,50 |               |
| 15. | Dusk                                   | 7,00  |               |
| 16. | Clay                                   | 1,50  |               |
| 17. | Texture                                | Sand  |               |

Soil analyzed at Soil Laboratory of Faculty of Agriculture University of Brawijaya.

## RESULTS AND DISCUSSION

From the variance analysis indicates that the treatment of green and inorganic fertilizer, there is an interaction that occurs in *sunan* candlenut high growth. The full results are presented in Table 2.

Table 2 – Interaction between green and inorganic fertilizer application to plant height

| Treatment | Plant Height (cm) |           |           |          |           |          |
|-----------|-------------------|-----------|-----------|----------|-----------|----------|
|           | May               | June      | July      | August   | September | October  |
| CoPo      | 36,67 b           | 62,13 d   | 89,50 b   | 111,31 e | 118,38 e  | 123,32 e |
| CoP1      | 44,04 ab          | 69,38 cd  | 91,17 ab  | 114,13 d | 124,77 c  | 127,75 d |
| CoP2      | 47,71 ab          | 74,46 cbd | 101,79 ab | 117,25 c | 122,36 d  | 127,06 d |
| CoP3      | 44,29 ab          | 63,50 d   | 98,04 ab  | 119,78 c | 121,94 d  | 127,97 d |
| C1P0      | 50,21 ab          | 79,67 abc | 108,00 ab | 122,79 b | 127,93 b  | 134,80 c |
| C1P1      | 51,75 a           | 86,58 ab  | 110,25 ab | 124,60 b | 127,99 b  | 135,83 b |
| C1P2      | 56,08 a           | 90,71 a   | 117,79 a  | 129,99 a | 132,38 a  | 137,71 a |
| C1P3      | 45,83 ab          | 85,42 ab  | 111,25 ab | 123,99 b | 126,89 b  | 133,97 c |

The accompanied value of the same letter in the same column is not significantly different in Duncan 5% test.

Table 2 shows that C1P2 treatment provides optimal plant height growth. This is suspected that the soil used for experiments affecting *Juncea* by 5 kg / tree increased the high growth of the *sunan* candlenut plant.

Organic fertilizer has a significant effect on the increase of soil and plant productivity. According to Hartatik and Setyorini (2012) stated that the role of organic fertilizer to the soil physical properties are a). Improve soil structure because organic substantial can bind soil particles into a solid aggregate; b). Improve the soil pore size distribution, thus the water holding capacity of the soil becomes better and the air movement (aeration) in the soil is smooth and c). reduce (buffer) soil temperature fluctuations. Furthermore, it was suggested that the role of organic fertilizer on soil biology is as an energy source and food for micro and meso soil fauna. In the end the availability of sufficient organic material in the soil activity of organisms to be developed with an optimal that is not directly related to the availability of nutrients, nutrient cycles and the micro pore and macro formation soil for the better.

The variance analysis indicates that the treatment of green and inorganic fertilizer interaction of stem diameter growth. The complete results are listed in Table 3.

Table 3 – Interaction between the application of green and inorganic fertilizer to stem diameter

| Treatment | Stem Diameter ( mm) |           |          |          |           |          |
|-----------|---------------------|-----------|----------|----------|-----------|----------|
|           | May                 | June      | July     | August   | September | October  |
| CoPo      | 16,87 b             | 22,37 bc  | 28,01 d  | 35,83 g  | 38,54 e   | 40,95 e  |
| CoP1      | 18,29 ab            | 23,25 abc | 28,88 c  | 36,44 f  | 38,50 e   | 41,41 de |
| CoP2      | 18,42 ab            | 23,51 abc | 29,22 c  | 37,00 ef | 38,75 e   | 41,64 cd |
| CoP3      | 17,90 ab            | 21,30 c   | 29,44 c  | 37,33 de | 40,07 d   | 41,37 de |
| C1P0      | 20,06 ab            | 25,05 abc | 30,79 b  | 37,73 cd | 40,41 cd  | 42,37 c  |
| C1P1      | 20,48 ab            | 25,44 ab  | 31,01 b  | 38,11 bc | 41,00 bc  | 43,17 b  |
| C1P2      | 20,73 a             | 26,56 a   | 31,78 a  | 38,86 a  | 41,76 a   | 44,44 a  |
| C1P3      | 19,91 ab            | 25,86 ab  | 31,06 ab | 38,50 ab | 41,29 ab  | 42,72 bc |

The accompanied value of the same letter in the same column is not significantly different in Duncan 5% test.

The C1P2 treatment provides the best stem diameter growth. The circular growth is one of the signs which can be used as an indication of the *sunan* candlenut plant growth rate. The faster the growth rate of *sunan* candlenut planting should be supported by the availability of sufficient organic material for the plant. According to Hamid (1991), the necessity for C-Organik in candlenut is based on the land suitability of > 0.4%. The speed of *Clotaria Juncea* green fertilizer in its activity and its function is strongly influenced by abiotic factors such as pH, temperature and local environment and substrate. In such conditions there is a tight competition between similar microbes or various other microbes. The process of green fertilizer becomes available for the plant, not separated from the microbial work which eats the cellulose and lignin; therefore quickly produce nutrients which can substitute the necessity of inorganic fertilizer for the plant. According Turmuktini et, al., (2012) stated that a method to minimalize inorganic fertilizer usage is by using green fertilizer or organic fertilizer.

The results of the variance analysis indicate that the treatment attempted interaction between *Clotaria Juncea* and inorganic fertilizer to canopy width (Table 4).

Table 4 – Interaction between green fertilizer and inorganic fertilizer application to canopy width

| Treatment | Canopy Width (cm) |          |          |           |           |          |
|-----------|-------------------|----------|----------|-----------|-----------|----------|
|           | May               | June     | July     | August    | September | October  |
| CoPo      | 68,79 e           | 86,42 ab | 91,14 c  | 95,38 ab  | 95,91 b   | 101,52 d |
| CoP1      | 73,84 c           | 86,92 ab | 93,88 b  | 94,92 ab  | 95,81 b   | 103,24 d |
| CoP2      | 75,93 b           | 90,92 ab | 91,83 c  | 95,81 ab  | 95,22 b   | 112,44 c |
| CoP3      | 70,20 d           | 85,50 b  | 86,22 d  | 91,08 b   | 93,39 b   | 115,85 b |
| C1P0      | 71,28 d           | 94,50 ab | 93,26 b  | 98,58 ab  | 99,61 ab  | 116,00 b |
| C1P1      | 76,30 b           | 96,63 a  | 96,47 ab | 95,75 ab  | 96,22 b   | 102,32 d |
| C1P2      | 78,07 a           | 96,29a   | 97,11 a  | 103,13 a  | 106,29 a  | 125,10 a |
| C1P3      | 71,30 d           | 93,00 ab | 94,37 b  | 100,46 ab | 101,39 ab | 113,21 c |

The accompanied value of the same letter in the same column is not significantly different in Duncan 5% test.

Table 4 shows that giving *Clotaria Juncea* by 5 kg / *sunan* candlenut tree with inorganic fertilizer as much as 140 gr Urea + 50 gr SP-36 + 120 gr KCl / tree can give the best canopy width. The canopy width is an indicator that the rooting arrangement is identical to the width of the canopy. If the canopy width is leafy then the roots arrangement is also wide, therefore the root penetration in search of nutrients in the ground is deeper.

From the ground propyl, it is seen that with Horizon AC symbol, depth 7-35 cm with dark brown color description (10 YR3 / 3) of loose structure sand, quite soft pore, adequate, quite rough, many smooth roots, adequate, clear, and bumpy boundaries. This indicates that the soil condition is dominated by sand, therefore very responsive when it is given green fertilizer to plant growth.

The parameters of branches number according to plant height, stem diameter and canopy width occurred interaction between *Clotaria Juncea* and inorganic fertilizer (Table 5).

Table 5 – Interaction between the application of green fertilizer and inorganic fertilizer to the branches number

| Treatment | The Number of Branches |         |         |        |           |         |
|-----------|------------------------|---------|---------|--------|-----------|---------|
|           | May                    | June    | July    | August | September | October |
| CoPo      | 0,00                   | 0,00 b  | 0,81 b  | 2,49 b | 2,61 d    | 2,86 d  |
| CoP1      | 0,67                   | 0,06 b  | 1,31 ab | 2,35 e | 2,81 c    | 2,95 d  |
| CoP2      | 0,00                   | 0,00 b  | 1,29 ab | 2,69 c | 2,81 c    | 2,932 d |
| CoP3      | 0,02                   | 0,10 ab | 1,17 ab | 2,84 b | 3,08 b    | 3,10 c  |
| C1P0      | 0,00                   | 0,08 b  | 1,23 ab | 2,85 b | 3,05 b    | 3,27 b  |
| C1P1      | 0,00                   | 0,00 b  | 1,67 ab | 2,94 b | 3,17 ab   | 3,29 b  |
| C1P2      | 0,00                   | 0,33 a  | 2,13 a  | 3,08 a | 3,27 a    | 3,48 a  |
| C1P3      | 0,04                   | 0,05 b  | 1,73 ab | 3,21 a | 3,18 ab   | 3,27 b  |

The accompanied value of the same letter in the same column is not significantly different in the test.

*Sunan* candlenut has a rather unique number of branches, each of the first buds will appear 3 branches, therefore during the growth, it forms like a branching umbrella, these branches as the place for fruits. The C1P2 treatment consistently gives the appearance of the best number of branches.

Based on the condition of soil research in the dry season, water shortage happened. To keep the plants from weakness it is necessary to provide water from the well water drilling irrigation. Besides, the provision of water can help the plants in absorbing nutrients in the soil.

## CONCLUSION

From this research, it can be concluded that the application of green fertilizer (*Clotaria juncea* L.) with 5 kg doses gives optimum growth for the *sunan* candlenut (plant height, stem diameter, leaf width and number of branches) with inorganic fertilizer combination of 140 gr Urea + 50 gr SP-36 + 120 gr KCl / tree. *Clotaria Juncea* addition can increase the land resonant capacity and plants and can reduce the use of inorganic fertilizer.

## REFERENCES

1. Adiningsih, J.S. 2005. Peranan bahan organik tanah dalam meningkatkan kualitas dan produktivitas lahan Pertanian Dalam Materi Workshop dan Kongres Nasional II Maporina. Sekretariat Mapoein, Jakarta.
2. Abbott, L. and D.V. Murphy. 2003. What is soil biological fertility ? in: Abbot, L.K., Murphy, D.V. (Eds). A key to Sustainable Land use Agriculture.p 1-15. Kluwer Academic Publishers. The Nedtherlands.
3. Doran, J.W. and Zeiss, M.R. 2000. Soil health and sustainability managing the biotic compone,nt of soil quality. Applied Soil Ecology. 15:3-11.
4. Djajadi .2015. Bahan Organik Peranannya dalam Budidaya Tebu Berkelanjutan. Journal Perspektif Review Penelitian Tanaman Industri Vol. 14 No. 1: 14-21.
5. Hariyono, B. 2016. Pemanfaatan Biochar Untuk Memperbaiki Kualitas Tanah Berstekstur Pasir dan Pengaruhnya pada Tebu (*Saccharum officinarum* L.). Desertasi Program Doktor Ilmu pertanian Bidang Studi Managemen Sumberdaya Lahan dan Lingkungan. Fakultas
6. Pertanian Universitas Brawijaya Malang Hal 1-190.
7. Hartatik, W. dan D. Setyorini. 2012. Pemanfaatan pupuk organik untuk meningkatkan kesuburan tanah dan kualitas tanaman. Prosiding Seminar Nasional Teknologi Pemupukan dan Pemulihan Lahan Terdegradasi p: 571-582.
8. Herman, M dan D. Pranowo. 2011. Budidaya candlenut sunan. Dalam Candlenut Sunan Sebagai Tanaman Konservasi dan Sumber Energi Terbarukan. Balittri. Puslitbang Perkebunan.p: 15-21.
9. Perpres (Peraturan Presiden Republik Indonesia) No 79 tahun 2014. Tentang kebijakan Energi Nasional.
10. Pranowo, D., M. Herman dan Syafaruddin. 2015. Potensi pengembangan candlenut sunan (*Reutealis trisperma* (Blanco) Airy Shaw) di lahan terdegradasi. Journal Perspektif Review Penelitian Tanaman Industri.Vol. 14 No.2. Hal 73-150.
11. Rees, RM., I.J. Bingham, J.A. Baddeley,C.A. Watson.2005. The role of plants and land management in sequestering soil carbon in temperate arabie and grassland ecosystems. Geoderma. 128: 130-154.
12. Schulze, E.D. and A. Freibauer. 2005. Environmental sciene-Catbon unlocke from soils. Nature.437 (7056):219-234.
13. Turmuktini, T., B. Natalie, Hersanti, Y. Yuwariah, B. Joy dan T. Simarmata. 2012. Kontribusi pupuk organik (kompos jerami +Pupuk Bio) untuk meningkatkan efisiensi pupuk anorganik (N, P, K) pertumbuhan dan hasil padi varietas ciherang dengan teknologi Ipat-BO. Prosiding Seminar Nasional Teknologi Pemupukan dan Pemulihan Lahan Terdegradasi p: 591-600.

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**ВЛИЯНИЕ ПОГОДНЫХ УСЛОВИЙ, МИНЕРАЛЬНЫХ И  
МИКРОБИОЛОГИЧЕСКИХ УДОБРЕНИЙ НА УРОЖАЙНОСТЬ И КАЧЕСТВО  
ОЗИМОЙ ПШЕНИЦЫ В ЛЕСОСТЕПИ**  
THE INFLUENCE OF WEATHER CONDITIONS, MINERAL AND MICROBIOLOGICAL  
FERTILIZERS ON WINTER WHEAT PRODUCTIVITY IN FOREST-STEPPE

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**АННОТАЦИЯ**

В статье представлены данные по изучению эффективности микробиологических удобрений Азолен Ж и Метилотрофин для обработки вегетирующих растений озимой пшеницы при разных агрометеорологических условиях. Изучено влияние препаратов совместно с минеральными удобрениями и без них на урожайность двух современных сортов – Немчиновская 17 и Московская 56. Наибольший положительный эффект был получен у первого сорта на вариантах с использованием препарата Метилотрофин при обработке растений в фазы «начало активной вегетации» и «флаговый лист» (доза – 0,1 л/га) без применения минеральных удобрений. Средняя урожайность зерна за три года (2014-2016) составила 5,06 т/га, чистый доход с 1 га – 5,4 тыс. рублей. За счет применения микробиологического удобрения Азолен Ж урожайность была 4,88 т/га, а доход – 3,5 тыс. руб./га. Совместное использование минеральных и микробиологических удобрений уменьшило доход от Азолен Ж до 0,8 тыс. руб./га, от Метилотрофина – до 1,9 тыс. руб./га.

**ABSTRACT**

The article presents data on the study of the effectiveness of microbiological fertilizers Azolen G and Methylothropin for the treatment of winter wheat plants under different agrometeorological conditions. The effect of preparations together with mineral fertilizers and without them on the productivity of two modern varieties - Nemchinovskaya 17 and Moscovskaya 56 - has been studied. The greatest positive effect was obtained for the first grade in variants with the use of the preparation Methylothropin at the treatment of plants in the phases "the beginning of active vegetation" and "flag leaf "(a dose of 0.1 l/ha) without the use of mineral fertilizers. The average grain yield for three years (2014-2016) was 5,06 t/ha, net income per hectare – 5,4 thousand rubles. Due to the application of microbiological fertilizer Azolen G, the yield was 4.88 t/ha, and the income was 3,5 thousand rubles/ha. The joint use of mineral and microbiological fertilizers reduced the income from Azolen G to 0,8 thousand rubles/ha, from Methylothropin to 1,9 thousand rubles/ha.

**КЛЮЧЕВЫЕ СЛОВА**

Озимая пшеница, удобрение, Азолен Ж, Метилотрофин, урожайность.

**KEY WORDS**

Winter wheat, fertilizer, Azolen G, Methylothropin, yield.

Озимая и яровая пшеница – важнейшие зерновые культуры в лесостепной зоне. Традиционные агротехнологии возделывания их, основанные преимущественно на использовании химико-техногенных факторов интенсификации, имеют ряд

недостатков. Несмотря на значительные вложения, имеющийся потенциал этих культур по продуктивности используется в недостаточной степени [1, 2]. Поэтому необходимо использовать новые элементы агротехнологий, которые дополняют традиционные средства интенсификации. Перспективным направлением совершенствования существующих агротехнологий возделывания сельскохозяйственных культур, в том числе и озимой пшеницы, является концепция биологизации растениеводства, которая заключается в интенсификации и максимальном использовании биологических факторов в системах земледелия [3]. Включение в традиционные агротехнологии возделывания сельскохозяйственных культур элементов биологизации, обеспечивает не только улучшение экономического состояния агрофитоценозов, но и ресурсо- и энергосбережение. Одним из направлений биологизации растениеводческой отрасли является внесение в почву и на растения полезных микроорганизмов за счёт обработки микробными препаратами [4].

Список используемых биопрепаратов ежегодно пополняется. Поэтому необходимо регулярно проводить их полевые испытания и выявлять эффективность. Микробиологическое удобрение Азолен-Ж создано на основе свободноживущих азотфиксирующих почвенных бактерий *Azotobacter vinelandii* ИБ-4; оно выпускается согласно ТУ 9291-018-22657427-2005 Свидетельство о государственной регистрации агрохимиката №1147-08-208-157-0-0-0-0 от 24 апреля 2008г. Основным действующим началом являются антибиотики феназин – 1 – карбоновая кислота и 2 – оксифеназин – 1 – карбоновая кислота, эффективно подавляющие рост ряда фитопатогенных грибов и бактерий.

Микробиологическое удобрение Метилотрофин – штамм *Methy Copacterium extovquens Clo* представлен Граммотрицательными подвижными неспорообразующими палочками, нейтрофил, мезофилл, характеризуются высокой устойчивостью к ультрафиолету, замораживанию и высушиванию. Фитосимбионт, использующий естественные продукты метаболизма растений – метанол, метиламины, формальдегид, формиат в качестве источников углерода и энергии изоцитратлиазонегативным путём C<sub>1</sub>-метаболизма. Синтезирует и накапливает гранулы полигидроксibuтиролвалерата. Синтезирует ряд биоактивных веществ (ауксины, цитокинины, витамин B<sub>12</sub>). Свидетельство о государственной регистрации микроудобрения Метилотрофин находится в разработке.

Механизм действия препаратов Азолен-Ж и Метилотрофин основан на выделении корневыми волосками растения углерода в виде сахаров, которые запускают размножение бактерий и выработку ими комплекса фенозиновых и триглицеридпептидных антибиотиков, супрессирующих рост фитопатогенных грибов. Препараты обладают фунгицидными и ростостимулирующими свойствами, высоким уровнем нитрогеназной активности, а также способностью синтезировать цитокининоподобные вещества (гормоны роста растений), что позволяет значительно снизить количество вносимых азотных удобрений и получать экологически чистые продукты [5].

*Цель исследования* – совершенствование агротехнологии возделывания озимой пшеницы за счет использования новых микробиологических удобрений в зависимости от погодных условий и внесения минеральных удобрений.

## МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ

Опыт по изучению влияния минеральных и микробиологических удобрений на урожайность и качество зерна озимой пшеницы проводился в отделе земледелия Тульского НИИСХ (лесостепь) в 2014-2016 гг., на выщелоченном чернозёме; предшественник – чистый пар. Перед посевом на всех вариантах были взяты образцы почвы в пахотном слое для определения агрохимических показателей по общепринятым методикам. Обработка посевов Азоленом Ж и Метилотрофином проводилась с помощью ручного опрыскивателя два раза: а) при возобновлении

вегетации, б) в фазе флагового листа. Во время вегетации отмечались основные фазы роста и развития растений, проводилась борьба с болезнями и вредителями, еженедельно определялись запасы продуктивной влаги в почве до 1 метра. Повторность в опыте – четырёхкратная, расположение вариантов – последовательное, общая площадь делянки – 40 м<sup>2</sup>; перед учётом урожайности отбирались пробные снопы на уровне земли для определения ее структуры. Уборка проводилась с помощью комбайна «Винтерштайгер», урожайность пересчитывалась на стандартную влажность и стопроцентную чистоту, математическая обработка сделана по Доспехову Б.А. [6]. На всех вариантах определялось содержание клейковины и группа качества зерна.

Опыт проводился на двух сортах озимой пшеницы: 1) Московская 56, выведенный методом многократного индивидуального отбора сорта Московская 39, разновидность эритроспермум, оригинатор ФГБНУ Московский НИИСХ «Немчиновка»; 2) Немчиновская 17, выведен коллективом селекционеров под руководством академика РАН Сандухадзе Б.И. методом индивидуального отбора из гибридной комбинации Немчиновская 24 x Московская 39.

### РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ

Погодные условия в годы исследований (2014-2016 гг.) существенно различались по температурному режиму и влагообеспеченности этой культуры, лишь зимние периоды были одинаково теплыми. 2013-2014 г. отличался недостатком тепла и избытком влаги в осенний период развития озимых культур; весь весенне-летний сезон наблюдался повышенный температурный режим при низкой влагообеспеченности. В 2014-2015г. была засушливая осень, очень жарко и сухо в первую половину весенне-летнего периода, а с 15 июня до 20 июля избыточное увлажнение почвы. В 2015-2016 г. была сухая осень, поздняя тёплая весна, с достаточным влагообеспечением, очень жарко с избытком влаги в июле.

Из-за неблагоприятных погодных условий (сильное переувлажнение почвы) сев в 2013 г. был проведён лишь 28 сентября, к этому времени уже наблюдались ежедневные заморозки, температура воздуха была на 3°C ниже многолетней. Недостаток тепла задержал прорастание семян до 8 октября, массовые всходы появились только 18 октября. Слабая вегетация продолжалась до конца первой декады ноября. В зиму растения ушли слаборазвитыми в фазе всходов, 3-й лист появился у 15-20%.

Сев в 2014 г. был проведён в оптимальный срок – 5 сентября, продуктивной влаги в почве было недостаточно – 8 мм в слое 0-10 см и 18 мм – в пахотном. Из-за сухости почвы всходы появились только через две недели, 3-й лист был отмечен на 28 день после сева (02.10.2014 г.). В первой декаде октября похолодало, в ночные часы почти ежедневно отмечались заморозки на почве и в воздухе. С середины октября пошли дожди, на 42 день после сева было отмечено массовое кущение, а на 47 – вегетация прекратилась, в срок близкий к многолетнему, но на две декады раньше 2013 г.

Предпосевной период осени 2015 г. был тёплым и сухим. Температура воздуха в августе превышала многолетнюю на 1,3°C, осадков выпало всего 6% от нормы, поэтому запасы продуктивной влаги в конце августа были крайне низкими, в пахотном (0-20 см) слое они составили – 12 мм, в слое 0-10 см – 0 мм. Сев озимых культур был проведён в оптимальный срок – 6 сентября. Осадков в первой декаде сентября выпало 122% от нормы, поэтому дружные всходы появились через неделю. В последующие четыре декады было только 10% их от многолетнего количества, запасы продуктивной влаги в слое 0-20 см в этот период составляли 8-14 мм, то есть были недостаточными. С 7 октября на почве и в воздухе были отмечены заморозки, вегетация озимых культур прекратилась, кустистость у обоих сортов была к этому времени 2,4-2,7 стебля на растение. Условия для закалки озимых культур в 2013, 2014, 2015 гг. были удовлетворительными. За осенний период вегетации выпало в 2013 г. – 42,9 мм



осадков (56% от нормы), в 2014 г. – 45,8 мм (34%); средняя температура воздуха в 2013 г. составила 6,5°C, это на 2,7°C выше средней многолетней, в 2014 г. – 10,9°C, что равно обычной величине в это время. В 2015 г. осадков выпало 25,3мм (39% от нормы), средняя температура воздуха составила 13,7°C, это на 3,8°C выше многолетней.

Зимы в исследуемых годах были умеренно-теплыми, средние температуры воздуха на 1-2°C превышали многолетние, осадков выпало 60-70% от нормы. Температура почвы на глубине залегания узла кущения в 2014 г. опускалась до – 4, – 5°C во второй половине января, в 2015 г – в третьих декадах октября и ноября до – 7, – 8°C. В остальной зимний период она составила –2, –4°C, с февраля поднималась до 0°C и выше, в 2016 г. температура почвы на глубине залегания узла кущения лишь в первые две декады января была около –1, –2°C, а с последней она повысилась до 0°C, что способствовало расходу питательных веществ на дыхание. Максимальное промерзание почвы было отмечено в 2014 году в конце февраля – 59 см, в 2015 году в конце января – 71 см, в 2016 году в середине января – 41 см. С начала февраля в эти годы наблюдались частые оттепели, снежный покров уменьшался, промёрзший слой почвы к середине месяца был слабосцементирован, что позволяло впитываться талым водам. Весна в 2014-2015 гг. наступила рано – 8 марта, но была затяжной. Слабая вегетация растений была отмечена с середины марта, так как в этот период максимальная температура воздуха составляла до +6-9°C, а на глубине узла кущения она была положительной (+1-2°C), поэтому растения подвергались выпиранию. Весенние процессы в 2016 г. начались 27 марта, на 6 дней позже многолетней даты. Возобновление вегетации растений наступило в 2014 г. 16 апреля (на неделю позже обычного), в 2015 г. – 24 апреля (на половину месяца), а в 2016 г. – 4 апреля (на 12 дней раньше многолетнего срока); почва полностью оттаяла 8 апреля. Поздние продолжительные весенние периоды были умеренно-тёплыми (средняя температура воздуха на 0,7°C выше многолетней), осадков выпало 178,6 мм или 137% от нормы. При обследовании посевов была отмечена гибель 5-8% растений от выпирания и вымокания. После перезимовки сохранилась третья часть листьев, состояние опытных делянок оценивалось как удовлетворительное. Запасы продуктивной влаги в метровом слое почвы были равны наименьшей полевой влагоёмкости – 175-180 мм.

Аномально тёплая погода апреля и хорошее увлажнение почвы (36 мм в пахотном слое почвы) благоприятствовали быстрому отрастанию и улучшению состояния растений после перезимовки. В конце второй декады мая начался рост стеблей (на несколько дней раньше средних многолетних сроков), в 2016 г. в конце апреля.

Период от выхода в трубку до колошения, когда у этой культуры формируются колоски и цветки, проходил в условиях повышенного температурного режима и недостаточной влагообеспеченности в 2014 и 2015 гг. Колошение отмечалось 25 мая. Вторая половина мая и первая июня отличались очень жаркой и сухой погодой; температура воздуха в этот период на 6-10°C превышала средние многолетние в 2014 году и на 3-4°C в 2015 году. Запасы продуктивной влаги уменьшались к концу мая до удовлетворительных в метровом слое – 72 мм, а к середине июня – до плохих (60 мм). Недостаток влаги и высокие температуры оказали отрицательное влияние на формирование урожая, снизилась высота растений и количество колосков в колосе. Цветение растений проходило в начале июня. Запасы продуктивной влаги в это время в слое почвы 0-50 см составили всего 20 мм. В первой декаде июня, в период цветения, посевы были обработаны от бронзовки.

С середины июня агрометеорологические условия существенно различались. В 2014 г. налив зерна проходил при достаточном увлажнении почвы и температуре воздуха, близкой к оптимальной (+15°C), но высота растений осталась ниже обычной на 20 см – 75-78см. Пшеница созревала при жаркой погоде, максимальная температура днём составляла 30-31°C, осадков за две декады июля выпало 17,8 мм (37% от нормы), полная спелость была отмечена 20 июля. В 2015 г. с середины июня до конца второй декады июля осадков выпало – 189,3 мм (188% от многолетней

величины). В результате запасы продуктивной влаги увеличились до избыточных (180-250 мм в метровом слое). Это способствовало распространению сорняков и болезней и задержало созревание зерна до конца июля. В фазу восковой спелости были отобраны снопы для определения структуры урожайности. На контрольных вариантах в 2014-2015 гг. высота сорта Немчиновская 17 составила 70 см, Московская 56 – 77 см., в 2016 г. – 92 см.

В 2016 г. растения в конце апреля вышли в трубку, в колосе образовалось 20-22 колоска, что на 4-5 больше обычного, кустистость увеличилась до 3, 5 стеблей, состояние их было удовлетворительное. Май оказался умеренно-тёплым с обильными осадками (213% от нормы). В первой половине июня сильно похолодало, средние температуры воздуха на 2-3°C были ниже многолетних значений, осадков выпало 67% от нормы, запасы продуктивной влаги в почве были удовлетворительными – 71-85 мм в 0-50 см слое. Колошение у растений было отмечено 20-22 мая, в конце месяца – цветение, а с 10 июня начало наливать зерно. В первой декаде июня из-за недостатка тепла агрометеословия были удовлетворительными, во второй – хорошие, в третьей – было жарко, в дневное время температура повышалась до +28, +30°C в воздухе и на почве – до +53, +55°C. В июле температура имела положительную аномалию, самой прохладной оказалась первая декада (+18°C), это лишь на 0,2°C выше обычной, вторая – самая жаркая (+21,9°C), превышение на 3,6°C (максимальные температуры воздуха составляли 31-32°C), в третьей (+21°C) превышение составило 2,3°C. Осадков в июле выпало 126,2 мм, это 136% от нормы, они носили ливневый характер, сопровождалась грозами, сильным ветром и иногда градом.

Растения находились в это время в восковой спелости, повышенная влажность почвы и сильный ветер вызвали полегание посевов, высокая влажность воздуха задержала полное созревание до конца второй декады июля. К моменту восковой спелости все листья были поражены грибными заболеваниями – септориоз (*Septoria*) и гельминтоспориоз (*Helminthosporium*), а также активизировался рост сорняков.

Таблица 1 – Элементы структуры урожайности

| п/п  | Количество продуктивных стеблей |        |        |                 |        |        | Масса 1000 семян |        |        |                 |        |        |
|--|---------------------------------|--------|--------|-----------------|--------|--------|------------------|--------|--------|-----------------|--------|--------|
|  | Московская 56                   |        |        | Немчиновская 17 |        |        | Московская 56    |        |        | Немчиновская 17 |        |        |
|  | 2014г.                          | 2015г. | 2016г. | 2014г.          | 2015г. | 2016г. | 2014г.           | 2015г. | 2016г. | 2014г.          | 2015г. | 2016г. |
| Контроль   | 572                             | 448    | 488    | 588             | 421    | 490    | 49,0             | 40,2   | 36,2   | 44,6            | 36,6   | 34,0   |
| Азолен Ж   | 552                             | 440    | 527    | 566             | 395    | 525    | 47,4             | 43,6   | 40,3   | 49,4            | 42,6   | 39,8   |
| Метилотрофин   | 579                             | 498    | 539    | 584             | 431    | 541    | 47,4             | 39,8   | 39,1   | 46,0            | 40,6   | 37,7   |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub>                | 540                             | 504    | 520    | 575             | 418    | 531    | 50,2             | 42,9   | 36,5   | 47,2            | 41,2   | 35,9   |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> + Азолен Ж     | 568                             | 485    | 544    | 573             | 411    | 508    | 49,2             | 41,4   | 38,3   | 44,3            | 40,9   | 39,1   |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> + Метилотрофин | 569                             | 477    | 530    | 628             | 417    | 559    | 50,6             | 42,3   | 39,2   | 46,0            | 40,7   | 38,9   |
| Среднее  | 563                             | 475    | 525    | 586             | 416    | 526    | 49,0             | 41,7   | 38,3   | 46,3            | 40,4   | 37,6   |

Количество продуктивных стеблей на всех вариантах изменялось незначительно, но различалось по годам, наибольшее из трёх лет было отмечено в 2014 г. – 586 на 1 м<sup>2</sup> у Немчиновской 17 и 569 у Московской 56, несколько ниже в 2016 г. – 526 и 530 соответственно, наименьшее – в 2015 г. – 416 и 477 (табл. 1). Наряду с этими данными величину общей урожайности определяет также масса 1000 семян. В 2014 г. наибольшие показатели были на вариантах, где применялись минеральные и микробиологические удобрения: 44,3 г – Азолен Ж, 46,0 г – Метилотрофин у сорта Немчиновская 17; у Московской 56 они были выше – 49,2 и 52,0 г. В 2015 г. лучшие показатели были на вариантах с применением минеральных удобрений – 41,2 г у Немчиновской 17 и 42,9 г – у Московской 56. Совместное применение минеральных и микробиологических удобрений увеличило массу 1000 семян у обоих сортов на 11% в сравнении с контрольными. В 2016 г. она оказалась меньше двух предыдущих лет, в

среднем по вариантам в 2014 г. у Немчиновской 17 она была 46,3 г, у Московской 56 – 49 г. в 2015 г. соответственно 40,4 и 41,7 г, а в 2016г. – 37,6 и 38,3 г.

Биологическая урожайность в 2014 г. повышалась значительно при обработке растений Метилотрофином, чем Азоленом Ж: без минеральных удобрений первый препарат увеличил ее у Немчиновской 17 на 3% и у Московской 56 – на 14%. Совместное применение минеральных и микробиологических удобрений повысило урожайность на 15 и 14% соответственно.

Таблица 2 – Влияние минеральных и микробиологических удобрений на урожайность (среднее за 2014-2016 гг.)

| Минеральные удобрения                           | Микробиологические удобрения | Урожайность зерна, т/га |                         |               |                         |
|---|------------------------------|-------------------------|-------------------------|---------------|-------------------------|
|   |                              | Немчиновская 17         |                         | Московская 56 |                         |
|   |                              | урожайность             | прибавки, % от контроля | урожайность   | прибавки, % от контроля |
| Контроль (б/у)                                  |                              | 4,42                    |                         | 4,93          |                         |
|   | Азолен-Ж                     | 4,88                    | +10                     | 5,25          | +6                      |
|   | Метилотрофин                 | 5,06                    | +14                     | 5,41          | +10                     |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> |                              | 4,62                    | +5                      | 5,13          | +4                      |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> | Азолен-Ж                     | 5,04                    | +14                     | 5,74          | +16                     |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> | Метилотрофин                 | 5,15                    | +17                     | 5,74          | +16                     |
| НСП <sub>05</sub>                               |                              | 0,04                    |                         | 0,03          |                         |

Микробиологические удобрения (норма 0,05-0,10 л/га) применялись в фазы «начало активной вегетации» и «флаговый лист».

Данные таблицы 2 показывают, что наименьшие прибавки за три года получены на вариантах с использованием минеральных удобрений N<sub>60</sub>P<sub>60</sub>K<sub>60</sub> – у сорта Немчиновская 17 – 5%, у Московской 56 – 4%. Значительно повышалась урожайность за счет применения микробиологических удобрений: Азолен Ж – на 10%, Метилотрофин – на 14% у Немчиновской 17, у Московской 56 – на 6% и 10% соответственно. Наибольшие прибавки были получены на вариантах с совместным применением минеральных и микробиологических удобрений – Азолен Ж увеличил урожайность на 14%, Метилотрофин – на 17% у Немчиновской 17; у Московской 56 она составила 16% для обоих препаратов.

Таблица 3 – Влияние минеральных и микробиологических удобрений на качество зерна (среднее за 2014 -2016 гг.)

| Минеральные удобрения                           | Микробиологические удобрения | Содержание клейковины, % |               | ИДК             |               | Группа качества |               |
|---|------------------------------|--------------------------|---------------|-----------------|---------------|-----------------|---------------|
|   |                              | Немчиновская 17          | Московская 56 | Немчиновская 17 | Московская 56 | Немчиновская 17 | Московская 56 |
|   |                              |                          |               |                 |               |                 |               |
| Контроль  | Контроль                     | 30                       | 26            | 77              | 76            | III             | III           |
| -   | Азолен Ж                     | 31                       | 29            | 82              | 76            | III             | III           |
| -   | Метилотрофин                 | 31                       | 29            | 83              | 76            | III             | III           |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> | -                            | 30                       | 28            | 81              | 77            | III             | III           |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> | Азолен Ж                     | 32                       | 29            | 85              | 75            | III             | III           |
| N <sub>60</sub> P <sub>60</sub> K <sub>60</sub> | Метилотрофин                 | 30                       | 29            | 85              | 79            | III             | III           |

Полученные результаты по содержанию клейковины в среднем за три года говорят о положительном влиянии минеральных и микробиологических удобрений на этот показатель. Зерно обоих сортов относится к III классу (табл. 3).

Экономическая эффективность микробиологических удобрений за исследуемые три года оказалась разной (табл. 4).

Таблица 4 – Экономическая эффективность минеральных и микробиологических удобрений на озимой пшенице в 2014-2016 гг.

| № п/п                  | Стоимость удобрений, руб./га | Затраты на их применение, руб./га | Урожайность, т/га |        |        |        | Прибавки, т/га |        |        |        | Чистый доход, руб./га |        |        |        |   |
|------------------------|------------------------------|-----------------------------------|-------------------|--------|--------|--------|----------------|--------|--------|--------|-----------------------|--------|--------|--------|---|
|                        |                              |                                   | 2014г.            | 2015г. | 2016г. | средн. | 2014г.         | 2015г. | 2016г. | средн. | 2014г.                | 2015г. | 2016г. | средн. |   |
| <b>Немчиновская 17</b> |                              |                                   |                   |        |        |        |                |        |        |        |                       |        |        |        |   |
| 1                      |                              |                                   | 6,27              | 3,46   | 3,53   | 4,42   |                |        |        |        | -                     |        |        |        |   |
| 2                      | 800                          | 240                               | 6,34              | 4,33   | 3,97   | 4,88   | 0,07           | 0,87   | 0,44   | 0,46   | -340                  | 7660   | 3360   | 3560   |   |
| 3                      | 800                          | 240                               | 6,69              | 4,00   | 4,48   | 5,06   | 0,42           | 0,54   | 0,95   | 0,64   | 3160                  | 4360   | 8460   | 5360   |   |
| 4                      | 4220                         | 140                               | 6,38              | 3,81   | 3,68   | 4,62   | 0,11           | 0,35   | 0,15   | 0,20   | -3260                 | -860   | -2860  | -2360  |   |
| 5                      | 5020                         | 380                               | 6,49              | 3,99   | 4,65   | 5,04   | 0,22           | 0,53   | 1,12   | 0,62   | -3200                 | -100   | 5800   | 800    |   |
| 6                      | 5020                         | 380                               | 6,56              | 4,11   | 4,79   | 5,15   | 0,29           | 0,65   | 1,26   | 0,73   | -2500                 | 1100   | 7200   | 1900   |   |
| НСР <sub>0,05</sub>    |                              |                                   | 0,35              | 0,33   | 0,05   |        |                |        |        |        |                       |        |        |        | - |
| <b>Московская 56</b>   |                              |                                   |                   |        |        |        |                |        |        |        |                       |        |        |        |   |
| 1                      |                              |                                   | 6,27              | 4,73   | 3,78   | 4,93   |                |        |        |        | -                     |        |        |        |   |
| 2                      | 800                          | 240                               | 6,46              | 4,98   | 4,32   | 5,25   | 0,19           | 0,25   | 0,54   | 0,32   | 860                   | 1460   | 4360   | 2160   |   |
| 3                      | 800                          | 240                               | 6,59              | 4,87   | 4,77   | 5,41   | 0,32           | 0,14   | 0,99   | 0,48   | 2160                  | -1026  | 8860   | 3760   |   |
| 4                      | 4220                         | 140                               | 6,37              | 5,20   | 3,83   | 5,13   | 0,10           | 0,47   | 0,05   | 0,20   | -2860                 | 360    | -3860  | -2360  |   |
| 5                      | 5020                         | 380                               | 6,59              | 5,27   | 5,36   | 5,74   | 0,32           | 0,54   | 1,58   | 0,81   | -2200                 | 0      | 10400  | 2700   |   |
| 6                      | 5020                         | 380                               | 6,63              | 5,13   | 5,45   | 5,74   | 0,36           | 0,40   | 1,67   | 0,81   | -1800                 | -1400  | 11300  | 2700   |   |
| НСР <sub>0,05</sub>    |                              |                                   | 0,33              | 0,35   | 0,03   |        |                |        |        |        |                       |        |        |        | - |

В наиболее благоприятном 2014 году доход был получен лишь на вариантах с использованием микробиологических удобрений. За счет применения минеральных удобрений результат был отрицательный. В 2015 г. урожайность была на 1,5-1,8 т/га меньше по всем вариантам опыта, чем в предыдущем 2014 г.; наибольший доход получился у сорта Немчиновская 17 при использовании биопрепарата Азолен Ж – 7,66 тыс.руб./га и Метилотрофин – 4,36 тыс.руб./га. У Московской 56 положительный результат был лишь от Азолена Ж. В самый неблагоприятный 2016 г. доход был получен на всех вариантах, кроме тех, где использовались минеральные удобрения. При этом на вариантах с совместным использованием микробиологических и минеральных удобрений он был ниже, чем одних биопрепаратов.

## ВЫВОДЫ

Минеральные удобрения в засушливые годы не дают увеличения урожайности зерна в такой степени, чтобы получать доход, из-за высоких цен на них. Применение микробиологических удобрений во все рассматриваемые годы дало больший доход, чем минеральных. При использовании микробиологических и минеральных удобрений затраты на них окупаются, но доход ниже, чем от применения одних биопрепаратов. Метилотрофин более эффективен в засушливые годы, чем Азолен Ж.

## БИБЛИОГРАФИЯ

1. Васютин А.С. Технология производства зерна озимых зерновых культур в Центральном Федеральном Округе РФ (рекомендации) – М., 2015. – 176 с.
2. Грунская В.П., Бровкин В.Н., Коломейченко В.В. Влияние средств химизации на урожайность озимой пшеницы в лесостепи // Земледелие, 2014. – №6. – С. 39-40.
3. Грунская В.П. Влияние удобрений и средств защиты растений на урожайность озимой пшеницы в лесостепи // Материалы 10 Международной научно-практической конференции «Achievement of high school» – Болгария. – С. 80-83.
4. Пигорев И.Я., Тарасова С.А. Элементы биологизации в технологии возделывания озимой пшеницы – Вестник ОрелГАУ. – 2014. – №5 (50). – С. 103-109.
5. Грунская В.П. Влияние биологических удобрений на урожайность и качество яровой пшеницы на черноземах Тульской области – Научный обозреватель. – 2016. – №10. – С. 63-65.
6. Горбунов О.П. Научноёмкие технологии производства и применения препаратов на основе штаммов Pseudomonax и Methylobacteriums - <http://mbio.bas-net.by>
7. Доспехов Б.А. Методика полевого опыта с основами статистической обработки результатов исследований. – М., Колос, 1979. – 416 с.

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**ВЛИЯНИЕ ОРГАНОМИНЕРАЛЬНЫХ СУБСТРАТОВ НА РОСТ И РАЗВИТИЕ ОГУРЦА**  
EFFECT OF ORGANOMINERAL SUBSTRATES ON THE GROWTH AND DEVELOPMENT  
OF CUCUMBER

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**АННОТАЦИЯ**

Исследованиями установлено, что применение вермикомпоста способствует интенсивному формированию фитомассы растений рассады огурца. Растения, выращенные на вермикомпосте из лузги гречихи и осадка сточных вод, имели на 17,2% выше содержание хлорофилла в листьях и на 39,9% больше площадь листовой поверхности.

**ABSTRACT**

The results of the research showed that the use of vermicompost promotes the intensive formation of plant phytomass of cucumber seedlings. Plants grown on a vermicompost of buckwheat husk and sewage sludge had 17.2% higher chlorophyll content in the leaves and 39.9% increase in the leaf area.

**КЛЮЧЕВЫЕ СЛОВА**

Органоминеральный субстрат, вермикомпост, фитомасса, огурец.

**KEY WORDS**

Organomineral substratum, vermicompost, phytomass, cucumber.

Важная роль в повышении урожайности овощных культур отводится удобрениям, но при использовании в овощеводстве повышенных доз азотных удобрений, необходимых для получения планируемых урожаев, встает вопрос о накоплении в продукции нитратов в опасных для человека концентрациях. Нитраты, попадая в организм человека, восстанавливаются до нитритов, которые в конечном итоге превращаются в нитрозосоединения, многие из которых оказывают канцерогенное и мутагенное воздействие [1-3].

Одним из наиболее эффективных способов снижения содержания нитратов в растительной продукции, упорядочивания минерального питания культур, улучшения водно-физических и агрохимических качеств грунтов является применение органоминеральных удобрений. Создание экологически чистых технологий выращивания посадочного материала овощных культур в настоящее время проблематично. Для получения посадочного материала в качестве питательного субстрата используют различные органические добавки – торф, навоз [4-6].

В проведенных нами исследованиях была изучена возможность использования технологии вермикультивирования в переработке в биогумус отходов крупяной промышленности (лузга гречихи) и коммунального хозяйства (осадок сточных вод г. Орла).

**МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ**

Лабораторные исследования по влиянию органоминеральных субстратов на рост и развитие рассады огурца проводили на кафедре земледелия, агрохимии и агропочвоведения ФГБОУ ВО Орловский ГАУ.

Состав отходов производства для приготовления вермикомпостов и органических субстратов: лузга гречихи – отход при шелушении гречихи: Химический состав (%): сухое вещество – 89,8; белок – 2,1–3,1; крахмал – 1,0–1,3; жир – 0,4–0,7; сырой протеин – 10,3; сырая клетчатка – 15,1; зола – 1,5–2,5; клетчатка – 40–70; кальций – 0,2; калий – 0,44; фосфор – 0,31; магний – 0,13 г; железо – 0,89 г; цинк – 0,086; плотность – 130–145 кг/м<sup>3</sup>;

Навоз КРС – составные части свежего навоза в основном твердые и жидкие экскременты животных и подстилка. Химический состав навоза на соломенной подстилке (%): влажность – 77,3; органическое вещество – 20,3; азот общий – 0,35; фосфор – 0,18; калий – 0,15;

Осадок сточных вод (ОСВ) г. Орла: влажность – 70,6%; рН<sub>ксл</sub> – 7,4; зольность – 48; органическое вещество – 51%; Pb – 54; Cd – 6,7; Ni – 115; Cu – 270; Zn – 660; Cr – 180; Mn – 157 мг/кг; N – 1,5%, K<sub>2</sub>O – 2%, P<sub>2</sub>O<sub>5</sub> – 2,5%, Сорг. – 43%, рН<sub>сол</sub> – 7,4–7,5.

Варианты опыта:

1. Органический субстрат (лузга гречихи + навоз КРС) 50:50 без червя;
2. Вермикомпост (лузга гречихи + навоз КРС) 50:50;
3. Органический субстрат (лузга гречихи + ОСВ) 70:30 без червя;
4. Вермикомпост (лузга гречихи + ОСВ) 70:30.

Опыт заложен в деревянных ящиках размером 50×50×25 см. Для вермикомпостирования использовали гибрид красного Калифорнийского червя (*Eisenia Andrei*) обычно живет в умеренном климате. Взрослая особь достигает 8–9 см в длину, 3–5 мм в диаметре и 0,5–1 г массы. Продолжительность жизни 16 лет. За год одна пара червей может дать 3000 особей. Он гермафродит, плодовит, оплодотворение в оптимальных условиях происходит каждые семь суток, начиная с 90-го дня жизни.

В переработанной червями, смешанной с кишечной слизью, земле повышается содержание кальция, магния, аммиака. Многие соединения переводятся в более доступную форму для растений.

## РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ

По результатам исследований видно, что органические субстраты отличаются по содержанию углерода, азота, фосфора и калия в зависимости от условий их трансформации и качества исходного органического вещества. Наибольшее количество углерода отмечается в органическом субстрате из гречишной лузги и навоза в соотношении 50:50 по массе, и разлагающемся без участия гибрида красного калифорнийского червя. Содержание органического углерода достигало 22%, что в два раза превышает количество органического углерода в субстрате из лузги гречихи и осадка сточных вод (70:30%), также установлены увеличение показателей в содержании таких важных элементов питания, как азот, фосфор и калий. В опытах показана возможность использования лузги гречихи и осадка сточных вод в качестве субстрата вермиккультуры. Установлено, что в вермикомпосте происходит незначительное снижение в содержании углерода органических веществ на 1,6–2,0%, а в содержании азота, фосфора и калия на 0,1–0,4% в зависимости от вида исследуемого субстрата (табл.1, рис.1).

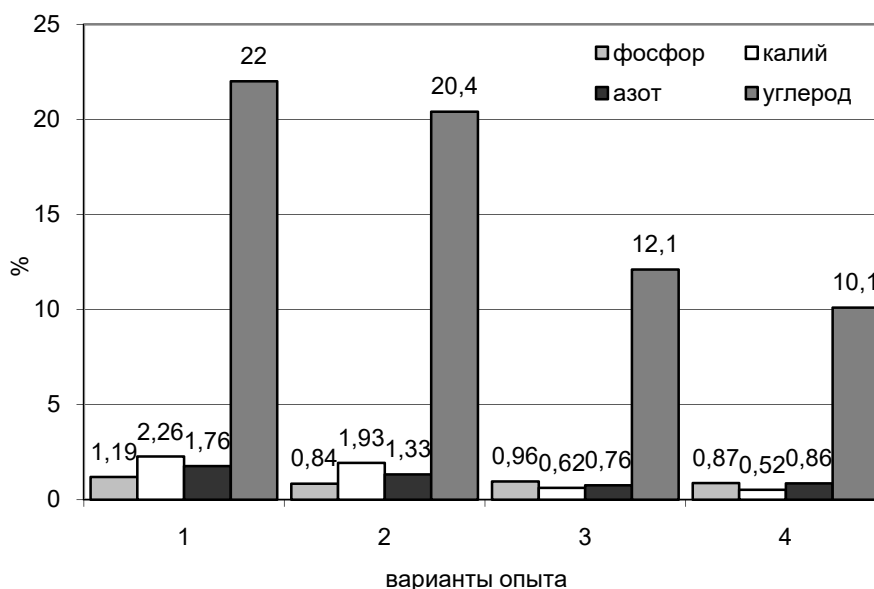
При этом различия в показателях оценки органических субстратов при переработке червями и без них для органических отходов из лузги и осадка сточных вод незначительные.

Таким образом, вермикомпост, полученный на основе отходов производства характеризуется хорошими показателями, что дает возможность использования его в условиях защищенного грунта.

Результаты исследований с органическими субстратами показали, что на вермикомпосте масса растений была выше, чем на прокомпостированном органическом субстрате без участия червей (табл. 2, рис.2).

Таблица 1 – Химический состав органических субстратов в зависимости от условий компостирования

| № п/п             | Варианты опыта                                      | PH   | %    |      |      |      |           |
|-------------------|---|------|------|------|------|------|-----------|
|                   |   |      | P    | K    | N    | C    | влажность |
| 1                 | Органический субстрат (лузга+навоз) 50:50 без червя | 6,4  | 1,19 | 2,26 | 1,76 | 22,0 | 25,9      |
| 2                 | Вермикомпост (лузга+навоз) 50:50                    | 6,4  | 0,84 | 1,93 | 1,33 | 20,4 | 36,2      |
| 3                 | Органический субстрат (лузга+ОСВ) 70:30 без червя   | 6,6  | 0,96 | 0,62 | 0,76 | 12,1 | 7,3       |
| 4                 | Вермикомпост (лузга+ОСВ) 70:30                      | 6,7  | 0,87 | 0,52 | 0,86 | 10,1 | 5,2       |
| НСР <sub>05</sub> |   | 0,20 | 0,12 | 0,11 | 0,18 | 2,25 | 0,72      |



\*1 – Органический субстрат (лузга+навоз (50:50) без червя; 2 – Вермикомпост (лузга+навоз (50:50); 3 – Органический субстрат (лузга+ОСВ (70:30) без червя; 4 – Вермикомпост (лузга+ОСВ (70:30)

Рисунок 1 – Химический состав органических субстратов

При этом растения рассады, выращенные на субстрате из лузги и навоза отличались наибольшей биомассой – 18,79 и 20,10 г, в то время как растения, полученные на субстрате из лузги и осадка сточных вод, имели сырую биомассу почти в 2–2,5 раза меньше – 6,65–6,97 г.

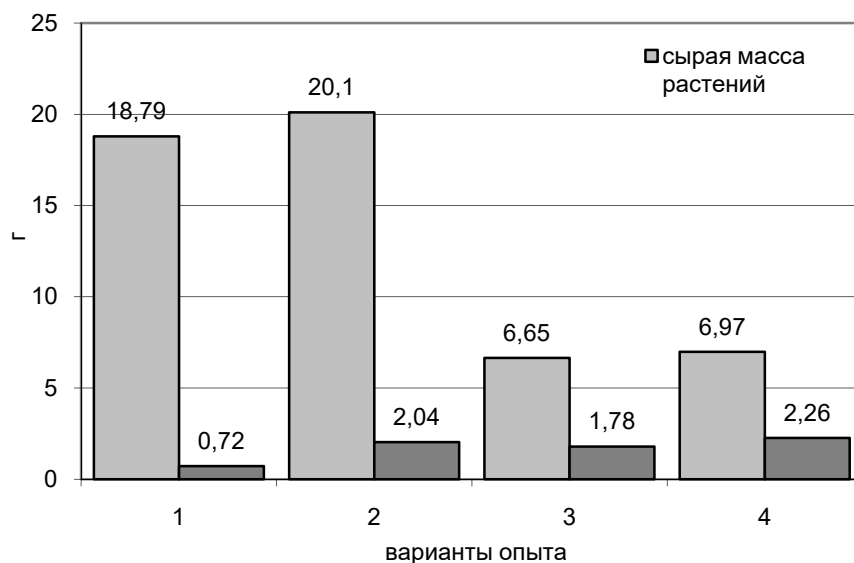
Таблица 2 – Влияние органических субстратов на накопление биомассы растений

| № п/п | Варианты опыта                                      | Масса растения, г |       | Интенсивность накопления, г/сут. |                |
|-------|---|-------------------|-------|----------------------------------|----------------|
|       |   | сырая             | сухая | сырой биомассы                   | сухой биомассы |
| 1     | Органический субстрат (лузга+навоз) без червя 50:50 | 18,79             | 0,72  | 0,78                             | 0,03           |
| 2     | Вермикомпост (лузга+ навоз) 50:50                   | 20,10             | 2,04  | 0,83                             | 0,08           |
| 3     | Органический субстрат (лузга+ОСВ) 70:30 без червя   | 6,65              | 1,78  | 0,27                             | 0,07           |
| 4     | Вермикомпост (лузга+ОСВ) 70:30                      | 6,97              | 2,26  | 0,37                             | 0,09           |

Интенсивность среднесуточного накопления сырой биомассы была на вермикомпосте из лузги и навоза самой высокой – 0,83 и 0,37 на вермикомпосте на основе лузги гречихи и осадка сточных вод. Интерес представляют данные по применению накопления сухого вещества растениями рассады.

Растения, выращенные на вермикомпосте из лузги и осадка сточных вод, имели самую большую величину сухого вещества в условиях опыта – 2,26 г, а на вермикомпосте из лузги и навоза – 2,04 г. Биомасса сухого вещества в растениях рассады, выращенных на невермикомпостированных субстратах была меньше 0,72 и 1,78 г. Интенсивность накопления сухого вещества была самой высокой на

вермикомпосте – 0,08 – 0,09 г/сутки и на органическом субстрате из лузги гречихи и отходов коммунального хозяйства.



\*1 – Органический субстрат (лузга+навоз (50:50) без червя; 2 – Вермикомпост (лузга+навоз (50:50); 3 – Органический субстрат (лузга+ОСВ (70:30) без червя; 4 – Вермикомпост (лузга+ОСВ (70:30)

Рисунок 2 – Влияние органических субстратов на накопление биомассы растений

Результаты исследований показали, что вермикомпост вызывает более интенсивное формирование фитомассы растений рассады (табл. 3).

Таблица 3 – Влияние органических субстратов на рост и развитие рассады

| № п/п | Варианты опыта                                      | Высота растений, см | Количество листьев, шт. | Площадь листовой поверхности, дм <sup>2</sup> | Содержание хлорофилла, мг на 100 г сырого вещества |
|-------|---|---------------------|-------------------------|---|--|
| 1     | Органический субстрат (лузга+навоз) без червя 50:50 | 17,0                | 5                       | 24,6  | 182,35   |
| 2     | Вермикомпост (лузга+навоз) 50:50                    | 14,3                | 5                       | 21,3  | 170,58   |
| 3     | Органический субстрат (лузга+ОСВ) 70:30 без червя   | 12,5                | 4                       | 19,4  | 158,00   |
| 4     | Вермикомпост (лузга+ОСВ) 70:30                      | 20,0                | 3                       | 29,8  | 200,00   |

Сравнение высоты растений в зависимости от характера компостирования и качества субстрата позволяет констатировать следующее: растения рассады, выращенные на вермикомпосте из лузги гречихи и осадка сточных вод имели на 17,2% выше содержание хлорофилла в листьях и на 39,9% больше площадь листовой поверхности, чем растения, полученные на вермикомпосте из лузги и навоза.

Количество хлорофилла и листовая поверхность растений на вермикомпосте были на 24,35 мг и на 100 г выше соответственно, чем в растениях на прокомпостированном органическом субстрате из лузги и осадка без участия червей. На органических субстратах из смеси лузги и навоза, не подвергшихся вермикомпостированию, растения рассады отличались большей высотой – 17,0 см, листовой поверхностью – 24,6 дм<sup>2</sup> и количеством хлорофилла – 182,35 мг на 100 г сырого вещества, чем растения на вермикомпосте из того же органического субстрата.

При этом интенсивность роста растений была установлена самой наибольшей для вермикомпоста из субстрата в составе лузги и осадка сточных вод. Различия в



эффективности органических субстратов обусловлены как количественными показателями в содержании углерода, азота, фосфора и калия, так и качественными изменениями в составе органических веществ исходных компонентов субстрата и образуемых в процессе их трансформации.

*Заключение.* Таким образом, результаты исследований подтверждают возможность использования органических отходов в качестве сырья для производства вермикомпоста и биологически активных веществ, извлекаемых из органических соединений биогумуса и включения их в субстраты для выращивания рассады огурца. Полученные данные являются основанием для разработки технологии использования вермикомпостов на основе отходов различных производств в овощеводстве и требуют продолжения научных исследований.

### БИБЛИОГРАФИЯ

1. Яковлева Н.В. Влияние органоминеральных и минеральных удобрений на урожай и качество рассады и культуры огурца / диссертация на соискание ученой степени кандидата сельскохозяйственных наук, Балашиха 2003 – С. 159
2. Степанова Л.П. Экологическая эффективность использования предпосевной обработки семян водными вытяжками из горных пород и вермикомпостов / Л.П. Степанова, В.Н. Стародубцев, Е.И. Степанова // Вестник Орловского государственного аграрного университета. 2010. Т. 26. № 5. С. 49-52.
3. Степанова Л.П. Агроэкологическая эффективность обработки семян водными вытяжками из горных пород и вермикомпостов / Л.П. Степанова, В.Н. Стародубцев, Е.И. Степанова // Вестник российского университета дружбы народов. Серия: экология и безопасность жизнедеятельности. 2011 №2. С.81-88.
4. Глунцов, Н.М. Рекомендации: Технология применения биогумуса и удобрений, полученных на основе вермикультуры / Н.М. Глунцов, А.И. Феоктистова, Е.А. Шиляева и др. Киров, 2002.
5. Кидин, В.В. Особенности питания и удобрения сельскохозяйственных культур: учебное пособие / В.В. Кидин. – М.: Изд-во РГАУ–МСХА, 2009. – 412 с
6. Мельник И.А. Вермикультура: производство и использование // К., Укр. ННТЕИ, 1994-128с.

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## **GROWTH OF LUJA PLANTS (*PERISTRHOPHE BIVALVIS MERRILL*) AT DIFFERENT LIGHT INTENSITIES AND MATERIAL TYPES OF CUTTINGS**

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### **ABSTRACT**

Light intensities and planting materials of cuttings are two critical factors affecting plant growth. This research was aimed to find out the effects of light intensities and planting material types of cuttings affecting the growth of *Luja* plants. The light intensity treatments consisted of 100%, 65%, 35%, 15% and the planting material types covered both basal and tip cuttings. The design used was Split Plot Design and continued with Duncan's Test. The results showed that there was no interaction between light intensities and cuttings, but the effect of light intensities and cuttings was singularly found in the SLA, RGR, LAD, LAR, and NAR variables. Moreover, *Luja* plants could grow well at the light intensity of 15% - 65% with the optimum light intensity of 35%. Both basal and tip cuttings could be used as the planting materials. However, the material type of cuttings that could accelerate the vegetative phase-growth of *Luja* plants the most was tip cuttings. *Luja* is categorized as a plant that can grow in full light conditions.

### **KEY WORDS**

*Luja*, growth rate, light intensity, cuttings.

Before the presence of synthetic dyes, *Luja* plants (*Peristrophe bivalvis* Merrill) has often been utilized and used by craftsmen as the raw material of fiber dyes in Maluku Province, Indonesia (Melati, 2016). In Vietnam, it is even used for food coloring (Dang *et al.*, 2014). To date, the utilization of *Luja* is only explorative. *Luja* is classified as a wild plant. The results of the research on growing habitats and other cultivation aspects have not been examined further in Indonesia, so there is no clear technical guidance on growth requirements. The purpose of this research was to find out the optimum light intensity and appropriate cutting material type for *Luja* growth. The intensity of light plays an essential role in plant metabolism, affecting the plant growth at the beginning of nursery (Mukhtar, 2016). Previous research has suggested that some of the factors that can influence the plant pigment resulted are light (Sirait, 2008; Ferus and Arkosiova, 2001), as well as the quantity and quality of the plant (Moacyr *et al.*, 2000; Fu *et al.*, 2012).

Different parts of cuttings give effects at the beginning stage of growth to production. Tip cuttings are recommended for growing plants by concerning on the position of the cuttings, the number of nodules, particularly in some plants such as *Stevia Rebaudiana* Bertoni, *Alstonia scholaris* (L.) R., sweet potatoes, *Plectranthus vettiveroides* (Mashudi and Adinugraha, 2015; Mardi *et al.*, 2016). The intensity of light is an environmental factor that must be regulated under low conditions to support the initial growth of cuttings without limiting the process of photosynthesis (Tombosi *et al.*, 2015). This is because light can provide a stimulus to the apical tissue enlargement, biomass formation, leaf area and even the visible plant pigment on the plant growth itself (Rozali *et al.*, 2011 ; Mauro *et al.*, 2011 ; Zervoudakis *et al.*, 2012 ; Gulshan *et al.*, 2012 ; Safeer *et al.*, 2013).

Biomass allocation in each organ of plants varies depending on the species and shade percentages (McAlpine dan Jesson, 2007; Devkota dan Jha, 2010; Santelices *et al.*, 2015).

## METHODS OF RESEARCH

This experiment was conducted using pots in Dadaprejo Subdistrict, Batu City, East Java at an altitude of 450 m asl (above sea level) and the biomass observation was performed in the laboratory of Environmental Resources, Faculty of Agriculture, Brawijaya University, which took place from October 2016 until January 2017. The treatment consisted of two factors namely light intensities (I) and planting materials (S) of cuttings. The light intensities covered 100% (I0), 65% (I1), 35% (I2) and 15% (I3) while the planting materials of cuttings consisted of basal cuttings (S1) and tip cuttings (S2), resulting in a total of 8 treatments. The treatment combinations used in this experiment were I0S1 (100% light intensity + basal cutting), I0S2 (100% light intensity + tip cutting), I1S1 (65% light intensity + basal cutting), I1S2 (65% light intensity + tip cutting), I2S1 (35% light intensity + basal cutting), I2S2 (35% light intensity + tip cutting), I3S1 (15% light intensity + basal cutting), I3S2 (15% light intensity + tip cutting).

The basal cuttings (S1) were taken from the basal parts of the secondary branches (stems) which were cut by four internodes while tip cuttings (S2) were the tip parts of the secondary branches (stems) consisting of four internodes calculated from the bud. The design used in this research was Split Plot Design repeated 3 times and continued with Duncan's Test to determine the difference of each treatment at the confidence level of 0.05 varieties using a Genstat software. The plants were placed in a shaded area for 4 weeks and then transferred to the planting area following the treatments being experimented. A destructive observation was performed at 2 weeks since after that. The subsequent treatments and observation were made at the interval of 2 weeks until the plants reached the age of 12 weeks after the treatments. The destructive observation consisted of Specific Leaf Area (SLA), Relative Growth Rate (RGR), Leaf Area Duration (LAD), Leaf Area Ratio (LAR) and Net Assimilation Rate (NAR). The formulas used to calculate the SLA, RGR, LAD, LAR and NAR variables according to Uzun and Kar, 2004; James and Drenovsky, 2007; Sugito, 2009; Poorter *et al.*, 2012; Sitompul, 2016 are as follows:

*Specific Leaf Area (SLA)*. SLA is the formation of leaf area per assimilate substrate unit shaped or the depiction of leaf thickness. SLA is obtained from the ratio of Leaf Area / LA (cm) to dry Leaf Weight/LW (g). SLA observation was conducted as much as 6 times, covering at the ages of 2, 4, 6, 8, 10 and 12 weeks after the treatments (wat) of transplanting:

$$SLA = \frac{LA}{LW}$$

*Relative Growth Rate (RGR)*. RGR is the index of plant growth obtained from the total dry weight of the plants / W (g) at a given period/ T (day) to determine the growth rate during the growing period. RGR observation was performed as much as 5 times with the observation intervals of 2-4 weeks, 4-6 weeks, 6-8 weeks, 8-10 weeks and 10-12 weeks after the treatments (wat) of transplanting.

$$RGR = \frac{\ln W_2 - \ln W_1}{T_2 - T_1}$$

*Leaf Area Duration (LAD)*. LAD is the duration of the ability of leaf unit to do photosynthesis, determined by Leaf Area (LA) and Time (T). LAR observation was carried out as much as 5 times with the observation intervals of 2-4 wat, 4-6 wat, 8-10 wat, and 10-12 wat.

$$LAD = \frac{LA_2 - LA_1}{\ln LA_2 - \ln LA_1} \times (T_2 - T_1)$$

**Leaf Area Ratio (LAR).** LAR is the quality of light received by leaves to form the whole plant organs. LAR can be calculated by comparing the Leaf Area (LA) with the total dry Weight (W) of the plants. LAR observation was conducted as much as 5 times with the observation intervals of 2-4 wat, 4-6 wat, 6-8 wat, 8-10 wat, 10-12 wat.

$$\text{LAR} = \frac{\text{LA}_2 - \text{LA}_1}{\text{W}_2 - \text{W}_1} \times \frac{\ln \text{W}_2 - \ln \text{W}_1}{\ln \text{LA}_2 - \ln \text{LA}_1}$$

**Net Assimilation Rate (NAR).** NAR is the ability of a unit of leaf area to produce biomass. NAR can be calculated by knowing the total dry Weight/ W (g), Leaf Area/ LA (cm), and observation Time/ T (days). NAR observation was performed as much as 5 times with the observation intervals of 2-4 wat, 4-6 wat, 6-8 wat, 8-10 wat, and 10-12 wat.

$$\text{NAR} = \frac{\text{W}_2 - \text{W}_1}{\text{LA}_2 - \text{LA}_1} \times \frac{\ln \text{LA}_2 - \ln \text{LA}_1}{\text{T}_2 - \text{T}_1}$$

## RESULTS AND DISCUSSION

**Specific Leaf Area (SLA).** In this research, the interaction between light intensities and planting material types of cuttings did not influence the growth of *Luja* plants. The effect of light intensities on the SLA was seen at all observation times, except 8 wat (Table 1). *Luja* plants exposed to the light intensity of 15% had a higher SLA value and were different from other treatments at the ages of 2 and 4 wat. In the other hand, *Luja* plants exposed to the light intensity of 35% obtained the highest SLA value at the age of 6 wat. However, they showed insignificant differences from those exposed to the light intensities of 65% and 15% but indicated significant differences from those exposed to the light intensity of 100%. *Luja* plants exposed to the light intensity of 15% had a higher SLA value and were different from the other treatments at the ages of 2 and 4 wat. At the age of 6 wat, the SLA of the plants exposed to the light intensity of 35% got the highest value and was the same with those exposed to the light intensity of 65% and 15% but different from those exposed to the 100% light intensity. The SLA values of all treatments began to decline at the age of 10 wat, but the SLA of the plants with the exposure of 35% light intensity obtained the highest and consistent value. This research is similar to the previous research on *Taxus baccata* L. plants that are tolerant to low light intensities and positively influence the SLA, leaf area, total chlorophyll, and, in contrast, give an adverse effect on the plant height and stem diameter (Perrin dan Mitchell, 2013). Besides, this research is also in line with research on low SLA values at high intensities for *Ocimum basilicum* L. plants (Caliskan *et al.*, 2009). The genetic ability of *Luja* plants exposed to the low light intensities tended to widen the leaves to receive light. The plants located in the environments with limited light would use the light as efficiently as possible to form carbohydrates, which are characterized by higher SLA values that also can be used as the characteristics of shade-tolerant plants such as *Nothofagus leonii* (Santelices *et al.*, 2015). Furthermore, according to Ma *et al.* (2015), plant performance will be different in shaded conditions, but the biomass and production under low light conditions will affect the carbohydrate production. Similarly, the coffee plants cultivated on a shaded land will have a higher SLA value than those cultivated on a full light-exposed land (Bote and Struik, 2011). The part of the cuttings that affected the specific leaf area was only found at the age of 4 wat, and there was no significant effect on the subsequent observations. The cuttings derived from the base (basal cuttings) obtained higher SLA values than the tip cuttings. The growth rate of the basal cuttings could be seen towards the generative phase in which the formation of leaves and biomass was produced quite a lot, thus affecting the SLA values. The success of stem cuttings is also influenced by the ability and morphology of the stem of the plant itself. For example, the cultivation of fig tree (*Ficus carica* L) using a tip, middle, and basal

cutting has the same statistical number of leaves at the ages of 2-10 weeks after planting (Yulistyani *et al.*, 2014).

One of the growth indicators that were used as a measure in identifying the determinants of the growth and biomass of *Luja* plants was the specific leaf area. The quality and quantity of biomass produced were influenced by the number and size of the leaves. The habitats supporting the growth of *Luja* plants had low-light intensity conditions (shade plant), indicating that *Peristrophe bivalvis* Merrill is tolerant to low light intensity although it also can grow in full light conditions. However, the increase in the leaf area was hampered by photo inhibition, resulting in smaller and fading leaves (Figure 1). The lower level of light intensity occurred in a more extensive leaf area. The same research result is also found on three varieties of *Dracaena sanderiana* with a larger leaf area at 50% - 70% shade. Higher shade levels will result in a larger leaf area on the three species of grass (Sirait, 2008; Srikrishnah and Sutharsan, 2012). Besides, the genetic factors of the plants also determine the limits of light absorption (Sevik *et al.*, 2012). Furthermore, stem-tip and basal cuttings planted in full and shaded light intensities show different growths, in which the tip cuttings of *Plectranthus vittiveroides* plants also successfully grow if they are in shaded conditions. (Safeer *et al.*, 2013). The more excellent SLA value was, the thinner the *Luja* leaves would become. It is affected by the ability of leaves to enlarge the leaf tissue and allow light that enters the plant canopy as efficient as possible. This research is in line with the previous research on *Taxus baccata* L. plants, which are tolerant to low light intensities and positively influence the SLA, leaf area, total chlorophyll, and, in contrast, give an adverse effect on the plant height and stem diameter (Perrin dan Mitchell, 2013). Besides, this research is also similar to the previous research on low SLA values at high intensities for *Ocimum basilicum* L. plants (Caliskan *et al.*, 2009).

Table 1 – Effect of Light Intensity and Planting Material on Specific Leaf Area (SLA) at the age of 2, 4, 6, 10 and 12 Weeks after Treatments (wat)

| Light Intensity   | Average Specific Leaf Area (cm <sup>2</sup> /g/t) |                     |                     |                     |                     |
|-------------------|---|---------------------|---------------------|---------------------|---------------------|
|                   | 2 wat   | 4 wat               | 6 wat               | 10 wat              | 12 wat              |
| 100%              | 224.75 <sup>a</sup>                               | 166.49 <sup>a</sup> | 150.69 <sup>a</sup> | 131.69 <sup>a</sup> | 119.12 <sup>a</sup> |
| 65%               | 233.26 <sup>a</sup>                               | 166.01 <sup>a</sup> | 196.50 <sup>b</sup> | 138.53 <sup>a</sup> | 150.60 <sup>a</sup> |
| 35%               | 290.52 <sup>a</sup>                               | 207.18 <sup>b</sup> | 232.20 <sup>b</sup> | 214.27 <sup>b</sup> | 213.01 <sup>b</sup> |
| 15%               | 303.80 <sup>b</sup>                               | 242.71 <sup>c</sup> | 213.00 <sup>b</sup> | 210.69 <sup>b</sup> | 207.64 <sup>b</sup> |
| Planting Material |   |                     |                     |                     |                     |
| Basal Cutting     | ns  | 208.14 <sup>b</sup> | ns                  | ns                  | ns                  |
| Tip Cutting       | ns  | 183.06 <sup>a</sup> | ns                  | ns                  | ns                  |

Description: The numbers followed by the same letters are not significantly different based on Duncan's Test at the 0.05 level; wat = weeks after treatment; ns = not significant.

**Relative Growth Rate (RGR).** In addition to SLA, the other indicator used to examine the growth of *Luja* plants in this research was the relative growth rate. The results of the variances found that the growth rate of *Luja* plants to the relative growth rate did not show an interaction between light intensities and planting materials of cuttings. The light intensities influenced the relative growth rate at the ages of 2-4 wat and 4-6 wat. In another side, the sections of cuttings showed its effects at the age of 4-6 wat (Table 2) while, at the other observation intervals, there was not found any significant difference. The plants exposed to the light intensities of 65%, 35%, and 15% differed significantly with those exposed to the light intensity of 100% (no shade) with the observation interval between 2-4 wat. In this phase, the highest RGR value was obtained at the light intensity of 15%. In contrast, entering the generative phase (aged 4-6 wat), the plants exposed to the light intensity of 100% got the highest RGR value compared to other treatments. The growth rate of *Luja* plants in shaded conditions at the beginning of growth was faster than that in unshaded conditions. However, the plants exposed to 100% light intensity began to adapt in the second month because of the influence of the biomass produced. Each herbaceous species has a different response to the growth rate of plants (Fini *et al.*, 2010). In shrubs, the highest relative growth rate was obtained in shaded conditions compared to the condition of full light intensity at the nursery

phase (Hastwell and Facelli, 2003). *Hevea brasiliensis* without shades at the age of 0-7 months after planting has a higher RGR value than those with shades of 33%, 55%, and 77%. However, the RGR values among the treatments are not different when the plants are at the age of 7-14 months after planting (Senevirathna *et al.*, 2003). As for *Adansonia digitata* plants, the highest RGR value is at 25% light intensity compared to 50-100% light intensities but among the treatments are not significantly different (Mukhtar, 2016). According to Wersal and Madsen (2013), aquatic plants of *Myriophyllum aquaticum* also have a high total RGR value in shaded conditions of 30% - 70%, affecting the physiological process that gives impacts on the difference in biomass among the plants exposed to full light intensity. Moreover, there is also a tendency to RGR increase of *P.notatum* and *S.secundatum* if placed in shaded conditions (Sirait, 2008). Each plant species has a different RGR value during the growing period in the forest area (Lamers *et al.*, 2006) and there is a positive relationship between the shaded plants and the values of RGR and LAR (Portsmouth and Niinemets, 2007).

**Leaf Area Duration (LAD).** The results of the variances found that there was no interaction between light intensities and material types of cuttings on the LAD variable but what made effects was a single factor. The light intensities did not affect at the age of 2 wat while the material types of cuttings showed significant differences between the basal cuttings and tip cuttings in which the tip cuttings obtained a higher value of LAD than basal cuttings. The light intensity of 35% got a high and consistent LAD value at each observation interval although it was not different from the results of 100% light intensity at the observation intervals of 4-6 wat and 6-8 wat. The plants exposed to 15% light intensity had the lowest LAD value and were not significantly different from those exposed to 65% light intensity at each observation interval. This indicated that the duration of *Luja* leaf area at the light intensity of 35% was more active or longer to photosynthesis than that of other treatments (Table 2). The value of LAD depends on the growth rate and the adaptability of the plant itself. The results of this research are supported by the previous research stating that LAD has a positive correlation with the plant growth and yield, and depends on the genotype of the plant itself (Hunkova *et al.*, 2011). Moreover, this research found that the plant age also determined the LAD for each treatment and it seemed that the highest LAD achievement was at the observation interval of 8-10 wat. However, the LAD value experienced a decline after entering the aging phase. The similar case is also found in some cereal plants that have different LAD values depending on the types and ages of the plants (Verma *et al.*, 2016).

**Net Assimilation Rate (NAR).** Light plays an important role in improving plant biomass. In another side, Net Assimilation Rate (NAR) becomes an indicator in examining the effect of light on plant growth rates. Plant propagation by cutting techniques should take into account the optimum growing conditions supporting the growth of the nursery phase, vegetative growth to production. The results of this experiment showed that there was no interaction between light intensities and material types of cuttings affecting the net assimilation rate of *Luja* plants. However, it was found a separated effect of light intensities. The different light intensities affected the value of NAR at the ages of 4-6 wat and 8-10 wat, while the effect of the cuttings was seen at the age of 8-10 wat (Table 2).

Table 2 – Effect of Light Intensity and Planting Material on Leaf Area Duration and Net Assimilation Rate at the age of 2-12 wat

| Light Intensity          | Average Relative Growth Rate (g/t) |                   | Average Leaf Range Duration (cm.week) |                        |                        |                        | Average Net Assimilation Rate (g/cm/t) |                        |                       |
|--------------------------|------------------------------------|-------------------|---------------------------------------|------------------------|------------------------|------------------------|--|------------------------|-----------------------|
|                          | 2-4 wat                            | 4-6 wat           | 2-4 wat                               | 4-6 wat                | 6-8 wat                | 8-10 wat               | 10-12 wat                              | 4-6 wat                | 8-10 wat              |
| 100%                     | 0.03 <sup>a</sup>                  | 0.12 <sup>b</sup> |                                       | 20983.00 <sup>b</sup>  | 37722.00 <sup>bc</sup> | 44336.00 <sup>b</sup>  | 43749.00 <sup>b</sup>                  | 8.28E-04 <sup>b</sup>  | 7.20E-05 <sup>a</sup> |
| 65%                      | 0.08 <sup>b</sup>                  | 0.07 <sup>a</sup> |                                       | 17837.00 <sup>bd</sup> | 31602.00 <sup>bd</sup> | 36551.00 <sup>bd</sup> | 32802.00 <sup>a</sup>                  | 6.31E-04 <sup>a</sup>  | 6.30E-05 <sup>a</sup> |
| 35%                      | 0.07 <sup>b</sup>                  | 0.08 <sup>a</sup> | ns                                    | 21226.00 <sup>b</sup>  | 38326.00 <sup>c</sup>  | 53266.00 <sup>c</sup>  | 43498.00 <sup>b</sup>                  | 1.53E-03 <sup>c</sup>  | 1.33E-04 <sup>b</sup> |
| 15%                      | 0.09 <sup>b</sup>                  | 0.07 <sup>a</sup> |                                       | 13131.00 <sup>a</sup>  | 30552.00 <sup>a</sup>  | 32282.00 <sup>a</sup>  | 31620.00 <sup>a</sup>                  | 6.66E-04 <sup>ab</sup> | 7.50E-05 <sup>a</sup> |
| <b>Planting Material</b> |                                    |                   |                                       |                        |                        |                        |  |                        |                       |
| Basal Cutting            |                                    | 0.10 <sup>b</sup> | 4844.00 <sup>a</sup>                  |                        |                        |                        |  |                        | 3.10E-05 <sup>a</sup> |
| Tip Cutting              | ns                                 | 0.07 <sup>a</sup> | 6908.70 <sup>b</sup>                  |                        |                        | ns                     |  | ns                     | 1.41E-04 <sup>b</sup> |

*Description: The numbers followed by the same letter are not significantly different based on Duncan's Test at the level of 0.05; wat = weeks after treatment; ns = not significant.*

*Luja* plants exposed to 35% light intensity obtained the highest NAR value and were significantly different from other treatments at the ages of 4-6 wat and 8-10 wat. Meanwhile, there was a similarity between the plants received full light intensity (100%) and those exposed to 15% light intensity but significantly different from those exposed to 65% light intensity at the observation interval of 4-6 wat. The plant growth in generative phase was different from the previous phase in which the highest NAR value was only found at the light intensity of 35% and significantly different from other treatments whereas the NAR values at the light intensities of 100%, 65%, 15% showed no difference. Adequate adaptability was shown by the high NAR values although the incoming light was blocked.

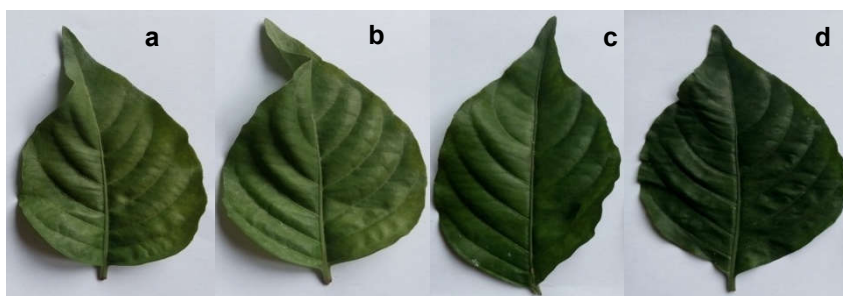


Figure 1 – Color Differences of *Luja* Leaves Based on Light Intensities:  
a = 100%, b = 65%, c = 35%, d = 15%

The response of *Luja* plants to the limited light conditions was to enlarge the leaf area and increase the number of leaves. In other words, the low light intensity formed the plant character by absorbing the received light as much as possible, showing the darker leaf color or dark green (Figure 1). The similar thing is also found in *Adansonia digitata* (L.) plants that have the same NAR value when exposed to the light intensities of 25%-100%, particularly at the time of nursery (Mukhtar, 2016). Differently, herbal plants of *Epimedium pseudowushanense* B.L.Guo exposed to a high light intensity ( $90.9 \pm 2.5 \mu\text{mol.m}^{-2}.\text{s}^{-1}$ ) have a higher NAR value than those exposed to a low light intensity (Pan and Guo, 2016) and *Trema micrantha* (L.) Blume plants (Valio, 2001). Physiologically, there is a positive correlation between NAR, RGR and the area of leaves which actively carry out the process of photosynthesis in brushes during the initial growth originating from a tropical forest (Li *et al.*, 2016). Low light intensities vary for each type of plant to a certain limit (Sevik *et al.*, 2012).

## CONCLUSION

Light intensities and planting materials of cuttings are the growth requirement that must be considered in cultivating and propagating *Luja* plants. *Luja* plants can grow generally at the light intensity range of 15%-65% with the optimum light intensity of 35%. However, the planting material that is able to encourage and accelerate the vegetative growth of *Luja* plants the most is tip cuttings.

## REFERENCES

1. Abdullateef, R. A., & M. Osman, 2012. Effects of Stem Cutting Types, Position and Hormonal Factors on Rooting in *Stevia Rebaudiana* Bertoni. *Journal of Agricultural Science* 4 (1): 49-57.
2. Afa, L.O. & W.A. Sudarsono, 2014. Pengaruh Naungan terhadap Pertumbuhan dan Hasil Tanaman Kolesom (*Talinum triangule* (Jacq.) Willd), *Agriplus* 24 (2): 144-151.
3. Brito, S. L., C. L. Pinheiro, F. C. B. Nogueira, S. M. Filho and D. M. S. Matos de. 2015. Influence of light on the initial growth of invasive *Cryptostegia madagascariensis* Bojer in the Brazilian semiarid region, *Acta Sci. Bio. Sciences* 37 (3): 385-392.

4. Buntoro, B.H., R. Rogomulyo & S. Trisnowati, 2014. Pengaruh Takaran Pupuk Kandang dan Intensitas Cahaya Terhadap Pertumbuhan dan Hasil Temu Putih (*Curcuma zedoaria* L.). *Vegetalika* 3 (4): 29 – 39.
5. Caliskan, O., M. S. Odabas & C. Cirak, 2009. The Modeling of the Relation Among the Temperature and Light Intensity of Growth in *Ocimum basilicum* L. *Journal of Medicinal Plants Research* 3 (11): 965-977.
6. Dang B. K., Dam S. M., Pham M. T., Dang T. B. O & Le T. H.V., 2014. *Peristrophe Roxburghiana* - A Review. *Annals. Food Science and Technology* 15 (1): 1-9.
7. Devkota, A & P. K. Jha, 2010. Effects of Different Light Level on the Traits and Yield of *Centella asiatica*. *Middle-East Journal of Scientific Research* 5 (4): 226-230.
8. Fauzi, R., Meiriani & A. Barus. 2016. Pengaruh Persentase Naungan Terhadap Pertumbuhan Bibit *Mucuna bracteata* D.C. Asal Setek dengan Konsentrasi IAA yang Berbeda, *Jurnal Agroekoteknologi* 4 (3): 2114-2126.
9. Ferus, P & Arkosiová, 2001. Variability of Chlorophyll Content under Fluctuating Environment “ Proceedings of the International Scientific Conference on the Occasion of the 55th Anniversary of the Slovak Agricultural University in Nitra” . *Acta fytotechnica et zootechnica* (4): 123-125.
10. Fini, A., F. Ferrini, P. Frangi, G. Amoroso & C. Giordano, 2010. Growth, Leaf Gas Exchange and Leaf Anatomy of Three Ornamental Shrubs Grown Under Different Light Intensities. *Europ.J.Hort.Sci.*, 75 (3): 111–117.
11. Fu, W., P. Li, Y. Wu, & J. Tang, 2015. Effects of Different Light Intensities on Antioxidative Enzyme Activity, Quality and Biomass in Lettuce. *Sch. Acad. J. Biosci* 3 (4): 392-396.
12. Gulshan, A. B., A.A. Dasti & S. Shakoor, 2012. Eco-Physiological Traits NAR and LAR Role in Determining the Relative Growth Rate in Competition. *Journal of Agricultural and Biological Scienc.* 7 (10): 803-813.
13. Hastwell, T. H & J. M. Facelli, 2003. Differing Effects of Shade-Induced Facilitation on Growth and Survival During the Establishment of a Chenopod Shrub. *Journal of Ecology* 2003 (91): 941–950.
14. Hlatshwayo, M. S & P. K. Wahome, 2010. Effects of Shading on Growth, Flowering and Cut Flower Quality in Carnation (*Dianthus caryophyllus*). *J. Agric. Soc. Sci.*, (6): 34–38.
15. Hunkova, E., M. Zivcak, K. Olsovka. 2011. Leaf Area Duration of Oilseed Rape (*Brassica napus* subsp. *napus*) Varieties and Hybrids and Its Relationship to Selected Growth and Productivity Parameters, *Journal of Central European Agriculture* 12 (1):1-15.
16. James, J. J. & R. E. Drenovsky, 2007. A Basis for Relative Growth Rate Differences Between Native and Invasive Forb Seedlings. *Rangeland Ecol Manage* (60):395–400.
17. Jurami, A. S., D.S.H Drennan & N. Anuar, 2004. The Effects of Shading on the Growth, Development of Biomass in Bermudagrass (*Cynodon dactylon* (L.) Pers.). *Journal of Biological Sciences* 4 (6): 756-762.
18. Lamers, J. P. A., A. Khamzina & M. Worbes, 2006. The Analyses of Physiological and Morphological Attributes of 10 Tree Species for Early Determination of Their Suitability to Afforest Degraded Landscapes in the Aral Sea Basin of Uzbekistan. *Forest Ecology and Management* (221): 249–259.
19. Li, W., B. Schmid, F. Wang, & C. E. T. Paine, 2016. Net Assimilation Rate Determines the Growth Rates of 14 Species of Subtropical Forest Trees. *Plos One Journal* 11 (3): 1-13.
20. Ma, J. Z., Z.J. Bu. X.X. Zheng, J.L. Ge & S.Z. Wang, 2015, Effects of Shading on Relative Competitive Advantage of Three Species of Sphagnum. *Mires and Peat*, 16 (04): 1–17.
21. Mardi, C.T., H. Setiando & K. Lubis, 2016. Pengaruh Asal Stek dan Zat Pengatur Tumbuh Atonik Terhadap Pertumbuhan dan Produksi Dua Varietas Ubi jalar (*Ipomoea batatas* L.) Lamb. *Jurnal Agroekoteknolog* 4 (4): 2341-2348.
22. Mashudi & H.A. Adinugraha, 2015. Kemampuan Tumbuh Stek Pucuk Pulau Gading (*Alstonia scholaris* (L.) R. Br.) dari Beberapa Posisi Bahan Stek dan Model Pemotongan Stek. *Jurnal Penelitian Kehutanan Wallacea* 4 (1): 63-69.



23. Mauro, R.P., A. Occhipinti, A. M. G. Longo & G. Mauromicale, 2011. Effects of Shading on Chlorophyll Content, Chlorophyll Fluorescence and Photosynthesis of Subterranean Clover. *Journal of Agronomy and Crop Science* (197): 57–66.
24. McAlpine, K.G., & L. K. Jesson, 2007. Biomass Allocation, Shade Tolerance and Seedling Survival of the Invasive Species *Berberis darwinii* (Darwin's barberry). *New Zealand Journal of Ecology* 31(1): 1-12
25. Melati, R., 2016. Keragaman sumber pewarna nabati yang digunakan Oleh masyarakat Maluku Utara, *Prosiding Seminar Nasional Pertanian "Optimalisasi Sumber Daya Lokal Berbasis Riset" Fakultas Pertanian Universitas Ternate, Cetakan Pertama* p. 65-70.
26. Moacyr, B., Dias-Filho, & A. F. C. Júnior, 2000. Growth, Biomass Allocation and Photosynthesis of *Rolandra fruticosa* (Asteraceae) in Response to Shade. *Planta Daninha* 18 (1): 71-78.
27. Mukhtar R.B., 2016. Influence of Light Intensity on Early Growth of *Adansonia digitata* (L.). *Res. J. Recent Sci.* 5(12): 5-9.
28. Musyarofah, N., S. Susanto, S. A. Aziz, & S. Kartosoewarno, 2007. Respon Tanaman Pegagan (*Centella asiatica* L. Urban) Terhadap Pemberian Pupuk Alami di Bawah Naungan, *Bul. Agron*, 35 (3): 217 – 224.
29. Pan, J & B. Guo, 2016. Effects of Light Intensity on the Growth, Photosynthetic Characteristics, and Flavonoid Content of *Epimedium pseudowushanense* B.L.Guo. *Molecules* (21): 1-12.
30. Perrin, P.M & F. J. G. Mitchell, 2013. Effects of shade on growth, biomass Allocation and leaf morphology in European yew (*Taxus baccata* L.). *Ireland European Journal of Forest Research* 132 (2): 211-218.
31. Poorter, H., K. J. Niklas, P. B. Reich, J. Oleksyn, P. Poot & L. Mommer, 2012. Biomass Allocation to Leaves, Stems and Roots: Meta-Analyses of Interspecific Variation and Environmental Control. *New Phytologist* (193): 30–50.
32. Rozali, S. E., K. A. Rashid & R. Farzinebrahimi, 2010. Effects of Shading Treatments on Pigmentation and Inflorescence Quality of *Calathea crotalifera* Bracts *Int. J. Agric. Biol.*, Vol. 00, No. 0, 201x.
33. Safeer, P.M., S. Sreekumar, P. N. Krishnan, C. K. Biju & G. Seeja. 2013. Influence of stem cuttings, spacing, group planting, light, irrigation and harvesting period on yield in *Plectranthus vettiveroides* (K.C. Jacob) N. P. Singh & B. D. Sharma, *Jour. of Agriculture and Veterinary Science* 6 (3): 47-53.
34. Santelices, R., S. Espinoza & A. M. Cabrera, 2015. Effects of Shading and Slow Release Fertilizer on Early growth of *Nothofagus leonii* Seedlings from Its Northernmost Distribution in Central Chile. *Bosque* 36(2): 179-185.
35. Sevik, H., D. Guney, H. Karakas & G. Aktar. 2012. Change to Amount of Chlorophyll on Leaves Depend on Insolation in Some Landscape Plants. *International Journal of Environmental Sciences* 3 (3): 1057-1064.
36. Sirait, J., 2008. Luas Daun, Kandungan Klorofil dan Laju Pertumbuhan Rumput pada Naungan dan Pemupukan yang Berbeda. *JITV* 13 (2): 109-116.
37. Sitompul, S.M., 2016. *Analisa Pertumbuhan Tanaman*. Malang: UB Press.
38. Srikrishnah, S., S.E. Peiris & S. Sutharsan, 2012. Effect of Shade Levels on Leaf Area and Biomass Production of Three Varieties of *Dracaena sanderiana* L. in the Dry Zone of Sri Lanka. *Tropical Agricultural Research* 23 (2): 142– 151.
39. Tombesi, S., A. Palliotti, S. Poni & D. Farinelli. 2015. Influence of Light and Shoot Development Stage on Leaf Photosynthesis and Carbohydrate Status During the Adventitious Root Formation in Cuttings of *Corylusavellana* L. *Frontiers in Plant Science* (6): 1-13.
40. Uzun, S & H. Kar, 2004. Quantitative Effects of Planting Time on Vegetative Growth of Broccoli (*Brassica oleracea* Var. *Italica*). *J. Bot.*, 36 (4): 769-777.
41. Valio, I. F. M., 2001. Effects of shading and removal of plant parts on growth of *Trema micrantha* seedlings. *Tree Physiology* (21): 65–70.

42. Verma, D., A.S. Gontia, A. Jha & A. Deshmukh. 2016. Study on Leaf Area Index and Leaf Area Duration of Growth Analytical Parameters in Wheat, Barley, and Oat, *International Journal of Agriculture, Environment and Biotechnology* 9(5): 827-831.
43. Widiastuti L., Tohari & E. Sulistyaningsih. 2004. Pengaruh Intensitas Cahaya dan Kadar Daminosida terhadap Iklim Mikro dan Pertumbuhan Tanaman Krisan dalam Pot, *Ilmu Pertanian* 11 (2): 53-42.
44. Yulistyani, W., D. S. Sobarna & A. Nuraini. 2014. Pengaruh Jenis Stek Batang dan Komposisi Media Tanam terhadap Pertumbuhan Bibit Tanaman Ara (*Ficus carica* L.), *Agric. Sci. J.* 1 (4): 215-224.
45. Zervoudakis, G., G. Salahas, G. Kaspiris & E. Konstantopoulo. 2012. Influence of Light Intensity on Growth and Physiological Characteristics of Common Sage (*Salvia officinalis* L.). *Braz. Arch. Biol. Technol* 55(1): 89-95.
46. Zheng, Y., W. Jiang, E. N. Silva, L. Mao, D.B. Hannaway & H. Lu. 2012. Optimization of shade condition and harvest time for *Dendrobium candidum* plants based on gas exchange, alkaloids and polysaccharides contents. *Plants Omics Journal* 5 (3):253-260.

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**ИСПОЛЬЗОВАНИЕ БИОЛОГИЧЕСКИ АКТИВНЫХ КОМПОНЕНТОВ РАСТЕНИЙ  
В ЗАЩИТЕ КАРТОФЕЛЯ ОТ LEPTINOTARSA DECEMLINEATA SAY**  
THE USE OF BIOLOGICALLY ACTIVE PLANT COMPONENTS IN POTATO PROTECTION  
FROM LEPTINOTARSA DECEMLINEATA SAY

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**АННОТАЦИЯ**

Проведено исследование влияния биологически активных компонентов растений на выживаемость личинок колорадского жука. Установлено, что фенольные соединения папоротника, гликоалкалоиды томатов (томатин) и картофеля (соланин) оказывают инсектицидное действие на насекомых-вредителей, снижая поражаемость картофеля.

**ABSTRACT**

A study was made of the effect of biologically active plant components on the survival of the larvae of the Colorado potato beetle. It has been established that phenolic fern compounds, tomato glycoalkaloids (tomato) and potato (solanine) have an insecticidal effect on insect pests, reducing potato damage.

**КЛЮЧЕВЫЕ СЛОВА**

Гликоалкалоиды, томатин, соланин, фенольные соединения.

**KEY WORDS**

Glycoalkaloids, tomato, solanine, phenolic compounds.

Культура картофеля относится к одной из самых незащищенных от патогенных микроорганизмов и насекомых вредителей. В настоящее время насчитывают свыше 30 наиболее распространенных болезней и насекомых-вредителей картофеля, среди которых особую опасность представляет колорадский жук (*Leptinotarsa decemlineana* Say), занимающий особое положение среди вредителей сельскохозяйственных культур.

Основной вред картофелю наносят личинки 3-4 возрастов первой генерации. По данным Г. Бура (1959), наиболее существенны для картофеля повреждения в период бутонизации - цветения, когда растения начинают формировать клубни, и особо чувствительны к сокращению листовой поверхности. Повреждения, наносимые в конце вегетации, не столь существенны [2]. Недобор урожая клубней от колорадского жука составляет, 4,2 млн. т. на сумму 19,4 млрд. рублей по средневзвешенным ценам 2016 года, что при общей площади картофельного поля России около 3,2 млн. га составляет почти 80% [7]. Урожайность картофеля в значительной степени зависит от эффективности мероприятий, направленных на защиту растений от болезней и вредителей.

Для защиты картофеля разработан и внедрен в практику целый комплекс организационно-хозяйственных, профилактических и истребительных мероприятий.

В системе защиты картофеля от колорадского жука первостепенное внимание должно уделяться профилактическим мероприятиям, так как они повышают выносливость растений картофеля к повреждениям, которые может причинить колорадский жук. По этой причине в крупных хозяйствах картофель желателен возделывать в четырехпольном севообороте.

Обработка почвы (осенью - лущение, дискование; весной – боронование, культивация, перепашка) – важный прием по защите сельскохозяйственных культур от вредных организмов, в том числе и от колорадского жука. Данные мероприятия обеспечивают оптимальные факты для роста и развития растений и создают в почве неблагоприятные условия для развития патогенов, фитофагов и сорняков. Доказано, что фон удобрений оказывает существенное влияние на изменение метаболических процессов в растениях в неблагоприятную сторону для вредного организма [5]. С целью защиты растений в каждом регионе для возделывания нужно подбирать районированные сорта картофеля, обладающие в конкретных почвенно-климатических условиях максимальной потенциальной продуктивностью и устойчивостью не только к болезням, но и вредителям. Возделывание устойчивых сортов позволяет снизить вредоносность колорадского жука, потери урожая клубней, уменьшить кратность обработок и снизить нормы расхода препаратов [6]. Практическое значение в снижении численности вредителя имеют несколько американских видов полезных насекомых (периллюс, подизус, мухи-тахины, эдовум, жужелица-лебия), а также некоторые местные виды энтомофагов, переключающиеся на питание данным фитофагом (жужелицы, божьи коровки, златоглазки, клопы, пауки) [1].

Урожайность картофеля в значительной степени зависит и от качества семенного материала. Во многих общественных и фермерских хозяйствах картофель сажают клубнями массовых репродукций, или смесью сортов. Только по этой причине снижается урожай на 30-40%. Научой и практикой установлено, что семенные участки картофеля нужно закладывать элитой или суперэлитой, а товарные посадки осуществлять семенным материалом не ниже пятой репродукции [10]. По данным ряда авторов, основой комплекса истребительных приемов борьбы с колорадским жуком является опрыскивание растений инсектицидами [8, 11].

Для опрыскивания растений против личинок младших возрастов можно использовать бактериальные препараты (кг/га): новодор, СК, - 3-5; битоксибациллин, П, - 2-5; бикол, СП, -1-2; против личинок и имаго - актиномицетовый препарат фитоверм, КЭ (0,3-0,4 л/га). Среди инсектицидов используют следующие препараты, (л/га): фитоверм, КЭ; альфа-ципи, КЭ; цезарь, КЭ; фаскорд, КЭ; моспилан, РП; кинмикс, КЭ; децис экстра, КЭ; атом, КЭ; имидж, ВРК; искра золотая, ТАБ; командор макси, ВДГ; банкол, СП и другие [9]. Из фосфорорганических инсектицидов применяют, КЭ (л/га): фосбецид; золон; пиринекс. Нехватка средств на защиту посадок от вредителя и его нарастающая резистентность к наиболее распространенным инсектицидам приводят к серьезным потерям урожая.

В связи с этим, большое практическое значение представляет создание средств защиты как альтернативы химическим пестицидам в качестве их полной замены или использования в интегрированной системе защиты растений. В этом плане актуальным представляется поиск биологически активных веществ, разработка средств защиты, исследование и испытание их биологической активности [3,4].

## **МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ**

В полевых условиях проведены испытания биологически активных компонентов папоротника (фенольные соединения), гликоалкалоидов томатов (томатин) и картофеля (соланин), гречиши (биофлавоноиды) на выживаемость личинок колорадского жука.

Для исследования действия препаратов на основе растений был выбран неустойчивый сорт Невский, так как заселяемость данного сорта колорадским жуком и личинками максимальна. Кусты картофеля обрабатывались экстрактами растений в

концентрации  $10^{-2}$  и  $10^{-7}$ % в трех повторностях. Контрольные кусты обрабатывались дистиллированной водой. В качестве второго контроля использовался пестицидный препарат «Актара». Оценка влияния инсектицидного действия на вредителя проводилась визуально через 24 часа.

Таблица 1 – Содержание биологически активных компонентов в растениях

| Биологически активные компоненты в объектах  | Содержание |
|--|------------|
| Содержание фенольных соединений в корнях папоротника, колебания, % на сухое вещество | 1,8-3,3    |
| Содержание гликоалкалоидов в листьях томата, колебания, % на сухое вещество          | 0,4-1,0    |
| Содержание гликоалкалоидов в листьях картофеля, мг/100г сырой массы                  | 306,6      |
| Содержание биофлавоноидов в гречихе, мг/100г сырой массы                             | 63,7       |

## РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ

Выявлено, что обработка биологически активными компонентами папоротника и томатов в концентрации  $10^{-2}$ % привела к максимальному снижению численности личинок (40% гибель) по сравнению с гликоалкалоидами картофеля (30% гибель) и биофлавоноидами гречихи (3% гибель). Испытание промышленного пестицида «Актара» привело к 100% гибели личинок. На контрольных кустах, обработанных водой, все личинки остались жизнеспособными.

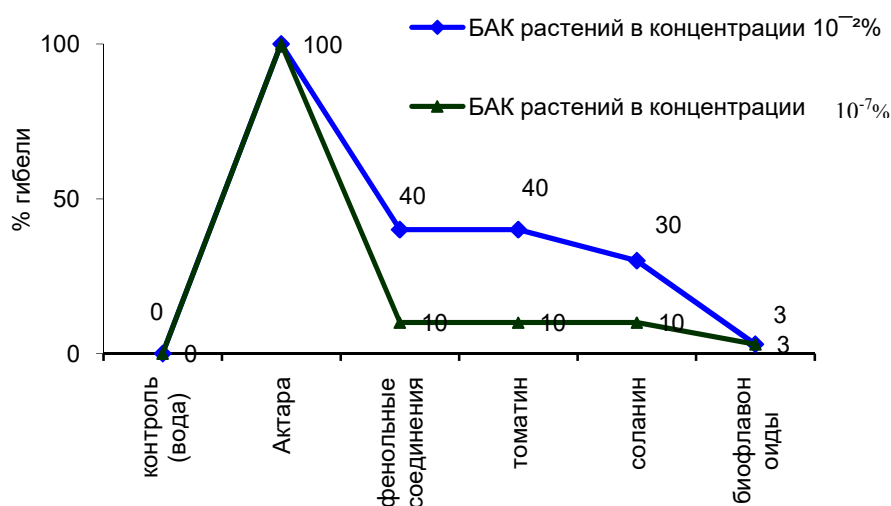


Рисунок 1 – Действие биологически активных компонентов растений на жизненную активность личинок колорадского жука (*Leptinotarsa decemlineana* Say)

Отмечено, что обработка экстрактами в концентрации  $10^{-2}$ % оказалось более эффективной, чем обработка экстрактами растений в более низкой концентрации ( $10^{-7}$ %), где максимальный процент гибели личинок на кустах картофеля, обработанного биологически активными компонентами папоротника и гликоалкалоидами томатов и картофеля составляет 10%. Минимальный процент гибели личинок (3%) наблюдается после обработки экстрактом биофлавоноидов гречихи.

**Заключение.** Анализируя инсектицидное действие биологически активных компонентов растений, следует отметить, что наибольшей эффективностью по отношению к насекомым-вредителям обладают фенольные соединения папоротника, гликоалкалоиды томата и картофеля – томатин и соланин, которые могут составить основу для создания новых средств защиты. Данные соединения являются экологически безопасными и могут использоваться для регулирования численности данного вредителя в условиях сельскохозяйственного производства.

### БИБЛИОГРАФИЯ

1. Биологическая защита растений / М.В. Штерншис и др.-М.: Колос, 2005.- 264 с.
2. Воловик, А.С. Защита картофеля от болезней, вредителей и сорняков./ А.С.Воловик, В.М.Глез, А.И.Замотаев. - М.: Агропрмиздат.-2009.-205 с.
3. Воронкова, М.В. Исследование состава запасных и вторичных метаболитов картофеля в связи с устойчивостью к колорадскому жуку (*leptinotarsa decemlineana* Say): автореф...канд. с.-х.н./ М.В.Воронкова.- Орел, 2009.- 24 с.
4. Воронкова, М.В. Диагностика устойчивости сортов картофеля к колорадскому жуку / М.В. Воронкова, Н.Е. Павловская //Защита и карантин растений. - 2008. - №6. – С.39-40.
5. Калинина, К.В. Биологическое обоснование защиты картофеля от колорадского жука *Leptinotarsa decemlineata* Say в условиях южной части северо-западного региона России: дис. ... канд. биол. наук / К.В.Калинина.- Псков, 2007.- 125с.
6. Молякко, А.А. Оценка сортов на устойчивость к колорадскому жуку / А.А.Молякко А.А., Ф.Е.Антощенко // Картофель и овощи.- 2015. -№2.- С. 29-31.
7. Мордковичский, К.З. Обсуждаются проблемы борьбы с колорадским жуком / К.З. Мордковичский // Защита и карантин растений.- 2016.-№3.- С.36-38.
8. Саидова, З.Х. Инсектициды для защиты картофеля от колорадского жука / З.Х.Саидова, М.П.Рашидов // II Всерос. съезд по защите растений (5-10 декабря 2005 г., г. Санкт-Петербург). Фитосанитарное оздоровление экосистем: материалы съезда. Т.II. –СПб., 2005.- С.258-259.
9. Список пестицидов и агрохимикатов, разрешенных к применению на территории РФ.-2008.- 629с.
10. Тимашов, И.А. Картофель. Рекомендации и практический опыт возделывания (на примере фермерских хозяйств Орловской области) / И.А.Тимашов, Н.Н.Лысенко, Г.И .Дурнев.- Орел, 2002.- С.28.
11. Черкашин, В.И. Фитосанитарное оздоровление экосистем / В.И.Черкашин // Материалы 2-го съезда по защите растений.- СПб.: 2005.-С.10.

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## THE EFFECT OF SINGLE AND DUAL INFECTIONS OF CITRUS TRISTEZA VIRUS AND CITRUS VEIN ENATION VIRUS ON CITRUS SPECIES

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### ABSTRACT

Viral diseases caused by CTV and CVEV induce dwarfing on plants and severe damage and yield loss to the citrus crop. The virus transmitted through infected plant material and by the same vectors, aphid. Problems cited in the field are complex of symptoms of the two diseases that are difficult to distinguish. This study aimed to determine the effect of single and dual infections of CTV and CVEV on Purut (*Citrus hystrix*) and Lime (*Citrus aurantifolia*). The research was conducted at the screen house and laboratory of Balitjestro, Batu and University of Brawijaya in October 2014 to April 2015. CTV and CVEV isolates used were from Balitjestro's collection. Treatments conducted were single inoculation for CTV and CVEV, 3 combinations of CTV and CVEV dual inoculation. Each treatment was carried out both on Purut and Lime. A total of 6 treatments and 5 replications were arranged in a Randomized Complete Design; each replication comprised of two plants. The results showed that the symptoms on Purut appeared faster and more severe than those on Lime. Both single and dual infections of CTV and CVEV affected the incubation period of CTV on vein clearing symptoms, cupping and vein enation. Symptom of vein clearing was found the fastest at dual infections treatment of CTV followed by CVEV. Cupping symptom was seen the fastest in the treatment of dual infections of CVEV followed by CTV, and symptom of vein enation was found only in a single infection of CVEV. The highest disease intensity and infection of vein clearing and cupping were observed on dual infections of CVEV followed by CTV while the highest infections of vein clearing and stem pitting were obtained from simultaneous dual infection of CTV and CVEV. The results of serologic testing by DAS ELISA on three observations (44 days after inoculation (dai), 86 dai, and 142 dai) showed that a dual-infection showed greater absorbance value than single infection treatment did. Plants growths on dual infections treatment were slower than those on single infection.

### KEY WORDS

Citrus histrix, Citrus aurantifolia, Citrus Tristeza Virus, Citrus Vein Enation Virus.

Most citrus germplasms in Indonesia are from other citrus-producing country, either from Asia, Australia, America, and Africa which were introduced through plant materials. These plant materials may pose risk to the citrus cultivation due to possible transmission of viral pathogens carried by the plant material. At the beginning of citrus free disease program in 1987, there were seven diseases specified dangerous and must be cleared through in vitro Shoot Tip Grafting (STG), namely CVPD (Citrus Vein Phloem Degeneration) / HLB (Huanglungbin), CTV (Citrus Tristeza virus), CVEV (Citrus Vein Enation Virus), CPsV (Citrus Psorosis Virus), CEV (Citrus Exocortis Viroids), CTLV (Citrus Tater Leaf Virus) and CCaV (Citrus Caxhexia Viroids) (Supriyanto & Whittle 1997). Then in 2011, there were two diseases (CTLV and CcaV) omitted from hazardous status since they showed no threat in Indonesia, which leaves the other five still in that dangerous status (Dwiasuti, 2016). Similar programs have been conducted in other countries, for example in India (Sharma et al. 2007), Taiwan (Su 2008), Croatia (Hančević et al. 2009), Italy (Meziane et al., 2009), USA

(Vidalakis et al. 2013), Cambodia (Setha & Su 2011), as well as many other countries with their respective main virus diseases.

In clonal citrus seed production, protection against those diseases already put into practice though not fully implemented. The heavy inter-region seed distribution is suspected to not fully used the disease-free plant materials. There are still many illegal seeds distributed causing diseases to be found in the field most of the time. From the results of a survey in Riau Seed Centers in 2014, it was discovered that the seeds used by farmers were without disease-free label. 66,7% of Budwood Multiplication Block (BMB) maintained without greenhouse and mother plant population in the field were infected by CTV and 100 % seeds from small nursery were also infected by CTV as well as CVPD in smaller amount (Dwiastuti & Wuryantini, 2014).

Currently, the complex of CTV and CVEV symptoms are frequently found in the field, thus rising concern of crop damage and loss of production. The two viruses spread through infected plant material and with the same aphid vectors (*Toxoptera citricida*, *T. Aurantii*, *Aphis spaerocola*, *A.gosypii*). As it is known, CTV and endemic CVEV are very difficult to control in the field when vectors are dominant and the shoots are always available.

Almost all citrus species and their hybrids, citrus showing stem pitting symptom, most lime, grapefruit and some sweet orange are susceptible to CTV (EPPO / CABI 1996), while citrus that are susceptible to CVEV are Rough lemon (*Citrus jamhiri*), sour orange (*C. aurantium*), lime (*C. aurantifolia*), Purut (*C. hystrix*), sweet orange (*C. sinensis*) and satsuma (*C. unshiu*) (EPPO / CABI 1996a).

Symptoms of CTV infection are characterized by damage to phloem, showing the indentation or extending notch on the wood tissue of trunk, branches or twigs (stem pitting) and vein clearing in the form of dotted or elongated lines in the translucent vein, 2 weeks to 2 months after infection. Plants grow poorly, dwarf with small leaves. In some cases, leaves become rigid with edges curved upwards (cupping). Other symptoms that may appear is the "vein crocking" (Dwiastuti 2016). CVEV can cause woody galls on rough lemon rootstock, and vein enation on Rough Lemon, Mexican Lime and sour orange (da Graça et al. 2007). Vein enation appears as a lateral bulge at the bottom of the leaves and hollows on the top surface. Vein enation has more striking symptoms in Mexican Lime and sour orange than on rough lemon, sweet orange, mandarin, and grapefruit. In field conditions, only sour orange and Mexican Lime showed heavy vein enation. Research on single and dual infections of CTV and CVEV has never been done on Purut (*Citrus hystrix*); CTV and CVEV tests usually use lime (*Citrus aurantifolia*) as an indicator. Therefore, it is necessary to investigate the viruses' effect on the severity of symptoms and growth of the plants.

## MATERIALS AND METHODS OF RESEARCH

Research was conducted in screen house and laboratory of Balitjestro, Batu and Brawijaya University in October 2014 to April 2015. The two viruses studied were CTV and CVEV isolates from Balitjestro's collection with three treatments: single inoculation of CTV, single inoculation of CVEV and three combinations on dual inoculation of CTV and CVEV which were 1) CTV inoculation, followed by CVEV inoculation after one month, 2) CVEV inoculation, followed by CTV inoculation after 1 month, and 3) simultaneous inoculation of CTV and CVEV. Each treatment was done in Purut and Lime. Research was arranged in a completely randomized design (CRD) with 6 treatments and 5 replications, each consisted of two plants. Inoculation was done by sticking the bark of infected plants. Parameters observed were incubation period, severity of CVEV and CTV symptoms, ELISA test, and plant growth (plant height, leaf number, leaf area).

The incubation period was observed every week which starts two weeks after inoculation until the appearance of the first symptoms. CTV symptoms observed were percentage of vein clearing, vein cupping, stem pitting, while symptoms of CVEV observed were vein enation, with intervals of 2 weeks up to 8 times from 4 weeks after inoculation. CTV and CVEV disease intensity calculated using following formula:



$$P = \frac{n}{N} \times 100\%$$

Where:

P = Percentage of disease (%);

N = number of plants showing *vein clearing/cupping/vein enation /stem pitting*;

N = total number of observed plant.

Serologic testing was conducted by Double Sandwich Enzyme Linked Immunosorbent Assay (ELISA DAS), performed three times at the beginning, middle, and end of observation. Elisa Kit for CTV (Agdia) was used to test whether there is CTV in the leaves. A total of 0.3 g of citrus leaf vein crushed in a solution of 3 mL buffer extract 1:25 g Tween-20, 1.0 g of non-fat milk / skim) in 250 mL of 1X PBST, pH 7.4. First, Elisa plate coated with 100  $\mu$ L of CTV coating antibody solution (100 ml coating buffer with 50  $\mu$ L of concentrated antibody 1: 200), incubated for two hours and rinsed with 1X PBST three times, three minutes each. Next, 100  $\mu$ L of fluid sample was added in each determined plate hole along with a positive control and a negative control, then incubated overnight in the refrigerator (4° C). After that, plate was washed with 1X PBST four times, three minutes each. 100  $\mu$ L solution of conjugate enzyme (alkaline phosphate conjugate (bottles A and B) were mixed with the ECG buffer (50 mL A and 50 mL B mixed with 10 ml of ECL buffer). Plate was incubated at room temperature for 2 hours. Solution of the enzyme conjugat was removed, then plate rinsed with 1X PBST four times each, three minutes each. 100  $\mu$ L of PNP 1 mg/mL solution was added in each hole. The PNP solution was prepared by dissolving 1 tablet of PNP into 5 ml substrate solution. This solution is enough for 8 rows of holes (96 holes). Solution then incubated for 30 minutes. Reaction was stop (to stabilize color formed) with 50 mL of 3 M sodium hidroxide (NaOH). The result was read using Elisa reader at 405 nm filter.

Plant height was determined by measuring the tip of the plant to the soil surface. The number of leaves was determined by counting all fully unfolded leaves at every branch of the tested plants. Observations for both parameters were done every two-week up to eight times. Leaf area was measured using a leaf area meter in the final observation. Data obtained from observations were analyzed using the F test at 5% level and then proceed with Honestly Significant Difference (HSD) test level of 5%.

## RESULTS AND DISCUSSION

*Incubation period of CTV and CVEV on Purut and Lime.* The incubation period of disease symptoms of CTV and CVEV in Lime occurred faster than Purut. The fastest of vein clearing incubation period observed in dual simultaneous inoculations treatment, at 86 days after inoculation (dai) on both varieties, while cupping appeared on Lime at 86 dai in simultaneous inoculation treatment followed by dual inoculation treatment of CVEV then CTV and dual inoculation treatment of CTV then CVEV (98 dai), both in Lime.

Table 1 – Incubation period of CTV and CVEV symptoms on Purut (*C.histrrix*) and Lime (*C.aurantifolia*)

| Treatment                                 | Incubation period on Purut (dai) |                |                     |                     | Incubation period on Lime (dai) |                |                     |                     |
|---|----------------------------------|----------------|---------------------|---------------------|---------------------------------|----------------|---------------------|---------------------|
|   | <i>Vein clearing</i>             | <i>cupping</i> | <i>vein enation</i> | <i>Stem pitting</i> | <i>Vein clearing</i>            | <i>cupping</i> | <i>vein enation</i> | <i>Stem pitting</i> |
| Control (healthy plant)                   | 0                                | 0              | 0                   | 0                   | 0                               | 0              | 0                   | 0                   |
| CTV single inoculation                    | 100                              | 0              | 0                   | 0                   | 92                              | 114            | 0                   | 0                   |
| CVEV single inoculation                   | 0                                | 0              | 86                  | 0                   | 0                               | 0              | 100                 | 0                   |
| Dual inoculation, CTV then CVEV           | 128                              | 0              | 0                   | 0                   | 0                               | 98             | 100                 | 0                   |
| Dual inoculation, CVEV then CTV           | 128                              | 142            | 0                   | 0                   | 0                               | 98             | 60                  | 0                   |
| Simultaneous inoculations of CTV and CVEV | 86                               | 0              | 0                   | 140                 | 86                              | 86             | 135                 | 0                   |

Symptom of vein enation was found the fastest in dual inoculation treatment of CVEV then CTV (44 dai) in Lime, followed by a single CVEV inoculation (86 dai) in Purut and 100 dai in Lime (Table 1). Symptoms of stem pitting was found only in Purut on dual simultaneous inoculation of CTV and CVEV at 140 dai.

*Effect of single and dual inoculation on the expression of symptoms and the percentage of CTV and CVEV attack on two citrus species.* Symptom of vein clearing was identified by changing appearance of the secondary or tertiary veins of leaves; there were dotted or elongated lines on translucent vein of leaves (Figure 1a, 1b). Leaf cupping showed symptom such as curving inward like a bowl (Figure 2a, 2b), stem pitting symptoms appeared on the twigs marked by horizontal lines and elongated curved which were clearly visible when the bark peeled (Figure 1d).

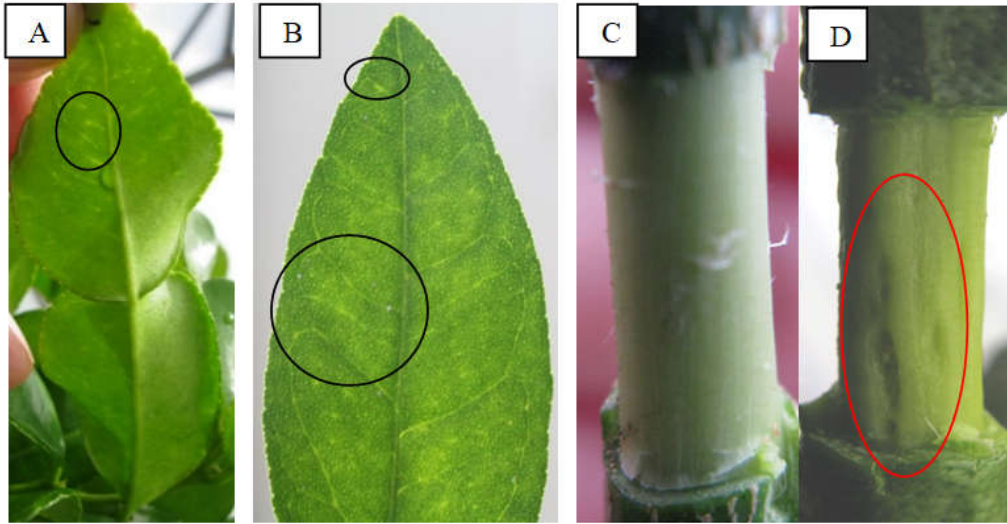


Figure 1 – Symptoms of *vein clearing* a) on leave of Purut, b) on top surface of secondary leave of Lime, c) healthy twig, d) twig showing *stem pitting* symptom



Figure 2 – *Cupping* symptom: a) on leave of Purut, b) on leave of Lime

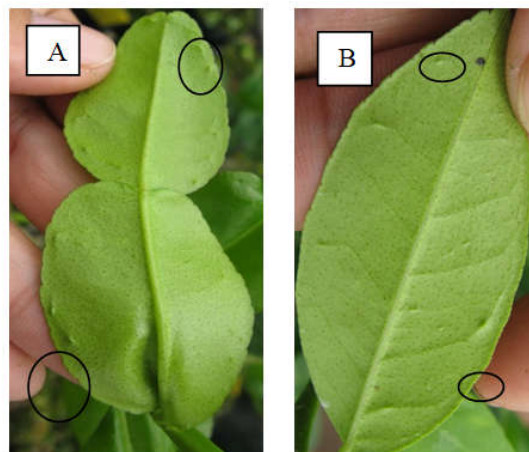


Figure 3 – Symptom of *vein enation*: a) on Purut, b) on Lime

Enation vein symptoms characterized by the occurrence of enations (bulge) on the lower surface of the vein of secondary leaves and slightly concave top surface (Figure 3a, 3b). Symptoms of vein clearing and cupping were more obvious on Lime than on Purut (Figure 1a, 1b and 2a, 2b), but symptoms of stem pitting only appeared on Purut (Figure 1d.). Both two citrus varieties showed vein enation symptoms (Figure 3). Plants infected by single inoculation of CTV only showed vein clearing symptom (Table 5) while plants infected by single CVEV inoculation only showed vein enation symptom (Table 7).

Symptoms of vein clearing in Lime were found the fastest and highest at simultaneous inoculation treatment which is also significantly different from other treatments except on the last observation, single CTV inoculation and dual inoculation of CTV then CVEV were faster (Table 5). Other treatments showed symptoms in observations on 128 dai, considered slow compared to previous studies. On Lime, vein clearing symptoms observed sooner in all three combinations of dual inoculation (at 100 dai) than on Purut (128 dai). Highest symptoms appeared on simultaneous inoculation treatment of CTV and CVEV.

Plants showing symptoms of cupping on Purut was found only in the treatment of dual inoculation of CVEV then CTV (at 142 dai), while in Lime, the symptoms were more abundant, namely at treatment of CTV single inoculation and three combinations of dual inoculation of CTV and CVEV (Table 6). Fastest infection (at 100 dai) and highest (60%) were found in the treatment of CTV and CVEV simultaneous inoculations (Table 6).

Table 5 – The effect of single and dual inoculation of CTV and CVEV on the percentage of *vein clearing* showing symptom plants on two citrus species

| Treatment                                 | Percentage (%) (day after inoculation) |   |     |   |     |    |     |    |     |    |
|---|--|---|-----|---|-----|----|-----|----|-----|----|
|   | 86                                     |   | 100 |   | 114 |    | 128 |    | 142 |    |
| <i>Purut (C.histris)</i>                  |  |   |     |   |     |    |     |    |     |    |
| Control (healthy plant)                   | 0                                      | a | 0   | a | 0   | a  | 0   | a  | 0   | a  |
| CTV single inoculation                    | 0                                      | a | 0   | a | 0   | a  | 20  | b  | 80  | c  |
| CVEV single inoculation                   | 0                                      | a | 0   | a | 0   | a  | 0   | a  | 0   | a  |
| Dual inoculation, CTV then CVEV           | 0                                      | a | 0   | a | 0   | a  | 30  | b  | 80  | c  |
| Dual inoculation, CVEV then CTV           | 0                                      | a | 0   | a | 0   | a  | 30  | b  | 50  | b  |
| Simultaneous inoculations of CTV and CVEV | 10                                     | b | 30  | b | 40  | b  | 50  | c  | 70  | bc |
| <i>Lime (C.aurantifolia)</i>              |  |   |     |   |     |    |     |    |     |    |
| Control (healthy plant)                   | 0                                      | a | 0   | a | 0   | a  | 0   | a  | 0   | a  |
| CTV single inoculation                    | 0                                      | a | 20  | a | 25  | b  | 30  | b  | 40  | b  |
| CVEV single inoculation                   | 0                                      | a | 0   | a | 0   | a  | 0   | a  | 0   | a  |
| Dual inoculation, CTV then CVEV           | 0                                      | a | 10  | a | 20  | ab | 25  | ab | 30  | b  |
| Dual inoculation, CVEV then CTV           | 0                                      | a | 5   | a | 10  | a  | 0   | a  | 0   | a  |
| Simultaneous inoculations of CTV and CVEV | 20                                     | a | 30  | a | 45  | c  | 55  | c  | 75  | c  |

Mean followed by the same letters on the same column is not significantly different according to HSD test 5%.

Table 6 – The effect of single and dual inoculation of CTV and CVEV on the percentage of *cupping* showing symptom plants on two citrus species

| Treatment                                 | Percentage (%) (day after inoculation) |   |     |   |     |    |     |   |     |   |
|---|--|---|-----|---|-----|----|-----|---|-----|---|
|   | 86                                     |   | 100 |   | 114 |    | 128 |   | 142 |   |
| <i>Purut (C.histris)</i>                  |  |   |     |   |     |    |     |   |     |   |
| Control (healthy plant)                   | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CTV single inoculation                    | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CVEV single inoculation                   | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| Dual inoculation, CTV then CVEV           | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| Dual inoculation, CVEV then CTV           | 0                                      | a | 0   | a | 0   | a  | 0   | a | 10  | b |
| Simultaneous inoculations of CTV and CVEV | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| <i>Lime (C.aurantifolia)</i>              |  |   |     |   |     |    |     |   |     |   |
| Control (healthy plant)                   | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CTV single inoculation                    | 0                                      | a | 0   | a | 15  | b  | 25  | b | 35  | b |
| CVEV single inoculation                   | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| Dual inoculation, CTV then CVEV           | 0                                      | a | 15  | b | 30  | c  | 40  | c | 50  | c |
| Dual inoculation, CVEV then CTV           | 0                                      | a | 15  | b | 20  | b  | 25  | b | 35  | b |
| Simultaneous inoculations of CTV and CVEV | 10                                     | b | 20  | b | 25  | bc | 40  | c | 60  | c |

Mean followed by the same letters on the same column is not significantly different according to HSD test 5%.

Plants showing symptom of vein enation on Purut were only found in CTV single inoculation, visibly increased linearly from 86 to 142 dai. On Lime, vein enation symptoms appeared in single CVEV treatment, as well as three combinations of dual inoculation with various percentages and were significantly different between treatments. Highest *vein enation* symptoms observed in dual inoculation CVEV then CTV, CVEV single inoculation, followed by dual inoculations CTV then CVEV and simultaneous inoculations treatment (Table 7).

Table 7 – The effect of single and dual inoculation of CTV and CVEV on the percentage of *vein enation* showing symptom plants on pada two citrus spesies

| Treatment                                 | Percentage (%) (day after inoculation) |   |     |   |     |    |     |   |     |   |
|---|--|---|-----|---|-----|----|-----|---|-----|---|
|   | 86                                     |   | 100 |   | 114 |    | 128 |   | 142 |   |
| <i>Purut (C.histrrix)</i>                 |  |   |     |   |     |    |     |   |     |   |
| Control (healthy plant)                   | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CTV single inoculation                    | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CVEV single inoculation                   | 20                                     | a | 20  | a | 30  | b  | 30  | b | 50  | b |
| Dual inoculation, CTV then CVEV           | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| Dual inoculation, CVEV then CTV           | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| Simultaneous inoculations of CTV and CVEV | 0                                      | a | 0   | a | 0   | b  | 0   | a | 0   | a |
| <i>Lime (C.aurantifolia)</i>              |  |   |     |   |     |    |     |   |     |   |
| Control (healthy plant)                   | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CTV single inoculation                    | 0                                      | a | 0   | a | 0   | a  | 0   | a | 0   | a |
| CVEV single inoculation                   | 0                                      | a | 15  | b | 20  | bc | 25  | c | 30  | b |
| Dual inoculation, CTV then CVEV           | 0                                      | a | 10  | b | 10  | b  | 10  | b | 20  | b |
| Dual inoculation, CVEV then CTV           | 0                                      | a | 30  | c | 35  | c  | 40  | d | 45  | b |
| Simultaneous inoculations of CTV and CVEV | 5                                      | b | 15  | b | 15  | b  | 15  | b | 20  | b |

Mean followed by the same letters on the same column is not significantly different according to HSD test 5%.

**ELISA test of CTV.** Elisa serology test using CTV antibody was performed three times at 44 dai (beginning), 88 dai (mid) and at 142 dai. The first test indicated that there were two dual inoculation treatments which were positive for the virus CTV in Purut (Table 8). In the second test, CTV was detected positive single inoculation of CTV. The absorbent value of positive resulted treatment showed increasing tendency at the subsequent test except in dual inoculation CVEV then CTV. Its absorbent value was small, less than twice as much PC value, indicating the samples did not contain CTV.

Table 8 – Result of ELISA on single and dual inoculation of CTV and CVEV on two citrus spesies

| Treatment                                 | Absorbent value of ELISA |             |               |
|---|--------------------------|-------------|---------------|
|   | I (44 dai)               | II (86 dai) | III (142 dai) |
| <i>Purut (C.histrrix)</i>                 |                          |             |               |
| Control (healthy plant)                   | -0,001 (-)               | 0,001 (-)   | -0,001 (-)    |
| CTV single inoculation                    | -0,002 (-)               | 0,099 (+)   | 0,105 (+)     |
| CVEV single inoculation                   | 0,007 (-)                | 0,000 (-)   | -0,002 (-)    |
| Dual inoculation, CTV then CVEV           | -0,001 (-)               | 0,100 (+)   | 0,111 (+)     |
| Dual inoculation, CVEV then CTV           | 0,032 (+)                | 0,101 (+)   | 0,097 (+)     |
| Simultaneous inoculations of CTV and CVEV | 0,107 (+)                | 0,099 (+)   | 0,096 (+)     |
| <i>Lime (C.aurantifolia)</i>              |                          |             |               |
| Control (healthy plant)                   | -0,001 (-)               | 0,001 (-)   | -0,001 (-)    |
| CTV single inoculation                    | 0,032 (+)                | 0,100 (+)   | 0,127 (+)     |
| CVEV single inoculation                   | 0,001 (-)                | 0,001 (-)   | 0,001 (-)     |
| Dual inoculation, CTV then CVEV           | 0,074 (+)                | 0,099 (+)   | 0,111 (+)     |
| Dual inoculation, CVEV then CTV           | 0,032 (+)                | 0,045 (+)   | 0,008 (-)     |
| Simultaneous inoculations of CTV and CVEV | 0,054 (+)                | 0,0076 (+)  | 0,100 (+)     |
| Grinding                                  | blank                    | blank       | blank         |
| NC  | -0,0015                  | 0,001       | -0,008        |
| PC  | 0,118                    | 0,110       | 0,102         |

Note: Measured with ELISA reader at 405 nm. Threshold for a positive reaction on new plate > 2x the negative. Control (Lamka, 1990). Negative (-) does not contain CTV and positive (+) contains CTV.

*Effect of single and dual inoculation of CTV and CVEV on Plant Growth.* Result of observation on number of leaves from 44 to 142 dai showed significant difference among the treatments on Purut, but no significant difference on Lime. Highest number of leaf was in control plant followed by single CVEV inoculation treatment and the least on single CTV inoculation treatment. Only few leaves were there on Lime plant at the beginning of the observation, and the growth was also slower than Purut (Table 9). The increase on number of leaves was fluctuating. The patterns were similar across treatments on Purut, rapid increase on the third to the fifth observation (58-72 dai) and the 13th to 15th (128- 142 dai) (Figure 3). The increase pattern in the number of leaves on the Lime varies between treatments. Highest increase on leaf number was from single inoculation of CTV (30.5) and dual inoculation CVEV then CTV (26.7) on the 13th to 15th observations (128-144 dai). Treatment of dual inoculation CVEV and CTV at 11-13 weeks (114-128 dai) showed highest increase of leaf number compared to other treatments, but went down in the next observation (Figure 4). The rate of Lime leaf growth at 9-11 weeks was actually decreased in all treatments.

Table 9 – Effect of treatment of single and dual inoculation of CTV and CVEV on number of leaves of two citrus species

| Treatment                                 | Number of leaves (dai) |          |          |         |          |          |         |         |
|---|------------------------|----------|----------|---------|----------|----------|---------|---------|
|   | 44                     | 58       | 72       | 86      | 100      | 114      | 128     | 142     |
| <i>Purut (C.histrix)</i>                  |                        |          |          |         |          |          |         |         |
| Control (healthy plant)                   | 22,50d                 | 23,30 d  | 46,50 d  | 56,00c  | 61,60 c  | 64,10 d  | 65,90 d | 91,70 d |
| CTV single inoculation                    | 14,60 b                | 17,60 a  | 22,00 a  | 29,60a  | 30,60 a  | 30,70 a  | 31,00 a | 42,50 a |
| CVEV single inoculation                   | 14,00 b                | 17,20 a  | 28,70 b  | 30,30a  | 32,50 a  | 41,40 bc | 48,00 c | 62,30 c |
| Dual inoculation, CTV then CVEV           | 12,00 a                | 20,00 bc | 28,60 b  | 35,20ab | 35,20 ab | 36,50 ab | 39,30 b | 50,60 b |
| Dual inoculation, CVEV then CTV           | 20,60 c                | 21,60 cd | 28,40 ab | 30,70 a | 33,10 ab | 38,70 bc | 45,60 c | 50,60 b |
| Simultaneous inoculations of CTV and CVEV | 15,00 b                | 19,00 ab | 38,80 c  | 38,20 b | 40,70 b  | 43,80 c  | 46,40 c | 50,00 b |
| <i>Lime (C.aurantifolia)</i>              |                        |          |          |         |          |          |         |         |
| Control (healthy plant)                   | 1,70 a                 | 3,40a    | 9,70a    | 9,80a   | 11,40a   | 17,10a   | 27,80a  | 37,80a  |
| CTV single inoculation                    | 1,60a                  | 2,70a    | 7,90a    | 12,20a  | 13,20a   | 14,30a   | 22,30a  | 52,80a  |
| CVEV single inoculation                   | 0,50a                  | 2,40a    | 7,00a    | 7,60a   | 7,80a    | 10,80a   | 23,10a  | 34,40a  |
| Dual inoculation, CTV then CVEV           | 0,90a                  | 4,30a    | 8,90a    | 9,30a   | 9,20a    | 12,80a   | 38,20a  | 53,40a  |
| Dual inoculation, CVEV then CTV           | 2,00a                  | 4,00a    | 9,10a    | 12,80a  | 15,40a   | 14,40a   | 24,80a  | 51,50a  |
| Simultaneous inoculations of CTV and CVEV | 0,00a                  | 0,80a    | 8,50a    | 14,30a  | 14,10a   | 14,10a   | 26,40a  | 55,70a  |

Mean followed by the same letters on the same column is not significantly different according to HSD test 5%.

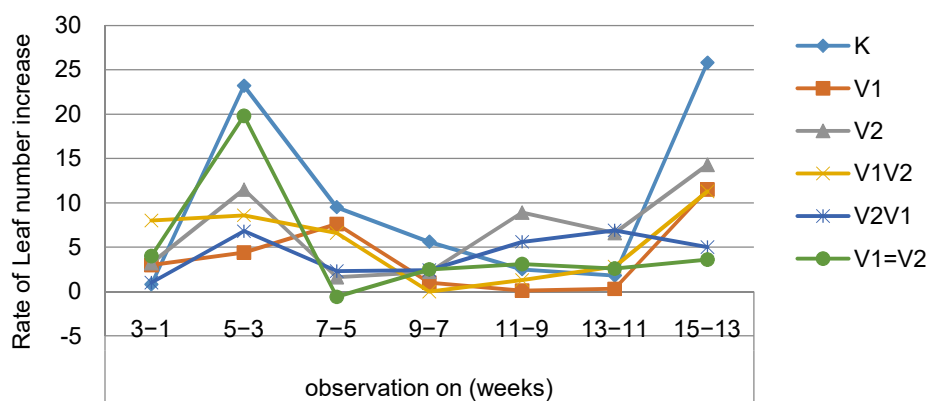


Figure 3 – Rate of leaf number increase on *C. Histrix*

Note: Control (K), single CTV inoculation (V1), single CVEV inoculation (V2), dual inoculation CTV then CVEV (V1V2), dual inoculation CVEV then CTV (V2V1), simultaneous inoculation of CTV and CVEV (V1=V2)

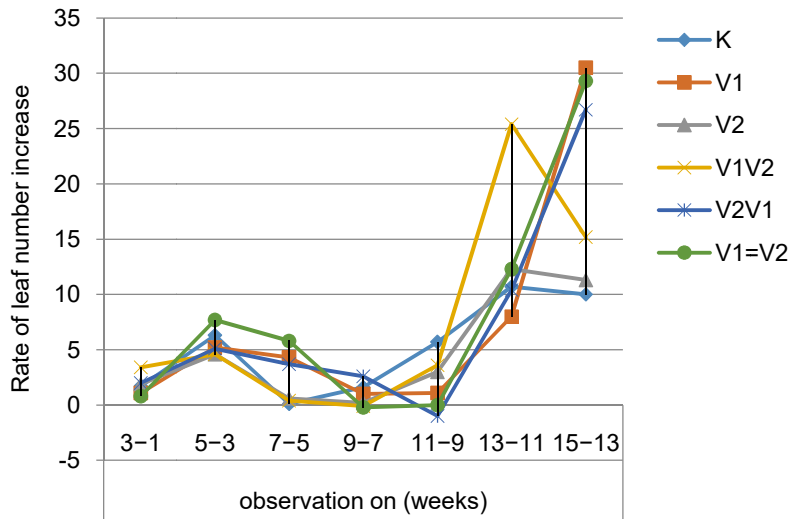


Figure 4 – Rate of leaf number increase on *C. Aurantifolia*

Note: Control (K), single CTV inoculation (V1), single CVEV inoculation (V2), dual inoculation CTV then CVEV (V1V2), dual inoculation CVEV then CTV (V2V1), simultaneous inoculation of CTV and CVEV (V1=V2)

Treatment of single and dual inoculation of CTV and CVEV influenced leaf area of Purut but not on Lime. Purut showed the smallest leaf area in dual inoculation treatment of CTV and CVEV followed by single inoculation of CTV and other combinations of dual inoculation (Table 10, Figure 5). Healthy control plants of Purut and Lime citrus showed the highest leaf area.

Table 10 – Effect of treatment of single and dual inoculation of CTV and CVEV on leaf area of two citrus species

| Treatment                                 | Leaf area (cm <sup>2</sup> ) |                        |
|---|------------------------------|------------------------|
|   | <i>C. histrix</i>            | <i>C. aurantifolia</i> |
| Control (healthy plant)                   | 18,43 b                      | 13,75 a                |
| CTV single inoculation                    | 15,24 ab                     | 12,41 a                |
| CVEV single inoculation                   | 16,12 b                      | 11,53 a                |
| Dual inoculation, CTV then CVEV           | 12,63 a                      | 11,40 a                |
| Dual inoculation, CVEV then CTV           | 15,60 ab                     | 10,03 a                |
| Simultaneous inoculations of CTV and CVEV | 16,02 ab                     | 9,14 a                 |

Mean followed by the same letters on the same column is not significantly different according to HSD test 5%.

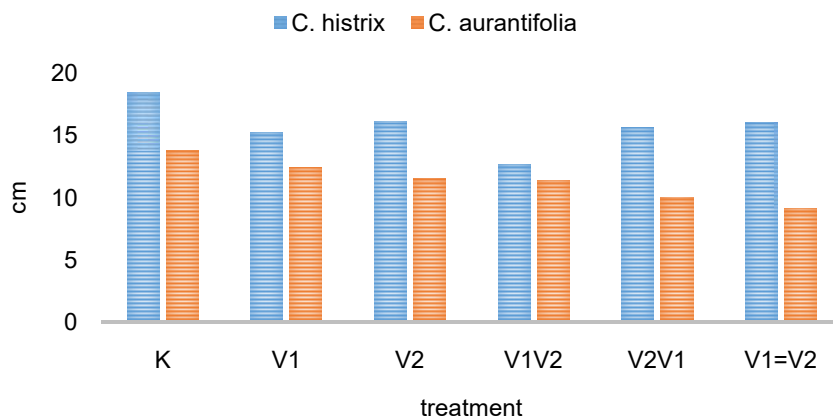


Figure 5 – Leaf area of two citrus species

Note: Control (K), single CTV inoculation (V1), Single, CVEV inoculation (V2), dual inoculation CTV then CVEV (V1V2), dual inoculation CVEV then CTV (V2V1), simultaneous inoculation of CTV and CVEV (V1=V2)

Table 8 – Result of ELISA on single and dual inoculation of CTV and CVEV on two citrus species

| Treatment                                 | Absorbent value of ELISA |             |               |
|---|--------------------------|-------------|---------------|
|   | I (44 dai)               | II (86 dai) | III (142 dai) |
| Purut                                     |                          |             |               |
| Control (healthy plant)                   | -0,001 (-)               | 0,001 (-)   | -0,001 (-)    |
| CTV single inoculation                    | -0,002 (-)               | 0,099 (+)   | 0,105 (+)     |
| CVEV single inoculation                   | 0,007 (-)                | 0,000 (-)   | -0,002 (-)    |
| Dual inoculation, CTV then CVEV           | -0,001 (-)               | 0,100 (+)   | 0,111 (+)     |
| Dual inoculation, CVEV then CTV           | 0,032 (+)                | 0,101 (+)   | 0,097 (+)     |
| Simultaneous inoculations of CTV and CVEV | 0,107 (+)                | 0,099 (+)   | 0,096 (+)     |
| Lime                                      |                          |             |               |
| Control (healthy plant)                   | -0,001 (-)               | 0,001 (-)   | -0,001 (-)    |
| CTV single inoculation                    | 0,032 (+)                | 0,100 (+)   | 0,127 (+)     |
| CVEV single inoculation                   | 0,001 (-)                | 0,001 (-)   | 0,001 (-)     |
| Dual inoculation, CTV then CVEV           | 0,074 (+)                | 0,099 (+)   | 0,111 (+)     |
| Dual inoculation, CVEV then CTV           | 0,032 (+)                | 0,045 (+)   | 0,008 (-)     |
| Simultaneous inoculations of CTV and CVEV | 0,054 (+)                | 0,0076 (+)  | 0,100 (+)     |
| Grinding                                  | blank                    | blank       | blank         |
| NC  | -0,0015                  | 0,001       | -0,008        |
| PC  | 0,118                    | 0,110       | 0,102         |

Note: Measured with ELISA reader at 405 nm. Threshold for a positive reaction on new plate > 2x the negative control (Lamka, 1990). Negative (-) does not contain CTV and positive (+) contains CTV.

## DISCUSSION OF RESULTS

*Incubation period of CTV and CVEV Purut and Lime.* The incubation period of vein clearing and cupping CTV (44 - 140 dai) and vein enation CVEV (86-142 dai) on Purut and Lime were relatively longer than the previously reported incubation period of CTV between 30-36 dai (Dwiastuti 2016) and CVEV between 60-90 dai at optimal temperature 24-27°C during the day and 18-21°C at night. During the study the temperature ranged between 28-30°C at noon. This temperature difference is likely to cause disruption in the multiplication of the two viruses although plants tested were considered sensitive. Based on the reported biological description (EPPO / CABI, 1996 and Shen et al. 2016) CVEV symptoms are detected through chip budding grafted part in 5-8 weeks on the leaves of Lime (*C. aurantiifolia*), rough lemons (*C. jambhiri*) or sour orange (*C. aurantium*).

In the field, Purut is often found infected by CVEV and CTV with mild to moderate infections, but in this study, it is known that the incubation period of the disease symptoms of CTV and CVEV on Lime occurred more rapidly than on Purut. These results are in line with a report by Vidalakis et al. (2010) which states that Lime is the most susceptible host for the two diseases. Therefore, in the routine test for disease indexing, Lime is used as a respective plant indicator.

*Effect of single and dual inoculation on the expression of symptoms and the percentage of CTV and CVEV attack on two citrus species.* Two or more viruses can infect the same plant within the same or different tissue or organ. In non-related viruses, synergistic interactions generally occur, the virus infects together and cause more severe symptoms than a single infection. In contrast, related viruses will have interactions or competition in which one of the viruses will be dominant (Pallas & Garci'a 2011; Folimonova 2013). CTV and CVEV are not related. CTV is closterovirus, has flexuous particle with a length of 2000 nm and a diameter of 12 nm (Sastry 2013) which consists of single molecule of single stranded RNA, included in family Closteroviridae (Hilf et al. 2005, Svetlana, et al., 2010, Folimonov et al. 2007). Meanwhile, CVEV is a virus with spherical shape and has a diameter of 22-24 nm (Vives 2013), included in family Luteoviridae.

In this study, synergistic interaction occurred in the dual inoculation of CTV then CVEV, as well as CTV and CVEV simultaneous inoculation, which causing them to express more severe symptoms of the two viruses (vein clearing, vein cupping and vein enation) in Lime, and some symptoms in Purut. In the treatment of dual inoculation CVEV then CTV by bark grafting method, in interval of 1 month, the synergy expression became lessen. The complex

of symptoms was reduced. Based on its size, CTV is assumed more capable in penetrating parenchyma towards phloem tissue and replicates there by using the host's metabolism and translocation which are faster than CVEV. There could be competition in time as well, which means viruses that enter first will be able to develop faster. The results are consistent with previous research (Vidalakis et al. 2004) on infection of CPsV (Citrus psorosis virus) and CVEV that carried out after CTV infection which showing reduced expression of CVEV and no CPsV symptom. This suggests that the variability in the expression of symptoms may also be influenced by the time of initiation of infection.

*Result of ELISA test of CTV.* The basic principle of ELISA is serology test, which involves the use of enzymes and immunosorbent, in which the enzymatic reaction will occur between the antibody and the corresponding antigen. This study used antibody of CTV, means that the one will be detected is CTV content in the tested sample (antigen) which can be tracked with the addition of the enzyme catalyzing the alkaline phosphatase substrate which then at the end point will show the color changing (yellow compound). The intensity of the color gives an indication of the amount of antibody or antigen binding (Albersio et al. 2012). In the treatment of single CVEV, no CTV can be detected.

*Effect of single and dual inoculation of CTV and CVEV on Plant Growth.* In studies by Hipper et al. (2013) and Roossinck (2013), plant virus is obligate intracellular parasite that live exclusively and relies on its host to complete its life cycle, starts from replication, encapsidation, cell to cell movement and long-distance transport. The virus swiftness on using food supplies in plant, such as photosynthesis product, is required for the virus to survive and this causes the crops suffer due to lack of food which expressed as chlorosis symptoms as well as interferes with plant growth. Gosalvez-Bernal et al. (2008) suggested that the pathogen often causes unbalance of plant hormonal system which then showed as different growth response of the plant from the healthy plant. The spread of the virus in the body of plants varies greatly, depending on: the type of virus, host plants, and the interaction between them.

Pazarlar et al. (2013) and Perez-Clemente et al. (2014) mentioned that the virus generally causes a decrease in photosynthesis through a decline in the number of chlorophyll per leaf area, decreased chlorophyll efficiency which then inhibit the growth of leaves and plant growth including the formation of new leaves. In the limited-to-phloem group of viruses, transport of nutrients from the roots to the leaves is disrupted because phloem tissue clogged by accumulation of viral particles (Hipper et al. 2010)

The effect of this viral infection may also be affected by the infection rate during the period of young plants. These results are consistent with the observations of Taiwo and Owolabi (2001) on the Celosia mosaic virus on *Celosia argentea* L. that the younger the plant at the time of infection, the more severe symptoms of the disease and the greater the effect on the growth and yield (Langham et al, 2005; Kareem and Taiwo, 2007; Taiwo et al., 2007).

From these results it can be concluded that the Lime species is more susceptible to single infection of CTV, of CVEV or three combinations of dual inoculation of CTV and CVEV. Single inoculation of CTV and dual inoculation of CTV and CVEV, either simultaneously or consecutively showed effect on the percentage of infected plants, more numerous and complex variations of symptoms, greater absorbent value of Elisa test, as well as the number of leaves and leaf area.

## REFERENCES

1. Albersio J, Lima A, Aline Kelly Q. Nascimento, Radaelli P and. Purcifull DE 2012. Serology Applied to Plant Virology, Serological Diagnosis of Certain Human, Animal and Plant Diseases, Dr. Moslih Al-Moslih (Ed.), ISBN: 978-953-51-0370-7, InTech, Available from: <http://www.intechopen.com/books/serological-diagnosis-of-certain-human-animal-and-plant-diseases/serology-applied-to-plant-virology>



2. Da Graça; Sétamou M.; Skaria, M. and French J. V. 2007. Arthropod Vectors of Exotic Citrus Diseases: A Risk Assessment for the Texas Citrus Industry. *Subtropical Plant Science*. Texas. p. 64 – 74.
3. Dwiastuti, ME 2016. Prevent the threat of citrus systemic diseases: Revitalize the glory of local citrus. IAARD press. Jakarta. Indonesia. 77 p. (in Bahasa Indonesia)
4. Dwiastuti ME & Wuryantini S. 2014. Evaluasi Kesehatan Benih Pada Alur Proses Produksi Dan Adopsi Teknologi Benih Jeruk Bebas Penyakit Di Pusat Perbenihan Jeruk Di Kabupaten Kampar, Propinsi Riau. Laporan hasil penelitian on top. Balitjestro. 16 p
5. Eppo/Cabi 1996. Citrus Tristeza cloterovirus in: Quarantine pest forurope, 2nd edition (Ed. By Smith IM, McNamara, DG, Scott PR, Holdermess M) CAB Internasional, Walingford, UK
6. Folimonov AS, Svetlana Y. Folimonova, Bar-Joseph M, Dawson WO.2007. A stable RNA virus-based vector for citrus trees. *Virology* 368 (2007) 205–216
7. Folimonova SY.. 2013. Developing an understanding of cross-protection by Citrus tristeza virus. *Frontiers in Microbiology | Virology* April 2013 vol. 4 (76) 1-9
8. Hančević K., Černi S., Radić T., Škorić D. 2012. Comparison of different methods for Citrus tristeza virus detection in Satsuma mandarins. *Journal of plant diseases and protection*. 119: 2-7.
9. Hipper C, Brault V, Ziegler-Graff V and Revers F. 2010. Viral and cellular factors involved in phloem transport of plant viruses. *Frontier in Plant science* www.frontiersin.org May 2013 (Volume 4) Article 154: 1 – 24
10. Hilf, M. E. and Garnsey, S. M. 2002. Citrus Tristeza Virus in Florida: A Synthesis of Historical and Contemporary Biological, Serological, and Genetic Data. Fifteenth IOCV Conference. p. 13 – 20.
11. Jiangfeng Shen, XianChen, JianpingChen & Liying Sun. 2016. A phloem-limited fijivirus induces the formation of neoplastic phloem tissues that house virus multiplication in the host plant. *Scientific Reports* | 6:29848 | DOI: 10.1038/srep29848. OPEN www.nature.com/scientificreports/1-9
12. Karasev, A. V.; Boyko, V. P.; Gowda, S.; Nikolaeva, O. V.; Hilf, M. E.; Koonin, E. V.; Niblett, C. L.; Cline, K.; Gumpf, D. J.; Lee, R. F.; Garnsey, S. M.; Lewandowski, D. J. and Dawson, W. O. 1994. Complete Sequence of the Citrus Tristeza Virus RNA Genome. *Virology* 208. p. 511 – 520.
13. Kareem, K.T. and Taiwo, M.A. 2007. Interaction of viruses in cowpea: effect on growth and yield parameters. *Virology Journal*. 4: 15
14. Lamka, G. L. 1990. Development of an immunosorbent assay for seed-borne *Erwinia stewartii* in corn seed. Iowa State University.
15. Langham, M.A.C., Cihlar-Strunk, C.L. and Hoberg A.E. 2005. Evaluation of high pressure spray inoculation of Bean pod mottle virus on yield and test weight of Soybean. *Phytopathology*. 95:164
16. Meziane M. , Frasheri D. , Carra A. , Djelouah K., Carimi F. , D’Onghia A.M.. 2009. Citrus sanitation methods for the elimination of Citrus tristeza virus (CTV) *Options Méditerranéennes B* 65: 177 - 180
17. Owolabi, A. T. and Taiwo, M.A. 2001. Effect of Celosia mosaic virus on Celosia argentea L. *Global J. Pure and Appl. Sci.* 7 (2): 209-212
18. Pallas V and Juan Antonio García JA. 2011. How do plant viruses induce disease? Interactions and interference with host components. *Journal of General Virology* (2011), 92, 2691–2705
19. Pazarlar S, Gümüş M, Öztekin Gb. 2013. The Effects of Tobacco mosaic virus Infection on Growth and Physiological Parameters in Some Pepper Varieties (*Capsicum annum* L.). *Not Bot Horti Agrobo*, 2013, 41(2):427-433
20. Perez-Clemente, RM, Montoliu, Vives, V, Lopez-Climent M. F. and Gomez-Cadenas A. 2014. Photosynthetic and antioxidant responses of Mexican Lime (*Citrus aurantifolia*) plants to Citrus tristeza virus infection. *Plant Pathology* (2014) <sup>a</sup> 2014 British Society for Plant Pathology: 1-9

21. Roossinck MJ. 2013. Plant Virus Ecology. PLOS Pathogens Volume 9 Issue 5 e1003304. [www.plospathogens.org](http://www.plospathogens.org)
22. Sastry, K. S. 2013. Plant Virus and Virois Diseases in the Tropics. Springer Science Business Media. Vol. 1. p. 11-97
23. Su, H.J. 2008. Production and Cultivation of Virus-free Citrus Saplings for Citrus Rehabilitation in Taiwan. Asia-Pacific Consortium on Agricultural Biotechnology, New Delhi and Asia-Pacific Association of Agricultural Research Institutions, Bangkok. P 51+ix.
24. Setha, V & Su, HJ. 2011. Controlling Citrus Huanglongbing (HLB) for the rehabilitation of Citrus Orchard in Cambodia. International Journal of Environmental and Rural Development (2011) 2-2: 6-12
25. Supriyanto, A& Whittle, AM 1997. Citrus Rehabilitation in Indonesia. Eleventh IOCV Conference. Pp: 409 -411
26. Taiwo, M.A., Kareem, K.T., Hughes, J d' A and Nsa, I.Y. 2007. Cowpea viruses: Effect of single and mixed infection on symptomatology and virus concentration. Virology Journal. 4:95.
27. Vidalakis, G. et al 2004. Efficacy of Bioindexing for Graft-Transmissible Citrus Pathogens in Mixed Infections. Department of Plant Pathology, University of California, USA. Vol.8. No. 12
28. Vidalakis G, da Graça J, Dixon W N, Ferrin D, Kesinger M, Krueger, Lee RF, Melzer MJ, John Olive J , Polek ML, Peggy J. Sieburth PJ, Williams LL and Wright GC. 2010. Citrus quarantine sanitary and certification program in the USA: Part I Citrus quarantine and introduction. Citrograph May/June 2010: 26 – 39
29. Vives, MC, Velázquez, K., Pina, JA, Moreno, P., Guerri, J & Navarro, L 2013. Identification of a New Enamovirus Associated with Citrus Vein Enation Disease by Deep Sequencing of Small RNAs 2013 The American Phytopathological Society. Vol. 103, No. 10, 2013: 1077 – 1086

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**СРОКИ СЕВА В УСЛОВИЯХ АРИДИЗАЦИИ КЛИМАТА КАК ФАКТОР  
РЕГУЛИРОВАНИЯ ПРОДУКТИВНОСТИ ОЗИМОЙ ПШЕНИЦЫ**  
SOWING DATES IN CONDITIONS OF CLIMATE ARIDISATION AS A FACTOR  
IN CONTROLLING THE PRODUCTIVITY OF WINTER WHEAT

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**АННОТАЦИЯ**

Одной из причин нестабильной урожайности и качества зерна озимой пшеницы является несовершенство технологий возделывания применительно к почвенно-климатическим условиям, особенно в связи с усилением аридности климата. В последнее десятилетие значительно возросла, как интенсивность нарастания, так и изменчивость температур, особенно в теплый период, за счет увеличения дней с экстремально высокими температурами. Сроки посева, как технологический прием, приобретают особую значимость для совершенствования технологий возделывания озимой пшеницы, так как ранний посев приводит к перерастанию посевов, что ухудшает условия перезимовки, а поздний – недостаточное осеннее развитие растений.

**ABSTRACT**

One of the reasons for the unstable yield and quality of winter wheat grain is the imperfection of cultivation technologies applied to soil and climatic conditions, especially in connection with increased aridity of the climate. In the last decade, both the intensity of the build-up and the variability of temperatures have increased considerably, especially in the warm period, due to the increase in days with extremely high temperatures. Terms of sowing, as a technological method, acquire special significance for the improvement of winter wheat cultivation technologies, since early sowing leads to overgrowth of crops, which worsens wintering conditions, and late - insufficient autumn development of plants.

**КЛЮЧЕВЫЕ СЛОВА**

Сроки посева, озимая пшеница, качество, урожайность.

**KEY WORDS**

Sowing, winter wheat, quality, yield.

Несмотря на достигнутый уровень производства зерна озимой пшеницы в России за последние годы (40-60 млн. т) по-прежнему остается ряд нерешенных агротехнологических и экологических проблем, сдерживающих дальнейший рост ее продуктивности. Прежде всего, как в мире, так и в России важным лимитирующим абиотическим фактором определяющим уровень ее продуктивности являются почвенно-климатические и погодные условия [1,2]. Так, за последние 5 лет в России варьирование валовых сборов озимой пшеницы составляет 41,6%, тогда как ее посевные площади изменились в пределах 7,8%.

Глобальные изменения климата, дестабилизирующие природные экосистемы, становятся все более ощутимыми. Продовольственная безопасность в ближайшие десятилетия будет зависеть от темпов и направленности процесса глобального потепления климата. Наблюдаемые и прогнозируемые климатические изменения несут как потенциальную выгоду, так и значительные риски для сельского хозяйства России, т.к. урожайность сельскохозяйственных культур и озимой пшеницы, в частности, будет

зависеть от характера изменения климата и увлажнения территорий. Это становится одной из главных проблем XXI века.

Глобальное потепление климата обуславливает необходимость совершенствования и адаптации технологий озимой пшеницы к конкретным агроэкологическим условиям, чтобы сорта могли максимально реализовать свой генетический потенциал [1,4].

Одним из важнейших производителей озимой пшеницы в РФ является Центрально–Черноземная Зона, где ее посевы составляют более 4 млн. га, в т.ч. Орловской области их сосредоточено около 12%. Валовой сбор пшеницы в 2014 г. достиг рекордной величины - 1,8 млн. т. при средней урожайности – 4,61 т/га. В то же время в Орловской области коэффициент вариации ее урожайности составляет 58% [3,10].

Одной из причин нестабильной урожайности и качества зерна озимой пшеницы является несовершенство технологий возделывания применительно к почвенно-климатическим условиям, особенно в связи с усилением аридности климата. Аридизация климата в Орловской области за последние 5-6 лет проявляется, прежде всего, в осеннем недостатке влаги в почве, когда наступают рекомендуемые для зоны сроки посева озимой пшеницы. Кроме того в мае и июне - основные месяцы, сопряженные с фазами кущения - выход в трубку озимой пшеницы отмечается аридизация климата, что оказывает отрицательное воздействие на формирование ее урожая, особенно если в метровом слое почвы создан недостаточный запас продуктивной влаги [5,9].

В последнее десятилетие значительно возросла, как интенсивность нарастания, так и изменчивость температур, особенно в теплый период, за счет увеличения дней с экстремально высокими температурами.

Это обстоятельство необходимо учитывать при выборе сроков посева, т.к. для получения дружных и качественных всходов важны не только среднесуточная температура воздуха, сумма активных температур для завершения осеннего цикла развития озимой пшеницы, но и запасы продуктивной влаги в пахотном слое почвы [6].

Сроки посева, как технологический прием, приобретают особую значимость для совершенствования технологий возделывания озимой пшеницы, так как ранний посев приводит к перерастанию посевов, что ухудшает условия перезимовки, а поздний – недостаточное осеннее развитие растений [11].

В настоящее время происходит удлинение теплого осеннего вегетационного периода, появляются новые сорта озимой пшеницы, способные успешно перезимовывать в стадии развития 1-2 побега. В связи с этим сроки высевы озимой пшеницы не должны быть строго постоянными, их необходимо корректировать в конкретных природно-климатических условиях регионов России. Поэтому выбор оптимальных сроков посева озимой пшеницы всегда был первоочередной задачей, а в условиях аридизации климата, приобретает особую актуальность [12-18].

*Цель исследований* - изучение влияния сроков посева на продуктивность озимой пшеницы.

## **МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ**

Полевые исследования проводили в НОПЦ «Интеграция» Орловской области в 2013 - 2015 г. г. на серой лесной почве среднесуглинистого механического состава, содержание гумуса - 3,1%, рН - 5,7, подвижного фосфора и обменного калия – 8,4 и 10,8 мг/100 г почвы соответственно. Опыт закладывали в трехкратной повторности с рендомезированным расположением делянок. Первый срок посева - рекомендуемый для зоны (5.09). Далее посевы озимой пшеницы осуществлялись через 10 дней (15.09, 25.09, 5.10, 15.10). Площадь опытной делянки – 300 м<sup>2</sup>, учетной - 105 м<sup>2</sup>. Объектом исследований являлся районированный в Орловской области сорт озимой пшеницы «Московская 39». Наблюдения за формированием густоты стояния растений и развитием растений проводили по общепризнанным методикам [7,8]. Для

установления тенденций и закономерностей формирования продуктивности растений определяли даты наступления фенологических фаз. Изреженность посевов озимой пшеницы учитывали в фазу полных всходов, определяли выживаемость растений после перезимовки, процент сохранившихся к уборке растений. Для установления тенденций и закономерностей формирования продуктивности растений определяли даты наступления фенологических фаз. Начало наступления фазы отмечали при вступлении в нее 10 % растений, полное - 75% растений. Изреженность посевов озимой пшеницы учитывали в фазу полных всходов, определяли выживаемость растений после перезимовки, процент сохранившихся к уборке растений.

Комбайновая уборка урожая проводилась комбайном Терри 2010 сплошным методом с последующим пересчетом на 14% влажность и 100% чистоту. В отобранных образцах определяли качественные показатели зерна озимой пшеницы. Статистическая обработка полученных данных выполнялись по общепринятой методике [7].

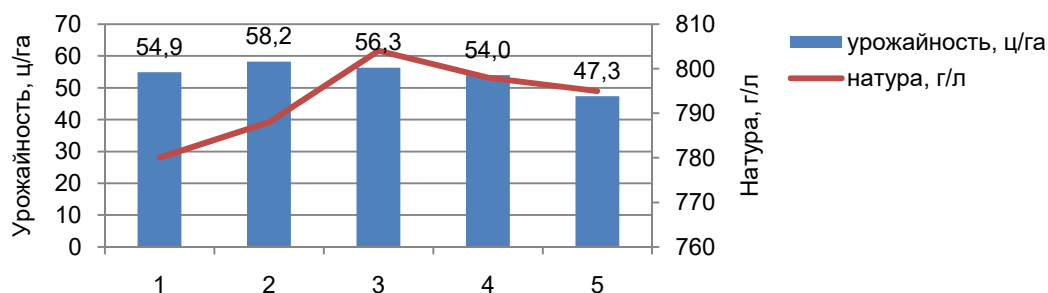
Технология возделывания - общепринятая для условий Орловской области. Предшественник озимой пшеницы - люпин на зеленое удобрение.

Метеорологические условия в годы исследований были контрастными, что позволяет сделать объективные выводы. Так 2015 г. характеризовался высокими дневными температурами и дефицитом осадков в критические периоды развития озимой пшеницы. Средняя годовая температура воздуха была на 2 °С выше средних многолетних значений, и ниже на 0,5 °С, чем в более благоприятном 2014 г. Количество осадков за год выпало около 80% от среднемноголетних значений (465 мм). В 2013 году погодные условия сложились менее благоприятно. В период вегетации осадков выпало выше нормы на 19,5%, а температурный режим был близок к среднемноголетним значениям.

## РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ

В результате наших исследований установлено, что полевая всхожесть семян зависела от сроков посева озимой пшеницы. Посев озимой пшеницы на 10-20 дней позже установленных сроков (2-3 срок) не снижал полевую всхожесть в сравнении с рекомендуемым 1 сроком. В этих вариантах озимая пшеница успешно перезимовывала (сохранность составила 74-90% в зависимости от года).

На четвертом сроке посева озимая пшеница успевает прорасти и сформировать один-два побега, что позволяет ей успешно перезимовать (сохранность составляет 61-75%).



НСР<sub>05</sub> - урожайность 1,4 ц/га; натура – 6,4 г/л; сроки посева: 1 - 05.09; 2 - 15.09; 3 – 25.09; 4 – 05.10; 5 – 15.10

Рисунок 1 – Влияние сроков сева на урожайность и качество зерна озимой пшеницы Московская 39 (НОПЦ «Интеграция» Орловский район, среднее за 2013-2015 гг.)

На пятом сроке посева перезимовывали в стадии прорастания семян. Весной они появились всходы, которые отставали в развитии на 2-3 недели в сравнении с оптимальным сроком. Сохранность посевов в этом варианте в различные годы составила 53,2-64,6%. В то же время растения на этом варианте хорошо кустились

(коэффициент продуктивной кустистости 2,4-2,9) и к фазе колошения визуального различия не наблюдалось в сравнении с 1 и 2 сроками посева.

В наших исследованиях установлено, что рекомендуемый для зоны 1 срок посева (5 сентября) обеспечил более высокую урожайность, чем в вариантах 4 и 5 срока (5.10, 15.10). В то же время установлено, что второй и третий сроки посева обеспечили достоверное превышение ее урожайности в сравнении с 1 сроком на 3,3- 1,4 ц/га, соответственно (рисунок 1).

Натура зерна возрастала в вариантах с более поздними сроками и превышала рекомендуемый (1 срок) на 8 - 24 г/л (рисунок 2).

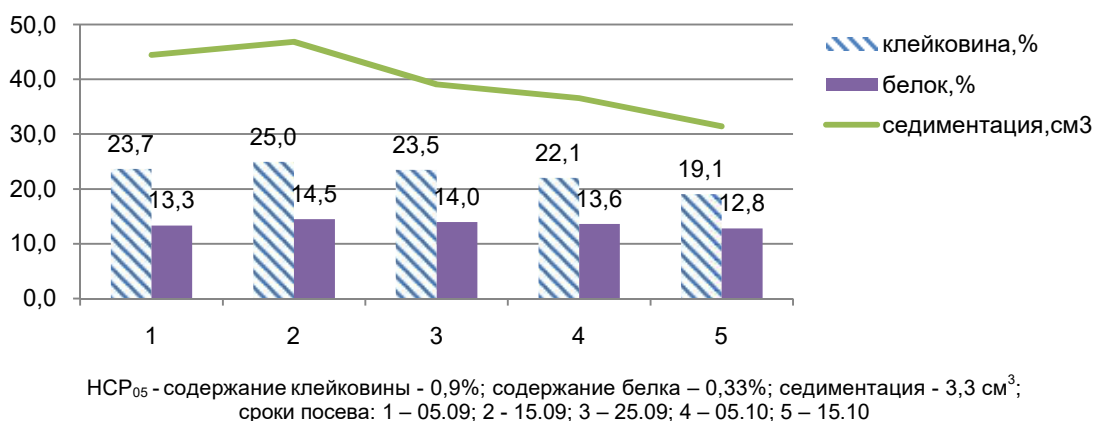


Рисунок 2 – Влияние сроков сева качество зерна озимой пшеницы Московская 39 (НОПЦ «Интеграция» Орловский район, среднее за 2013-2015 гг.)

Кроме того вариант с посевом озимой пшеницы во 2-й и 3-й срок обеспечил повышение белка в зерне на 0,7- 1,2 %, в сравнении с рекомендуемым – 1-м сроком (5 сентября). Максимальное накопление клейковины в зерне обеспечил второй срок посева (25%), что на 1,3% больше, в сравнении с рекомендуемым для зоны сроком. Седиментация зерна озимой пшеницы варьировала в зависимости от сроков сева в интервале 32 - 47,5 см<sup>3</sup>. Однако более высокий показатель седиментации зерна озимой пшеницы обеспечивали 1 и 2 сроки посева в сравнении с 3-5 сроками.

## ЗАКЛЮЧЕНИЕ

Сроки посева высокопродуктивных сортов озимой пшеницы не могут быть строго постоянными, потому что они во многом зависят от метеорологических условий года и генетических особенностей сорта. В условиях аридизации климата посев озимой пшеницы необходимо осуществлять в более поздние сроки. Сдвиг их от рекомендуемых до двух недель обеспечивает повышение урожайности и качества зерна. Связано это с тем, что растения меньше поглощают осенью азота из почвы и, следовательно, запасы его более интенсивно и продуктивно использует озимая пшеница в весенне-летний период вегетации.

В связи с тем, что сроки посева озимой пшеницы можно сместить на 10-14 дней, это обеспечивает увеличение продолжительности периода подготовки поля к посеву и возможность использовать непаровые предшественники, убираемые в более поздние сроки.

## БИБЛИОГРАФИЯ

1. Жученко А.А. Адаптивное растениеводство /А.А. Жученко //Адаптивное растениеводство (эколого-генетические основы). Теория и практика. – М.:ООО Изд.-во Агрорус. 2008.- т.1. - 813 с.

2. Кутровский В.Д. Основные факторы повышения устойчивости производства зерна в Центральном регионе России в условиях глобального изменения климата /В.Д. Кутровский, В.Н. Штырхун //Зерновое хозяйство России. 2010.№6. С.17-19.
3. Мельник А.Ф. Об элементах агротехники продуктивности и качестве зерна у озимой пшеницы в условиях Орловской области. /А.Ф. Мельник А.Ф., В.А. Фомочкин //Сельскохозяйственная биология. №1. 2014. С. 122-125.
4. Уваров Г.И. Учет погодных условий в технологии возделывания озимой пшеницы и сахарной свеклы /Г.И. Уваров, А.А. Найденов, А.П. Карабутов, В.Д. Соловиченко // Сахарная свекла. № 10. 2012. С. 24-27.
5. Амелин А.В. Методические подходы к созданию устойчивого и эффективного растениеводства в условиях глобального изменения климата (на примере Орловской области) /А.В. Амелин, С.Н. Петрова, Н.Н. Лысенко, В.М. Казьмин, В.М. Новиков, А.Ф. Мельник, Ю.В. Кузмичева, И.А. Рыжов, И.И. Брусенцов //Практические рекомендации. Орел: Изд -во Орел ГАУ.- 2015. 68 С.
6. Алабушев А.В. Стабилизация производства зерна в условиях изменения климата. /А.В. Алабушев //Зерновое хозяйство России.- №4.- 2011.- С.- 8-13.
7. Доспехов Б. А. Методика полевого опыта /Б.А. Доспехов //М.: Агропромиздат. 1985. 351 с.
8. Федин М.А. Методика государственного сортоиспытания сельскохозяйственных культур. /М.А. Федин, Ю.А. Роговский, Л.В. Исаева и др. //Выпуск первый. Общая часть.- М.: 1985. 270 с.
9. Груза, Г.В. Оценка зависимости урожайности озимых зерновых от колебаний климатических условий / Г.В. Груза, Т.В. Платова // Проблемы экологического мониторинга и моделирования экосистем.- СПб.: Гидрометеоиздат, 2000.- 139 с.
10. Сидоренко, О.В. Развитие зернового подкомплекса Орловской области /О.В. Сидоренко //Зерновое хозяйство России.- 2011.- № 1.- С. 65-69.
11. Лазарев, В.И. Влияние сроков посева на урожайность и качество зерна озимой пшеницы в условиях Курской области /В.И. Лазарев, М.Н. Котельникова //Вестник Курской государственной сельскохозяйственной академии.- 2015.- № 5.- С. 52-55.
12. Тупицын, Н. В. Влияние сроков сева на продуктивность озимой пшеницы в условиях Ульяновской области /Н. В. Тупицын, С. В. Валяйкин, А. В. //Агро 21.- 2011.- № 1—3 -С. 36-38.
13. Ториков В. Е. /Накопление сахаров в узлах кущения сортов озимой пшеницы, урожайность и качество зерна /В.Е. Ториков, О. В. Мельникова, Р. А. Богомаз //Нива Поволжья.- 2015.- № 2 (35).- С. 69.
14. Скворцова, Ю. Г. Сроки посева и посевные качества семян озимой мягкой пшеницы /Ю. Г. Скворцова, Е. В. Ионова// Зерновое хозяйство России. - 2015. - N 5. - С. 24-26.
15. Кудашкин М. И. Урожайность и качество озимой пшеницы в зависимости от вида пара, сроков посева, макро- и микроудобрений / М. И. Кудашкин, И. А. Гайсин // Достижения науки и техники АПК. - 2010. - № 3. - С. 10-13
16. Квасов, Н. А. Сроки сева как фактор регулирования продуктивности озимых культур в условиях изменения климата / Н. А. Квасов// Земледелие. - 2012. - № 3. - С. 18-20.
17. Изотов, А. М. Адаптивное управление сроком сева и нормой высева озимой пшеницы в Крыму / А. М. Изотов// Образование, наука и производство. - 2014. - N 2, 3. - С. 94-97.
18. Егушова, Е. А. Влияние сроков посева на продуктивность и качество зерна озимой пшеницы в лесостепной зоне Кемеровской области / Е. А. Егушова, Е. П. Кондратенко// Достижения науки и техники АПК. - 2012. - N 6. - С. 54-57.

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## **STUDY OF EFFICIENCY LEVEL OF SOME SOYBEAN VARIETIES' PLANTING METHOD IN THE LOWLAND AREAS**

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### **ABSTRACT**

This study aims to determine the effect of planting method some soybean varieties in the lowland on growth and yield of soybean. The event was held in the Mojokerto and Lamongan District, east Java Indonesia the in dry season of 2014. Experiments in randomized factorial block design with 12 treatments and repeated 3 times, that is a factor I (3 varieties), that is: Anjasmoro; Sinabung and Kaba, and factor II (4 ways of planting): planting spread; planting spread + mulch; planting drill; and planting drill+mulch. Spacious plot of 4 m x 3 m with a drill spacing of 40 cm x 15 cm (seed as much as 40 kg/ha, and method to plant spread (seed as much as 80 kg/ha). Mulch of straw 5t/ha given evenly, the amount of fertilizer given based on recommendation from AIAT East Java. Results of the study in both locations showed that Kaba variety (2.13 t / ha), was the highest yield in Mojokerto and the Sinabung variety (2.18 t / ha) was the highest yield in Lamongan. Then the way of planting drill + mulch 5t/ha in Mojokerto and Lamongan together gives the highest result that are 2,11 ton/ha and 2,17 t/ha. Economic Analysis Soybean cultivation in lowland with Kaba (Mojokerto) varieties and Sinabung (Lamongan) by planting drill method with mulch was given most economically evisien, because R/C Ratio achieved respectively highest are 3,38 and 3,07 than others.

### **KEY WORDS**

Method of planting, varieties, soybean, lowland, Lamongan, Mojokerto.

Soybean production of national can be increased through increasing productivity and expansion of planting area. The productivity of soybean at the farmer level is still low, ie an average of 1.3 t/ha with a range of 0.6-2.0 t/ha, while the potential yield can reach 3.0 t/ha. This enormous productivity gap provides an opportunity for increased production through increased productivity at the farm level [1].; [2]. According, low soybean production in addition to being influenced by low productivity at farm level, as well as local market has not been very attractive to farmers and the difficulty of developing soybean agribusiness due to limited soybean farming, and lack of adequate infrastructure and lack of seeds the good one. Increased productivity of soybeans can be achieved with farms that employ location specific soybean production technologies including using quality new superior varieties seeds and specific location fertilization, land preparation, maintenance and plant protection and post-harvest [3].

One of the determinants of the success of soybean farming is the provision of quality seeds from superior varieties and its supply following the precise six patterns of exact varieties, quality, time, quantity, place and price but this pattern is never fully achieved. Superior varieties greatly determine the level of productivity of crops and are technological components that are relatively easy to adopt farmers [4].; [5]. According to increasing soybean productivity can be achieved when applying appropriate technology (new superior variety and land, water, and plant disturbing organism) for each agroecosystem [6]. In Lowland agroecosystem, soybean is usually grown on DS. I planted after the first rice harvest or on DS II planted after the second rice harvest [7]. According to [8].; [9]. The success of technological package was determined by the application of technology approved by farmers and authors/counselors.

Common obstacles to soybean development in lowland rice are the saturation of the water at the beginning of the cropping season which is bad for the germination of soybean seeds, the solid soil structure will hamper the development of plant roots [10]. Soybean



variety selection should be based on maturity, yield potential, lodging, drought tolerance, and resistance to pests and diseases. The maturity period should be the first consideration when choosing a variety suited to your geographical zone. Therefore, on the solid soil structure it is necessary to consider proper land management. In general, farmers plant soybeans in lowland rice without preceding soil tillage, to avoid the delay of planting time that can reduce soybean yield. [11] According, treatment of soil tillage before planting in lowland does not increase yield compared with no tillage. Unprocessed soils are usually followed by straw cutting at the soil surface and used as mulch for soybean crops [4<sup>+</sup>], [3<sup>+</sup>], so mulch serves to suppress weed growth, seed fly attack and reduce evapotranspiration and increase chances results.

Soybean produces well over a wide range of planting dates, if moisture is available [12]. Soybean in lowland is planted drill or spread. Planting in a dispersed way is taken for two reasons, namely: (a) labor shortage, by planting the spread of planting power will be much less, and (b) to optimize the use of soil moisture, at harvest time the soil is still muddy cannot be planting drill, if waiting for the condition of the soil can planting drill means there will be loss of moisture, so that the soybean seeds are planted on a scattered land is still muddy [4<sup>++</sup>], [3<sup>++</sup>]. By way of planting spreads resulted in differences in planting time is faster and the need for more seeds than how to plant drill. In addition, planting scattering methods will make it difficult in plant maintenance such as fertilizing, weeding, spraying and harvesting.

This study aims to determine the effect of planting method and mulch usage of some soybean varieties in lowland on the growth, yield and efficiency level of soybeans.

## MATERIALS AND METHODS OF RESEARCH

The research location of planting method of soybean varieties is located in lowland of Sidorejo Village, Sugio Sub-district, Lamongan District and Paterongan Village, Bangsal Sub-district, Mojokerto District, at dry season of 2014. Experiments used randomized factorial block design with 12 treatments and repeated 3 times, ie factor I (3 varieties): a) Anjasmoro, b) Sinabung, and c) Kaba, as well as factor II (4 method of planting): a) planting spread, b) planting spread + mulch, c) planting drill, and d) planting drill + mulch. Size of plot of 4 m x 3 m with a drill spacing of 40 cm x 15 cm (seed as much as 40 kg/ha, 2 seeds per hole), and method to plant spread (seed as much as 80 kg/ha). Rice straw mulch as much as 5 t/ha are given by way of evenly distributed, while the dose of fertilizer was 50 kg Urea/ha + 75 kg SP 36/ha + 75 kg KCl/ha + 1 ton of organic fertilizer/ha. The method of fertilization of organic fertilizer 1 t/ha and all doses of inorganic fertilizers is given by planting drill about 5 cm in addition to the line of plants, together with the time of planting soybeans. who states that wet land has adequate nutrient, and thus the yield is quite promising despite less addition of fertilizers [13]. The time of weeding of soybean plants was done at age 30 DAP and 60 DAP.

Plant observations included: plant height, number of branches per plant, number of leaves per plant, number of pods per plant, weight of 100 dry seeds and dry seed yield (t/ha). Analyze data using ANOVA followed by Duncan multiple range test (DMRT 5%) [14]. Analysis of soybean farming was done to determine the feasibility of soybean farming using R/C Ratio. [15].; [16].; [17].; [18]. Mathematically feasibility of soybean farming by calculating R/C, that is as follows:

$$R/C = TPV/TC$$

where, R/C = Ratio of income and cost

NPT = Total production value (Rp/ha) BT = Total cost value (Rp/ha)

If, R/C > 1: Feasible developing

R/C = 1: Breakeven

R/C < 1: Not feasible developing

## RESULTS AND DISCUSSION

The analysis of variance showed that the interaction between the treatment of several varieties and the method of planting in lowland that had real effect in Mojokerto District was found to 1 observed variables, namely: number of branches per plant age 40 DAP, while in Lamongan District found 2 variables that is on the number of leaves per plant age 40 DAP

and 70 DAP. The treatment of varieties in Mojokerto District had significant effect on 5 observed variables: height of soybean plant age 40 DAP and 70 DAP, number of leaves per plant age 40 DAP and 70 DAP, and number of branches per plant age 40 DAP, while in Lamongan District 5 varieties of varieties are significantly different, namely: high soybean plants age 40 DAP and 70 DAP, number of leaves per plant age 40 DAP and 70 DAP, and number of branches per plant age 70 DAP. For the treatment of planting method in Mojokerto District have significant effect on 2 observed variables, namely: the number of leaves per plant age 70 DAP and weight of 100 seeds, whereas in Lamongan District there are 6 variables that are significantly different, ie height of soybean plant age 40 DAP and 70 DAP, number of leaves per plant age 40 DAP and 70 DAP, weight of 100 seeds and seed yield (Table 1).

Table 1 – Recapitulation of various method of planting some of soybean varieties on growth and yield of soybean in Mojokerto District and Lamongan District, DS I 2014

| Variable                                | Varieties (V) |        | Planting method (P) |        | Interaction (V x P) |        |
|---|---------------|--------|---------------------|--------|---------------------|--------|
|   | Mjkerto       | Lmngan | Mjkerto             | Lmngan | Mjkerto             | Lmngan |
| High soybean plant age 40 DAP           | *             | *      | ns                  | **     | ns                  | ns     |
| Number of branches per plant age 40 DAP | *             | ns     | ns                  | ns     | **                  | ns     |
| Number of leaves per plant age 40 DAP   | *             | *      | ns                  | *      | ns                  | *      |
| High soybean plant age 70 DAP           | *             | **     | ns                  | **     | ns                  | ns     |
| Number of branches per plant age 70 DAP | ns            | **     | ns                  | ns     | ns                  | ns     |
| Number of leaves per plant age 70 DAP   | *             | *      | **                  | *      | ns                  | *      |
| Number of pods per plant                | ns            | ns     | ns                  | ns     | ns                  | ns     |
| Weight of 100 dry seeds (g)             | ns            | ns     | *                   | *      | ns                  | ns     |
| Seed yield (t/ha)                       | ns            | ns     | ns                  | *      | ns                  | ns     |

Description: \*\* and \* are each significantly different at the error rate of 1% and 5%; ns = no significant.

**Effect of Variety and Planting Method Interaction.** The interaction of the treatment of varieties with planting method in Mojokerto District with the number of branches per plant at the age of 40 DAP highest was found in the use of Anjasmoro varieties by planting spread + mulch 5 t/ha (0.90 branch) or by planting drill (0.90 branch), as well as Kaba varieties by planting drill (89 branches), whereas in Lamongan District there is interaction between varieties and planting method to the highest number of leaves per plant at 40 DAP observation using Kaba varieties by planting spread + mulch 5 t / ha (12, 22 leaves), while the observation of the number of leaves per plant age 70 DAP did not show a real interaction between the use of varieties and planting method of soybeans. The interaction of the planting method treatment of several varieties of soybean showed that the diversity of genetic factors of some soybean varieties had the response of planting method to the number of leaves and number of branches per plant. Argomulyo Variety has better prospect because it has big size of seed with uniform color of yellow [19].

**Effect of Variety.** High plant of soybean in lowland the highest in Mojokerto District at 40 DAP observation on Anjasmoro variety, and 70 DAP observation was found in Sinabung variety, whereas in Lamongan District, plant height at 40 DAP did not show significant differences between varieties, and observation age 70 DAP found height plant of highest on Sinabung variety.

The soybean branches number of highest at age 40 DAP in Mojokerto District was found in interaction of Anjasmoro varieties by planting spread + mulch 5 t/ha (0.90 branches) or planting drill method (0.90 branches) and Kaba varieties by planting drill (0,89 branches), whereas in Lamongan District, the largest number of soybean branches is produced by Kaba and Sinabung varieties. The largest number of soybean branches at the age of 70 DAP in Mojokerto District is produced by Sinabung of 3.03 branches, while in Lamongan District, the most branches are found in Sinabung and Kaba varieties was each of 2.86 branches and 2.83 branches.

The highest number of leaves per plant at the age of 40 DAP in Mojokerto District produced 11.13 leaf varieties of Anjasmoro, while in Lamongan District found in interaction of

Kaba varieties by planting spread + mulch 5 t/ha of 12.22 leaves. The highest number of leaves per plant at age 70 DAP in Mojokerto District and Lamongan District of some varieties and planting methods did not show significant differences (Table 2).

Table 2 – Effect of planting method on plant height, number of branches, and number of leaves of three soybean varieties in lowland of Mojokerto District and Lamongan District, DS I 2014

| Varieties/<br>Planting Method           | Mojokerto |          |         |        | Lamongan  |          |          |        |
|---|-----------|----------|---------|--------|-----------|----------|----------|--------|
|   | Anjasmoro | Sinabung | Kaba    | Rataan | Anjasmoro | Sinabung | Kaba     | Rataan |
| High plant age 40 DAP (cm)              |           |          |         |        |           |          |          |        |
| Spread                                  | 42,56     | 43,76    | 42,44   | 42,92b | 42,34     | 42,11    | 41,22    | 41,89b |
| Spread+mulch                            | 53,56     | 55,33    | 49,89   | 52,93a | 42,22     | 44,22    | 44,89    | 43,78b |
| Drill                                   | 49,56     | 46,22    | 44,11   | 46,63b | 43,22     | 41,33    | 44,56    | 43,04b |
| Drill+ mulch                            | 47,44     | 44,67    | 41,89   | 44,67b | 48,89     | 44,89    | 49,22    | 47,67a |
| Average                                 | 48,28a    | 47,49ab  | 44,58b  | 46,79  | 44,17a    | 43,14a   | 44,97a   | 44,09  |
| Number of branches per plant age 40 DAP |           |          |         |        |           |          |          |        |
| Spread                                  | 0,10c     | 0,23bc   | 0,40abc | 0,13   | 2,00      | 2,33     | 3,00     | 2,44b  |
| Spread+mulch                            | 0,90a     | 0,57abc  | 0,43abc | 0,63   | 2,87      | 3,56     | 2,89     | 3,10a  |
| Drill                                   | 0,90a     | 0,78ab   | 0,89a   | 0,86   | 1,87      | 2,22     | 2,22     | 2,10c  |
| Drill+ mulch                            | 0,77ab    | 0,67abc  | 0,67abc | 0,70   | 2,00      | 2,00     | 2,44     | 2,15c  |
| Average                                 | 0,67      | 0,56     | 0,51    | 0,58   | 2,18b     | 2,53a    | 2,64a    | 2,45   |
| Number of leaves per plant age 40 DAP   |           |          |         |        |           |          |          |        |
| Spread                                  | 9,31      | 9,11     | 9,67    | 9,36c  | 10,78bc   | 11,78abc | 11,11abc | 11,22  |
| Spread+mulch                            | 11,21     | 10,00    | 10,68   | 10,63b | 10,78bc   | 11,78abc | 12,22a   | 11,59  |
| Drill                                   | 11,43     | 11,33    | 12,56   | 11,77a | 10,67c    | 11,44abc | 11,00abc | 11,04  |
| Drill+ mulch                            | 12,56     | 11,56    | 11,34   | 11,82a | 11,00abc  | 12,11ab  | 10,89c   | 11,33  |
| Average                                 | 11,13a    | 10,50b   | 11,06ab | 10,90  | 10,81     | 11,78    | 11,31    | 11,30  |
| High plant age 70 DAP (cm)              |           |          |         |        |           |          |          |        |
| Spread                                  | 54,76     | 60,43    | 60,89   | 58,69b | 46,22     | 47,78    | 45,33    | 46,44b |
| Spread+mulch                            | 63,89     | 68,00    | 67,67   | 66,52a | 49,43     | 55,22    | 50,99    | 51,88a |
| Drill                                   | 54,22     | 62,11    | 55,89   | 57,41b | 51,78     | 57,11    | 46,44    | 51,78a |
| Drill+ mulch                            | 58,66     | 59,00    | 57,44   | 58,37b | 54,34     | 58,44    | 52,67    | 55,15a |
| Average                                 | 57,88b    | 62,39a   | 60,47ab | 60,25  | 50,44b    | 54,64a   | 48,86b   | 51,31  |
| Number of branches per plant age 70 DAP |           |          |         |        |           |          |          |        |
| Spread                                  | 2,11      | 2,89     | 2,33    | 2,44b  | 2,66      | 2,76     | 3,00     | 2,80a  |
| Spread+mulch                            | 1,78      | 2,90     | 2,11    | 2,26b  | 2,00      | 3,67     | 2,77     | 2,81a  |
| Drill                                   | 2,44      | 3,11     | 3,11    | 2,89a  | 1,21      | 2,33     | 2,90     | 2,15b  |
| Drill+ mulch                            | 2,78      | 3,23     | 3,11    | 3,04a  | 1,90      | 2,67     | 2,64     | 2,40b  |
| Average                                 | 2,28c     | 3,03a    | 2,67b   | 2,66   | 1,94b     | 2,86a    | 2,83a    | 2,54   |
| Number of leaves per plant age 70 DAP   |           |          |         |        |           |          |          |        |
| Spread                                  | 11,11     | 11,67    | 12,02   | 11,60b | 13,67a    | 13,22a   | 13,56a   | 13,48  |
| Spread+mulch                            | 11,22     | 13,11    | 12,00   | 12,11a | 12,67a    | 13,78a   | 13,56a   | 13,33  |
| Drill                                   | 11,22     | 10,89    | 11,22   | 11,11b | 13,00a    | 12,67a   | 13,56a   | 13,07  |
| Drill+ mulch                            | 12,11     | 10,67    | 11,46   | 11,41b | 13,78a    | 13,00a   | 13,67a   | 13,48  |
| Average                                 | 11,42a    | 11,58a   | 11,68a  | 11,56  | 13,28     | 13,17    | 13,58    | 13,34  |

The numbers followed by the same letter on the same column and row do not differ significantly on the DMR test of 5%.

The highest number of pods per plant in Mojokerto District and Lamongan District was found in the Anjasmoro varieties of 103.03 pods and 106.37 pods, while the highest 100 seeds in Mojokerto District and Lamongan District were found in Anjasmoro varieties, each weighing 14.02 g and 11.40 g (Table 3).

The highest yield of soybean seeds in Mojokerto District was found using Kaba varieties of 2.13 t/ha, while in Lamongan District, soybean crop yielding the highest seeds was found in Sinabung varieties of 2.18 t/ha (Figure 1). Soybean of Kaba and Sinabung varieties of medium seeds have the adaptability to grow better when planted in lowland after rice than Anjasmoro varieties of large seeds. [4<sup>+++</sup>]. According, superior varieties greatly determine the level of productivity of crops and is a technology component that is relatively easy to adopt farmers.

**Effect of Planting Method.** The highest planting height of soybean in Mojokerto District was observed at age 40 DAP (52.93 cm) and age 70 hst (66.52 cm) was encountered with planting method + mulch 5 t/ha (52.93 cm), whereas in Lamongan District, the highest plant

height at observation 40 DAP was found by planting drill + mulching 5 t/ha (47.67 cm) and observation age 70 DAP was encountered with planting spread + mulching 5 t/ha (51.88 cm) or planting drill (51.78 cm) or planting drill + mulch 5 t/ha (55.15 cm).

Table 3 – Effect of planting method to number of pods, weight of 100 seeds and yield of three varieties of soybean in lowland of Mojokerto and Lamongan District, DS I 2014

| Varieties/<br>Planting Method | Mojokerto                   |          |        |         | Lamongan  |          |        |         |
|-------------------------------|-----------------------------|----------|--------|---------|-----------|----------|--------|---------|
|                               | Anjasmoro                   | Sinabung | Kaba   | Rataan  | Anjasmoro | Sinabung | Kaba   | Rataan  |
|                               | Number of pods per plant    |          |        |         |           |          |        |         |
| Spread                        | 89,32                       | 81,77    | 91,77  | 87,62d  | 105,56    | 106,43   | 100,66 | 104,21b |
| Spread+mulch                  | 111,53                      | 93,57    | 72,89  | 92,66c  | 136,56    | 100,10   | 103,67 | 113,44a |
| Drill                         | 87,69                       | 104,10   | 99,33  | 97,04b  | 90,47     | 79,11    | 96,56  | 88,71c  |
| Drill+ mulch                  | 123,56                      | 84,42    | 95,02  | 101,00a | 92,90     | 83,67    | 80,33  | 85,63c  |
| Average                       | 103,03a                     | 90,96b   | 89,75b | 94,58   | 106,37a   | 92,33b   | 95,30b | 98,00   |
|                               | Weight of 100 dry seeds (g) |          |        |         |           |          |        |         |
| Spread                        | 13,90                       | 10,56    | 10,65  | 11,70a  | 11,62     | 8,42     | 8,96   | 9,66a   |
| Spread+mulch                  | 14,17                       | 10,59    | 10,37  | 11,71a  | 11,42     | 8,45     | 8,55   | 9,47a   |
| Drill                         | 14,45                       | 10,68    | 10,54  | 11,89a  | 11,06     | 8,13     | 8,12   | 9,10a   |
| Drill+ mulch                  | 13,57                       | 11,06    | 10,40  | 11,68a  | 11,51     | 8,36     | 8,35   | 9,41a   |
| Average                       | 14,02a                      | 10,72b   | 10,49b | 11,75   | 11,40a    | 8,34b    | 8,49b  | 9,41    |
|                               | Yield seed (t/ha)           |          |        |         |           |          |        |         |
| Spread                        | 1,16                        | 1,62     | 2,05   | 1,61c   | 1,51      | 1,94     | 2,02   | 1,82a   |
| Spread+mulch                  | 1,75                        | 2,27     | 2,22   | 2,08a   | 1,75      | 2,21     | 2,27   | 2,08a   |
| Drill                         | 1,32                        | 2,09     | 1,92   | 1,78b   | 1,52      | 2,21     | 2,02   | 1,92a   |
| Drill+ mulch                  | 1,62                        | 2,33     | 2,35   | 2,11a   | 1,98      | 2,34     | 2,19   | 2,17a   |
| Average                       | 1,46b                       | 2,08a    | 2,13a  | 1,89    | 1,69c     | 2,18a    | 2,13b  | 2,00    |

The numbers followed by the same letter on the same column and row do not differ significantly on the DMR test of 5%.

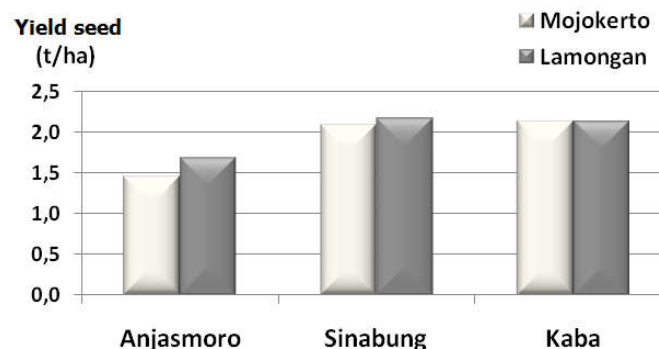


Figure 1 – The yield of soybean seed from varieties Anjasmoro, Sinabung and Kaba

The highest number of branches per plant of soybean in Mojokerto District at observation 70 DAP was found by planting drill + mulch 5 t/ha (3,04 branches) and planting drill (2,89 branches), while in Lamongan District, 40 DAP (3,10 branches) and 70 DAP (2,81 branches) were found by planting spread + mulch 5 t/ha. The number of leaf per plant in Mojokerto District at observation 40 DAP was found on planting drill (11,77 leaves) or planting drill + mulch 5 t/ha (11,82 leaves), while observation age 70 DAP was found by planting spread + mulch 5 t/ha (12,11 leaves).

The highest number of pods per plant of soybean in Mojokerto District was found in the planting drill + mulch 5 t/ha as much 101 pods, while in Lamongan District the highest number of pods on planting spread was 113,44 pods. The weight of 100 seeds of soybean from several planting method in Mojokerto District and Lamongan District showed no significant difference.

The yield seeds of soybean in Mojokerto District and Lamongan District resulted in the highest weight by planting drill + mulch 5 t/ha each 2.11 t/ha and 2.17 t/ha (Figure 2).

Table 4 – Analysis of farming of some varieties of soybean with various planting method in lowland, DS I 2014, Mojokerto District

| No.         | Activity                     | Anjas+<br>spr | Anjas+<br>spr+mlc | Anjas+<br>drill | Anjas+<br>drill+mlc | Snbung+sp | Snbung+<br>spr+mlc | Snbung+drill | Snbung+<br>drill+mlc | Kaba+<br>spr | Kaba+<br>spr+mlc | Kaba+<br>drill | Kaba+<br>drill+mlc |
|-------------|------------------------------|---------------|-------------------|-----------------|---------------------|-----------|--------------------|--------------|----------------------|--------------|------------------|----------------|--------------------|
| (x IRD.000) |                              |               |                   |                 |                     |           |                    |              |                      |              |                  |                |                    |
| I           | <i>Labor (DW)</i>            |               |                   |                 |                     |           |                    |              |                      |              |                  |                |                    |
| 1.          | Channel                      | 240           | 240               | 240             | 240                 | 240       | 240                | 240          | 240                  | 240          | 240              | 240            | 240                |
| 2.          | Cropping : spead             | 140           | 140               |                 |                     | 140       | 140                |              |                      | 140          | 140              |                |                    |
|             | drill                        |               |                   | 550             | 550                 |           |                    | 550          | 550                  |              |                  | 550            | 550                |
| 3.          | Cut straw                    | 360           | 360               | 360             | 360                 | 360       | 360                | 360          | 360                  | 360          | 360              | 360            | 360                |
| 4.          | Fertilization                | 240           | 240               | 240             | 240                 | 240       | 240                | 240          | 240                  | 240          | 240              | 240            | 240                |
| 5.          | Spraying                     | 120           | 120               | 120             | 120                 | 120       | 120                | 120          | 120                  | 120          | 120              | 120            | 120                |
| 6.          | Weeding                      | 400           | 400               | 400             | 400                 | 400       | 400                | 400          | 400                  | 400          | 400              | 400            | 400                |
| 7.          | Harvest                      | 580           | 580               | 580             | 580                 | 580       | 580                | 580          | 580                  | 580          | 580              | 580            | 580                |
| 8.          | Drying                       | 200           | 200               | 200             | 200                 | 200       | 200                | 200          | 200                  | 200          | 200              | 200            | 200                |
| 9.          | Threshing                    | 240           | 240               | 240             | 240                 | 240       | 240                | 240          | 240                  | 240          | 240              | 240            | 240                |
| II          | <i>Means prod. (kg; lt)</i>  |               |                   |                 |                     |           |                    |              |                      |              |                  |                |                    |
| 1.          | Seed (kg/ha)                 | 960           | 960               | 600             | 600                 | 960       | 960                | 600          | 600                  | 960          | 960              | 600            | 600                |
| 2.          | Fertilizer (kg/ha):          |               |                   |                 |                     |           |                    |              |                      |              |                  |                |                    |
|             | Urea                         | 90            | 90                | 90              | 90                  | 90        | 90                 | 90           | 90                   | 90           | 90               | 90             | 90                 |
|             | SP-36                        | 150           | 150               | 150             | 150                 | 150       | 150                | 150          | 150                  | 150          | 150              | 150            | 150                |
|             | KCI                          | 450           | 450               | 450             | 450                 | 450       | 450                | 450          | 450                  | 450          | 450              | 450            | 450                |
|             | Petroganik                   | 500           | 500               | 500             | 500                 | 500       | 500                | 500          | 500                  | 500          | 500              | 500            | 500                |
| 3.          | Pesticide (lt/ha)            | 152           | 152               | 152             | 152                 | 152       | 152                | 152          | 152                  | 152          | 152              | 152            | 152                |
| III         | <i>Cost of Prod. (Rp/ha)</i> | 4.822         | 4.822             | 4.872           | 4.872               | 4.822     | 4.822              | 4.872        | 4.872                | 4.822        | 4.822            | 4.872          | 4.872              |
| IV          | <i>Seed yied (kg/ha)</i>     | 1.160         | 1.750             | 1.320           | 1.620               | 1.620     | 2.270              | 2.090        | 2.330                | 2.050        | 2.220            | 1.900          | 2.350              |
|             | <i>Revenue (Rp/ha)</i>       | 8.120         | 12.250            | 9.240           | 11.340              | 11.340    | 15.890             | 14.630       | 16.310               | 14.350       | 15.540           | 13.300         | 16.450             |
| V           | <i>profit (Rp/ha)</i>        | 3.298         | 7.428             | 4.368           | 6.468               | 6.518     | 11.068             | 9.758        | 11.438               | 9.528        | 10.718           | 8.428          | 11.578             |
| VI          | <i>R/C</i>                   | 1,68          | 2,54              | 1,90            | 2,33                | 2,35      | 3,30               | 3,00         | 3,35                 | 2,98         | 3,22             | 2,73           | 3,38               |

Description of price: seeds = Rp. 12,000/kg; consumption = Rp. 7,000/kg; Urea = Rp. 1,800/kg; SP-36 = Rp. 2,000/kg; KCI = Rp. 6,000/kg; Petroganik = Rp. 500/kg

Table 5 – Analysis of farming of some varieties of soybean with various planting method in lowland, DS I 2014, Lamongan District

| No.         | Activity                     | Anjas+<br>spr | Anjas+<br>spr+mlc | Anjas+<br>drill | Anjas+<br>drill+mlc | Snbung+<br>spr | Snbung+<br>spr+mlc | Snbung+<br>drill | Snbung+<br>drill+mlc | Kaba+<br>spr | Kaba+<br>spr+mlc | Kaba+<br>drill | Kaba+<br>drill+mlc |
|-------------|------------------------------|---------------|-------------------|-----------------|---------------------|----------------|--------------------|------------------|----------------------|--------------|------------------|----------------|--------------------|
| (x IRD.000) |                              |               |                   |                 |                     |                |                    |                  |                      |              |                  |                |                    |
| I           | <i>Labor (DW)</i>            |               |                   |                 |                     |                |                    |                  |                      |              |                  |                |                    |
| 1.          | Channel                      | 300           | 300               | 300             | 300                 | 300            | 300                | 300              | 300                  | 300          | 300              | 300            | 300                |
| 2.          | Cropping : spead             | 170           | 170               |                 |                     | 170            | 170                |                  |                      | 170          | 170              |                |                    |
|             | drill                        |               |                   | 550             | 550                 |                |                    | 550              | 550                  |              |                  | 550            | 550                |
| 3.          | Cut straw                    | 400           | 400               | 400             | 400                 | 400            | 400                | 400              | 400                  | 400          | 400              | 400            | 400                |
| 4.          | Fertilization                | 230           | 230               | 230             | 230                 | 230            | 230                | 230              | 230                  | 230          | 230              | 230            | 230                |
| 5.          | Spraying                     | 120           | 120               | 120             | 120                 | 120            | 120                | 120              | 120                  | 120          | 120              | 120            | 120                |
| 6.          | Weeding                      | 640           | 640               | 640             | 640                 | 640            | 640                | 640              | 640                  | 640          | 640              | 640            | 640                |
| 7.          | Harvest                      | 740           | 740               | 740             | 740                 | 740            | 740                | 740              | 740                  | 740          | 740              | 740            | 740                |
| 8.          | Drying                       | 200           | 200               | 200             | 200                 | 200            | 200                | 200              | 200                  | 200          | 200              | 200            | 200                |
| 9.          | Threshing                    | 340           | 340               | 340             | 340                 | 340            | 340                | 340              | 340                  | 340          | 340              | 340            | 340                |
| II          | <i>Means prod. (kg; lt)</i>  |               |                   |                 |                     |                |                    |                  |                      |              |                  |                |                    |
| 1.          | Seed (kg/ha)                 | 960           | 960               | 600             | 600                 | 960            | 960                | 600              | 600                  | 960          | 960              | 600            | 600                |
| 2.          | Fertilizer (kg/ha):          |               |                   |                 |                     |                |                    |                  |                      |              |                  |                |                    |
|             | Urea                         | 90            | 90                | 90              | 90                  | 90             | 90                 | 90               | 90                   | 90           | 90               | 90             | 90                 |
|             | SP-36                        | 150           | 150               | 150             | 150                 | 150            | 150                | 150              | 150                  | 150          | 150              | 150            | 150                |
|             | KCl                          | 450           | 450               | 450             | 450                 | 450            | 450                | 450              | 450                  | 450          | 450              | 450            | 450                |
|             | Petroganik                   | 500           | 500               | 500             | 500                 | 500            | 500                | 500              | 500                  | 500          | 500              | 500            | 500                |
| 3.          | Pesticide (lt/ha)            | 185           | 185               | 185             | 185                 | 185            | 185                | 185              | 185                  | 185          | 185              | 185            | 185                |
| III         | <i>Cost of Prod. (Rp/ha)</i> | 5.475         | 5.475             | 5.495           | 5.495               | 5.475          | 5.475              | 5.495            | 5.495                | 5.475        | 5.475            | 5.495          | 5.495              |
| IV          | <i>Seed yied (kg/ha)</i>     | 1.510         | 1.750             | 1.520           | 1.980               | 1.940          | 2.210              | 2.210            | 2.340                | 2.020        | 2.270            | 2.020          | 2.190              |
|             | <i>Revenue (Rp/ha)</i>       | 10.570        | 12.250            | 10.640          | 13.860              | 13.580         | 15.470             | 15.470           | 16.380               | 14.140       | 15.890           | 14.140         | 15.330             |
| V           | <i>profit (Rp/ha)</i>        | 5.095         | 6.775             | 5.145           | 8.365               | 8.105          | 9.995              | 9.975            | 11.045               | 8.665        | 10.415           | 8.645          | 9.835              |
| VI          | <i>R/C</i>                   | 1,93          | 2,24              | 1,94            | 2,52                | 2,48           | 2,83               | 2,82             | 3,07                 | 2,58         | 2,90             | 2,57           | 2,79               |

Description of price: seeds = Rp. 12,000/kg; consumption = Rp. 7,000/kg; Urea = Rp. 1,800/kg; SP-36 = Rp. 2,000/kg; KCl = Rp. 6,000/kg; Petroganik = Rp. 500/kg.

Soybean is very sensitive to competition with weeds. In soybean cultivation of farmers in lowland is rarely done weeding, so weed control by using rice straw mulch of 5 t/ha can be recommended because it can suppress weed growth of about 55-65% [3<sup>\*\*\*</sup>]. In addition to helping suppress weeds, mulching on soybean crops can maintain soil moisture by suppressing the evaporation of ground water [20-21]. Added that the use of straw mulch with or without soil treatment can increase soybean yield, reduce weed growth and not decrease soil penetration than Oxadiazon herbicide application.

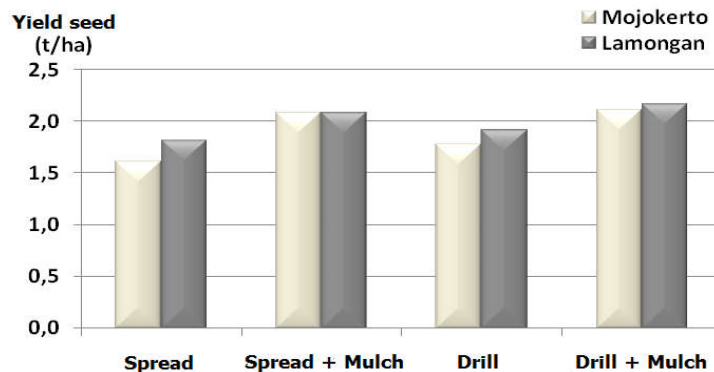


Figure 2 – Yield of soybean seeds from planting spread, planting spread + mulch, planting drill and planting drill + mulch

The types of weeds that develop on soybean crops in lowland include: narrow-leaved weeds/grasses: Tuton (*Echinochloa colona*), type of puzzles weed: Babawangan (*Fimbristylis milacea*), broadleaf weeds: Walik ope (*Trianthema portulacastrum*), etc.

*Analysis of Soybean Farming.* The results of soybean farming analysis showed that with soybean cultivation technology in Mojokerto District using Kaba varieties with planting drill and mulch obtained the highest R/C of 3.38 (Table 4), while in Lamongan District with using Sinabung varieties by planting drill and mulch obtained the highest R/C of 2.98 (Table 5), whereas, so the cultivation of soybeans in two locations is economically feasible. The high R/C ratio in soybean cultivation by planting drill and mulch is influenced by the increase of seed yield and the low requirement and the cost of seed compared to the planting spread.

## CONCLUSION

The interaction of varietal by planting soybean treatment only occurs on the number of branches and the number of leaves per plant.

The highest yield of soybean seeds in Mojokerto regency was found on the use of Kaba varieties (2.13 t/ha), while in Lamongan regency on Sinabung varieties (2.18 t/ha).

The yield of soybean seeds in Mojokerto regency and Lamongan regency resulted in the highest weight by planting drill + mulch 5 t/ha respectively of 2.11 t/ha and 2.17 t/ha.

Economic Analysis Soybean cultivation in lowland with Kaba (Mojokerto) varieties and Sinabung (Lamongan) by planting drill method + mulch was given most economically evisien, because R/C Ratio achieved respectively highest are 3,38 and 3,07 than others.

## REFERENCES

1. Atman, 2009. Strategy to increase soybean production in Indonesia. Scientific Journal of Tambua, Vol. VIII, No. 1, January-April 2009: 39-45 p.
2. Kusbini, B.A. 2011. Problems, challenges and opportunities for achieving self-sufficiency in soybean. In Adie et al (eds.). Technological Innovation For Soybean Development Toward Self-Sufficiency. Proceedings of National Seminar on Research Results of Various Beans and Tubers. Center for Food Crops Research and Development. p: 11-16.

3. Adisarwanto, T., Subandi and Sudaryono, 2007. Soybean production technology. In Sumarno et al. (Eds.). Soybean, Production and Development Technique. Center for Food Crops Research and Development. Agency for Agricultural Research and Development. p: 229-252.
4. Subandi, A. Harsono, and H. Kuntastyuti. 2007. Plantation area and soybean production system in Indonesia. In Sumarno et al. (Eds.). Soybean, Production and Development Technique. Center for Food Crops Research and Development. Agency for Agricultural Research and Development. p: 104-129.
5. Zakaria, A.K., 2010. Adoption Rate of Soybean Cultivation Technologies on Irrigated Wetland in Pasuruan, East Java. Center for Food Crops Research and Development. Journal of Food Crops Agriculture Research. 29 (3): 180-185.
6. Sudaryanto, T and D.K.S. Swastika, 2007. Soybean economy in Indonesia. In Sumarno et al. (Eds.). Soybean, Production and Development Technique. Center for Food Crops Research and Development. Agency for Agricultural Research and Development. p: 1-27
7. Puslitbangtan, 2010. Technical guide of soybean cultivation in various agro-ecosystem. Center for Food Crops Research and Development. 30p.
8. Suyanto dan Indrawati. 1992. Penelitian Pengembangan Budidaya Kedelai di Sumbawa. Makalah Balitan Malang no. 92.116
9. F.Kasijadi. 2000.Cooperative Farming Sebagai Pemanfaatan SumberdayaPertanian Lahan Sawah di Jawa Timur. Makalah diskusi panel. BPTP Karangploso.
10. Sudaryono, A. Taufiq and A. Wijanarko, 2007. Opportunity to increase soybean production in Indonesia. In Sumarno et al. (Eds.). Soybean, Production and Development Technique. Center for Food Crops Research and Development. Agency for Agricultural Research and Development. p: 130-167
11. Sumarno and A.G. Manshuri, 2007. Requirement of growing and production area of soybean in Indonesia. In Sumarno et al. (Eds.). Soybean, Production and Development Technique. Center for Food Crops Research and Development. Agency for Agricultural Research and Development. p: 74-103
12. Dugje, I.Y., L.O. Omoigui, F. Ekeleme, R. Bandyopadhyay, P. Lava Kumar, and A.Y. Kamara, (2009). Farmers' Guide to Soybean Production in Northern Nigeria.
13. Suyanto, 1999. Penelitian Lapang Pemupukan Kedelai Pada Jenis Tanah Aluvial, Grumosol, Latosol dan Planosol. Perbaikan Komponen Teknologi untuk Meningkatkan Produktivitas Tanaman Aneka Kacang dan Aneka Umbian. Edisi Khusus Balitkabi no.13
14. Gomez, A.K and A.A. Gomez. 1993. Statistical Procedures for Agricultural Research. 2nd Edition. Los Banos.
15. Soekartawi. 1993. Prinsip Dasar Ekonomi Pertanian Teori dan Aplikasinya. PT Raja Grafindo Persada, Jakarta.
16. 1995. Analisis Usahatani. UI-PRESS, Jakarta.
17. 2002. Farming analysis. University of Indonesia Press. p: 85-87
18. 2003. Teori Ekonomi Produksi. PT Raja Grafindo Persada, Jakarta.
19. Chamdi Ismail dan Gunawan Effendi. 1998. Pengkajian Teknik Produksi Varietas Unggul Kedelai. Prosiding Seminar Hasil Penelitian/Pengkajian BPTP Karangploso.
20. Ramakrishna, A., HM Tam, SP. Wani and TD Long, 2006. Effect of mulch on soil temperature, moisture, weed infestation and yield of groundnut in Northern Vietnam. Field Crops Res. 95: 115-125
21. Abdullah, S., 1999. Effect of soil management on weed growth and soybean yield after direct paddy rice crops. J. Agrotropika. 4 (2): 28-33.



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## **USE OF UPSUS TECHNOLOGY AND ITS RELATIONSHIPS WITH THE PRODUCTION AND REVENUE OF RICE FARMERS: A CASE STUDY IN BATANG ASAM DISTRICT OF JAMBI PROVINCE, INDONESIA**

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### **ABSTRACT**

The objective of the study was to measure the use of upsus technology and its relationship with the production and income of paddy rice farmers. Sampling method is done by *simple random sampling*; sample size is 60 kk farmers. Statistical analysis used is spearman correlation coefficient analysis with t-test. The results showed that the use of upsus technology was in the low to moderate category. Although upsus technology requires significant additional costs but is able to provide additional production, revenue, net income and RC ratio significantly compared to non-upsus rice farming. The application of upsus technology also provides a benefit-cost ratio that benefits farmers. Application of elements of upsus technology; improved varieties, quality seeds, soil cultivation, planting, fertilizing and irrigation are positively related and very real to production and income (sig.0.00 <  $\alpha = 0,01$ ). While elements of upsus technology, nurseries, pest and disease control, weed control, harvest and post harvest relate positively to production and income but not significantly different (sig. >  $\alpha = 0,05$ ). If the better the application of elements of technology upsus, it will have a positive and tangible effect on the production and net income of rice farming.

### **KEY WORDS**

Production, revenue-cost ratio, benefit-cost ratio, farmers.

The food crops sub-sector is one part of the agricultural sector and is a producer of strategic commodities in the form of rice that is the staple food of most Indonesians. The need for rice food never recedes, but always increases according to the needs of the population as the factors that most determine the demand for rice. Rice is a food that provides energy in the form of carbohydrates. It is undeniable that rice occupies a very strategic position for the life of the people; on the one hand rice is an economic and social commodity that is the source of farmer's income, and the fulfillment of the need for other society. The existence of rice is difficult to replace and should be available in sufficient quantities.

Various policies outlined by the government in agriculture sector that have been, are, and will be implemented are aimed at promoting agriculture, making farming much more efficient and increasing productivity, higher farmer income levels and more equitable welfare (Suratiah, 2014).

Increased production of rice farming aims primarily to create rice self-sufficiency and increase farmer income. To achieve this goal the government seeks to increase yield yield per hectare, the policy package outlined is the increased efficiency and effectiveness of the use of upsus technology.

According to Wijaya, I Gede (2016) that the most important input to be considered in the effort to increase productivity of rice farming is by applying rice upsus technology. Rice upsus technology can significantly improve production efficiency and farmer earnings. The use of perfect upsus technology, the production rate will increase from 4.36 tons to 6.82 tons per hectare. Even if applied adaptively, then the level of production can reach 12 tons per hectare.

But in fact, the achievement of increased production is not as expected. Many factors are proposed by various parties that the productivity of lowland rice farming is still low. The low productivity factor per hectare shows that the technical efficiency of using upsus

technology is still low. This results in no significant difference in production and income levels before, and after the use of upsus technology.

In the relationship above, Wijaya, I Gede (2016) questioned whether it is true that with the recommended technological usage, the production and income of farmers can increase significantly. If the correct use of these technologies can improve the technical and economic efficiency of rice farming, how much power the results? On the use of upsus technology is the amount of additional costs, production, revenues and RC ratio of rice farming system?

## METHODS OF RESEARCH

Batang Asam District was chosen purposively because this area is the center of rice production in Jambi Province, the sampling method used is simple random sampling method. The sample size is 60kk. The data were collected by interviews guided by a structured questionnaire. To analyze the role of upsus technology in rice farming is by BC ratio (Soekartawi, 2005). Meanwhile, to measure the relation of elements of the use of upsus technology with the production and net income of farmers is done with Spearman correlation coefficient (Djarwanto, 2006):

$$RS = \frac{\sum x_i^2 + \sum y_i^2 - \sum d_i^2}{2\sqrt{\sum x_i^2 \sum y_i^2}}$$

Where:  $x_i^2 = (h_i - \bar{h})^2$ ;  $y_i^2 = (k_i - \bar{k})^2$ ;  $d_i^2 = (h_i - k_i)^2$ ;  $X_i$  = Score elements of using upsus technology;  $Y_i$  = Production or income;  $h_i$  = Rank score elements use upsus technology;  $k_i$  = Rank for production and net income.

Testing is done by t test with formula:

$$t = rs \sqrt{\frac{(n-2)}{(1-rs^2)}}$$

With the rules of decision making:  $H_0$  accepted if:  $-t(\alpha/2; n-2) \leq t_{hit} \leq t(\alpha/2; n-2)$ .

$H_1$  accepted if:  $t_{hit} > t(\alpha/2; n-2)$  or  $t_{hit} < -t(\alpha/2; n-2)$ .

## RESULTS AND DISCUSSION

*Level of Use of Upsus Technology by Farmers.* The level of application of upsus technology is from the criteria: 000 - 24.99% (very low), 25% - 49.99% (low), 50% - 74.99% (medium), 75% - 100% (high). The level of upsus technology is the superior varieties average score of 62.5 or 76.6% of the recommendation, the average seed quality score of 56.45 or 65.4% of the recommendations, the average land processing score of 78.2 or 81, 3% of recommendation, nursery average score 72,3 or 85,7% from recommendation, seed average score 58,7 or 55,6% from recommendation, planting average score 52,6 or 52,2 % of recommendations, average fertilization score of 53.4 or 48.3% of recommendations, average irrigation score of 62.3 or 54.6% of recommendations, pest and disease controls average score of 51.7 or 48, 5% of the recommendations, weed controls average score 58.4 or 61.4% of recommendation, harvest and post harvest average score of 75.6 or 82.5% of the recommendations. With the level of implementation of intensification (upsus technology) of 63.64% of the recommendations. This means that on average the level of use of upsus technology is categorized as low to moderate, and this factor may be the cause of the low production of wetland rice farming. Compared with the production potential (12 tons per hectare).

*Revenue Analysis and Efficiency of Rice Farming.* The amount of net income can be used as an indicator of the profits to be gained by farmers from rice farming. If the net income of farmers is greater, it means that the benefits of farmers get bigger, otherwise if the

net income of farmers is relatively low, it will be inhibiting factors in an effort to increase production (Tuwo, 2011).

Table 1 it shows that the magnitude of  $R / C = 2.51$  for non upsus rice which means every sacrifice of production cost equal to Rp. 1.00 will only provide revenue of Rp. 2.51. While the amount of  $R / C$  for rice upsus only amounted to 1.96, which means Rp. 1.00 will only provide income for farmers of Rp. 1.96, so if the  $R / C$  of the farming can be increased then the flow of economic opportunities obtained by farmers will grow larger, because the magnitude of  $R / C$  is a determinant factor to increase farmer income. Although upsus technology requires a significant additional cost but able to provide additional production, revenue, net income and RC ratio significantly compared to non-upsus rice farming.

*Role of Using Upsus Technology in Wetland Rice Farming.* Using destructive technology to provide additional production is a benefit for farmers, but the use of upsus technology requires additional costs. BENEFIT - cost ratio ( $B / C$ ) is the big picture (technological feasibility) advantage of using upsus technology.

The role of the use of Upsus technology to  $B / C$  can be seen table 2. From table 2 shows that the role of use of upsus technology to additional net income is high with the amount of  $B / C = 4.50$ . This means any additional cost of Rp. 1.00 can bring in additional net income of Rp. 4.50.

*Connection of Elements of Use of Upsus Technique with Farmer Net Income Level.* The use of upsus technology is an essential element in increasing production efforts. Farm efficiency is highly dependent on the level of use of upsus technology, because upsus technology is an essential factor in increasing productivity per unit farming area (Sutawati, 2014). The relationship of the application of upsus technology with increased production and net income of farmers can be seen in table 3.

Table 1 – The large current of economic opportunity of paddy upsus and non paddy rice farming

| Description           | Upsus Paddy |             | Non Upsus Rice |             |
|-----------------------|-------------|-------------|----------------|-------------|
|                       | Per farmer  | Per hectare | Per farmer     | Per hectare |
| Production (tonnes)   | 4,52        | 5,86        | 3,63           | 4,14        |
| Reception (Rp)        | 174.176.000 | 22.268.000  | 13.794.000     | 15.732.000  |
| Production Costs (Rp) | 7.583.500   | 8.875.000   | 6.472.200      | 7.685.750   |
| Net Income (Rp)       | 9.592.500   | 13.393.000  | 7.321.800      | 8.046.250   |
| $R / C$               | 2,265       | 2,509       | 2,131          | 1,955       |

Table 2 – The amount of the benefit-cost ratio upsus use of technology in paddy rice farming

| Description                 | U PSUs Rice | Non Upsus Paddy | Additional results |
|-----------------------------|-------------|-----------------|--------------------|
| Production (ton / ha)       | 5.86        | 4.14            | 1, 7 2             |
| Receipts (Rp / ha)          | 22.268.000  | 15.732.000      | 6,536,000          |
| Production cost (Rp / ha)   | 8. 875,000  | 7,685,750       | 1.189.250          |
| Opinion of a n bersiah (Rp) | 13,393,000  | 8,046,250       | 5.346.750          |
| BC ratio ( $B / C$ )        | -           | -               | 4,496              |

Table 3 – Relationship of the application of upsus technology with the level of production and net income of farmers from rice farming

| Intensification Score | Average production (Ton/Ha) | Total Cost (Rp / Ha) | Revenue (USD / ha) | Income (Rp / Ha) |
|-----------------------|-----------------------------|----------------------|--------------------|------------------|
| 450 - <480            | 3.95                        | 7,850,600            | 15,010,000         | 7159400          |
| 480 - <540            | 4.82                        | 7,985,750            | 18,316,000         | 10,330,250       |
| 510 - <540            | 5.42                        | 8,382,255            | 20,596,000         | 12,213,745       |
| 540 - <570            | 6.04                        | 8,485,240            | 22952,000          | 14,466,760       |
| 570 - <600            | 6.68                        | 11,530,450           | 25,384,000         | 13,853,550       |
| 600 - <630            | 7.43                        | 13,970,060           | 28,234,000         | 14,263,940       |

From table 3 it can be seen that the higher the score of upsus technology use, the greater the production rate and net income. At a score of 450-480 the production rate is only up to 3.95 ton / ha with net income of Rp 15,010,000, and at the highest score of 600-630 gives production rate of 7.43 ton / ha with net income of Rp. 14.263.940, -.

The magnitude of correlation coefficient elements of upsus technology with production and net income is analyzed by using spearman correlation coefficient. The analysis results can be seen Table 4.

Table 4 – The correlation coefficient upsus technology elements with production and net income

| Elements of Technology   | Production | Sig    | Income | Sig    |
|--------------------------|------------|--------|--------|--------|
| Superior Variety         | 0.7521     | 0.0000 | 0.7162 | 0.0000 |
| Quality Seed             | 0.6343     | 0.0034 | 0.5966 | 0.0031 |
| Soil Processing          | 0.5247     | 0.0043 | 0.4935 | 0.0035 |
| Seedlings                | 0.4231     | 0.1426 | 0.4136 | 0.1126 |
| Seeds                    | 0.4635     | 0.0935 | 0.4035 | 0.0835 |
| Planting                 | 0.5674     | 0.0042 | 0.5243 | 0.0036 |
| Fertilization            | 0.7182     | 0.0000 | 0.6980 | 0.0000 |
| Irrigation               | 0.6247     | 0.0031 | 0.5672 | 0.0042 |
| Pest and Disease Control | 0.4215     | 0.1396 | 0.3943 | 0.1256 |
| Weed Control             | 0.3542     | 0.2435 | 0.2247 | 0.2334 |
| Harvest and Post harvest | 0.4033     | 0.1573 | 0.3962 | 0.1450 |

From the amount of correlation coefficient can be seen that elements of upsus technology elements are positively associated with the production and net income of farmers. Superior varieties, quality seeds, soil cultivation, planting, fertilizing, and irrigation are positively related to production and net income of farming ( $\text{sig} < \alpha = 0.01$ ). While the elements of upsus technology, nursery, pest and disease control, weed control, harvest and post harvest are positively related to production and income but not significantly different ( $\text{sig} > \alpha = 0,05$ ). This means that all application of upsus technology elements is positively with production and net income of farmers. In other words the better elements of upsus technology applied to rice farming, the more positive and real impact on production and net income. This is in accordance with opinion (Sumaryanto, Wahida, and M. Siregar 2003) stating that the higher the score value of the intensification application, the production of widespread unity of rice farming will increase.

## CONCLUSION

The use of upsus technology is essentially aimed at increasing production and income by increasing production and productivity of wetland rice farming. The rate of use of upsus technology by farmers is still categorized as low to moderate. This is what results in significant differences in production and income levels before and after using upsus technology. If the higher the value of the application of upsus technology then the average level of production and net income of unity will also increase, with the correlation coefficient increasingly positive and significantly different.

To realize the real efficiency improvement of farming, it is necessary to:  
 (1) implementation and improvement of upsus implementation program at the farm level,  
 (2) improvement of infrastructure and upsus program at farmer level.

## REFERENCES

1. Djarwanto, P.S. 2006. Statistik Non Parametrik. Penerbit Liberty. Yogyakarta.
2. Soekartawi. 2005. Prinsip Dasar Ekonomi Pertanian. Penerbit Raja Grafindo Persada.
3. Sumaryanto, Wahida dan M. Siregar. 2003. Determinan Efisiensi Teknis Usahatani Padi di Lahan Sawah Agro Journal Ekonomi; 21 (1):71-96.
4. Suratiyah Ken. 2014. Ilmu Usahatani. Penerbit Penebar Swadaya. Jakarta.
5. Sutawati, Fathimah. 2014. Analisis Efisiensi Teknis dan Alokatif Usahatani Padi Sawah di Kabupaten Sambas, Kalimantan Barat ; Pendekatan Stochastic Frontier.
6. Tuwo, M. Akib. 2011. Ilmu Usahatani, Teori dan Aplikasi Menuju Sukses. Kendari.
7. Wijaya, I Gede M. A Sudewa, 2016. Efektivitas Alokasi Input Usahatani Padi dalam Program Upsus Pajale, Kabupaten Tabanan, Bali. Universitas Udayana, Denpasar.

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**ФЕРМЕНТАТИВНАЯ АКТИВНОСТЬ И РЕЗИСТЕНТНОСТЬ СЕМЕННОГО МАТЕРИАЛА TRITICUM AESTIVUM ПОД ВЛИЯНИЕМ БИОСТИМУЛЯТОРОВ РОСТА**  
**ENZYMATIC ACTIVITY AND RESISTANCE OF TRITICUM AESTIVUM SEED MATERIAL UNDER THE INFLUENCE OF GROWTH BIOSTIMULATORS**

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**АННОТАЦИЯ**

Исследованиями установлено, что изменение ферментативной активности под действием биостимуляторов роста на начальных стадиях развития повышает иммунитет растений озимой пшеницы. Наибольшая устойчивость проростков озимой пшеницы «Московская 56» к поражению грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* была отмечена на вариантах Альбит – 96,7%, Вымпел – 96%, Лариксин – 95,7% на фоне фунгицида, что на 48,7; 48,0; 47,7% по сравнению с контролем. У озимой пшеницы «Бирюза» наибольший эффект отмечен при применении Альбита и Лариксина на фоне фунгицида – 96 и 96% соответственно, что на 45% выше контроля.

**ABSTRACT**

Studies have established that the change in enzymatic activity under the action of growth biostimulators at the initial stages of development increases the immunity of plants of winter wheat. The greatest resistance of winter wheat "Moscovskaya 56" to the fungus of the genus *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* was noted in variants of Albit - 96.7%, Vympel - 96%, Larixin - 95.7% along with fungicide, which is 48.7; 48.0; 47.7% compared to the control. Winter wheat "Biryuza" has the greatest effect when using Albit and Larixin against fungicide - 96 and 96% respectively, which is 45% higher than the control.

**КЛЮЧЕВЫЕ СЛОВА**

Озимая пшеница, биостимуляторы роста, ферменты, резистентность, активность, продуктивность.

**KEY WORDS**

Winter wheat, growth stimulators, ferments, resistance, activity, productivity.

Изучение ростовых процессов, происходящих в растениях и механизмов их регуляции является одной из актуальнейших проблем современной физиологии растений. Биохимические процессы, протекающие в клетках живых организмов, в том числе и зерне, регулируются различными ферментами, о которых И.П. Павлов сказал: «Все эти вещества играют огромную роль, они обуславливают собою те процессы, благодаря которым проявляется жизнь, они и есть в полном смысле возбудители жизни. Ферменты есть, так сказать, первый акт жизненной деятельности» [1-4].

Один из факторов нарушения физиологических процессов растений является интенсивная генерация активных форм кислорода (АФК). Известно, что генерация АФК начинается при прорастании семян, и защита от них осуществляется за счет высокоактивных антиоксидантных систем в составе низко- и высокомолекулярных соединений [5]. В комплекс высокомолекулярной антиоксидантной системы защиты входят следующие ферменты: супероксиддисмутаза (СОД), пероксидаза, каталаза и др. Поэтому целью наших исследований было изучение ферментативной активности и

резистентность семенного материала *Triticum aestivum* под влиянием различных биостимуляторов роста.

## МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ

Лабораторные исследования проводились на кафедре земледелия, агрохимии и агропочвоведения, а также кафедре - биотехнологии ФГБОУ ВО Орловский ГАУ.

Объектами исследования служили сорта озимой пшеницы: Московская 56 (эритроспермум) и Бирюза (лютесценс), районированных по 5 региону.

Биохимический механизм действия стимуляторов роста на начальных стадиях развития озимой пшеницы изучался в лабораторном опыте [6]. Определение активности пероксидазы проводили по методике Ермакова А.И. и др. [7]. Определение активности супероксиддисмутазы сделано по методике Полесской О.Г. и др. [8]. Определение зараженности возбудителями болезней выполнены в соответствии с ГОСТ 12038-84 [6].

Предпосевную обработку семян проводили следующими препаратами: Альбит-40 мл/т, Новосил 50 мл/т, Росток – 0,5л/т, Вымпел – 0,5 л/т, Аквамикс – 100 г/т, Лариксин - 0,5л/т, Кинто – Дуо – 2л/т. Контроль обрабатывался соответствующим объемом чистой воды. Действие выше перечисленных препаратов изучалось на чистых семенах, и обработанных фунгицидом. Опыт проводился в 3-х кратной повторности.

## РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ

В результате наших исследований было установлено, что применение биостимуляторов роста растений оказывает различное действие на активность СОД. При обработке семян озимой пшеницы Альбитом активность СОД на третий день проведения опыта увеличилась до 459,5 условных единиц (у.е.), что на 98 % выше контроля – 232 у.е. Действие Альбита сохранилось на всем протяжении лабораторного опыта. Необходимо отметить, что стимулирующий эффект к концу эксперимента (10 сутки) постепенно снижается. Так на пятый день исследований активность СОД была на 87,5 у.е. или 16,6 % выше контроля – 526,5 у.е., а на десятый день на 234 у.е. или 25 % выше контроля – 924,5 у.е. (рис. 1).

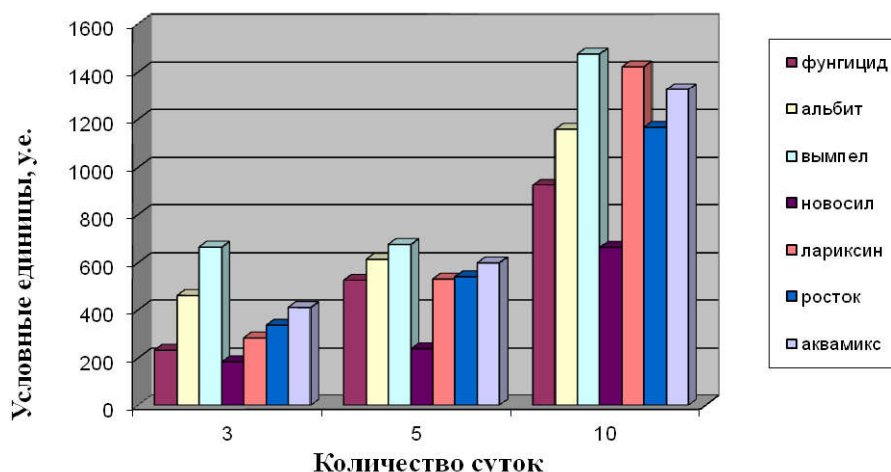


Рисунок 1 – Активность супероксиддисмутазы под действием биостимуляторов роста

Применение Вымпела обеспечило максимальное повышение активности СОД на всем протяжении лабораторного опыта. На третий день она составила 664,5 у.е., что на 432,5 у.е. выше контроля. На пятый день активность СОД была на 149 у.е. выше по сравнению с контролем, а на десятый день на 550 у.е.

Обработка семян озимой пшеницы Новосилом оказала отрицательное действие на активность СОД. На третий день эксперимента она составила 184 у.е., что на 48 у.е. ниже контроля. На пятый день активность СОД составила 238,5 у.е., что на 54,7 % меньше контроля, на десятый день – 663,5 у.е., что на 28,3 % меньше контроля.

Лариксин оказал положительное влияние на активность СОД. Так на третий день проведения исследований она была выше контроля на 51 у.е., на пятый день – на 5,5 у.е. На 10 день исследований отмечена наибольшее положительное влияние Лариксина, активность СОД составила – 1421 у.е., что выше контроля на 496,5 у.е.

Применение Ростка оказало положительное влияние на активность СОД. На третий день она составила 336 у.е., что 44,8% выше контроля – 232 у.е. На пятый день исследований активность СОД была на 15,5 у.е. выше контроля – 526,5 у.е., а на десятый день на 242 у.е. выше контроля – 924,5 у.е.

Активность СОД при обработке Аквамиксом возрастает. Так на третий день проведения исследований она была выше контроля на 178 у.е., на пятый день – на 72,5 у.е. На 10 день исследований отмечено наибольшее положительное влияние, активность СОД составила – 1325 у.е., что выше контроля на 400,5 у.е.

Воздействие изучаемых биостимуляторов роста растений оказало различное влияние на активность СОД. Наибольшее положительное влияние отмечено при применении Вымпела, Альбита, Лариксина, Аквамикса, несколько меньше при применении Ростка. А обработка Новосилом не эффективна по сравнению с остальными биопрепаратами и контролем. Обработка Вымпелом и Аквамиксом обеспечивает одинаковое положительное влияние на протяжении всего опыта.

Нашими исследованиями было установлено различное действие биостимуляторов роста растений на активность пероксидазы. При обработке Альбитом активность пероксидазы на третий день исследований увеличилась на 19 у.е. по сравнению с контролем – 178 у.е. На пятый день она составила 474 у.е., что на 19 у.е. выше контроля – 455 у.е., а на десятый день – 1060 у.е., что на 6 у.е. выше контроля – 1054 у.е. (рис. 2).

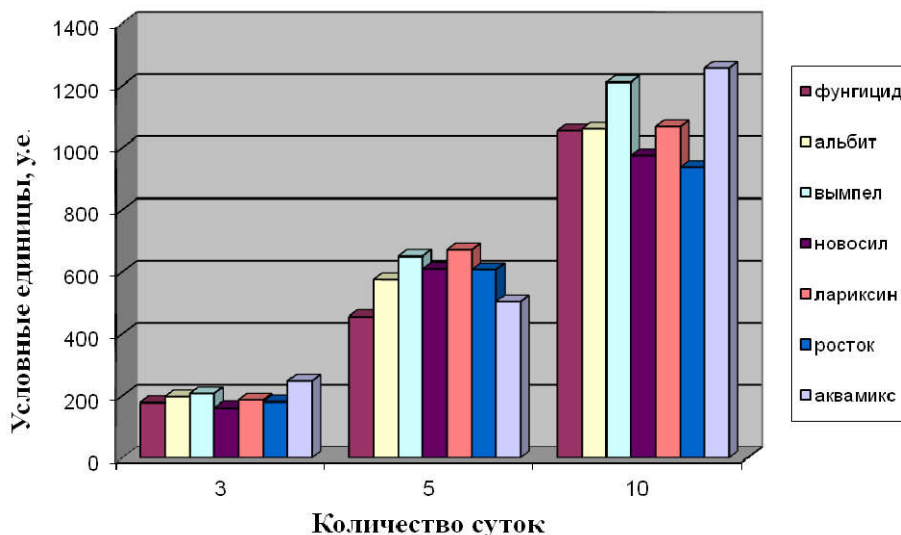


Рисунок 2 – Активность пероксидазы под действием биостимуляторов роста

Применение Вымпела также обеспечило повышение активности пероксидазы, но на более высоком уровне. На третий день она составила 207 у.е., что на 29 у.е. выше контроля, на пятый день – 649, что на 194 у.е. выше по сравнению с контролем, а на десятый день на 156 у.е. выше контроля.

Обработка семян озимой пшеницы Новосилом также, как и на активность СОД, на активность пероксидазы оказала негативное влияние. На третий день исследований она составила 161 у.е., что ниже контроля на 17 у.е., на десятый день – 974 у.е., что

меньше контроля на 80 у.е. Однако на пятый день исследований отмечено положительное влияние – 609 у.е., что выше контроля на 154 у.е.

Лариксин оказал положительное влияние на активность пероксидазы. Так на третий день проведения опыта она была выше контроля на 8 у.е., на пятый день – на 215 у.е. выше контроля, на 10 день на 13,5 у.е. выше контроля.

Применение Ростка оказало положительное влияние на активность пероксидазы. На третий день она составила 180,5 у.е., что на 2,5 у.е. выше контроля, на пятый день – 607 у.е., что на 152 у.е. выше контроля. На десятый день исследований положительное влияние Ростка сменилось на негативное, так активность пероксидазы составила 935 у.е., что на 119 у.е. ниже контроля.

Активность пероксидазы при обработке Аквамиксом возрастает. Так на третий день проведения исследований она была выше контроля на 71 у.е., на пятый день – на 48,5 у.е. На 10 день исследований отмечено наибольшее положительное влияние, активность пероксидазы составила – 1256 у.е., что выше контроля на 202 у.е.

В целом можно отметить, что по эффективности влияния на активность пероксидазы биостимуляторы роста располагаются в следующем порядке: Вымпел, Лариксин, Аквамикс, Альбит. Обработка Новосилом и Ростком менее эффективна по сравнению с остальными биопрепаратами и контролем. Вымпел и Аквамикс обеспечивают более устойчивое положительное влияние в течение всего опыта.

Изменение ферментативной активности под действием биостимуляторов роста повлияло и на устойчивость проростков озимой пшеницы к болезням на ранних стадиях вегетации.

При обработке семян озимой пшеницы «Московская 56» биостимуляторами роста в чистом виде отмечено существенное влияние на устойчивость проростков: Наибольшая эффективность установлена при применении Альбита – 72,7%, Вымпела – 64,7% и Лариксина – 60%, что на 24,7, 16,7 и 12,0% соответственно выше контроля – 48%. Обработка фунгицидом, также повышает устойчивость к заболеваниям на 41% по сравнению с контролем (рис. 1).

Наибольшая устойчивость проростков озимой пшеницы «Московская 56» к поражению грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* была отмечена на вариантах Альбит – 96,7%, Вымпел – 96%, Лариксин – 95,7% на фоне фунгицида, что на 48,7%, 48%, 47,7% по сравнению с контролем. Обработка семян озимой пшеницы «Московская 56» Новосилом, Аквамиксом как в чистом виде, так и на фоне фунгицида также обеспечивает существенное влияние на устойчивость к поражению грибными заболеваниями на ранних стадиях развития, но на более низком уровне, чем выше указанные биопрепараты.

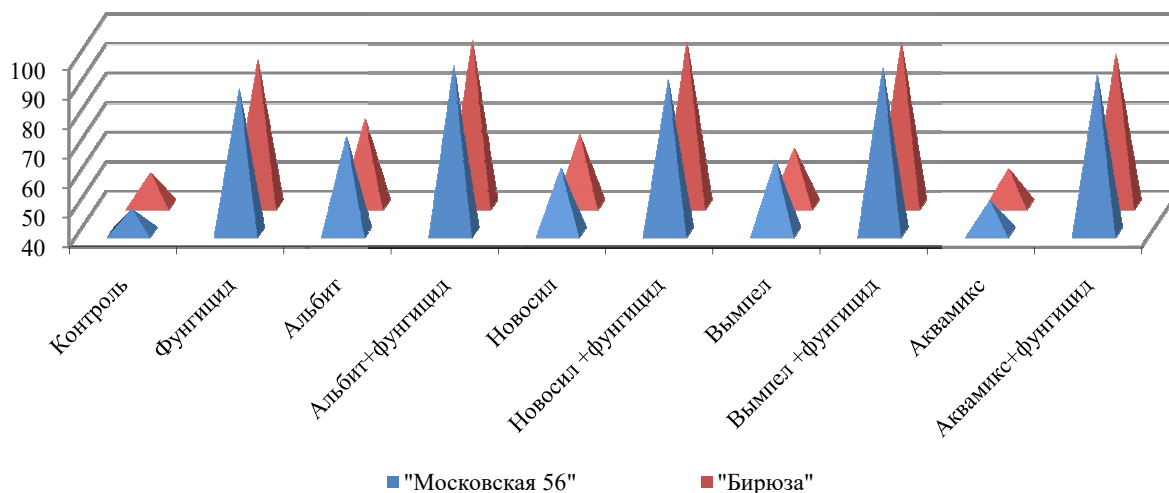


Рисунок 1 – Устойчивость проростков озимой пшеницы к грибам рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* под действием биостимуляторов роста на фоне фунгицида



При обработке семян озимой пшеницы «Бирюза» биостимуляторами роста сохраняется та же тенденция на устойчивость проростков к поражению грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* (рис. 1).

Наибольшее поражение грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* было при применении Ростка в чистом виде (рис. 1, 2) – 50%, что на 2% ниже контроля. Это свидетельствует о том, что данный биопрепарат не обладает фунгицидным действием.

Предпосевная обработка биостимуляторами роста повышает устойчивость растений озимой пшеницы «Бирюза» на ранних стадиях развития к болезням, так при применении Альбита – 69,3%, Новосила – 64%, Лариксина – 63,3%, что на 18,3, 13 и 12,3% соответственно выше контроля – 51% (рис. 1).

Обработка семян озимой пшеницы «Бирюза» фунгицидом оказывает стимулирующий эффект на устойчивость проростков к поражению грибными заболеваниями, и составила 89,3%, что выше контроля на 38,3%. Наибольший эффект отмечен при применении Альбита и Лариксина на фоне фунгицида – 96 и 96% соответственно, что на 45% выше контроля.

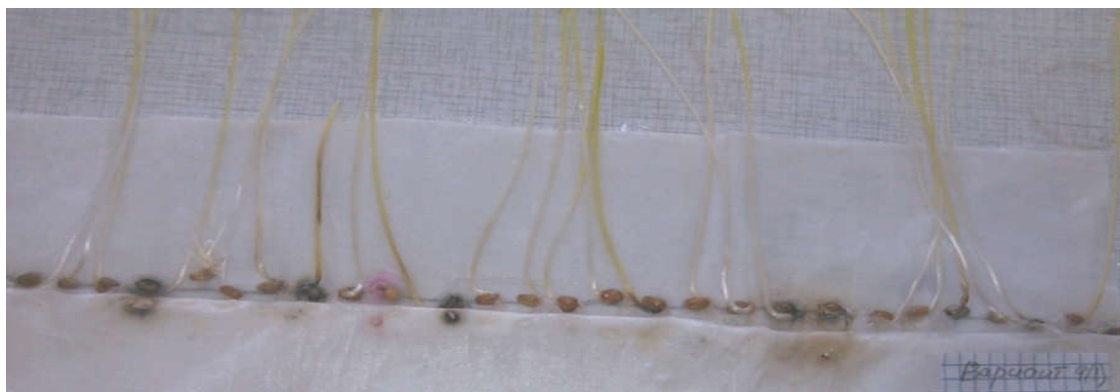


Рисунок 2 – Поражение грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* при обработке семян озимой пшеницы «Московская 56» Ростком, 10-ый день исследований (фото авторов)

Обработка семян озимой пшеницы Вымпелом и Новосилом, как в чистом виде, так и на фоне фунгицида также обеспечивает существенное повышение устойчивости проростков к поражению грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria*. Применение Ростка, Аквамикса повышает устойчивость проростков, но на более низком уровне, а при использовании их на фоне фунгицида защитное действие усиливается.

Полученные в наших исследованиях данные свидетельствуют о том, что применение биостимуляторов роста повышает иммунитет растений озимой пшеницы на ранних стадиях развития. Нами установлено, что все изучаемые биопрепараты повышают устойчивость к поражению грибами рода *Fusarium*, *Aspergillus*, *Penicillium*, *Alternaria* растений озимой пшеницы «Московская 56» и «Бирюза» как в чистом виде, так и на фоне фунгицида. Применение фунгицида усиливает защитное действие изучаемых препаратов. Аналогичные данные были получены Пигоревым И. Я. [9].

Несмотря на общую тенденцию повышения устойчивости проростков озимой пшеницы «Московская 56» и «Бирюза» под действием биостимуляторов роста растений, «Московская 56» все же проявляет наименьшую эффективность при воздействии данных биопрепаратов. Полученные в наших исследованиях данные необходимо учитывать при предпосевной обработке семян озимой пшеницы.

Таким образом, была установлена положительная тенденция увеличения активности СОД и пероксидазы под влиянием биостимуляторов роста, а также различное их пролонгирующее действие на резистентность к болезням, что необходимо учитывать, как технологический фактор при выборе биопрепаратов и построении технологии возделывания культуры.

## БИБЛИОГРАФИЯ

1. Павлов И. П. Полное собрание сочинений / АН СССР. - Изд. 2-е, доп. - М.: Изд-во АН СССР. 1951 – 1954. С. 274-372.
2. Кириличенко Е.В. Физиологические показатели развития и продуктивность растений яровой пшеницы при предпосевной обработке семян лектином и лектин – бактериальной композицией // Сельскохозяйственная биология №1, 2012. С. 98-104.
3. Каташов Д.А., Хрянин В.Н. Влияние фитогормонов и селената натрия на содержание пигментов и продуктивность растений рапса сорта «Ратник» (*Brassica Napus*) // Известия высших учебных заведений. Поволжский регион. Естественные науки, 2014 №1 (5). С. 25-35.
4. Душкин С.А., Лукьянцев В.С., Глинушкин А.П., Соловых А.А., Белошапкина А.А., Машенков М.И., Зоров А.А. Влияние химических и биологических препаратов на всхожесть семян и выживаемость *Triticum Aestivum* L// Вестник ОрелГАУ №6, 2012. С.- 30-34.
5. Якушкина Н.И. Физиология растений/ Н.И. Якушкина, Е.Ю. Бахтенко// М. - ООО «Гуманитарный издательский центр Владос.» 2004. С. 410-412.
6. ГОСТ 12038-84. Семена сельскохозяйственных культур. Методы определения всхожести.– Введ. 1986-07-01. М.: Изд-во стандартов. 2002, 3 с.
7. Ермаков А.И., Арасимович В.В., Ярош Н.П., Перуанский Ю.В., Луковинкова Г.А., Иконникова М.И. Методы биохимического исследования растений // Л.: Агропромиздат. 1987. С. 41-45.
8. Полесская О.Г., Каширина Е.И., Алехина И.Д. Изменение активности антиоксидантных ферментов в листьях и корнях пшеницы в зависимости от формы и дозы азота в среде// Физиология растений. 2004. Т. 51. С. 686-691.
9. Пигорев И.Я., Тарасов С.А. Влияние биопрепаратов на распространенность листостебельных заболеваний озимой пшеницы // Вестник Курской государственной сельскохозяйственной академии. – 2015. - №4 – С. 42-45.

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## IMPROVING QUALITY AND QUANTITY OF ONIONS YIELDS IN MOUNT MERAPI ERUPTION SOIL WITH VARIOUS SOURCES OF POTASSIUM AND SULFUR

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### ABSTRACT

This research was conducted on post-eruption land area near Mount Merapi in Central Java Indonesia with the addition of goat manure of 30 tons/ha using factorial experiment prepared in Randomized Block Design (RAKL), with two treatment factors, and the treatment was repeated three times. The first factor was the source of potassium: no potassium, KCl, KNO<sub>3</sub>. Second factor source was Sulfur: without sulfur, ZA, Petro-Cas. The data were analyzed by variance, if there is real difference followed by LSD test 1%. The results show that (1) Fertilization of KNO<sub>3</sub> and ZA(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> in onion plants shows the highest yield on fresh weight of onion tubers per clump and per square meter; (2) Fertilization of KNO<sub>3</sub> without the addition of sulfur to obtain dry weight of the lowest weight of onion tubers per clump and per square meter; (3) Fertilization of KCl and ZA (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> on onion plant causes the highest water content on dried onion tubers; and (4) Fertilization of KCl and Petro-Cas (CaSO<sub>4</sub>) 2H<sub>2</sub>O on onion plants yields the highest number of essential oil.

### KEY WORDS

Onions, sulfur, potassium, yield, soil.

Production of food crops and horticulture is a primary need for the Indonesian society so that this is necessary to strived in order to meet domestic production. The conversion of agricultural land into non-agricultural land, however, obviously reduces the planting area in Indonesia. Despite the Spatial Plan (RPLW) or a Regional Regulation occur in managing land use, including the land conversion, the decrease of planting area cannot be avoided due to vast national development. Therefore, one of possible effort is to improve the quality of existing agricultural land with a variety of engineering in order to produce food with a better quality and quantity, as well as with high economic value.

This study focuses on land near Sawangan sub-district, Central Java, affected by eruption of Mount Merapi in 2010. Most of the land has been reforested with various food crops and horticulture, but the production of food crops and horticulture grown by farmers has not been able to prosper their life; the more land are leased to seed entrepreneurs and farmers from outside the region. In order for the landowners to work on their land, special strategies are needed to obtain methods that can increase food production and selection of crops. Onion (*Allium cepa* L.) is one type of commodity that has significance for the community, both seen from the economic value and nutritional content.

### METHODS OF RESEARCH

The research was conducted in post-eruption land near Mount Merapi in Central Java with the addition of goat manure 30 tons/ha using factorial experiment prepared in Randomized Completely Randomized Block Design (RAKL) with two treatment factors, and the treatment was repeated three times. The factors were:

Factor 1: Potassium (K) source:

- K0: without potassium
- K1: KCl
- K2: KNO<sub>3</sub>

Factor 2: Sulfur (S) source:

- S0: without sulfur

- S1: ZA (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>
- S2: Petro-Cas (CaSO<sub>4</sub>)<sub>2</sub>H<sub>2</sub>O

Of the factors above, it was obtained nine combinations of treatments, each of which was repeated three times with the following scenario:

$$Y_{ijk} = U + A_k + B_i + T_j + E_{ijk}$$

Where:

$Y_{ijk}$ : observation score on the treatment number  $i$  and  $j$  and group to  $k$ ;

$U$ : general median;

$A_k$ : the influence of treatment number  $k$ ;

$B_i$ : the influence of treatment number  $i$ ;

$T_j$ : the influence of treatment number  $j$ ;

$E_{ijk}$ : trial error on the treatments of  $i$ ,  $j$ , and group number  $k$ ;

The data obtained were analyzed by using variance, and the treatment was continued to LSD if the significance level is 1%.

## RESULTS AND DISCUSSION

Table 1 shows that the results of analysis of fertilization treatments from various sources of potassium and sulfur which do not show the difference on the parameters of both fresh weight and dry weight of tubers per square meter, fresh weight and dry weight per square meter, the essential oil content. On the other hand, the parameter of water content of dry onion tubers is very distinct on the block.

Table 1 – Analysis results of observation on onion plants

| Observation parameters                               | Block                | Treatments           |
|--|----------------------|----------------------|
| 1 Fresh weight of tuber per clump                    | 1.1550 <sup>ns</sup> | 0.4690 <sup>ns</sup> |
| 2 Dry weight of stored onion tubers per clump        | 1.3060 <sup>ns</sup> | 0.7210 <sup>ns</sup> |
| 3 Fresh weight of tubers per square meter            | 1.7898 <sup>ns</sup> | 0.8112 <sup>ns</sup> |
| 4 Dry weight of stored onion tubers per square meter | 2.3900 <sup>ns</sup> | 1.1180 <sup>ns</sup> |
| 5 Water content of dried tubers                      | 4.0554 <sup>**</sup> | 1.5612 <sup>ns</sup> |
| 6 Essential oil content of onions                    | 1.411 <sup>ns</sup>  | 1.118 <sup>ns</sup>  |

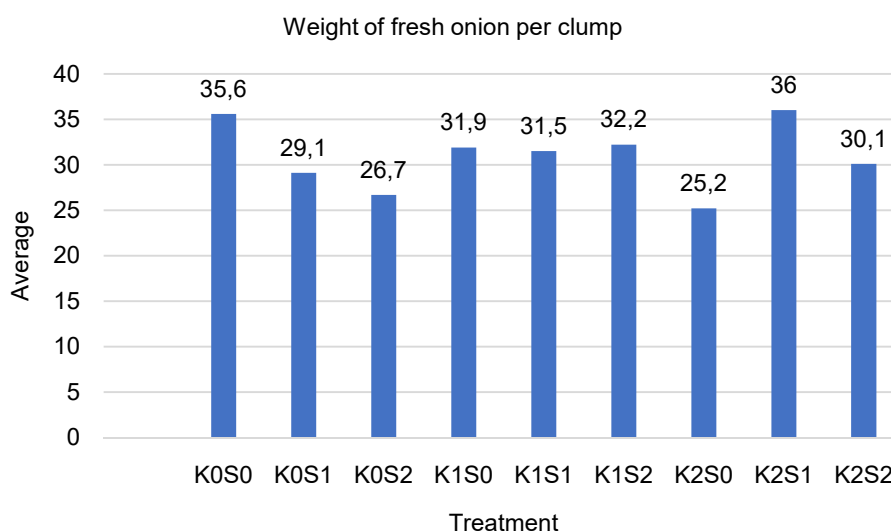


Figure 1 – Diagram of average weight of fresh onion tubers per clump

In Figure 1, the average weight of fresh onion tubers per clump on the treatment with K<sub>2</sub>S<sub>1</sub> (the addition of KNO<sub>3</sub> and ZA (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>) shows the highest yield, i.e. 36 grams.

Similarly in Figure 2, the diagram of weight of fresh onion tubers per square meter, weighing 1,044.5 grams.

The high weight of fresh onion tubers on the  $K_2S_1$  treatment is caused the nitrogen uptake in the form of nitrate ( $NO_3$ ) and ammonium ( $NH_4$ ) from the treatment. Nitrate is the most preferred substance for most plant's growth. The ammonium uptake occurs best on neutral medium and decreases as the decreasing pH. On the other hand, nitrate uptake is faster at lower pH, and the higher uptake occurs if both N forms are in soil solution. The changes of nitrate into N form are reduced after being inside the plant tissue and require energy, and the energy conservation occurs during the absorption process of N as ammonium which is used in metabolic processes, including for ion absorption and plant growth, increasing the weight of fresh onion tubers either per clump or per square meter.

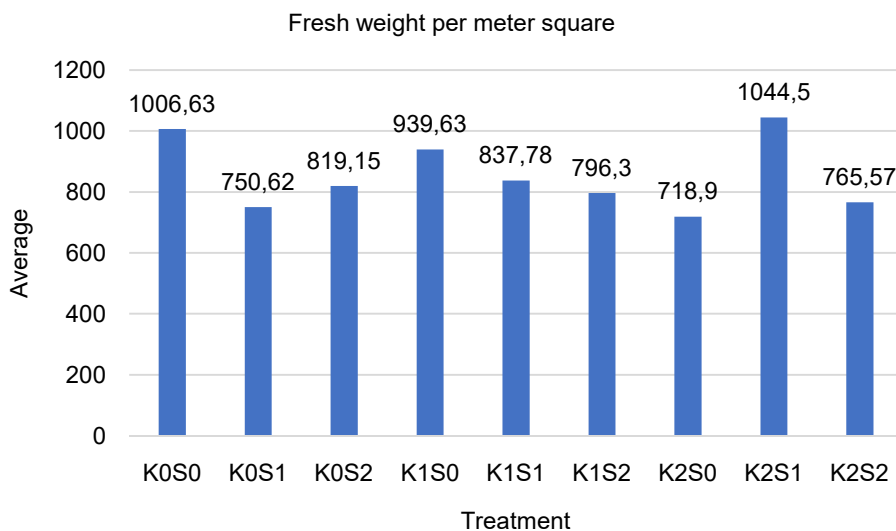


Figure 2 – Diagram of the average weight of fresh onion square meter

The sufficiency of potassium in plants will facilitate photosynthesis since the potassium in the plant body has some functions, namely: a) as an activator of some enzymes, b) related to the regulation of water and energy, c) playing a role in protein and starch synthesis, and d) *photosynthate* removal. *Photosynthate* as a result of photosynthesis will be transported from the leaf to the places where it is needed, either for the use or storage. The potassium element is essential in photosynthesis process as it is involved in the synthesis of ATP, the production in the activity of photosynthetic enzymes, the absorption of  $CO_2$  through the mouth of the leaves and maintaining the electrical balance during photophosphorylation in chloroplasts, besides potassium is also involved in transporting photosynthesis results from leaves through phloem to tissues of reproduction and storage organs (fruit, seeds, and tubers). In fruit and vegetable crops (oranges, bananas, tomatoes, potatoes, and onions), potassium supply can improve the size, color, taste and fruit skin, which is important for storage and transport, this also causes the addition of potassium from fertilization of  $KNO_3$  can increase fresh weight of onion tubers.

Plants with high sulfur content are *legume* and *Lilaceae* (including onions). Sulfur is an important constituent of all proteins, some plant hormones, vitamins and enzymes, oil-mustard glycosides and glutathione and essential for the formation of chlorophyll, so that the addition of sulfur can activate the process of photosynthesis, which in turn will increase the weight of onions either per clump or per square meter.

Figures 3 and 4 show that the treatments with  $K_2S_0$  (with the addition of  $KNO_3$  without the addition of sulfur) obtained the lowest stored weight of dry onions, namely 16.375 grams per clump and 452.17 grams per square meter.

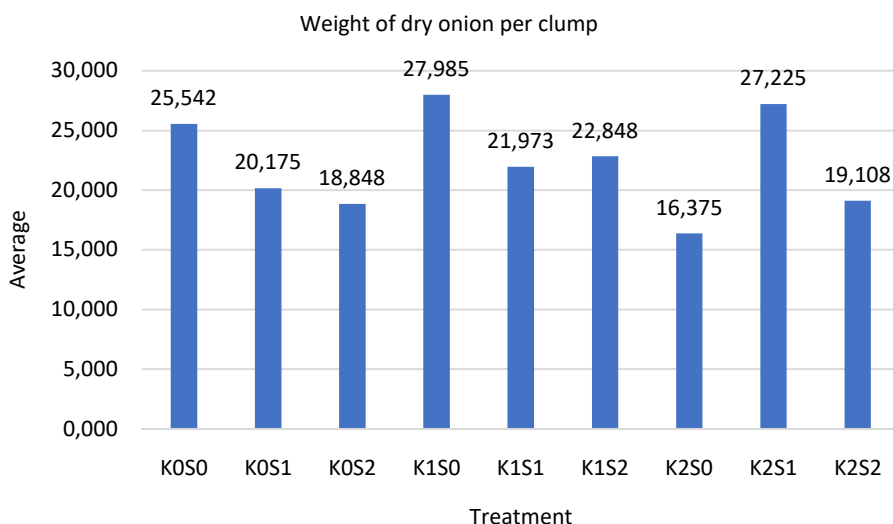


Figure 3 – Diagram of the average of stored weight of dry onions per clump

Potassium heightens the movement of *photosynthate* out of the leaves to the roots, and it will increase the provision of energy for the root growth and the development of fruits in terms of size and quality. In addition, the provision of potassium in large number increases the amount of stomata per unit of leaf area. In short, the increased supply of potassium supported with the favorable moisture conditions will increase the opening of stomata, thus affecting photosynthesis which will ultimately boost adequate results.

Plants require sulfur as much as phosphate elements, about 0.1% to 0.5% distributed to all parts of the plant. High sulfur content can be found in plants that produce mustard oil with distinctive odors and flavors in plant species of the *Cruciferae* family, such as cabbage, cabbage and *Lilaceae* family plants, such as onions, garlic, and asparagus. Typical flavors and odors in both plant families are due to the presence of volatile S compounds. Even though the compound is not the constituent, S also affects the formation of chlorophyll and the synthesis of carbohydrates, so the S deficiency influences the color of the leaves (turning into yellow color) and the dry weight of the onions becomes lower.

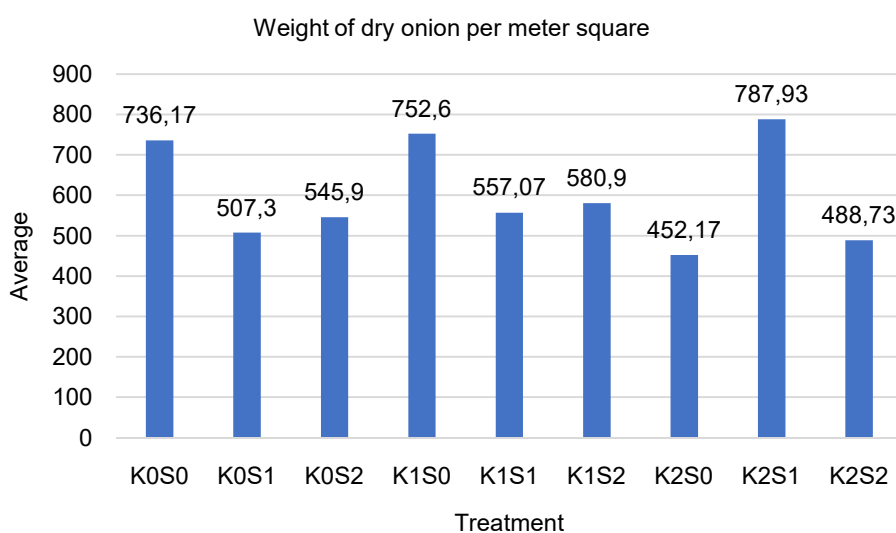


Figure 4 – Diagram of the average weight of dry onions per square meter

Figure 5 shows that treatment with  $K_1S_1$  (with the addition of KCl and ZA  $(NH_4)_2SO_4$ ) affects the stored weight of dry onion tubers containing the highest water content of 90.51%.

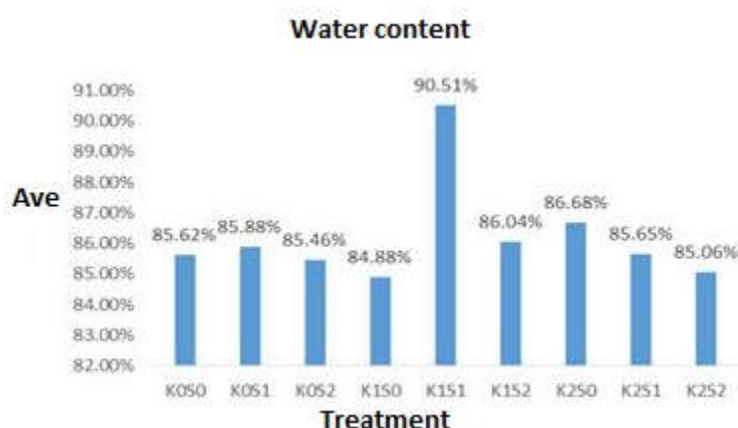


Figure 5 – Diagram of water content in the stored dry onion tubers (%)

Fertilization of N in the form of nitrate causes the absorption of Cl decreased since both are negative, while fertilization of N in the form of ammonium causes Cl uptake increasing. *Chlor* acts as a plant nutrient,  $Cl^-$  ion has a role of protoplasm bubbling and increasing cell permeability. The role of cell turgor is almost the same as the K ion, which increases the osmotic pressure of the cell. *Chlor* also plays a role in the cell's water system, preventing unbalanced water loss and causing the addition of ammonium from ZA fertilizer plus KCl fertilization which cause an increase of Cl in plants and increase water content in onions.

Figure 6 shows that the treatment with K1S2 (with the addition of KCl and Petro-Cas  $(CaSO_4)_2H_2O$  fertilizer on onion plants) yields the highest essential oil content (which is often called mustard oil) of 13.133%, which means there is an increase of more than 100% of essential oil content of the planted seeds (6.2%).

Loss of sulfur from the soil is partly due to overlapping as sulfate, especially on sandy soil. The land area used for the study is typical sandy soil that allows sulfate removal. Onion plants require considerable sulfur, comparable to phosphate requirements so as to be highly responsive to sulfur fertilization derived from Petro-Cas. This is indicated by the highest increase in essential oil content, and in accordance with the opinion of Havlin et al (2005) who states that the high S content found in plants produces mustard oil with distinctive smells and flavors.

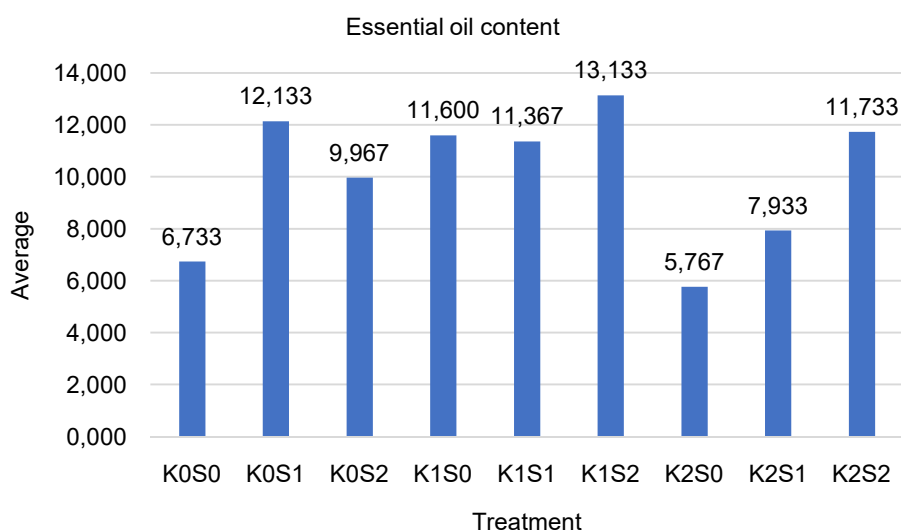


Figure 6 – Diagram of essential oil content in onion tubers (%)

The roles of sulfur in plant growth and metabolism are namely (1) for the synthesis of amino acids containing S, such as *Cystine*, *Cysteine* and *Methonine* and also for protein synthesis, so that S deficiency can lead to inhibition of protein preparation, which is amino acids; (2) activating certain proteolytic enzymes such as *papainase*, *papain*, *bromelin* and *ficin*; (3) being part of certain vitamins, *coenzym A* and glutathione; (4) increasing in-plant oil content such as soybeans; and (5) also available in oils of some plans such as spices and onions (Havlin et al, 2005).

## CONCLUSION

Corroborating the analysis of all relevant parameters, it is concluded that:

By looking at the analysis of all parameters, it is concluded:

Fertilization of  $\text{KNO}_3$  and ZA  $(\text{NH}_4)_2\text{SO}_4$  in onion plants shows the highest yield on fresh weight of onion tubers per clump and per square meter;

Fertilization of  $\text{KNO}_3$  without the addition of sulfur is to obtain the lowest dry weight of onion tubers, both in terms of weight per clump and per square meter;

Fertilization of KCl and ZA  $(\text{NH}_4)_2\text{SO}_4$  on onion plants causes the highest water content on dry weight of stored onion tubers; and

The fertilization of KCl and Petro-Cas  $(\text{CaSO}_4)_2\text{H}_2\text{O}$  on onion plants yields the highest essential oil.

## REFERENCES

1. Anonymous. 2011. Luas Panen, Produksi dan Produktivitas Bawang Merah. <http://www.bps.go.id>. Center of Statistic Agency. Accessed at 7 July 2014.
2. Astiningrum, Murti, Historiawati & Tujiyanta. 2014. Increasing Production Land of Mount Merapi Eruption for the Cultivation of *Apomoea reptans*. Report of Competitive Grant I. Faculty of Agriculture, UNTIDAR, Magelang.
3. Astiningrum, Murti, Historiawati & Tujiyanta. 2015. Increasing Production Land of Mount Merapi Eruption for the Cultivation of *Apomoea reptans*. Report of Competitive Grant II. Faculty of Agriculture, UNTIDAR, Magelang.
4. Astiningrum, Murti, & Historiawati. 2016. Increasing Production Land of Mount Merapi Eruption for the Cultivation of *Apomoea reptans*. Report of Competitive Grant III. Faculty of Agriculture, UNTIDAR, Magelang.
5. Havlin JL, Beaton JD, Nelson WL. 2005. Soil Fertility and Fertilizers. An Introduction to Nutrient Management. New Jersey: Pearson Prentice Hall.
6. Muhlizah, F. & S. Hening-S. 2000. Sayur dan Bumbu Dapur Berkhasiat Obat. Jakarta: Penebar Swadaya.
7. Purwanto, 2010, Pemulihan Lahan di Kawasan Merapi, [www.kr.co.id](http://www.kr.co.id)., Accesed at 27 January 2014.
8. Rajiman. 2009. Pengaruh Pemupukan NPK Terhadap Hasil Bawang Merah di Lahan Pasir Pantai. *Jurnal Ilmu-Ilmu Pertanian*. (5) 1: pp. 52-60.
9. Rubatzky, V. E. & M. Yamaguchi, 1998. Sayuran Dunia 2 Prinsip, Produksi, dan Gizi. ITB, Bandung.
10. Rukmana, Rahmat. 2005. Bawang Merah : Budidaya dan Pengelolaan Pasca Panen. Kanisius. Yogyakarta.
11. Suprpto, Agus, Historiawati & Murti Astiningrum. 2015. Pemanfaatan Mikoriza dan Pupuk Organik terhadap Hasil Bawang Merah (*Allium cepa* fa. *Ascolanicum*) pada Lahan Pasir erupsi Merapi. Laporan Penelitian Hibah Bersaing.
12. Suprpto, Agus & Tujiyanta. 2016. Peningkatan Hasil Bawang Merah (*Allium cepa* fa. *Ascolanicum*, L.) Dengan variasi pupuk organik dan Jarak Tanam Di Lahan Pasir Erupsi Merapi. Laporan Penelitian Hibah Bersaing.
13. Wibowo, S. 2009. Budidaya Bawang Putih, Bawang Merah dan Bawang Bombay.



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**ОЦЕНКА УРОВНЯ ЭКОЛОГИЧЕСКОЙ БЕЗОПАСНОСТИ В АГРАРНОМ СЕКТОРЕ  
ЭКОНОМИКИ**

**ASSESSMENT OF ENVIRONMENTAL SAFETY IN THE AGRICULTURAL SECTOR  
OF THE ECONOMY**

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**АННОТАЦИЯ**

Целью статьи является теоретико-методическое обоснование информационно-аналитической составляющей обеспечения экологической безопасности в аграрном секторе экономики для определения наиболее перспективных способов и методов мотивированного принятия оптимальных управленческих решений в этой сфере. Методологические и теоретические основы работы базируются на системно-структурном и диалектическом методе познания эколого-экономических явлений, комплексном подходе к их анализу, современных наработках отечественных и зарубежных ученых в сфере обеспечения экологической безопасности. В статье обоснованы условия реализации информационно-аналитического фактора обеспечения экологической безопасности в аграрном секторе экономики как системы взаимоотношений, которые содержат процесс формирования информации о влиянии сельскохозяйственных товаропроизводителей на состояние агроэкосистем, распространение этой информации, определение ее роли в реализации экологической политики. Определена необходимость в обеспечении оптимума накопления и использования информационных ресурсов, учитывая современные тенденции развития информационных технологий при формировании и функционировании информационных систем. Предложена система аналитической оценки уровня экологической безопасности в аграрном секторе экономики, которая может быть составляющей экологического паспорта, что так же даст возможность рассмотреть в сочетании и взаимозависимости экологические факторы, определить конкретные причины, которые обусловили полученный результат оценки.

**ABSTRACT**

The aim of the article is theoretical and methodical substantiation of the information-analytical ensuring of environmental safety in the agricultural sector to determine the most promising methods and techniques motivated the adoption of optimal management decisions in this area. Methodological and theoretical foundations of the work are based on a systemic-structural and dialectical method of cognition of the ecological-economic phenomena, an integrated approach to their analysis, modern developments of domestic and foreign

scientists in the field of environmental security. The paper substantiates the conditions of implementation of information-analytical factor of environmental security in agrarian sector of economy as a system of relations that contain the process of the formation of information about the influence of agricultural producers on the status of agroecosystems, the dissemination of this information, determination of its role in the implementation of environmental policy. Identified the need to ensure optimum savings and use of information resources, taking into account modern tendencies of development of information technologies in the formation and operation of information systems. The proposed system analytical assessment of the level of environmental safety in the agricultural sector, which can be a component of the ecological passport, which will enable you to consider in the combination and interdependence of environmental factors to determine specific causes that led to the result of the evaluation.

### **КЛЮЧЕВЫЕ СЛОВА**

Экологическая безопасность, аграрный сектор экономики, информационно-аналитический фактор, аналитическая оценка, экономический рост, эффективность контроля, экологический контроль, механизм управления.

### **KEY WORDS**

Environmental security, agricultural sector, information and analytical factor, analytical estimation, economic growth, efficiency control, environmental control, control mechanism.

Современные условия сельскохозяйственного природопользования обуславливают необходимость изменения стратегии развития аграрного сектора экономики с учетом экологических требований, в связи с чем первоочередной задачей является формирование соответствующего инструментария обеспечения экологической безопасности. В таких условиях аграрный сектор экономики нуждается в такой трансформации системы управления, которая позволила бы реализовать программу экономического роста, повысила экологическую безопасность через создание гибкой системы реагирования на внешние и внутренние угрозы. При этом оперативное и мотивированное решение задач управления экологической безопасностью возможно решать только с помощью успешно действующей системы информационно-аналитического обеспечения.

Проблемами определения роли информационно-аналитического обеспечения в системе экологической безопасности, изучению принципов организации, существующих и перспективных информационных методов, и технологий посвящено много работ, в частности таких ученых, как С.П. Салмин [1], О.Л. Голицына [2], А.С. Астахов [3], Б.Т. Бадагуев [4], Б.В. Буркинский [5], В.Н. Калыгин [6], Н.Н. Агапов [7] и другие. В то же время многоплановость, сложность и недостаточность изучение проблем информационного обеспечения экологической безопасности в аграрном секторе экономики, наличие ряда дискуссионных вопросов в этой сфере требуют дальнейших научных исследований.

Согласно действующего законодательства в области охраны окружающей среды любое предприятие, в частности сельскохозяйственное, находится под контролем Государственной экологической инспекции России.

Представители этой службы могут запретить производственную деятельность сельскохозяйственного предприятия, если оно является крайне экологически опасным объектом. Однако на территории России сеть экспериментальных наблюдений за экологическим состоянием агроэкосистем чрезвычайно неравномерна и не всегда результативная. Оставляет желать лучшего и само качество проведенных измерений.

Действующая система экологического мониторинга, выполняемого как научными учреждениями, так и контролирующими органами, малоэффективна не только по причине низкой технической оснащенности, но и в значительной степени из-за игнорирования современных методов управления данными и комплексной математической обработки результатов многомерных наблюдений [8].

Эффективность экологического контроля обеспечивается комплексным учетом всех аспектов деятельности человека, влияющие на изменение состояния окружающей среды. Среди задач экологического контроля стоит выделить: создание информационной базы с характеристиками качественного и количественного состояния объектов окружающей среды; обеспечение доступа к актуальной информации о его состоянии и контроля за случаями несоблюдения норм, наносящих вред ему или его компонентам; проведение профилактических мероприятий, направленных на минимизацию сверхлимитного экологического ущерба.

Развитие информационных технологий позволяет осуществлять экологический контроль, который является неотъемлемой звеном в системе экологического обеспечения аграрного производства. Общая цель экологического контроля, или контроля качества окружающей среды, может быть определена как обеспечение соблюдения действующих природоохранных и ресурсосберегающих правил, требований и норм на всех этапах аграрного производства, связанного с активным или косвенным изменением состояния окружающей среды [9].

Несовершенство современного информационно-аналитического обеспечения экологической безопасности в агросфере негативно влияет на качество принятия управленческих решений на уровне государства и хозяйствующих субъектов, которые негативно сказываются на эффективности управления и препятствует сбалансированному развитию аграрного сектора экономики. Проблемы разного характера часто переплетаются, поэтому экологические проблемы, как и экономические и социально-демографические, требуют наличия достоверной и актуальной информации для их решения. Для надлежащей обработки и дальнейшего использования такой информации необходимо использовать определенную методику. Это обеспечивает эффективное применение информации во время выполнения управленческих функций и гражданских прав и обязанностей.

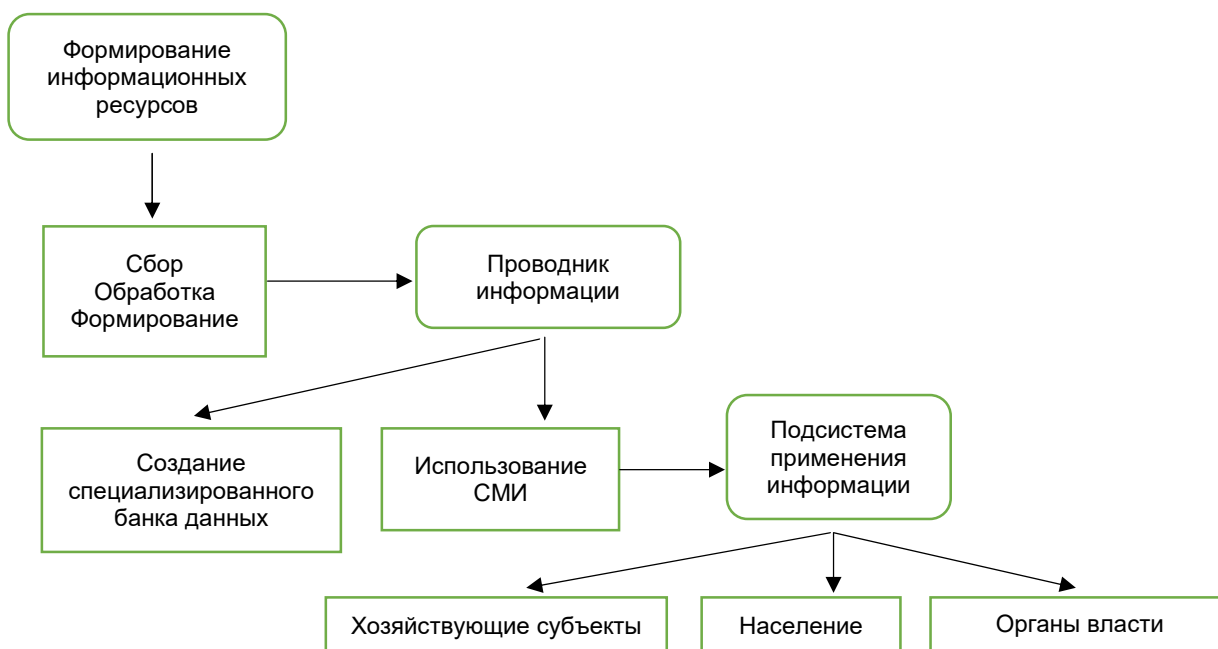


Рисунок 1 – Информационно-аналитический фактор экологической безопасности в аграрном секторе экономики

Итак, основное место при формировании устойчивого механизма управления играет информационно-аналитический фактор обеспечения экологической безопасности. Определение последнего в аграрном секторе экономики трактуется как совокупность взаимоотношений, формирующих информационное поле вокруг деятельности хозяйствующих субъектов, которое охватывает вопросы реализации

экологической политики, распространение информации относительно решения экологических задач и позволяет реализовывать самые перспективные способы и методы минимизации отрицательного воздействия на агроэкосистемы. То есть информационное обеспечение экологической безопасности объединяет три составляющие (рисунок 1).

Первой составляющей системы является подсистема формирования информационных ресурсов, содержащая сбор информации, ее обработки и укладки в формат, удобный для использования заинтересованными лицами.

Выбор способов сбора информации и классификации показателей, которые учитываются при этом, разнообразен. Главным аспектом управления на этой стадии формирования информации должен стать принцип ее актуальности, то есть реального отображения ситуации, доведен до сведения субъекта управления в кратчайший срок. Очевидно, что далеко не все хозяйствующие субъекты готовы добровольно заявлять о своих недостатках в работе, особенно если это связано со штрафными санкциями, административными взысканиями [10]. Таким образом, сбор информации не должно ограничиваться только теми данными, которые будут предоставлять сами субъекты экономической деятельности.

Сейчас есть широкий выбор вариантов моделей обработки информации, часть из которых предусматривают ранжирование сельскохозяйственных предприятий по социально-экологическому фактору. То есть предлагается определять уровень рейтинга как сумму социологических показателей, которые получаются при наложении вертикальной структуры социума (способности, потребности, деятельность, отношения, институты) на горизонтальную (экономики, экологии, искусства, педагогики, управления). Это заключение позволяет оценивать эффективность влияния на различные сферы деятельности.

Создание системы – проводника информации – является следующей составляющей информационного обеспечения экологической безопасности [11]. Многие исследования в этом направлении указывают на перспективность такого подхода, который основывается на своевременном и адекватном реагировании на изменение показателей экологического состояния. Это позволяет оперативно принимать управленческие решения по предотвращению и устранению негативных последствий влияния аграрного производства на окружающую среду. Важным аспектом реализации этого мероприятия является использование автоматизированных баз данных о наличии тяжелых металлов, нитратов, нефтепродуктов в почве и сельскохозяйственной продукции. Задачами информационной системы являются также определение регламента воздействий и непосредственное управление природопользователей: экспертиза проектов воздействий, нормирование воздействий, сбор информации и контроль деятельности, принятие мотивированных и обоснованных управленческих решений.

Разумеется, речь идет об определенной системе баз данных, в которых, на наш взгляд, должны учитываться минимум два основных условия:

- доступность информации;
- комплексность данных, содержащий правовой, технический, технологический, организационный и ресурсный аспекты.

Для получения оптимального результата при использовании минеральных удобрений в виде максимизации их полезного действия и минимизации вреда, причиненного окружающей среде от их использования, проводятся опыты по вариативным сочетаниям твердых минеральных удобрений, жидких комплексных удобрений, а также ядохимикатов.

Информационно-аналитическое обеспечение экологической безопасности в аграрном секторе экономики занимает центральное место при реализации экологической политики. Она же служит основой экологического менеджмента и экологической политики. Информационная база обеспечения экологической безопасности производственной деятельности аграрного предприятия имеет три уровня; оперативный, тактический и стратегический.

Оперативный информационный менеджмент содержит весь объем информации о деятельности природопользователя и его влияния на агроэкосистему. На его основе составляются экологические балансы, отчетность по экологическим показателям. Тактический информационный менеджмент необходим для учета эффектов будущих лет, для более полного отражения «вклада» предприятия в загрязнение и деградацию окружающей среды, для планирования в случае необходимости текущих природоохранных мероприятий [12]. Стратегический информационный менеджмент является информационной базой механизма экологического управления в целом, что обеспечивает экологическую безопасность сельскохозяйственного предприятия и его производственную деятельность.

Важным элементом информационно-аналитической составляющей реализации стратегии обеспечения экологической безопасности в аграрном секторе является система критериев и индикаторов, которые подразумевают оценку экологически ориентированного развития, количественное определение уровня экологической безопасности и ранжирование ее видов [13]. Как мы считаем, критерии экологической безопасности являются не менее важными для устойчивого развития аграрной сферы, чем экономическая эффективность, которая была приоритетной в рыночном индустриально-потребительском обществе.

Поэтому возникает необходимость разработки и использования небольшого числа интегральных критериев безопасности и получения на их основе обобщенной оценки состояния объекта. По нашему мнению, следует выделить следующие критерии:

- главным критерием экологической безопасности является обеспечение здоровья и нормальной жизнедеятельности человека (ES 1). Для измерения степени экологической безопасности по данному критерию могут быть использованы такие показатели, как средняя продолжительность жизни, коэффициенты заболеваемости и смертности, коэффициент рождаемости и другие показатели, характеризующие здоровье населения и качество жизни людей. В то же время показатели отклонений состояния окружающей среды от нормативов также могут быть использованы при измерении уровня экологической безопасности;

- важным критерием является сохранение, воспроизведение и производительность природных ресурсов агросферы (ES 2), в частности для экосферы и ее частей – биомов, регионов, ландшафтов, то есть более-менее крупных территориальных природных комплексов, может служить уровень эколого-экономического или природно-производственного паритета, т. е. степени соответствия общей экологической нагрузки на территории ее ассимиляционного потенциала;

- сбалансированное развитие и устойчивость агроэкосистем (ES 3) (сочетание природных (рельефа, почв, биоты, водных объектов) и антропогенных элементов, что дает возможность сохранять устойчивость к экологическим угрозам, в частности важными индикаторами безопасности выступает целостность, сохранность их видового состава, биоразнообразия и структуры внутренних взаимосвязей.

Каждому критерию должен соответствовать определенный набор индикаторов (показателей), характеризующий природные и антропогенные характеристики, необходимые для принятия управленческих решений. Выбор индикаторов осуществляется по принципам репрезентативности (то есть учитываются наиболее весомые показатели, которые влияют на уровень экологической безопасности в аграрном секторе экономики). Указанные индикаторы зависят от объекта, относительно которого определяется экологическая безопасность в аграрном секторе экономики: государство, регион, район, отдельная территория или сельскохозяйственный товаропроизводитель. При определении также стоит учесть ряд особенностей, в частности: доступность и достоверность статистических данных, наличие лабораторно-аналитической информации, оперативность, своевременность и непрерывность ее поступления, а также затраты на ее получение. Интересной особенностью в процессе получения информационно-аналитических материалов является ограничение доступа к данным сельскохозяйственных предприятий и

превращение их значительного массива в конфиденциальную информацию, для чего есть веские причины. Прежде всего это искажение данных учета с целью уклонения от уплаты налогов и штрафных санкций.

Сформированный перечень индикаторов с помощью корреляционного анализа проверяется на степень плотности статистических связей между их числовыми рядами с целью избегания усиленного эффекта во время расчета интегрального показателя. В случае использования индикаторов, которые имеют специфическую периодичность определения (например, эколого-агрохимическое обследование земель), применяются последние имеющиеся данные соответствующих показателей.

Противоречивость оценки экологической безопасности в аграрном секторе определяет необходимость применения различных методов анализа. Для количественной оценки экологической безопасности в аграрном секторе экономики применяют суммарное количество индексов (показателей) в составе трех основных критериев, определенных как относительные показатели составляющих экологической безопасности. Эта методика предусматривает устранение различия размерностей приведенных параметров путем нормирования, т. е. перевод их в безразмерную форму. Для этого абсолютные значения показателей сравниваются с пороговыми значениями соответствующего показателя [14, 15].

То есть важным этапом при расчете индекса экологической безопасности является определение пороговых (предельных) показателей оценки. Определение пороговых значений индикаторов в зависимости от их свойств проводится с помощью таких методов: аналогового (оптимальным считается базовое (эталонное) значение для данного вида, под которым понимают желаемую, с точки зрения оптимизации условий (максимальное или минимальное), величину); нормативного подхода (критическое или оптимальное значение определяется в нормативно-правовых актах (например, ПДК); экспертной оценки.

Итак, перевод фактических значений в нормированные проводится через диапазон нормированных значений каждого индикатора от 0 до 1. При этом показатели, между которыми существует прямая связь с интегральным индексом (то есть предпочтительнее прирост показателя относительно базового), рассчитываются как отношение фактического значения до предельного (1), и соответственно те показатели, оптимальным для которых является снижение, рассчитываются отношением предельного значения к фактическому (2):

$$x_i \rightarrow \max, \text{ то } x_i = \left( \frac{1, Y_i \leq Z_i}{\frac{Y_i}{Z_i}} \right) \quad (1)$$

$$x_i \rightarrow \min, \text{ то } x_i = \left( \frac{1, Y_i \geq Z_i}{\frac{Z_i}{Y_i}} \right) \quad (2)$$

Где:  $Y_i$  - фактическое значение  $i$ -го показателя;  $Z_i$  - пороговое (предельное) значение  $i$ -го показателя;  $x_i$  - нормализованное значение  $i$ -го показателя.

Интегральный показатель экологической безопасности в аграрном секторе экономики предлагается вычислять как сумму нормированных значений упомянутых выше показателей с учетом соответствующих весовых коэффициентов (3):

$$I_{ESn} = f(ES_1, ES_2, ES_3) = \sum_{i=1}^n x_i \times d_i \quad (3)$$

где  $x_i$  - нормализованное значение  $i$ -го показателя;  $d_i$  - весовой коэффициент, определяющий степень вклада  $i$ -го показателя в интегральный индекс экологической безопасности в аграрном секторе экономики;  $n$  - количество показателей, которые применяются при расчете.

На основе результатов интегрального показателя экологической безопасности в аграрном секторе экономики возможно оценить объект (регион, район,

сельскохозяйственный товаропроизводитель) по уровню экологической безопасности согласно предложенной классификации (таблица 1).

Таблица 1 – Классификация уровней экологической безопасности в аграрном секторе экономики

| Уровни экологической безопасности         | Значение интегрального показателя (или отдельного индикатора) экологической безопасности |
|---|--|
| Устойчивый                                | 0,76-1   |
| Допустимый                                | 0,51-0,75  |
| Неудовлетворительный                      | 0,26-0,5   |
| Критический                               | 0,01-0,25  |
| Опасный уровень (экологическая опасность) | 0  |

Таким образом, методические подходы, которые содержат перечень основных индикаторов состояния экологической безопасности, их нормирование в соответствии с определенными пороговыми значениями, а также алгоритм расчета интегрального индекса, позволяют оценить уровень экологической безопасности в аграрном секторе экономики.

*Выводы и перспективы дальнейших исследований.* Информационно-аналитический фактор обеспечения экологической безопасности в аграрном секторе экономики заключается в обработке информации о деятельности хозяйствующих субъектов, негативное антропогенное влияние сельскохозяйственной деятельности на агроэкосистему, об аспектах качества жизни населения, связанные с аграрным производством. Основной функцией информационно-аналитической составляющей в аграрном секторе экономики является повышение управляемости системы обеспечения экологической безопасности через создание единого информационного пространства, концентрирующего данные, которые поддерживают документооборот и принятие решений в условиях неполноты информации и отсутствии четких алгоритмов управления. Концепция формирования и функционирования информационных систем должна обеспечивать оптимальность накопления и использования информационных ресурсов, учитывая современные тенденции развития информационных технологий. Также предложенная система аналитической оценки уровня экологической безопасности в аграрном секторе экономики может быть составляющей экологического паспорта, который, кроме оценки экологичности технологий производства и продукции, дает возможность рассмотреть в сочетании и взаимозависимости экологические факторы, определить конкретные причины, которые обусловили полученный результат оценки.

## БИБЛИОГРАФИЯ

1. Салмин С.П. Информационное обеспечение процессов управления. – М.: Синергия, 2015. – 254с.
2. Голицына О.Л. Информационные технологии. – М.: Форум, 2015. – 341 с.
3. Астахов А.С. Экологическая безопасность и эффективность природопользования / А.С. Астахов, Е.Я. Диколенко, В.А. Харченко. - Вологда: Инфра-Инженерия, 2009. - 323 с.
4. Бадагуев Б.Т. Экологическая безопасность предприятия: Приказы, акты, инструкции, журналы, положения, планы / Б.Т. Бадагуев. - М.: Альфа-Пресс, 2012. - 568 с.
5. Буркинский Б.В. Экономико-экологическая безопасность морехозяйственной деятельности / Б.В. Буркинский. - Рн/Д: Феникс, 2008. - 648 с.
6. Калыгин В.Н. Безопасность жизнедеятельности. Промышленная и экологическая безопасность в техногенных чрезвычайных ситуациях / В.Н. Калыгин, В.А. Бондарь, Р.Я. Дедеян. - М.: КолосС, 2008. - 520 с.
7. Агапов, Н.Н. Экология и экономика природопользования / Н.Н. Агапов, Н.Ю. Липатова. - М.: МГИУ, 2008. - 104 с.

8. Kuzubov A.A., Denisenko I.A. Theoretical aspects of the analysis of agricultural enterprises" fixed assets // Russian Journal of Agricultural and Socio-Economic Sciences. 2017. Т. 64. № 4. С. 107-112.
9. Эколого-экономическая сбалансированность регионального развития: методологические и методические основы. Монография под ред. д.э.н., профессора М.Ф. Замятиной. СПб.: ИПРЭ РАН, ГУАП, 2013, 142 с
10. Шашло Н.В. Организационно-экономический механизм стратегического управления внешнеэкономической деятельностью предприятий // Организатор производства. 2015. № 3 (66). С. 53-60.
11. Шехова Н.В. Экологизация потребления в целях уменьшения экологического ущерба. // Экономика и менеджмент организации. 2013. №8(106) с.59-63
12. Kuzubov A.A. Development factors of the biotechnological products' market in the world economy // Russian Journal of Agricultural and Socio-Economic Sciences. 2017. Т. 65. № 5. С. 20-25.
13. Daly, H. E. Ecological Economics: Principles and Applications / H. E. Daly. – Washington: Island Press, 2007. – 385 p.
14. Jiang M. Introduction to Ecological Safety / Mingjun Jiang. – World Affairs Press, 2012. – 491 p.
15. Дзюин А.Г. Влияние длительного применения систем удобрений на баланс питательных веществ в почве / А.Г. Дзюин, Г.П. Дзюин // Агрехимический вестник, 2015. - № 6. - С. 14-17.



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**РОЛЬ ЭЛЕКТРОЭНЕРГЕТИКИ В РАЗВИТИИ АГРОПРОМЫШЛЕННОГО КОМПЛЕКСА**  
**THE ROLE OF ELECTRIC POWER INDUSTRY IN DEVELOPMENT**  
**OF AGRO-INDUSTRIAL COMPLEX**

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**АННОТАЦИЯ**

Развитие агропромышленного комплекса является незаменимой частью экономики, где производится жизненно важная для общества продукция, и сосредоточен огромный экономический потенциал. В нем занято почти 30% работающих в сфере материального производства, задействована пятая часть производственных фондов, и создается около трети валового национального дохода. Развитие агропромышленного комплекса в решающей мере определяет состояние всего народнохозяйственного потенциала, уровень продовольственной безопасности государства и социально-экономическую обстановку в обществе.

**ABSTRACT**

The development of the agro-industrial complex is an indispensable part of the economy, where production is vital for society, and a huge economic potential is concentrated. It employs almost 30% of those working in the sphere of material production, employs a fifth of production assets, and creates about a third of the gross national income. The development of the agro-industrial complex determines decisively the state of the entire national economic potential, the level of food security of the state and the social and economic situation in the society.

**КЛЮЧЕВЫЕ СЛОВА**

Электроэнергетика, развитие, АПК, проблемы электроэнергетики, рыночная экономика, энергетический рынок.

**KEY WORDS**

Electric power industry, development, agro-industrial complex, problems of electric power industry, market economy, energy market.

Энергетика – область национальной экономики, науки и техники, охватывающая энергетические ресурсы, их производство, передачу, преобразование, аккумулирование, распределение и потребление. Электроэнергетика является важнейшей составной частью топливно-энергетического комплекса страны, обладает рядом специфических черт, делающих ее непохожей ни на одну отрасль промышленности. Электроэнергетика России является важнейшей инфраструктурной отраслью, призванной обеспечивать экономику и социальную сферу страны электроэнергией и теплом с требуемыми надежностью и качеством; имеет структуру, существенно различающуюся в различных регионах страны в зависимости от

природно-климатических, экономических и других факторов; функционирует в сложных социально-экономических условиях благодаря ЕЭС России как технологически единому комплексу.

Единая энергетическая система России (ЕЭС России) – федеральная энергетическая система, включающая в себя комплекс энергетических систем, электрических, тепловых станций и сетей, объединенных общим в масштабе страны технологическим режимом, имеющим единое оперативно-диспетчерское управление и обеспечивающим надежное, качественное энергоснабжение отраслей и населения при наиболее эффективном использовании энергетических ресурсов.

В составе Единой энергетической системы России выделяют шесть объединенных энергосистем, седьмая - энергосистема Востока - работает изолированно от Единой энергетической системы. Основной частью ЕЭС является единая национальная энергетическая сеть, включающая в себя систему магистральных линий электропередачи, объединяющих большинство регионов страны, и представляющая собой один из элементов гарантии целостности государства. Все энергосистемы соединены межсистемными высоковольтными линиями электропередачи напряжением 220-500 кВТ и выше и работают в синхронном режиме (рисунок 2).



Рисунок 2 – Структура единой энергосистемы РФ

Территориальное распределение потребления электрической энергии по объединенным энергосистемам (далее – ОЭС), отражающее сложившиеся региональные пропорции российской экономики, характеризуется преобладанием трех крупнейших ОЭС – Центра, Урала и Сибири, их доля оценивается в 2016 году на уровне 68,5% от общего объема потребления электрической энергии ЕЭС России. Анализ уровня цен на рынке электроэнергетики для конечного потребителя значительно разнится. Средняя стоимость электроэнергии по государствам представлена на рисунке 3.

Самое дешевое электричество в Кувейте – 1,00 цент за кВт. Примерно 35 копеек. Второе место по дешевизне занимает – 1,30 цента за кВт. Тройку лидеров замыкает – 3,1 цента за кВт. Наиболее дорогая стоимость Англии в Германии - 21,9 руб, в Дании – 22,6 р. В зависимости от стоимости и доступности электроэнергии, зависят общие объемы потребления электроэнергии. Интересным является сравнительная характеристика стоимости электроэнергии для различных потребителей: производственные предприятия и население в рамках потребления ЖКХ.

Для многих европейских государств прослеживается следующая динамика: стоимость электроэнергии значительно выше для потребителя в виде населения, в то время как стоимость электроэнергии для промышленных предприятий значительно ниже. Главными показателями, определяющими всю экономику энергетического производства, являются: капитальные затраты или для сравнения разных электростанций удельные капиталовложения (к), р./кВт; годовые расходы по эксплуатации или себестоимость производства единицы энергии, коп./кВт·ч.

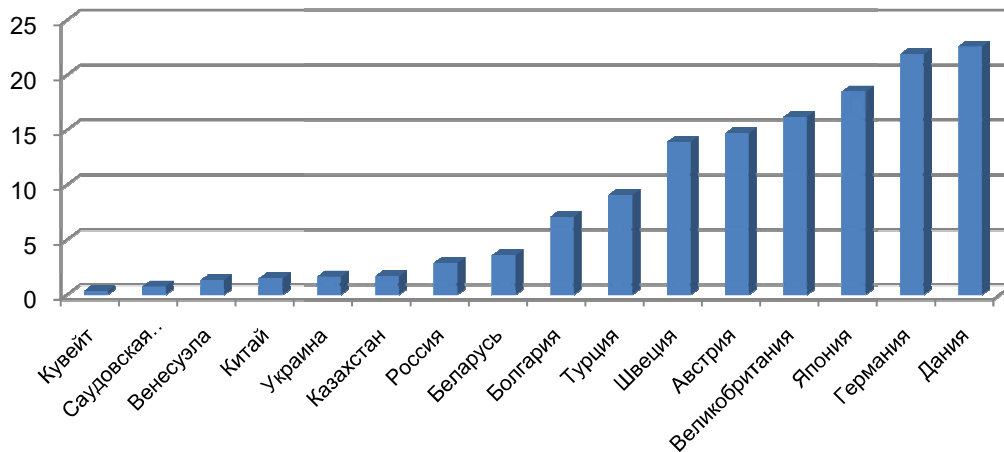


Рисунок 3 – Средняя стоимость электроэнергии по государствам

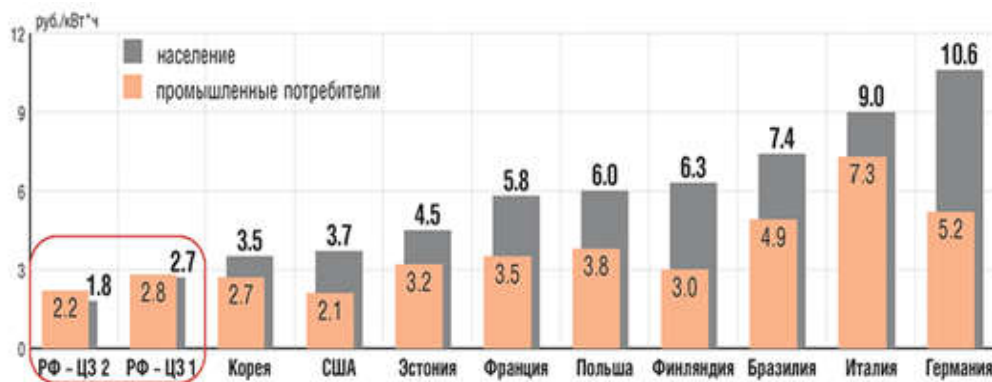


Рисунок 4 – Соотношение стоимости электроэнергии для конечных потребителей в различных государствах

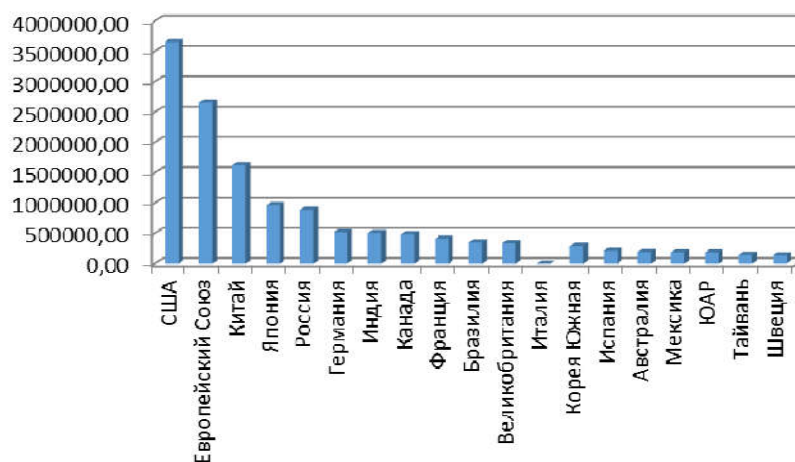


Рисунок 5 – Объемы годового потребления электроэнергии в государствах, млрд кВтч

В Российской Федерации Порядок формирования цен утвержден 29.12.2011 г. Постановлением Правительства №1179 «Об определении и применении гарантирующими поставщиками нерегулируемых цен на электрическую энергию». Сегодня на территории России стоимость электричества в каждом регионе несколько отличается.

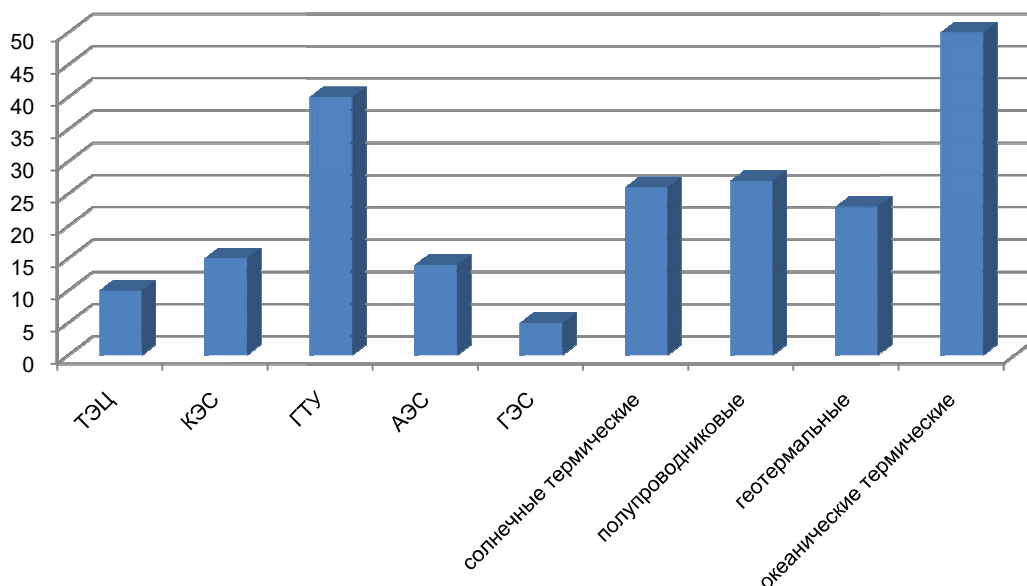


Рисунок 6 – Себестоимость производства электроэнергии, коп/кВт·ч

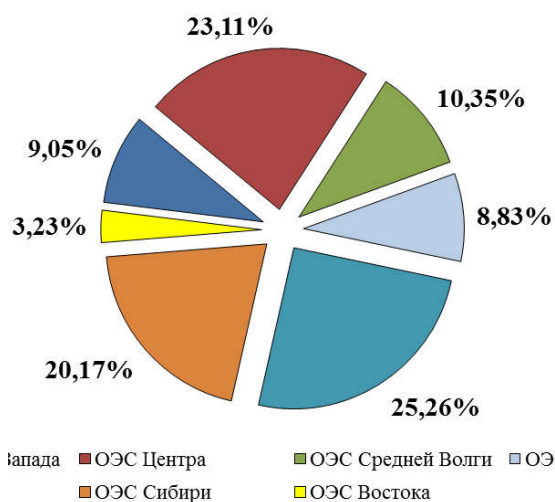


Рисунок 5 – Территориальная структура потребления электрической энергии по ОЭС за 2016 год, %

Ожидается увеличение величины спроса на электрическую энергию, по ЕЭС России к 2023 году оценивается в размере 1101,044 млрд. кВт·ч, что больше объема потребления электрической энергии 2016 года на 74,188 млрд. кВт·ч. Превышение уровня 2016 года составит в 2023 году 7,2% при среднегодовом приросте за период 1,0%. Федеральная целевая программа предполагала необходимость привлечения более чем 120 млрд руб. в электроэнергетику региона в период до 2013 г. В настоящее время общий объем необходимых инвестиций на среднесрочный период до 2025 г. можно оценить более чем в 1,5 трлн. руб. — это соответствует предложениям, учтенным при разработке проекта стратегии развития электроэнергетики Дальнего Востока до 2020 г. и на период до 2025 г.

Программа «Развитие и модернизация электроэнергетики» разработана для усовершенствования уже имеющейся системы управления, которая, по своей природе, должна обеспечивать эффективную реализацию политики государства в области энергосбережения и повышения энергетической эффективности, а также, несмотря на негативные факторы, должна снижать энергоёмкость экономики.

Таблица 3 – Изменение территориальной структуры потребления электрической энергии по ОЭС в соответствии с прогнозом электропотребления на 2023 год

| Регион            | 2016 год, факт |       | 2023 год, прогноз |       |
|-------------------|----------------|-------|-------------------|-------|
|                   | млрд. кВт·ч    | %     | млрд. кВт·ч       | %     |
| ОЭС Северо-Запада | 92,880         | 9,0   | 95,826            | 8,7   |
| ОЭС Центра        | 237,276        | 23,1  | 248,537           | 22,6  |
| ОЭС Средней Волги | 106,270        | 10,4  | 108,482           | 9,9   |
| ОЭС Юга           | 90,703         | 8,8   | 106,336           | 9,6   |
| ОЭС Урала         | 259,383        | 25,3  | 272,170           | 24,7  |
| ОЭС Сибири        | 207,167        | 20,2  | 226,595           | 20,6  |
| ОЭС Востока       | 33,177         | 3,2   | 43,098            | 3,9   |
| ЕЭС России        | 1026,856       | 100,0 | 1101,044          | 100,0 |

Программа позволит решить следующие задачи: масштабная модернизация электроэнергетики и перевод ее на новый технологический уровень; повышение экономической и энергетической эффективности электроэнергетики; повышение надежности функционирования электроэнергетики.

Для выполнения поставленных задач планируется увеличить вливание бюджетных средств к 2020 г. до 13,9 млрд рублей.

Реализуемые предприятиями данная программа приносит: модернизацию и новое строительство генерирующих мощностей; модернизация и новое строительство электросетевых объектов; повышение доступности энергетической инфраструктуры; ликвидация межтерриториального перекрестного субсидирования в электроэнергетике.

Однако реализация масштабных инвестиционных проектов – единственно возможный путь развития дальневосточной электроэнергетики и преодоления тех проблем, которые наблюдаются в отрасли на сегодняшний день. В частности, строительство новых энергоблоков и магистральных ЛЭП необходимо для устранения дефицита мощности и замещения неэффективных либо выработавших ресурс электростанций; развитие распределительно-сетевых комплексов требуется для подключения новых потребителей, обеспечения надежности электроснабжения и снижения потерь электроэнергии. Инвестиции в отрасль увеличиваются, преимущественно в здания и оборудование.

В настоящее время на предприятиях агропромышленного комплекса функционирование технологических процессов осуществляется через различные технические системы. Эффективность использования и эксплуатации технических систем определяется показателями их работоспособности и надежности. Общая продолжительность простоя машины из-за оборудования и технического обслуживания и ремонта Skog составляет значительную часть их годового фонда рабочего времени. В этой связи необходимо провести всестороннюю оценку эффективности технических систем.

Существует много подходов к решению этой проблемы, мы видим некоторые из них. Для оценки эффективности элементов технической системы в предстоящий период работы был разработан ряд вероятностных показателей эффективности. Важнейшим техническим и экономическим показателем качества любого технического устройства, определяющим его способность надежно работать с постоянными техническими характеристиками в течение заданного периода времени при определенных условиях эксплуатации, является надежность. Среди широко используемых количественных характеристик надежности: вероятность безотказной работы и отказа, частота отказов, коэффициент доступности, параметр отказа потока и т.д.

Появление предприятий системы АИС мощных электродвигателей, сварочного оборудования, мощных выпрямительных трансформаторов, осветительных систем на основе флуоресцентных источников света и других приемников перко-переменной нагрузки создало их проблему электромагнитной совместимости с системой электропитания. Успешное решение этой проблемы обеспечивает рациональную

работу с такими приемниками и приемниками с тихой нагрузкой, подключенной к одной и той же системе электропитания. К индикаторам качества электроэнергии для трехфазных цепей переменного тока относятся устойчивое отклонение напряжения, отклонение частоты, синусоидальное напряжение сигнала искажения, появление более высоких гармонических составляющих, вызванное несинусоидальным напряжением и другие.

Появление системы на предприятиях АПК мощных электродвигателей, сварочного оборудования необходимо для обеспечения рациональных приемников, подключенных к одной и той же системе электроснабжения. Создание безопасной рабочей среды и повышение надежности элементарной базы сельских электрических сетей является неотложной задачей агропромышленного комплекса (АПК). Это сложная проблема оптимизации, требующая технологических инвестиций.

Таким образом, одной из проблем является использование возобновляемых источников энергии при предоставлении сервитутов их собственности с точки зрения ландшафтных зон, социально-культурной организации общественных пространств и инфраструктуры физической культуры и спорта в целях здоровья и здорового образа жизни сотрудников и их семей. Эти задачи сегодня являются неотъемлемой частью развития, как для южных, так и северных районов Российской Федерации, для деятельности культурно-дикого растениеводства, животноводства и птицеводства.

Таблица 4 – Показатели инвестиций в электроэнергетику

| Инвестиции, млн. руб. | 2013 | 2014 | 2015 | 2016 |
|-----------------------|------|------|------|------|
| Иностранные           | 48   | 58   | 38   | 57   |
| В оборудование        | 365  | 268  | 153  | 238  |
| В здания и сооружения | 628  | 351  | 255  | 318  |
| Итого                 | 1041 | 677  | 446  | 612  |

На данный момент разработаны проекты создания на Дальнем Востоке энергопромышленных кластеров, объединяющих энергоемкие предприятия и мощные источники электроэнергии. Среди них — проект развития Южно-Якутского гидроэнергетического комплекса, покрывающего потребность добывающих предприятий в электроэнергии за счет выработки каскада новых ГЭС на р. Тимптон, а также проект достройки Усть-Среднеканской ГЭС в Магаданской области, питающей новые горнорудные производства. Незначительную долю составляют иностранные инвестиции, преимущественно, компании осуществляют инвестирование за счет государственного финансирования и собственных средств за счет привлечения средств путем размещения акций. Помимо устранения имеющихся отраслевых ограничений привлечение инвестиций в электроэнергетику может придать мощный импульс всей экономике региона.

Таблица 5 – Источники финансирования инвестиционных проектов, %

| Доля от общего объема инвестирования           | Электросети |
|--|-------------|
| Собственные средства, в т.ч.:                  | 62,7        |
| - чистая прибыль текущего года                 | 10,1        |
| - прибыль прошлых лет                          | 9,7         |
| - амортизация                                  | 27,1        |
| - средства от дополнительной эмиссии акций     | 5,2         |
| - неиспользованная амортизация прошлых лет     | 0,8         |
| - НДС к возмещению                             | 9,8         |
| Привлеченные средства, в т.ч.: займы (кредиты) | 37,3        |

Для быстрого успешного преобразования экономики надо изменить структуру цен на энергетические и минеральные ресурсы до среднемирового уровня. Это позволит высвободить производственные ресурсы из неэффективных секторов экономики, а тарифы и цены на энергетические продукты сделать объектом [16-17].

Необходимо усилить государственную роль в инвестициях и перераспределении ресурсов, а также в борьбе с инфляцией разными немонетарными методами: регулирование ценовых пропорций, ведение осмысленной политики доходов, заморозка цен [18].

Подводя итог всему вышеизложенному, основными направлениями развития электроэнергетической системы России для обеспечения энергетической безопасности и экономической устойчивости электроэнергетического комплекса с целью расширения возможностей развития агропромышленного комплекса должны стать: использование возобновляемых источников энергии; повышение эффективности использования электрической энергии как ресурса для агропромышленного комплекса, которая определяет во многом стоимость агропродукции; использование потенциала энергосбережения для всех категорий потребителей [19].

Кроме того, необходимо учитывать динамику развития экономики с учетом миграционных процессов и планов развития социально-экономических структур. Целью является достижение сбалансированности и минимизации расходования всех ресурсов [20].

Решение данной проблемы невозможно рассматривать как что-то конкретное, а именно оно должно быть экосистемным, учитывать баланс и движение любых видов ресурсов: материальных, природных, трудовых, энергетических и информационных.

## БИБЛИОГРАФИЯ

1. Энергоэффективность в России: скрытый резерв. [Электронный ресурс] // Совместный отчет группы ЦЭНЭФ и Мирового банка. – Режим доступа: [http://www.cenef.ru/le/FINAL\\_EE\\_report\\_rus.pdf](http://www.cenef.ru/le/FINAL_EE_report_rus.pdf)
2. Генеральная схема размещения объектов электроэнергетики в России до 2020 года. [Электронный ресурс] // Интернет-портал сообщества ТЭК Energyland.info. – Режим доступа: <http://www.energyland.info/library-group-120>
3. Распоряжение Правительства РФ «Об Энергетической стратегии России на период до 2035 года» в ред. от 07.02.2014 г. [Электронный ресурс] // Данные портала по энергосбережению «Энергосовет». – Режим доступа: <http://www.energosoвет.ru>
4. Смагина М.Н., Нестулаева Д.Р. Исследование российского рынка электроэнергии. / М.Н. Смагина, Д.Р. Нестулаева/ Научный журнал «Вестник экономики, права и социологии» №3 – 2015. – С.94-96
5. Финам.ру [Электронный ресурс] // Сценарии и прогнозы – Режим доступа: <https://www.finam.ru/analysis/forecasts/dva-goda-nizkix-cen-na-energoresursy-vliyanie-na-mirovuyu-ekonomiku-20160707-18540/>
6. Астахова Е.В., Завальный Т.Д. Иностранные инвесторы и инвестиционный климат приморского края / Е.В. Астахова, Т.Д. Завальный // Азимут научных исследований: экономика и управление. – 2016. – Т. 5. – №4 (17). – С. 164-166.
7. Официальный сайт Министерства энергетики Российской Федерации. [Электронный ресурс] // Режим доступа: <https://minenergo.gov.ru/node/538/>
8. Макарова А.А., Григорьева Л.М., Митровой Т.А. Прогноз развития энергетики мира и России 2016/ А.А.Макарова, Л.М.Григорьева, Т.А.Митровой. – ИНЭИ РАН–АЦ при Правительстве РФ – Москва, 2016. – 196 с.
9. Тершукова М.Б. Денежно-кредитное регулирование: учебное пособие для студентов вузов/ М.Б. Тершукова. – Самара: АО «РПП Мир печати», 2014. – 140 с.
10. Максимов Б.К. Теоретические и практические основы рынка электроэнергии: учебное пособие для студентов вузов / Б.К. Максимов, В.В. Молодюк. – М.: Изд. Дом МЭИ, 2015. – 289 с.
11. Решетняк Е.И., Данько Н.И., Астахова Е.В., Ван Ч. Моделирование развития единого евроазиатского энергетического рынка // Фундаментальные исследования. – 2017. – №1. – С. 198-203.
12. Об электроэнергетике: Федеральный закон от 26.03.2003 N 35-ФЗ [Электронный ресурс] // СПС «КонсультантПлюс». – Режим доступа: <http://www.consultant.ru>

13. Бугиев Г.А. Состояние и пути эффективного функционирования энергетики // Промышленная энергетика. – 2016. – №5. – С.75-78.
14. Красова Е.В., Маркова Д.А. Развитие отечественного бизнеса в условиях текущей макроэкономической нестабильности//Вектор науки Тольяттинского государственного университета. Серия: Экономика и управление.-2016
15. Astakhov V.V. Instrumental and technological directions to ensure economic security of enterprise // Int. Review of Management and Marketing. 2016. №S1. С. 172-178.
16. Герасименко В.В. Ценообразование: учебник – М.: Эксмо, 2016. – 422 с.
17. Об Энергетической стратегии России на период до 2020 года: распоряжение Правительства РФ от 13.11.2009 N 1715-р [Электронный ресурс] // СПС «КонсультантПлюс». – Режим доступа: <http://www.consultant.ru>
18. Об Стратегии социально-экономического развития Дальнего Востока и Байкальского региона на период до 2025 года: Распоряжение Правительства РФ 28.12.2009 2094-р [Электронный ресурс] // СПС «КонсультантПлюс». – Режим доступа: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_96571/](http://www.consultant.ru/document/cons_doc_LAW_96571/)
19. Развитие энергетики Дальнего Востока [Электронный ресурс] // ПАО «РусГидро»: официальный сайт. – Режим доступа: <http://www.rushydro.ru>
20. Вайнзихер Б.Ф. Электроэнергетика России 2030: Целевое видение / Под общ. ред. Б.Ф. Вайнзихера. – М.: Альпина Бизнес Букс. – 2015. – 360 с.



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**ФАКТОРЫ ИННОВАЦИОННОСТИ И ИХ ВЛИЯНИЕ НА ЭКОНОМИЧЕСКУЮ  
ЭФФЕКТИВНОСТЬ ПРОИЗВОДСТВА СУБЪЕКТОВ МАСЛОЖИРОВОГО  
ПОДКОМПЛЕКСА**

THE FACTORS OF INNOVATIVENESS AND THEIR INFLUENCE ON PRODUCTION  
EFFICIENCY OF CONSTITUENT ENTITIES OF FAT-AND-OIL SUBCOMPLEX

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**АННОТАЦИЯ**

В статье сконцентрировано внимание на проблемах взаимосвязи экономического роста и инновационных достижений. Для полного понимания сущности «инновация» представлено внутреннее содержание инновационного процесса, являющегося базовой основой инновационной деятельности. Определены значимые факторы, способствующие или препятствующие осуществлению инновационных процессов в сельском хозяйстве. Установлено, что экономическая эффективность производства продукции субъектов масложирового подкомплекса в значительной степени определяется системой экономических отношений между контрагентами, а также хозяйствующими субъектами рынка семян и растительного масла.

**ABSTRACT**

The article focused on the problems of interrelation between economic growth and innovative achievements. For a complete understanding of "innovation" represented by the inner content of the innovation process, which is the basic Foundation of innovation. Specifies factors that promote or inhibit the implementation of innovation processes in agriculture. It is established that the economic efficiency of production of constituent entities of oil and fat subcomplex is largely determined by the system of economic relations between the parties, as well as economic entities of the market of seeds and vegetable oil.

**КЛЮЧЕВЫЕ СЛОВА**

Аграрная экономика, инновация, инновационный процесс, масложировой подкомплекс, сельскохозяйственные культуры, факторы, эффективность.

**KEY WORDS**

Agrarian economy, innovation, innovation process, crops, factors, efficiency.

Проблемы взаимосвязи экономического роста и инновационных достижений становятся предметом изучения отечественных и зарубежных экономистов. Это вызвано тем, что инновационные процессы являются стратегическими направлениями развития сельского хозяйства и всего агропромышленного комплекса.

Освоение инноваций обуславливает его воздействие на эффективность аграрного сектора – экономической категории, подразумевающей широкий комплекс функционирования производительных сил и производственных отношений, обеспечивающих в совокупности процесс расширенного воспроизводства. Применительно к сельскому хозяйству эта категория отражает степень рационального использования земли и других средств производства, а также окупаемость затрат на производство сельхозпродукции. Инновационный процесс направлен на решение этой задачи.

В связи с этим возникает необходимость уточнения сущности инновации. Под инновацией (анг. Innovation – нововведение, новшество, новаторство) мы понимаем

«инвестицию в новацию». Новация (лат. Novation - изменение, обновление) представляет собой какое-то новшество, которого не было раньше. В экономической литературе указывается, что слово «инновация» не имеет точного русского перевода.

Серьезное внимание проблемам взаимосвязи экономической динамики и инновационного развития уделялось в работах немецкого экономиста Й. Шумпетера. В первом десятилетии XX века австрийский (позже американский) ученый Йозеф Алоиз Шумпетер (J.A. Schumpeter, 1883-1950 г.) ввел в научный оборот понятие «новые комбинации». В своей работе «Теория экономического развития, изданной в 1911 г., он рассматривал инновацию как новую технологическую парадигму [18].

Определение инновации и концепция Й. Шумпетера о новых комбинациях факторов производства легли в основу одного из двух наиболее распространенных подходов к трактовке основных положений теории нововведений.

Сторонники первого подхода, характеризующие инновацию как изменение, внесли ряд дополнений в определение этого понятия. Так, М. Бунин определяет инновацию как любую деятельность, идею или вещественный результат, которые качественно отличаются от существующих форм [1].

Э.И. Крылов под инновацией понимает средство или особый инструмент, с помощью которого предприниматели, используя изменения, осуществляют новый вид бизнеса или услуг [10]. Г. Вайнштейн под инновацией признает целевое качественное или количественное изменение функций той или иной сферы деятельности предприятия [4].

Второй подход к понятию «инновация» рассматривает ее с позиций создания и внедрения конкретных видов техники, технологии, других новых продуктов, что на наш взгляд, является неточностью, так как наряду с приводимыми формами, инновация может выражаться и в новых методах организации производственно-хозяйственного процесса, сбыта готовой продукции, маркетинга, то есть все то, что может принести выгоду. В отечественной экономической литературе одним из первых на эту проблему обратил внимание Н. Кондратьев, его идеи послужили теоретической базой перспективной инвестиционной политики, согласно которой в условиях неравномерности научно-технического прогресса и циклического экономического развития нормальным состоянием должно считаться равновесие социально-экономической системы, а не экономическое или финансовое равновесие. Более того, в условиях цикличности экономического развития под воздействием факторов научно-технического прогресса невозможно достичь такого равновесия иначе, чем в процессе динамичного развития на основе повышения эффективности технологического строения капитала и обеспечения качественного роста путем приоритетного инвестирования научно-технического развития [8].

Для полного понимания сущности инновации, необходимо представлять внутреннее содержание инновационного процесса, являющегося базовой основой инновационной деятельности. Под инновационным процессом в сельском хозяйстве мы понимаем процесс воспроизводства инноваций, охватывающий все его основные стадии и осуществляемый эффективно в интересах потребителей и производителей инновационных продуктов, а также обеспечивающий конкурентоспособную и экономически эффективную деятельность аграрного сектора.

Высокий уровень сложности сельскохозяйственного производства как системы и указанные особенности инновационного процесса в нем предопределяют своеобразие подходов и методов его реализации.

Обобщив существующие классификационные признаки, отражающие сущность, модели, стадии и структуру инновационных процессов, мы выделяем следующие, наиболее значимые факторы, способствующие или препятствующие осуществлению инновационных процессов в сельском хозяйстве (рисунок 1). В инновационном процессе аграрного сектора участвуют сельскохозяйственные научные и учебные учреждения, органы управления производством, обслуживающие и внедренческие формирования различных типов, непосредственно сами сельскохозяйственные товаропроизводители.

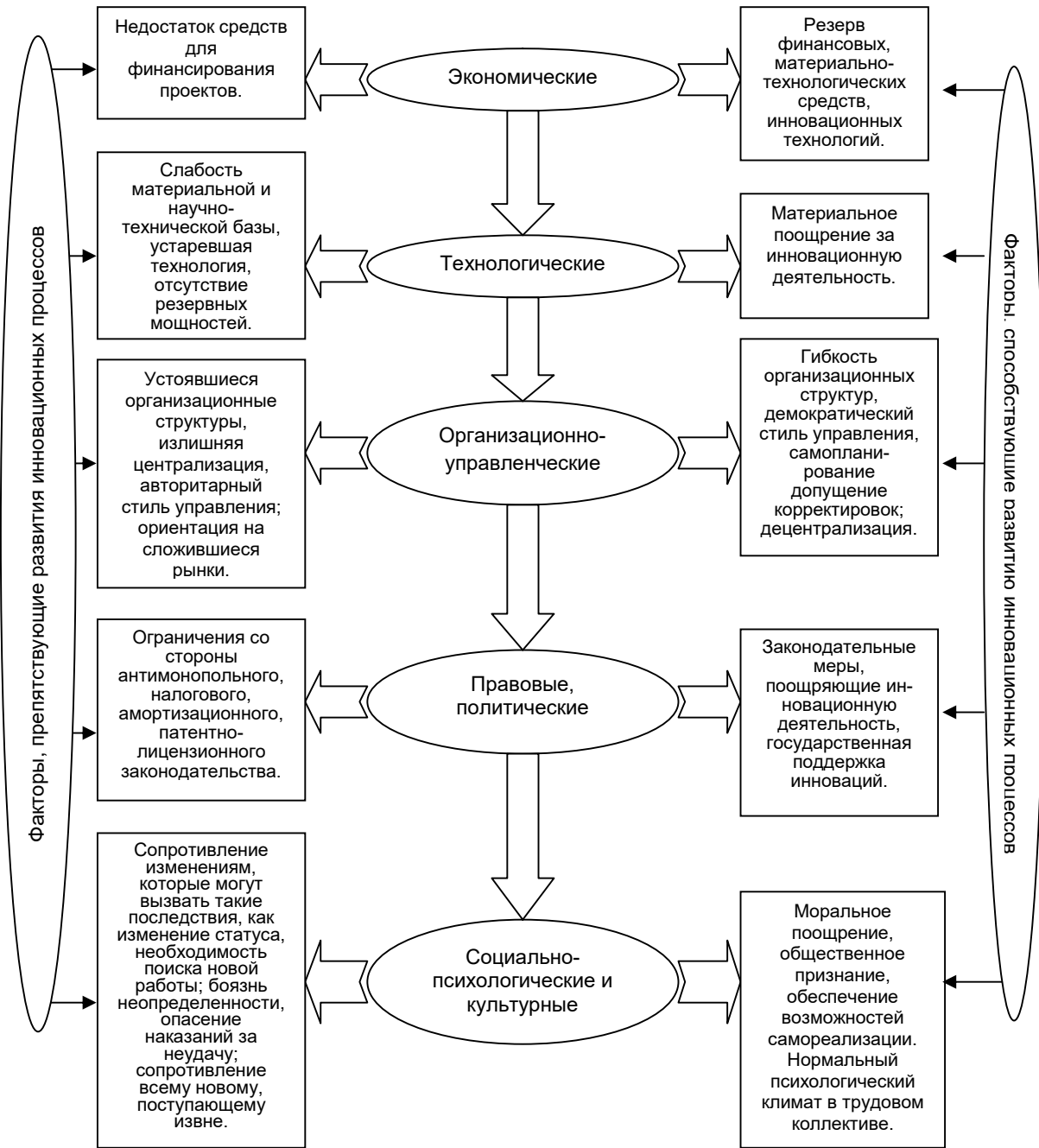


Рисунок 1 – Классификация факторов, влияющих на развитие инновационных процессов

Рост экономической эффективности производства сельскохозяйственной продукции во многом будет зависеть от комплексного рассмотрения факторов, влияющих на развитие инновационной деятельности и оценки необходимых для ее осуществления ресурсов во взаимосвязи с результатами их использования. В конечном итоге это будет способствовать развитию производства и реализации растениеводческой продукции, повышению эффективности и конкурентоспособности отрасли [2].

Однако, в настоящее время, решение продовольственной безопасности России требует дифференцированных подходов к использованию ресурсов агропромышленных комплексов регионов и обеспечению их населения продуктами питания. Недостаточное потребление жизненно важных продуктов в России представляет опасность для здоровья. Значительная часть населения не может питаться по физиологическим нормам. Из-за неполноценного питания отдельных

социальных групп населения в стране возрастает заболеваемость и смертность, ухудшаются антропологические показатели здоровья детей. Что обуславливает необходимость увеличения потребления полноценных белков, витаминов, ряда важных микроэлементов.

В условиях недостаточных объемов производства продуктов питания, важное место отводится масличным культурам, которые являются сравнительно дешевым источником получения жира, пищевого, кормового белка и других предметов потребления [15].

Среди исследователей сложилось мнение о значимости развития производства рапса наряду с другими культурами. Мы разделяем данную позицию и полагаем, что в продовольственном обеспечении страны немаловажная роль принадлежит рапсу. Важное значение при анализе производства рапса имеют определение размеров посевных площадей и выявление резервов их расширения, изучение особенностей структуры посевных площадей. В связи с влиянием конъюнктуры рынка изменилась и структура посевных площадей масличных культур Орловской области (таблица 1).

Таблица 1 – Структура посевных площадей масличных культур в Орловской области (хозяйства всех категорий)

| Год                   | 2012 г. |      | 2013 г. |      | 2014 г. |      | 2015 г. |      | 2016 г. |      |
|-----------------------|---------|------|---------|------|---------|------|---------|------|---------|------|
|                       | тыс. га | %    | тыс. га | %    | тыс. га | %    | тыс. га | %    | тыс. га | %    |
| Масличные культуры    | 107,8   | 100  | 121,3   | 100  | 124,1   | 100  | 119,2   | 100  | 129,5   | 100  |
| Подсолнечник на зерно | 31,7    | 29,4 | 41,2    | 34,0 | 40,1    | 32,3 | 33,4    | 28,0 | 56,6    | 43,7 |
| Соя                   | 25,0    | 23,2 | 26,2    | 21,6 | 46,8    | 37,7 | 57,4    | 48,2 | 51,4    | 39,7 |
| Горчица               | 2,7     | 2,5  | 2,2     | 1,8  | 3,1     | 2,5  | 4,8     | 4,0  | 4,9     | 3,8  |
| Рапс                  | 48,4    | 44,9 | 51,7    | 42,6 | 34,1    | 27,5 | 23,6    | 19,8 | 16,6    | 12,8 |

На протяжении ряда лет доминирующее положение занимает подсолнечник на зерно, на долю которого до 2016 г. в среднем приходилось 43,7% возделывания масличных культур в Орловской области. Отметим, что с 2014 года наблюдается сокращение площадей рапса. Согласно статистическим данным за последние 3 года подобная тенденция наметилась по всей России. Относительный спад популярности рапса среди российских аграриев совпал с дефицитным сезоном по всему миру, что обусловило взрывной рост котировок на сырье и масло.

В Орловской области посевная площадь рапса на 2017 год планировалась в районе 19,8 тыс. га, что на 3,2 тыс. га больше по сравнению с 2016 г.

Динамика производства рапса в целом по России и в Орловской области представлена в таблице 2 [19].

Таблица 2 – Динамика производства рапса в РФ и Орловской области [19]

| Производство              | Годы |      |      |      |      |      | 2016 в % к 2010 г., раз |            |
|---------------------------|------|------|------|------|------|------|-------------------------|------------|
|                           | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |                         | 2016       |
| Посевные площади, тыс. га |      |      |      |      |      |      |                         |            |
| РФ                        | 856  | 893  | 1190 | 1326 | 1191 | 1020 | 978,3                   | 114,3      |
| Орловская область         | 39,3 | 48,1 | 48,4 | 51,7 | 34,1 | 23,6 | 16,6                    | 0,4        |
| Доля в РФ                 | 4,6  | 5,4  | 4,1  | 3,9  | 2,9  | 2,3  | 1,7                     | 0,4        |
| Валовый сбор, млн т       |      |      |      |      |      |      |                         |            |
| РФ                        | 258  | 956  | 945  | 1259 | 1338 | 1012 | 999                     | 3,9 раза   |
| Орловская область         | 24,5 | 65,0 | 70,0 | 58,6 | 63,0 | 35,6 | 28,3                    | в 1,2 раза |
| Доля в РФ                 | 9,5  | 6,8  | 7,4  | 4,7  | 4,7  | 3,5  | 2,8                     |            |
| Урожайность, ц/га         |      |      |      |      |      |      |                         |            |
| РФ                        | 25,8 | 26,9 | 24,9 | 26,5 | 28,0 | 29,1 | 28,4                    | 110,1      |
| Орловская область         | 8,1  | 17,0 | 14,9 | 14,1 | 19,1 | 15,3 | 17,0                    | в 2,1 раз  |

Орловская область вошла в ТОП-20 регионов по валовым сборам семян рапса, по состоянию на 1 ноября 2016 года, на ее долю приходится около 28,3 тыс. тонн, или 2,8% общего объема этой культуры в России. Одна из главных причин снижения

валовых сборов – сокращение посевных площадей с 1 млн. 191 тыс. га до 978,3 тыс. га. Особенно существенное сокращение площадей наблюдалось под озимым рапсом (до 144 тыс. га), что было связано с засухой в период сева [19].

Колебания размеров посевных площадей рапса связано с тем, что это молодая культура, которая еще не заняла прочное место в севооборотах сельскохозяйственных организаций. Кроме того, площади посева и валовые сборы рапса очень сильно зависят от погодных условий. В годы незначительного снижения посевных площадей рапса ситуация выравнивалась увеличением его урожайности [17].

Основной вопрос заключается не в количестве посевных площадей, а в достаточной для потребностей внутреннего рынка урожайности, которая должна быть не менее 15 ц/га.

Средняя урожайность семян рапса в России составляет 25-27ц/га, в Орловской области в 2016 г. по сравнению с 2010г. урожайность рапса увеличилась более чем в 2 раза и составила 17 ц/га. В 2016 г. максимальная урожайность в отдельных хозяйствах составила 25 ц/га.

Несмотря на трудности, в последние годы в Орловской области наблюдается тенденция к росту урожайности рапса. Одним из факторов повышения экономической эффективности производства рапса является перевод отрасли на инновационный путь развития на основе внедрения современных агротехнологий, техники нового поколения и максимального использования потенциала сельскохозяйственной науки. Среди лидеров в производстве рапса - ОАО «АПК «Юность», ЗАО «Куракинское», ООО «Русь».

Таким образом, исследование повышения производства рапса связано с изучением современного состояния, особенностей и тенденций его развития, объективной оценкой эффективности производства. В настоящее время рапсовая отрасль в России и Орловской области в частности сохраняет свою инвестиционную привлекательность. На рапс установлены высокие закупочные цены, что подтверждает необходимость наращивания объемов его производства рапса в целях более полного удовлетворения населения области растительным (рапсовым) маслом и животных кормами. Расширение производства рапса позволит улучшить финансовое положение организации и в целом повысить конкурентоспособность аграрной отрасли Орловской области.

На наш взгляд основными резервами увеличения объемов производства продукции масложирового подкомплекса являются:

- Одним из важнейших факторов увеличения ресурсного потенциала является сокращение потерь маслосемян на всех стадиях производства. Данную проблему требуется решать с учетом всего технологического цикла, включая семеноводство, возделывание, уборку, послеуборочную подработку семян, их транспортировку, хранение, повышение качества.
- Основные потери при возделывании сельскохозяйственных культур связаны с нарушением агротехнических требований при обработке почвы, посева и хранении семян, недостаточным внесением удобрений, не укомплектованностью системы машин. Эти и другие факторы не позволяют достичь биологического потенциала сортов и гибридов сельскохозяйственных культур.
- В повышении урожайности большое значение имеет рациональная организация севооборотов. Нарушение чередования культур создает благоприятные условия для распространения болезней и вредителей растений [16].
- Значительные потери урожая и снижение качества продукции в организациях допускаются из-за низкой трудовой и технологической дисциплины в период уборки урожая, которая производится зачастую после наступления полной спелости. Причиной таких ожиданий является желание сельскохозяйственных товаропроизводителей получить сухие семена непосредственно с поля. В результате затягивания сроков уборки увеличиваются потери урожая (например, из-за осыпания семян рапса). К тому же у рапса есть своя

особенность: его желательно убирать ночью, так как на жаре его стручки лопаются и осыпаются.

- Внедрение инновационных технологий — основной фактор эффективности производства продукции сельского хозяйства, практически это проявляется в технологическом совершенствовании отдельных технологических операций в направлении высокой производительности труда и минимизации производственных затрат [9,13].

Таким образом, совокупные потери, возникающие на всех стадиях технологического цикла производства продукции достигают почти половину биологического потенциала урожайности сельскохозяйственных культур.

При исследовании динамики производства подсолнечника, на основе данных Росстата, была выявлена общая тенденция увеличения валового сбора семян подсолнечника на территории РФ. Так за анализируемый период с 2001 по 2014 год производство семян подсолнечника увеличилось в 3,4 раза, однако наибольший валовой сбор приходится на 2013 год и составлял 10554 тыс., тонн (рис. 2).

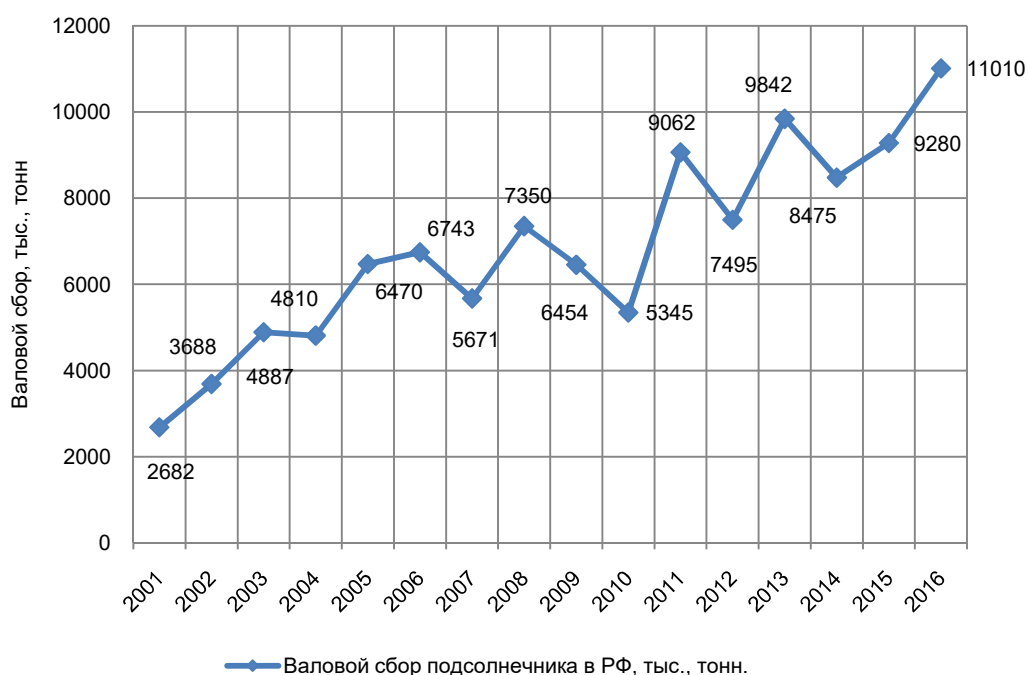


Рисунок 2 – Динамика производства подсолнечника в РФ

Общая тенденция увеличения производства подсолнечника связана в первую очередь с высокой потребностью населения в продуктах переработки семян. С целью импортозамещения аналогичной продукции была поставлена цель наращивания производства сырья (семена подсолнечника) необходимого перерабатывающим предприятиям.

Однако в соответствии с Приказом Министерства сельского хозяйства РФ от 23 мая 2014 г. N 170 "Об утверждении отраслевой программы "Развитие масложировой отрасли Российской Федерации на 2014-2016 годы" к 2016 году планировалось достичь валового сбора подсолнечника на уровне 10.2 млн., тонн. В этой связи можно считать, что плановые показатели по производству подсолнечника в 2016 г. в РФ выполнены.

Роль Орловской области в производстве семян подсолнечника с течением времени становилась более значимой, увеличение посевных площадей и урожайности подсолнечника отдельных предприятий и включение в севооборот подсолнечника организаций, ранее не занимающихся производством данной культуры, повысило валовой сбор в целом по области (рис. 3).



Рисунок 3 – Динамика производства семян подсолнечника в Орловской области

Как видно на диаграмме Орловская область начала производство подсолнечника только в 2006 году, но с наименьшими объемами, и в следующем году производство данной культуры было снижено до нуля. Однако дальнейшее наращивание производства подсолнечника, связано со спросом данного вида культуры на перерабатывающих предприятиях области. Резкий скачек производства наблюдается в 2011 году и превышает предыдущий год на 52,5 тыс., тонн.

С каждым годом сельскохозяйственные организации уделяют производству подсолнечника, как стратегически важному продукту, все большее внимание. Возделывание подсолнечника, как пропашной культуры, содержит в себе комплекс дополнительных мероприятий при его производстве, что дает огромное поле действий для инновационного производства на основе современных знаний и достижений науки, в том числе применения ресурсосберегающих и экономически эффективных технологий [3].

Эффективность производства субъектов масложирового подкомплекса во многом определяется системой экономических отношений между партнерами АПК. Экономические отношения представляют собой форму связей, посредством которых реализуются экономические интересы организаций в процессе производственной деятельности и при обмене ее результатами. Функционирование рыночной системы не возможно без насыщения ее необходимыми обществу доступными и качественными продуктами, обеспечивающими одновременную выгоду всем участникам. Исключительно важным моментом является эффективность реализуемой продукции или услуг. Вместе с тем, необходимо осознания ключевого момента в системе рыночной экономике – процесса производства. В любом случае реализуемый товар необходимо вначале произвести, обосновать важность продукта, его количество, качество, технологические, организационные моменты, и экономическую целесообразность. Одновременно обеспечить сбыт произведенной продукции на основе создания системы государственных заказов и развития сельскохозяйственной потребительской кооперации [14].

Производственный процесс доведения продуктов переработки товарного зерна до конечного потребителя обеспечивается взаимодействием нескольких хозяйственно обособленных звеньев: сельского хозяйства, сферы заготовок, хранения и переработки, оптовой и розничной торговли. Единство этих звеньев и целостность производственного процесса реализуется не только посредством экономических отношений между ними, но и технико-технологической модернизации сельского хозяйства [12].

В соответствии с рассмотренными особенностями формирования рынка продовольственных товаров, условий для повышения конкурентоспособности отечественного рынка и наполнения его емкости за счет продукции, вырабатываемой из отечественного сырья [7], следует, что положения концепции построения и развития системы заготовки и переработки должны, на наш взгляд реализоваться на региональном уровне в модель, учитывающую основной комплекс факторов, обеспечивающих ее системность. Технологическая цепочка производства продукции масложирового подкомплекса должна отражать совокупность отраслей и видов деятельности агропромышленного производства для достижения конечной цели. Она включает следующие сферы: обеспечение специализированными ресурсами; выращивание сельскохозяйственной продукции; специализированное научное обеспечение товаропроизводителей; масложировая промышленность; производственная инфраструктура, включающая заготовку, хранение рапса и его транспортировку, материально-техническое обслуживание и ремонт специализированной техники и технологического оборудования; реализация семян сельскохозяйственных культур и продуктов их переработки. При этом стратегия современного агробизнеса должна быть нацелена на создание эффективного агропромышленного производства, повышение конкурентоспособности хозяйствующих в этой сфере экономики субъектов посредством проведения их технической модернизации [5].

Обеспечить развитие региональных экономических систем можно только при масштабном притоке инвестиций, как отечественных, так и иностранных. Однако объемы привлекаемых в российские регионы инвестиционных ресурсов явно недостаточны для инновационного прорыва региональной экономики [11].

Таким образом, экономическая эффективность производства продукции субъектов масложирового подкомплекса в значительной степени определяется системой экономических отношений между партнерами, а также хозяйствующими субъектами рынка семян и рынка растительного масла. Действующая в сфере производства области система экономических взаимоотношений не является совершенной формой межотраслевых связей, поскольку не стимулирует сельскохозяйственные организации на увеличение объемов и повышение эффективности производства продукции. Следовательно, необходима работа по мобилизации факторов инновационности с целью повышения конкурентоспособности масложирового подкомплекса.

## БИБЛИОГРАФИЯ

1. Бунин М. Экономическая сущность понятия инновация / М. Бунин, А. Эйдис // Международный сельскохозяйственный журнал. - 2004.- №4.- с.13-15.
2. Бураева Е.В. Анализ факторов роста производства сельскохозяйственной продукции в контексте инновационного развития отрасли (на примере Орловской области) // Экономический анализ: теория и практика. 2013. № 14 (317). С. 20-30.
3. Буяров А.В. Современные технологии производства свинины. Учебное пособие // Буяров В.С., Михайлова О.А., Буяров А.В., Крайс В.В.
4. Орел, 2014. – 184 с.
5. Вайнштейн Г. От новых технологий к «новой экономике» //Мировая экономика и международные отношения. 2002. № 10. С. 22.
6. Грудкина Т.И. Современный агробизнес: теория и практика повышения конкурентоспособности хозяйствующих субъектов и мотивация персонала // В сборнике: Россия в экономических системах всемирного хозяйства: судьба крупного бизнеса (экономические очерки) Сборник статей. Ярославский государственный педагогический университет им. К.Д. Ушинского. Ярославль, 2006. С. 133-149.
7. Ефремова Н.А. Реформирование заработной платы как фактор роста благосостояния работников АПК // В сборнике: Государственное регулирование территориального развития и региональных экономических систем 2003. С. 90-91.



8. Калиничева Е.Ю. Формирование рынка сельскохозяйственной продукции // Региональная экономика: теория и практика. 2010. № 31. С. 37-41.
9. Кондратьев Н.Д. Основные проблемы экономической статистики и динамики: Предвар. Эскиз // Подгот. В.В. Иванов М.С. Ковалева; АН СССР. Ин-т социологии. Комис. по науч. Наследию Н.Д. Кондратьева. М.: Наука, 1991.
10. Кравченко Т.С. Обоснование эффективности отраслевых инноваций в растениеводстве региона / Т.С. Кравченко // Инновации. 2012. № 3. С.82-85.
11. Крылов Э.И. Анализ эффективности производства, научно – технического прогресса и хозяйственного механизма. – М.: Финансы и статистика, 2001. – 165с.
12. Осипов А.Э. Сухачева Н.А. Механизм формирования взаимоотношений субъектов региональных экономических систем инвесторов // Инновационный Вестник Регион. 2011. № 4. С. 26-32.
13. Полухин А.А., Плыгун С.А. Экономическая оценка перспектив технической модернизации сельского хозяйства России в целях отраслевого форсайта // В сборнике: Актуальные вопросы инновационного развития агропромышленного комплекса материалы Международной научно-практической конференции. Ответственный за выпуск И.Я. Пигорев. 2016. С. 246-253.
14. Рыбалко Т.С. Эффективные инновационные технологии производства продукции растениеводства в Орловской области // Современные проблемы науки и образования. 2007. № 4. С. 13.
15. Суровцева Е.С. Управление по результатам как основа государственной политики развития крестьянских (фермерских) хозяйств и сельских индивидуальных предпринимателей // Вестник Орловского государственного аграрного университета. 2016. Т. 62. № 5. С. 8-16.
16. Сухочева Н.А. Тенденции и объективная необходимость развития производства рапса // Опыт и практика реализации приоритетных направлений национального проекта «Образование»: Сб. научных трудов по материалам научно – практической конференции (2006 г., Орел). - Орел: СГА, 2006 – с.85-89.
17. Сухочева Н.А., Грудкина Т.И. Стратегия реализации потенциала масложирового подкомплекса в развитии животноводства // Вестник Саратовского государственного технического университета. 2014. Т. 1. № 1 (74). С. 201-209.
18. Сухочева Н.А., Грудкина Т.И., Ловчикова Е.И. Экономическая эффективность инновационно-альтернативной продукции субъектов агробизнеса: проблемы, тенденции, стратегии повышения // Экономика и предпринимательство. 2016. № 6 (71). С. 773-781.
19. Шумпетер Й. Теория экономического развития – М.: Прогресс – 1982 – с. 167 – 214.
20. Официальный сайт Федеральной службы государственной статистики [Электронный ресурс]. – Режим доступа: <http://www.gks.ru> (дата обращения 27.10.2017).

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**THE IMPLEMENTATION OF CORPORATE PARTNERSHIP PROGRAM  
WITH SMALL AND MEDIUM ENTERPRISES TO ENHANCE A BUSINESS GROWTH:  
A STUDY ON THE PARTNERSHIP OF PT. CHAROEN POKPHAND INDONESIA  
THROUGH PT. SINAR SARANA SENTOSA WITH BROILER CHICKEN BREEDERS  
IN BLITAR REGENCY**

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**ABSTRACT**

The development of business world today has undergone much progress. Various types of businesses have started to pop up. Speaking of livestock, the livestock sector is an integral part of agricultural sector development prioritized to meet the needs of food and nutrition. The development of livestock sector is part of the overall development which aims to provide food in the form of meat, milk, and eggs which have high nutritional value as well as increasing the farmer's or breeder's income and expand the employment opportunity. The chicken broiler is a very effective chicken to produce meat. In general, the main weaknesses in this business lie in the relatively small capital, lack of knowledge on maintaining the management capability, and relatively high price of feed. Another problem that occurs in this business is the field of marketing. One of the best ways that can be recommended in the development of broiler chicken agribusiness is the implementation of vertical coordination system with the partnership pattern. The problem discussed by the author in this study is about the partnership concept application between PT. Charoen Pokphand Indonesia through its subsidiary of PT. Sinar Sarana Sentosa and Small and Medium Enterprises (SMEs) of broiler chicken breeders in improving the business growth in Blitar. This study is conditional and can be developed after the researcher conducted the research directly. This aims to analyze the problems about the application of partnerships and factors that support and inhibit the partnership, thus, it is possible that the theory of broiler chicken breeders partnership is developed. This research uses descriptive qualitative approach. In the research results, companies and breeders also need each other. It means that the company needs good breeding results. Breeders as the plasma need guidance to maximize the results. The majority of plasma breeders that participate in the partnership program with PT. Sinar Sarana Sentosa is small-scale breeders. They choose to participate in this partnership program because they have limited capital, marketing, and technological constraints.

**KEY WORDS**

Broiler, chicken, SMEs, partnership.

The development of the business world today has undergone much progress. Various types of businesses began to emerge ranging from small to medium scale enterprises. Livestock business is also included in one of the business group which currently experiencing a high increase. The awareness of importance on high nutritional food needs one indicator to realize the prosperity of the community that can be met from animal protein such as meat, egg, and milk. Therefore, in the framework of livestock products procurement to meet the needs of the community, it is necessary to develop the field of livestock that produce faster products. One of the livestock commodities that has a potential to achieve this goal is broiler chicken. This encourages the development of livestock sector so that in the future it is expected to give areal contribution to the development of national economy (Salam, et al, 2006). To achieve the development of agriculture in general and livestock in particular, a maximum productivity is needed as it acts as a support for the need of animal protein that is part of the basic human needs. In general, the maintenance only needs 35 days. In that period of time, the chicken already has an average body weight of

1,8kg/chicken and can be sold immediately. Thus, the capital rotation could run within a short time (Muslimin, 2002). These developments are supported by stronger downstream industries such as breeding farms, feed mills, veterinary companies, and livestock equipment (Saragih, 2000).

In general, the main weaknesses in the business of broiler chicken breeders, mostly in the form of livestock farming, lie in the field of relatively small capital, lack of knowledge about the ability of maintenance management, and relatively high price of feed. Whereas, the requirement of broiler chicken itself is big enough ranging from 60 - 70% from production cost (Rasyaf, 2004). One of the best ways that can be advocated in the development of broiler agribusiness is to apply vertical coordination system with partnership pattern (Suparta, 2001). Livestock development is part of agribusiness which includes business on livestock production management, livestock cultivation management, processing or handling during livestock maintenance, post-harvest handling, and marketing (Tobing, 2005). This broiler chicken breeding business can involve multinational communities and small farmers community because the business capital and all other aspects are depended on the breeder itself. The livestock business can also be taken independently or in partnership (Rita, 2009). Broiler chicken breeders, mostly in the form of community livestock, are in cooperation with large companies within a partnership form (Hertanto, 2009). The partnership is expected to be a solution to spur the growth of breeders in Indonesia especially for smallholders who have relatively small capital ownership (Rasyaf, 1995). The following table shows the content of several types of livestock.

Table 1 – Nutritional Content of Chicken, Cow, and Goat

| Type of Meat    | Protein (%) | Water (%) | Fat (%) |
|-----------------|-------------|-----------|---------|
| Broiler Chicken | 23,40       | 73,70     | 1,90    |
| Cow             | 21,50       | 69,50     | 8,00    |
| Goat            | 19,50       | 71,50     | 7,50    |

Source: Center for Agricultural Products Industry (2009).

Based on Table 1, it is known that the levels of nutrients such as protein and water owned by broiler chicken are higher than the cows and goats while it also holds the smallest fat content. This shows that chicken meat is good to be consumed and better than other types of meat. Based on the description that has been described, it is known that broiler chicken has a very good potential to be developed. Independent breeders, generally, have small-scale businesses with limited capital and technology. This condition causes independent breeders to become more vulnerable to the impact of economic crisis.

In a partnership business, the price of livestock production facilities and the price of chicken are determined by the partnered company in a partnership contract agreed upon by both parties. The partnership is also expected to be one of the solutions to stimulate the growth of livestock agribusiness, especially to overcome the problems of small-scale breeders (Abidin, 2002). The maintenance management includes all activities of broiler chicken production in the cage. This consists of a selection of day old chicks, feeds, vaccine administration, labor organization, and other matters concerning broiler chicken breeding management (Rasyaf 2004). Limited technology owned by breeders is also a problem that can generate less efficient production. Apart from the above developments, a partnership of broiler chicken breeders is a strategy to increase the livestock sector in meeting the market needs and to help the breeders who belong to Small and Medium Enterprises (SMEs) in improving the development of livestock sector for the better.

SMEs are a means of independence for many small entrepreneurs. No matter how small it is, the independent entrepreneurs are not dependent on others but the quality of human resources as a business actor. According to Siahaan, Rambe and Mahidin (2006: 11), empowerment can be interpreted as an attempt to increase the ability of a person or a group to carry out the duties and authority as the performance of the task. The problems concerning SMEs in the livestock sector, especially broiler chicken breeders have made PT. Charoen Pokphand Indonesia to help SMEs increasing the growth of broiler chicken

breeding in Blitar with a partnership strategy. In correlation with the partnership, PT. Charoen Pokphand Indonesia already has its own subsidiary which was established to focus in the partnership of broiler chicken namely PT. Sinar Sarana Sentosa (PT. SSS). This incorporated company was established on January 1, 2000, with its original name, NUJ (*Nusantara Unggas Jaya*) before it changed to PT. SSS in 2008.

Table 2 – Poultry population by type in Blitar

| Year | Ayam Kampung | Ayam Petelur | Broiler Chicken |
|------|--------------|--------------|-----------------|
| 2015 | 2 596 300    | 14 973 000   | 965 600         |
| 2014 | 2 583 400    | 14 679 500   | 955 600         |
| 2013 | 2 857 800    | 15 336 300   | 1 194 500       |
| 2012 | 2 555 780    | 15 336 300   | 4 992 100       |
| 2011 | 2 341 098    | 13 900 400   | 21 873 600      |

Source: Central Bureau of Statistics, Blitar.

The data in Table 2 shows that every year, most of the livestock population in Blitar has decreased because of the lack of management knowledge ranging from breeding to selling process. Another obstacle is the market condition that there started to be many broiler chicken breeders. This indicates that the livestock in Blitar needs more special attention from the livestock service up to the broiler chicken breeders to continue to be developed as an effort to fulfill the needs of the meat whether in the local market or in provincial level. The broiler chicken industry has such competitiveness or comparative advantage in its business. Broiler chicken breeding is intended to fulfill domestic needs that are economically efficient in the utilization of domestic resources (Siregar and Rusastra, 2002). This potential can be seen from the development of broiler chicken population in Blitar.

### LITERATURE REVIEW

*Implementation Concept.* Browne and Wildavsky (Usman, 2004) suggested that "implementation is an extension of mutually adjusting activities". According to Syaukani et al (2004), implementation is a series of activities to deliver the policy to the community so that the policy can bring the results as expected. The series of these activities include the preparation of follow-up rules that become the interpretations of the policy. Second, the preparation of resources to mobilize the implementation including all facilities and infrastructure, financial resources, and the determination of who is responsible for the implementation of the policy. Lastly, is about how to convey the policy concretely to the community.

*Program Implementation Model.* One of the models of this program implementation is the model disclosed by David C. Korten. This model uses the learning process approach and better known as the suitability model of program implementation. Korten's suitability model is described as follows:

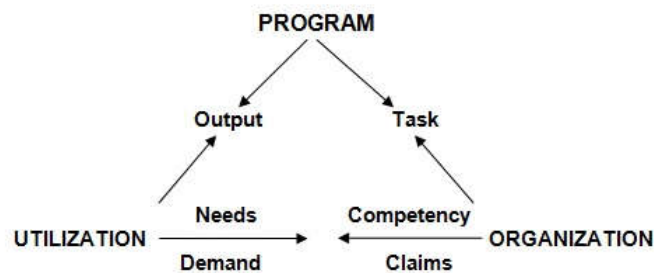


Figure 1 – The Concept of Program Utilization

Korten described this model into three elements that exist in the program implementation such as the program itself, program implementation, and program target. A

program is said to be successfully implemented if there is a conformity in between those three elements of program implementation. First, the suitability of the program with the beneficiaries such as the suitability of what is offered by the program and what is needed by the target group (beneficiaries). Secondly, the suitability of the program and the implementing organization such as the suitability of the tasks required by the program and the capability of the implementing organization. Third, the agreement between groups of users with the implementing organization, the demands of the organization, the decision management program, and the output of task competency that is the suitability in between the requirements of the organization to obtain the output of the program and things that can be done by the target group (Akib and Tarigan, 2000).

*The Concept of Local Economic Development (LED).* The Concept of Development from Bottom allows the smaller territory to construct themselves independently as it is separated from the rest of the world. However, in fact, a development is more directed to a market system. As a result, the relationship in between territories has no limit which then is known as globalization. This means that the Concept of Development from Bottom is very difficult to implement. This concept has been developed in the context of Western Europe but has increasingly perceived its relevance to developing countries such as Indonesia (Firman 2007). Blakely (1989) adds that local economic development is a process whereby local governments and/or community groups manage the existing resources and take part in the partnership with the private sector or others as well as create jobs and stimulate economic activities within the economic zones. In line with the above statement, Schumpeter (1961) in Coffey and Polese (1984) added that the concept of LED is built on the entrepreneurial spirit which can be a major driver for the economy of society. Furthermore, Coffey and Polese (1984) in Todoro 2000 provide an understanding of LED as an enhancement of the role of endogenous elements in the socio-economic life of a locality while keep maintaining its functional and spatial linkages and integration with the wider region.

*Understanding of Broiler Chicken.* Broiler chicken is one type of poultry that grows rapidly, after experiencing a breeding as a superior broiler Abidin (2002). The advantage of broiler breeding business is the type of livestock that has a relatively fast growth rate so that the selling age is quite short, 4-5 weeks. Meanwhile, the disadvantage of this broiler chicken is the fact that it often competes with humans in the stock of food and its resistance against disease is low when compared to *Ayam kampung* (Rasyaf, 2004). Broiler chicken is a term that refers to the strains of technological chicken-results that have economic characteristics. This has a characteristic of rapid growth rate as a meat producer with an economical conversion (Abidin, 2002).

*Partnership.* The partnership comes from the word "partner" which means friend or colleague. Partnership arises because there are at least two partners. The desire to have a partner comes from each side, although it can also happen that partnership arises from the role of third parties (Salam, et al, 2006). In regard to the first thing, broiler chicken breeding is one of the sub-systems of broiler farm agribusiness. Today, we no longer develop livestock merely in terms of cultivation or no longer approach how breeders produce broiler chicken but we must approach the agribusiness comprehensively. As for examples, the approach in the sub-systems of input procurement or pre-production sub-systems, the approach in sub-systems of cultivation or production processes and in sub-systems of processing and marketing or post-production sub-systems, and the approach of components or other factors associated with the agribusiness system (Saragih, 2000). According to Rita (2009), the partnership is cooperation in between various parties both vertically on small businesses with a medium or large businesses and horizontally on the same scale enterprises. This must be conducted in regard to the principle of mutual need or mutual reinforcement. In line with this concept, Saptana et al. (2006) said that a business partnership supports economic efficiency because each party offers its advantages in an attempt to strengthen the market mechanisms, cost of capital, and/or to promote its products.

The pattern of partnership that takes place between companies and broiler chicken breeders is the core pattern of the plasma; the company acts as the core and the breeders as the plasma. The core provides day-old chicks (DOC), vaccines and feeds during the

maintenance activities while the plasma breeders provide land and cages. Supervision and guidance are technically done by the core company while ensuring the marketing system by taking the breeding results at the base price specified in the agreement (Marliana, 2008). So far, in the core of plasma pattern, the partnership on the chicken field that runs, companies provide means of livestock production in the form of DOC, feed, vaccines/vitamins, technical guidance, and marketing results. On the other hand, the plasma provides cages and labor (Nasir, 2011). The main objective of the partnership is to develop an independent and sustainable development (Self-propelling Growth Scheme) with a solid base, economic structure, as well as economic justice to the people as the main backbone (Salam, et al, 2006).

*Small and Medium Enterprises.* Sudisman et al (1996), suggested that the development of SMEs have a big role in the development of manufacturing industry. The development of small-scale enterprises can overcome the problem of unemployment by using labor-intensive technology so as to increase employment and opportunities in business. Based on the law no.9 of 1995 concerning small business, it is said that the economic activity of people is set in maximum annual sales by IDR 1 billion and have a net worth, excluding land and building, as well as a business place at most IDR 200 million (Sudisman & Sari, 1996: 5).

## **METHODS OF RESEARCH**

The problems in this study are about the partnership concept application between PT. Charoen Pokphand Indonesia through its subsidiary of PT. Sinar Sarana Sentosa and SMEs (broiler chicken breeders) in improving the business growth in Blitar. This is conditional and can be developed after the research is done. This study aims to analyze problems of partnership application and its supporting factors as well as the inhibitors. By that, it is possible that the theory of broiler chicken partnership is developed further. According to Kriyantono (2006: 69), the descriptive approach in a research is aimed to describe the issues in sequence, in order, and valid in the facts and properties of particular population or object. Researchers already have the concept and conceptual framework. Through the conceptual framework (theoretical basis), the researcher operates the concept that will produce the variables along with the indicators. This research is used to describe the reality without having to explain the relationship between variables. Moleong (2009: 11) said that that the data collected are in the form of words and pictures so that the report will contain direct quotes from the interviews or other data to provide an overview of the report assessment. Besides that, this research is confirmative. It just analyzes the issues discussed once it is confirmed. The data contained in the research are interviews, field notes, company data, or maybe documentation photographs taken from the research observations.

## **RESULTS AND DISCUSSION**

A deeper understanding of the partnership context in the assisted areas of PT. SSS in Blitar needs to be continuously improved as it can be seen from the results of the above data that there are still some unclear concepts concerning the partnership as a whole. This needs more in-depth socialization. Partnership, in this case, can be described as a form of empowerment. In the context of community empowerment, this statement has two meanings. First, in the empowerment process, there is a strong side to empower the weak. It can be said to be effective because there are companies (core) that are pleased to help or empower small farmers with supporting facilities and infrastructure. The form of compensation earned by the SMEs has a hope to improve the performance of broiler chicken SMEs; this needs to be done due to several problems. This is expected that by the presence of this compensation, it is able to reduce the mortality rate of chicken and chicken disease thus FCR (Feed Conversion Ratio) becomes better or in accordance with the standard. The development of human resources, especially in broiler chicken breeding, is very necessary for the development of broiler chicken which the demand keeps on increasing day per day.

This potential needs to be considered to further improve the productivity of the existing broiler chicken breeders in Blitar.

Certainly, the increasing production of broiler chicken is a good impact to improve the quality of breeders' life. Therefore, the training activities of broiler chicken breeding are very influential to increase the production of broiler chicken among other breeders around the partner area. Training can encourage the availability/supply of broiler chicken to be always stable in the market. The most common obstacle in optimizing the supply of broiler chicken is the condition where the demand is higher than the rate of production. In this case, counseling is basically an education. The target is that farmers need to experience behavioral changes starting from a simple aspect to a more advanced level. Therefore, the main task of breeding socialization is to help the farmers in making decisions. The involvement of the government and PT.SSS in handling broiler chicken breeding is expected to support the improvement of this breeding business in Blitar because it receives direct counseling. Essentially, as a livestock product that is always needed by the community, broiler chicken breeding in Blitar has big potential as one of the commodities that can be developed by the community. In this case, one who has a role in the development of broiler chicken breeding is the activity of socialization that it is one of the livestock department programs assisted by partner companies.

*Supporting and inhibiting factors from the implementation of the partnership program between PT.Sinar Sarana Sentosa with SMEs in Garum, Srengat, and Gandusari of Blitar Regency.* The first supporting factor is the condition of partnership company that must be big. Charoen Pokphand has a market share of fodder by 38%, DOC by 37%, and processed chicken meat by 66% in 2015. This is because Charoen Pokphand has a large business scale. The advantage with the existence of contract between business partner is the certainty of market and price such as the partnership done by PT Charoen Pokphand through PT.SSS with local chicken breeders. By doing this partnership and by the existence of contract which have been clear and agreed by both parties, this makes many benefits for breeders. Breeders could obtain marketing and price certainty that will be accepted by the company so that when the price of chicken is dropped, breeders can still be calm because there is a certainty of price from the company. On the other hand, PT. SSS also get benefits with this contract, the company will receive a fixed and continued supply so that the production efficiency can be improved. In addition to that, the company will also get benefits when the chicken prices soared. Company does not need to pay high to farmers because of the contracts that have been arranged in advance. If there is a decrease and rise of chicken prices, the process will run in accordance with the partnership contract. The second supporting factor is the availability of DOC and feed that is maintained. Adequate DOC and feed supplies will enhance the development process of broiler chicken breeding and production. Goods that are generated must ensure the effectiveness of company's marketing activities to ensure the continuity operation and to achieve the goal to maximize the value of the company rights. The last supporting factor is that mentoring and counseling are often understood as separate and distinct activities, but in fact, mentoring and counseling have a common purpose and in line to each other. Therefore, the Livestock Department of Blitar and PT. SSS have a cooperation through the extension of workers to provide technical guidance for the community such as capital, science, technology, information on livestock services, veterinary services, technical assistance, avoidance of fees that generate high cost economy, and partnership to increase synergy among business actors.

*Inhibiting Factors.* The first inhibiting factor is the high mortality of chickens especially broiler chicken. This is one factor that can affect the sustainability of the independent broiler breeding business. The number of broiler chicken that died both the DOC and finisher has caused huge losses for breeders. Losses caused by high mortality affect the decision of the breeder to stop his business. From some sources of this study, it is stated that mortality has triggered the breeders to stop the business. The average breeder has a business scale of 1500 heads. Meanwhile, the average mortality rate is 100-500 in the harvest. Mortality is a major factor affecting the sustainability of the independent broiler breeding business. It is known that the factors affecting mortality rates are body weight, chicken type, climate,

hygiene, ambient temperature, equipment sanitation, cages, and diseases. This is a big problem for breeders because broiler chickens aged 5-8 weeks have higher mortality rate than the chickens aged 2-4 weeks. A high mortality rate will cause a big loss for breeders. This is in accordance with the opinion of Bell and Weaver (2002) that broiler chicken maintenance is successful if the overall mortality rate is less than 5. The mortality rate is affected by age. High mortality rates can affect breeders' income and even cause considerable losses.

The second inhibiting factor is the high level of disease, the disease in broiler chicken always becomes a constraint in the development of this business. In other words, this business cannot be separated from some chicken diseases. The causes of the disease are quite complex, ranging from bacteria, viruses, protozoa, and parasites. Some of the popular chicken diseases in Indonesia include Chronic respiratory disease, coryza, Newcastle disease (ND) or commonly called as *tetelo*, *gumboro*, dysentery, Colibacillosis, and Avian influenza which becomes a frightening enemy for breeders lately. In the first option, there also kinds of losses that are ready to pounce. Will a market capacity still exist if chickens continue to be maintained? Because only certain customers who want to receive big chickens. Planning this livestock business certainly and carefully, choosing the chicken strain that best suits the natural surrounding conditions, using high-quality livestock feed, doing the best possible maintenance activity, and not forgetting the favorable market aspect. Apart from the outbreak of disease, broiler chicken in the age of 1 to 7 days is very vulnerable to experience death. The last inhibiting factor is the high level of losses caused by the uncertain timing of the harvest. This becomes one of the big problems in a business. High losses can affect the sustainability of a business. Under normal conditions, the breeders will be easy to sell a ready-cut broiler chicken. While if the supply is higher than demand, breeders will have difficulty in selling their products. Here lies the absence of certainty which can cause breeders to sell broiler chicken at cheap prices. As a result, breeders will experience losses, a lot of chicken prices will fluctuate. Price is one of the factors that influence the sustainability of the independent broiler chicken breeding business. Chicken prices can rise when feed prices also rise. However, farmers are afraid to sell the chicken at high prices because it will affect the volume of sales. If the price is set too high, there will be less profit. In this case, the buyer will decrease, sales volume will decrease, all costs may not be covered so that the business will be shut down. High demand for broiler chickens will only happen on particular days. It usually happened before Idul Fitri holiday. The price will rise up in the second week of Ramadhan month and will reach its peak in 2-3 days before the holiday.

*The impact of implementation of the partnership between PT. Sinar Sarana Sentosa with SMEs in Garum, Srengat, and Gandusari of Blitar Regency.* One of the people that set up a breeding farm in Sutojayan, Srengat, and Gandusari of Blitar Regency still contributes to the community in the local village. The majority of the workers are farmers and breeders. There are workers who only depend on farming or breeding and there also civil servants, businessmen, and others but only a few. One of the people who become entrepreneurs through the business of broiler chicken breeding is established in Garum, Srengat, and Gandusari. In establishing the breeding farms ideally, they have a private yard. They should not establish a livestock that is close to residential area because it will disturb the stabilities and activities of the community in daily life and will also impact on the public health when the breeding activities have started.

Education is one of the main factors in the formation of a person's personality. Education is instrumental in the development of the nation so that it must be supported by adequate infrastructure facilities within its implementation. In addition to formal education, non-formal education also greatly affects breeders in increasing the experience as well as in the decision-making related to the efforts of business development. A large number of livestock is one of the important factors of production. If the business has produced a lot of products, then it will also affect the income of the farmers. Many job opportunities and businesses are open with the existence of this broiler chicken breeding activities both as a chicken breeder, cage labor, chicken traders, sellers of chicken pieces, sellers and processors of chicken manure, processors of chicken food products and other businesses



both in the upstream and downstream sector of this broiler chicken breeding business activity. The economic aspects include all activities that support the farmer's economy rates such as capital convenience, increased income, management activity, ease of marketing, and increased volume of broiler chicken. With the existence of PT. SSS, the efficiency of losses can be minimized and new job fields in livestock sub-sector could be opened in Blitar. The most important impact of the company in an area is to absorb new employment for local workers. This assumption is intended to provide opportunities in reducing unemployment in Blitar because of the education level that is not maximal. Increasing Local Own Revenue for Blitar Regency. A mastery of technology acquired by plasma breeders can help them to breed the broiler chicken well. However, the company has not been able to empower farmers to be independent. Conversely, companies give an impact of dependency to plasma farmers. This issue is needed to be done on a scale. The utilization of biosecurity by the company is intended to improve production quality.

## CONCLUSION

Based on the results of interviews with broiler chicken breeders, the guidance by core companies still not maximize the agreed programs. It is advisable for core companies to improve the services provided. Breeders of broiler chicken should have more intense communication with PT. SSS and with the Livestock Department of Blitar in order to reduce the level of losses resulting from the lack of understanding of contract system in the partnership pattern. SMEs should be more active in learning the pattern of partnership. The broiler chicken management is already right so that it can continue to minimize the level of loss borne. The quality of service in the context of the partnership is already good enough as a whole but still needs to be improved in order to satisfy the plasma breeders better. Eventhough it is partially benefited from the presence of the partnership, it is not impossible that plasma breeders will cease to associate with a particular core to look for other core companies as having a better quality of service.

The livestock department acts as a legal umbrella and as a facilitator between the SMEs actors and PT. SSS. They should continue to monitor so that breeders can continue to grow and able to be a regional economic support in Blitar. The Livestock Department must monitor the report directly from PT. SSS to make the company becomes more transparent with the farmers, not only on financial problems but also with other things in the partnership. By that, there will be no expectation from the farmers because of there still some unclear things in this partnership context. Overall, the authors conclude that there is still a lot of research that needs to be done. Suggestion for further research concerning the relationship analysis between the subsidiary company and PT. Sinar Sarana Sentosa, as well as other companies, are expected so that a study that could really help both SMEs and companies as its partner can be obtained.

## REFERENCES

1. Abidin, Z. 2002. Meningkatkan Produktivitas Ayam Ras Pedaging. Jakarta: Agromedia.
2. Direktorat Jenderal Peternakan. 2001. Peluang usaha Ternak Ayam Broiler/Ras Usaha Budidaya Peternakan. Jakarta: Bina UKM.
3. Hamidi. 2004. Metode Penelitian Kualitatif: Aplikasi Praktis Pembuatan Proposal dan Laporan Penelitian. Malang: UMM Press.
4. Hartono, R. 2000. Minimisasi Biaya Produksi Usaha Ternak Ayam Broiler dalam Pola Kemitraan. Bulletin Peternakan.
5. Hertanto, A.A. 2009. Kemitraan Usaha Ras Pedaging: Kajian Posisi Tawar Dan Pendapatan. Unpublished Graduate Thesis.
6. Kriyantono, R. 2009. Teknik Riset Praktis Komunikasi. Jakarta: Kencana.
7. Moleong, L. 2009. Metodologi Penelitian Kualitatif: Edisi Revisi. Bandung: PT. Remaja Remaja.
8. Muslimin. 2002. Budidaya Bina Ayam. Yogyakarta: Kanisius.

9. Rasyaf, M. 2004. Mengapa Peternakan Saya Rugi? (Cetakan Kedelapan). Yogyakarta: Penerbit Kanisius.
10. Rasyaf, M. 2002. Manajemen peternakan ayam broiler. Jakarta: PT. Penebar Swadaya.
11. Rasyaf, M. 1993. Beternak Ayam Pedaging: Edisi Revisi. Jakarta: Penebar Swadaya.
12. Rita, Y. 2009. Analisis Efisiensi Produksi Usaha Peternakan Ayam Ras Pedaging Pola Kemitraan dan Mandiri di Kota Palu Propinsi Sulawesi Tengah. Unpublished Graduate Thesis. Universitas Diponegoro.
13. Salam, T, Muis M, Rumengan AE. 2006. Analisis Finansial Usaha Peternakan Ayam Broiler Pola Kemitraan. Jurnal Agrisistem, Juni 2006, Vol.2, No.1.
14. Saragih, B.2000. Agribisnis Berbasis Peternakan. Bogor: Pustaka Wirausaha Muda.
15. Siahaan, Amiruddin, Rambe dan Mahidin. 2006. Manajemen pengawas pendidikan. Jakarta: Quantum Teaching.
16. Suparta, N. 2001. Perilaku Agribisnis dan Kebutuhan Peternak Ayam Ras Pedaging. Unpublished Dissertation. Bogor: Institut Pertanian Bogor.
17. Syaukani H R; Afan Gaffar; M Ryaas Rasyid. 2004. Otonomi Daerah dalam Negara Kesatuan. Yogyakarta: Pustaka Pelajar.
18. Tobing, V.2005. Beternak Ayam Broiler Bebas Antibiotika: Murah dan Bebas Residu. Jakarta: Penebar Swadaya.
19. Usman, S. 2004. Pembangunan dan Pemberdayaan Masyarakat. Yogyakarta: Pustaka Pelajar.

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## THE FLUSHING FOR LEAD IN FRESHWATER SNAIL *FILOPALUDINA JAVANICA* (VON DEM BUSCH, 1844)

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### ABSTRACT

Increasing industrial activities in Lamongan District is assumed to be followed by the increase on the amount of liters in rivers and ponds. Freshwater snails (*Filopaludina javanica* v.d Busch 1844) that live in rivers and ponds are always exposed to heavy metals. Based on the result of the measurement of Pb in freshwater snails in Waung river, Glagah subdistrict, Lamongan, the highest amount of Pb reached 4.48 mg/kg. This aim of this research was to decrease the amount of Pb in freshwater snails. This research employed an experimental method using complete randomized design with 4 treatments and 3 repetitions; P1 (6-hour flushing procedure), P2 (12-hour flushing procedure), P3 (18-hour flushing procedure), and P4 (24-hour flushing procedure) with the reduction on the level of Pb in the “whole organ” of the freshwater snails. The results show that 24-hour of flushing has reduced the amount of Pb as much as 53.2%, from 2.65 ppm, leaving only 1.24 ppm. Meanwhile, the least reduction was found in the 6-hour flushing procedure at 7.2%. The results of the treatments have obtained amount of Pb under the minimum safety requirement set by BPOM (2009), Fisheries (DKP) No: Kep 17/Men/2004, SK Ditjen POM No. 03725/B/SK/VII/1989, in which it is stated that materials that contain heavy metals less than 1.5 ppm are safe to consume for duck weft and for human. Further researchers are suggested to investigate the accumulation of lead (Pb) in ducks that consume freshwater snails within certain period of time.

### KEY WORDS

Flushing, freshwater snails, Pb, well water.

According to the data issued by (*Badan Pusat Statistik Kabupaten Lamongan, 2007*), Glagah subdistrict lies in a lowland of around 0 – 25 m in the central-north of Lamongan district which is famous for its Bonorowo lowland in Sekaran, Maduran, Laren, Karanggeneng, Kalitengah, Turi and Karang Binangun districts. In those areas, freshwater snails (*Filopaludina javanica* v.d Busch 1844) are easy to find in rivers and ponds at a huge amount of around 100 snails/ m<sup>2</sup> year-round. Freshwater snails can be used as ingredients for duck weft. Besides, freshwater snails are also edible for human. People in the area collect freshwater snails from the habitat manually to be sold to duck farmers (*Yuliana Firdaus, 22 August 2017*). Usually, people collect bigger snails (*Filopaludina javanica* v.d Busch 1844) of around 25 – 27 mm along with their shells for duck weft.

However, the result of a research conducted by Purbalisa and Mulyadi (2013), rice field areas in Glagah subdistrict contained the highest Pb of 0.67 mg/kg compared to other subdistricts; Laren (0.56 mg/kg), Karanggeneng (0.44 mg/kg) and Kedungpring (0.22 mg/kg). Whereas, the amount of Pb found in the bodies of freshwater snails in Glagah subdistrict was also the highest one at 4.47 mg/kg. From the obtained data, it can be implied that there is a certain correlation between freshwater snails which were exposed with Pb content in their habitat which had accumulated the amount of Pb in their bodies. Hutagalung (1991) mentioned that the amount of Pb found in certain organism is usually higher than the amount of Pb in its habitat due to massive accumulation. The amount of Pb in freshwater snails might contaminate the ducks that were fed with weft made from the snails.

Siregar (2013) in his research on freshwater snails of Viviparidae family found a high amount of lead in their flesh around 14.6554 mg/kg, making them dangerous to consume. Hence, it prove that organisms living in a certain habitat can be used as an indicator to measure pollution and to measure the organisms' ability to accumulate pollutants in their

bodies. Therefore, it was necessary to find out the amount of lead in the whole organ of freshwater snails in Glagah subdistrict as an anticipation of its effect on ducks and human that consume the snails.

Brite *et al.*, (2006) explained that maintaining the quality and the safety of food products can be done by reducing the amount of Pb in the snails. The amount of Pb can be reduced by conducting flushing procedure or by soaking the snails and flowing them with clean water before they are used as food for poultry and for human (DKP, 2008). In line with this view, Chan *et al.* (1999) said that flushing off the heavy metals in snails can be done by moving them out from the contaminated habitat to a cleaner habitat. This research provides information on the appropriateness of freshwater snails to use as food for poultry and for human consumption. This research attempted at reducing the amount of Pb in freshwater snails (*Filopaludina javanika* v.d busch 1844) through flushing procedures.

## METHODS OF RESEARCH

Freshwater snails around the size of 25 – 27 mm which were usually used as duck well (*Filopaludina javanika* v.d busch 1844) were collected from ponds and rivers which were exposed to heavy metals including Pb. The observation and the flushing procedures were conducted in the laboratory around the field. This reseach employed an experiment method using a complete randomized design with 4 treatments and 3 repetitions, including identification on the quality of the water (pH, temperature, DO) and the amount of Pb in the “whole organ” of the snails. The flushing procedure used clean freshwater that did not contain any Pb which was then filled into 12 containers. The flusing procedures used in this study were modified from the procedures performed by Nuriyani in 2016. Nuriyani (2016) showed that the soaking procedure did not give any significant effect without the changing of water.

The sample of freshwater snails used in the flushing procedure contained Pb amount beyond the safety limit set by BSN (1.5 mg/kg), DKP (1.5 mg/kg) Regulation of Food Specification NO 466/2001/EC (0.1 ppm) and Depkes (2 mg/kg). Each container was filled with water up to 20 cm for 4 different flushing periods of 6, 12, 18 and 24 hours in 3 repetitions. The flushing speed at 0.43 m/second was used regarding to the suggestions from previous studies by measuring the average water speed in the habitat. This speed was also determined from the previous study conducted by Ahmad (2012) in which the flushing of water at 0.43 m/second in 3 weeks has successfully reduced the amount of Pb in the shell of the snails from 1.19 ppm to 0.45 ppm (62.18%).

## RESULTS AND DISCUSSION

The result of the first stage preliminary study done to the flesh of freshwater snail in Waung river showed the highest contamination of lead (Pb) of 4.48 mg/kg, whilst the least amount of lead (Pb) was found in Bengawan Blawi river at 0.5 mg/kg.

The sample collection in the stage 2 preliminary study was done in 4 locations which were the station 1 (Gayam Pond 1) located in the coordinate point 7<sup>0</sup> 03'27.93" S and 112<sup>0</sup> 27' 56.01" E, Station 2 (Gayam River) at 7<sup>0</sup> 03'33.81" S and 112<sup>0</sup> 27' 51.26" E, Station 3 (Gayam Pond 2) at 7<sup>0</sup> 03'35.34" S and 112<sup>0</sup> 27' 52.16" E, and Station 4 (Anak Kali Waung River) at 7<sup>0</sup> 03'35.34" S and 112<sup>0</sup> 27' 52.16" E.

The concentration of lead (Pb) in the “whole organ” of the freshwater snails showed the highest value in Station 1 at 3.432 ppm, followed by Station 3 at 2.924 ppm, Station 2 at 2.402 ppm and the lowest one was found in Station 4 at 0.07 ppm (Figure 2). Regarding to the decision letters issued by the Ministry of Marine and Fisheries No: Kep 17/Men/2004 and National Standardization Institution (2009), the maximum limit of lead content is 1.5 ppm. Thus, the freshwater snails collected from station 1, 2, and 3 had reached over the safety limit, and only the ones found in station 4 were under the limit.

In the second preliminary study, the amount of lead (Pb) in station 4 decreased from 4.48 ppm to 0.07 ppm. The decrease was resulted by the increase on the water speed in

Waung river from 0.5 m/second to 1 m/second in February until July 2017. The faster water speed has flushed the amount of Pb within the flesh of the snails. Besides, mud litters thrown into the river from rice fields were low since it was not yet the harvest time. In the harvest time, farmers throw away the litters from their field into the river, causing high mud sedimentation in the river which forces freshwater snails to accumulate more Pb in their bodies. According to Purbalisa and Mulyadi (2013) the contamination of lead (Pb) in the rice fields is assumed to come from the phosphate element as the impurities in the fertilizer. Phosphate fertilizer contains  $P_2O_5$  as the primary element and it contains some secondary nutrients such as Ca, Mg and other micro elements including Fe, Mn, Cu, Zn and some heavy metals at various amount such as Cd (0.1-170 ppm) Cr (66-245 ppm), Pb (40 – 2000 ppm), (Setyorini,2003).

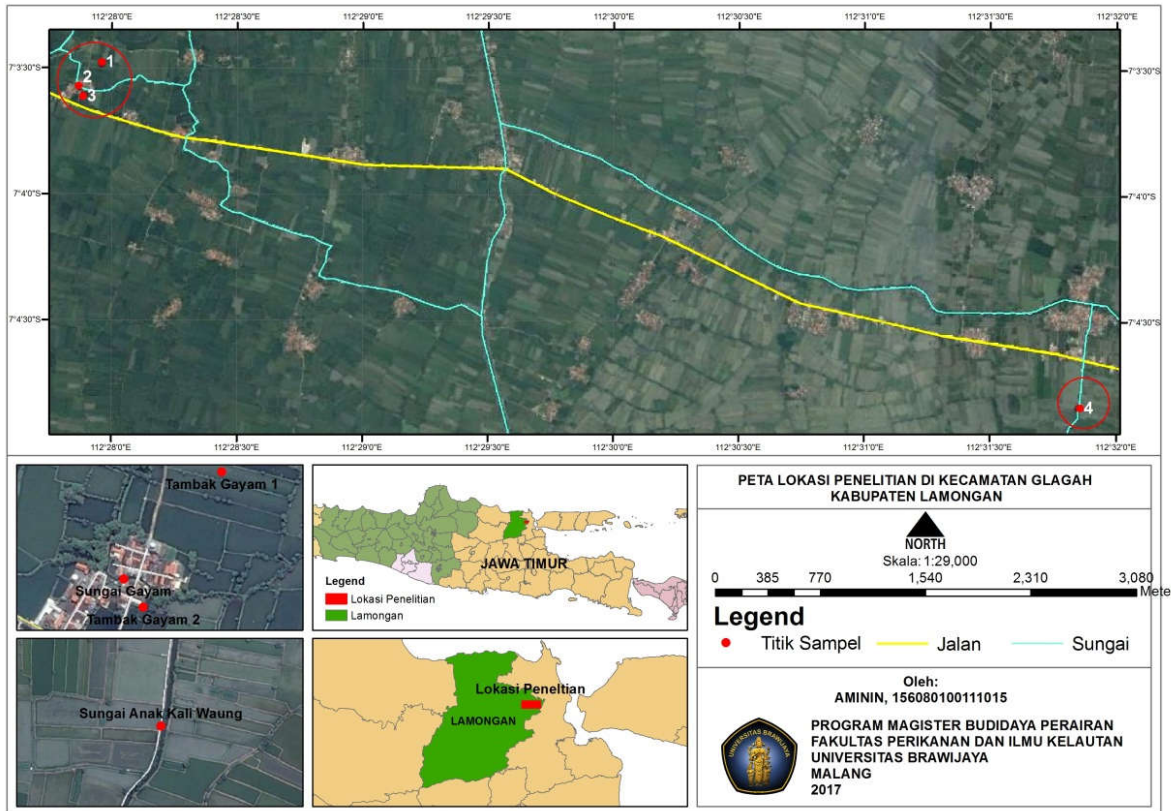


Figure 1 – The location of sample collection in the second stage preliminary study in Glagah subdistrict, Lamongan (Source: Google 2017 shapefile (SHP) Indonesian Geographical Images)

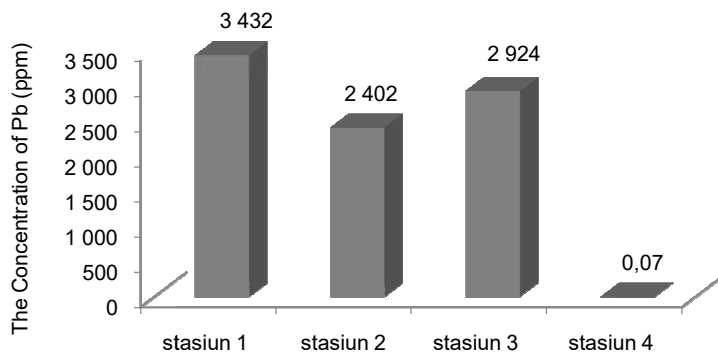


Figure 2 – Average lead (Pb) concentration in rivers and ponds in Glagah Subdistrict, Lamongan (Notes: Stasiun 1: Gayam Pond 1; Stasiun 2: Gayam River; Stasiun 3: Gayam Pond 2; Stasiun 4: Anak Kali Waung River)

**Results of Flushing Procedure.** Based on the result of this research, it can be concluded that the longer the flushing time, the higher the amount of ions flushed away from the flesh of the snails, which results to lower concentration of Pb in the snails. 6-hour flushing process has decreased the concentration of Pb as much as 7.2%. The 12-hour flushing process has decreased 19.6% of the Pb, leaving only 1.12 ppm. The 18-hour flushing process has decreased 38.1% of the Pb concentration, remaining only 1.64 ppm. The highest decrease of Pb was obtained from the 24-hour flushing process which has successfully decreased 53.2% of Pb concentration from 2.65 ppm to 1.24 ppm. Regarding to the maximum limit of Pb concentration determined by the BPOM (2009) at 1.5 ppm, the concentration of Pb in freshwater snails after the flushing process is under the limit and is safe for human consumption.

Suprijanto *et al.* (1997) stated that depuration procedure decreases Pb concentration within the organisms' bodies since there is no addition of heavy metals from outside. The decreased concentration of Pb resulted from the release of metallic ions from the protein structure in the snails which are leached from their flesh as the balancer of Pb concentration in the flesh. Naturally, metallic ion exchange happens easily, especially to ions which are bounded to metalloprotein for metalloprotein chains are not stable (Wahyuni dan Widiyanti, 2004).

The result of Anova test has resulted an average concentration of Pb after the flushing procedure with a significant effect ( $p > 0.5$ ). Hence, flushing procedure can be regarded highly effective in decreasing the concentration of Pb in freshwater snails. It happened due to the changing of water all the time which washed away the heavy metals in the snails' body. This insight goes in line with Riyadi (2016) who stated that clams are able to release heavy metals from their bodies which are later flushed away by ever flowing water circulation. Zhu *et al.*, (1999) mentioned that the effort to clean clams and snails is often done in land with stable supply of flow-through water.

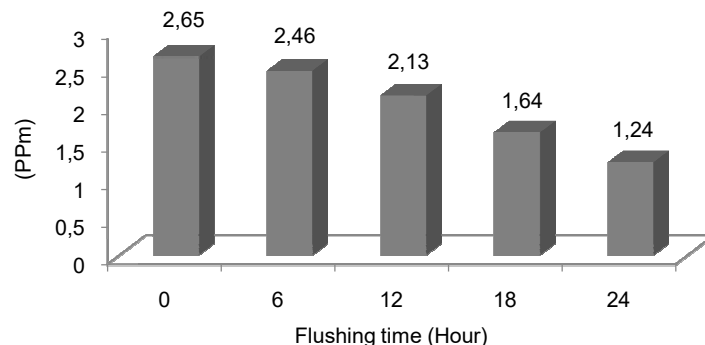


Figure 3 – The Result of AAS Test to the Whole Organ of Freshwater Snails after the Flushing Procedure

**Water Quality.** Physical and chemical parameters of the water were measured before and during the treatment. Water quality shows the relative condition of the water related to the necessities of creatures living in water. Moreover, the water quality also becomes the standard measurement to determine the quality of water ecosystem. Measurement was conducted on site in for each treatment including water temperature, pH and the dissolved oxygen (DO). The average score of the water quality measurement in each flushing process is presented in Table 1.

The average temperature during the flushing treatment was around 26.9 – 30.5 °C. The average temperature shows that the water in the containers was favorable for the freshwater snails to live. Sumarni (1989) stated that most Mollusca, especially snails are able to live within the temperature of around 22 – 33 °C. Meanwhile, Junting (1956) mentioned that *Bellamnya javanika* family Viviparidae are able to tolerate temperature up to 35 °C. generally, the pH found in each treatment was around 7.3 – 7.5. Hynes (1987) explained that usually

gastropods living in fresh water are able to live in pH level around 5.0 – 9.0. Seen in Table 1, the pH of the water used in the research had been suitable with the ideal habitat of the freshwater snails. In line with Connel and Miller (1995); Novotny and Olem (1994), the increase of pH in the water is usually followed by the decrease of the solubility of the heavy metals, which makes the heavy metals to settle.

Table 1 – Average score of water quality during the flushing process

| Treatment (Hour) | Parameters       |     |          |
|------------------|------------------|-----|----------|
|                  | Temperature (°C) | pH  | DO (ppm) |
| 0 Hour           | 29.9             | 7.3 | 3        |
| 6 Hours          | 27.1             | 7.3 | 2.8      |
| 12 Hours         | 26.9             | 7.4 | 3.3      |
| 18 Hours         | 30.2             | 7.4 | 3.4      |
| 24 Hours         | 30.5             | 7.5 | 4.0      |

The result of the analysis on DO, the DO in each treatment tended to fluctuate. In the control treatment, the concentration of DO was found at 3 ppm, yet it decreased to 2.8 ppm after being given 6-hour flushing process. The decrease might be caused by the metabolism process of the freshwater snails (*Filopaludina javanika* v.d busch 1844) which requires high amount of oxygen. Rosita (2005) found in her research that performing depuration procedure decreases the DO of water. However, the increase in the concentration of DO in the water of immersion after the flushing process was rather caused by the aeration that works with the accordance of the gravity. In this context, the flowing water intensified the interaction between the air and the water, which gradually increased the concentration of the dissolved oxygen in the water (Wheaton, 1977).

### CONCLUSION AND SUGGESTIONS

24-hour flushing procedure has been able to decrease the highest amount of Pb as much as 53.2% from 2.65 ppm to 1.24 ppm. Thus, after the treatment, the freshwater snails are safe for poultry feed and for human consumption. The flushing treatment conducted in this research has resulted to freshwater snails which are safe to consume based on the maximum limit of heavy metal contamination at 1.5 ppm set by BPOM (2009), Fisheries (DKP) No: Kep 17/Men/2004, SK Ditjen POM No. 03725/B/SK/VII/1989.

Further research should be conducted to investigate the accumulation of Pb in ducks that consume freshwater snails that are contaminated with Pb within certain period of time.

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### REFERENCES

1. Ahmad, A. 2012. Pengaruh Perbedaan Kecepatan Aliran Air Terhadap Perubahan Kadar Logam Berat Timbal (Pb) Pada Cangkang Kijing Taiwan (*Anodonta Woodiana*). Skripsi. Fakultas Perikanan dan Ilmu Kelautan Universitas Brawijaya. Malang.
2. Anonim. 2007. Manfaat Keong Sawah di Lamongan <http://Yulian.Firdaus.or.id/2007/02/08/tutut/>. (22 Agustus 2017)
3. [BSN] Badan Standardisasi Nasional. 2009. Batas Maksimum Cemar Logam Berat dalam Pangan. Badan Standardisasi Nasional. Jakarta.
4. Badan Pusat Statistik dan Pemerintah Kabupaten Lamongan. 2007. Lamongan Dalam Angka. Lamongan.
5. Brite, M., J, Dewi., dan Kurniastuty. 2006. Rekayasa Pengujian Depurasi Keperangan dalam Upaya Meningkatkan Keamanan Bagi Konsumen. Jurnal Departemen Kelautan dan Perikanan. Jakarta.

6. [DKP] Departemen Kelautan dan Perikanan. 2008. Budidaya kerang hijau (*Perna viridis*). <http://www.indonesia.go.id/id/index.php.htm> [15 Feb 2009].
7. Connel, D.W dan G,J. Miller. 1995. Kimia dan ekotoksikologi pencemaran. UI Press, Jakarta. 520 hlm.
8. Chan KW, Cheung RYH, Leung SF, Wong MH. 1999. Depuration of metal from soft tissue of oyster (*Crassostrea gigas*) transplanted from a contaminated site to clean sites. *Environmental Pollution* 105:299-310.
9. Hutagalung, H.P. 1991. Pencemaran Laut oleh Logam Berat dalam Beberapa Perairan Indonesia. Puslitbang Oseanologi LIPI, Jakarta. p. 1–20.
10. Purbalisa, W. Dan Mulyadi. 2013. Pb Dan Cu Pada Badan Air Dan Tanah Sawah Sub-Das Solo Hilir Kabupaten Lamongan. *Jurnal. Balai Penelitian Lingkungan Pertanian. Jawa Tengah*.
11. Hynes, H.B.N. (1978). *The biology of polluted waters*. Liverpool University press.London.
12. Jutting, W.S.S. (1956). *Systematic Studies on The Non Marine Mollusca of the Indo Australian Archipelago*. V. Critical Revision on The javanese Fresh Water Gastropods. *Treubia*.
13. Novotny, V.and Olem, H. 1994. *Water Quality, Prevention, Identification and Management of Diffuse Pollution*. New York: Van Nostrans Reinhold
14. Riyadi P. H., Anggo A.D., dan Romadhon 2016. Efektifitas Depurasi Untuk Menurunkan Kandungan Logam Berat Pb Dan Cd Dalam Daging Kerang Darah (*Anadara granossa*). Prosiding Seminar Nasional Tahunan Ke-V Hasil-Hasil Penelitian Perikanan dan Kelautan. Universitas Diponegoro Semarang.
15. Rosita N. 2005. Efektivitas Kitosan dalam Menurunkan Kandungan Timbal (Pb) pada Kerang Hijau (*Mytilus viridis*) dengan Sistem Resirkulasi Sederhana [Skripsi]. Bogor: Program Studi Teknologi Hasil Perairan, Fakultas Perikanan dan Ilmu Kelautan, Institut Pertanian Bogor.
16. Sari, W.P., Bahtiar dan Emiyarti. 2016 Studi Preferensi Habitat Siput Tutut (*Bellamyia javanica*) di Desa Amonggedo Kabupaten Konawe. *Jurnal.. Fakultas Perikanan dan Ilmu Kelautan Universitas Halu Oleo. Kendari*.
17. Setyorini, D., Soeparto, dan Sulaeman. 2003. Kadar Logam Berat Dalam Pupuk. Hal 219-229 dalam Risalah seminar peningkatan kualitas lingkungan dan produk pertanian. Kudus, 4 Nopember 2002. Puslittanak, Badan Litbang, Deptan.
18. Siregar, N. M. 2013. Analisis Kandungan Logam Berat Pb Dan Cd Pada Keong Tutut (*Bellamyia Javanica* V.D Bush 1844) Di Waduk Saguling, Jawa Barat. Skripsi. Fakultas Perikanan Dan Ilmu Kelautan Institut Pertanian Bogor. Bogor.
19. Sumarni, 1989. Golden Shell Keong Mas Baru Penghuni Aquarium. *Trubus* No. 240 Th XX November. Yayasan Tani Membangun. Jakarta. Hal 217.
20. Sugianto,D,N. 1997. Tingkat Bioakumulasi Logam Berat Timbal (Pb) pada Jaringan Lunak kerang Bulu (*Anadora Inflata reeve*). *Jurusan Ilmu Kelautan. Universitas Diponegoro, Semarang*. 69 p.
21. Suprijanto, J., I. Widowati., P.W. Dyah., Widianingsih dan I. Hermawan. 1997. Bioakumulasi Logam Berat Timah Hitam (Pb) pada Jaringan Lunak Kerang (*Anadara* sp): Analisa Kualitatif dan Kuantitatif. *Fakultas Perikanan dan Ilmu Kelautan. Universitas Diponegoro. Semarang. Laporan Hasil Penelitian (Tidak Dipublikasikan)*. 49 p.
22. Wahyuni, M. dan Widiyanti, S. 2004. Reduksi kadar merkuri pada kerang hij au (*Mytilus viridis*) di Teluk Jakarta melalui metode asam serta pemanfaatannya dalam metode kerupuk. *Prosiding Seminar Nasional dan Temu Usaha. Universitas Sahid, Jakarta*. p. 206–220.
23. Wheaton, F.W. 1977. *Aquacultural Engineering* , second printing. Robert E. Krieger Publishing Company. Malabar, Florida.



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**ОСНОВНЫЕ НАПРАВЛЕНИЯ ОЗДОРОВИТЕЛЬНЫХ МЕРОПРИЯТИЙ  
ПРИ САЛЬМОНЕЛЛЕЗЕ ПТИЦ: ПРИНЦИПЫ И НЕДОСТАТКИ  
АНТИБИОТИКООБРАБОТОК**  
THE MAIN DIRECTIONS OF HEALTH IMPROVEMENT MEASURES  
FOR SALMONELLOSIS OF BIRDS: THE PRINCIPLES AND DISADVANTAGES  
OF ANTIBIOTIC TREATMENT

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**АННОТАЦИЯ**

Универсальной лечебно-профилактической схемы при сальмонеллезе предложить невозможно. Антибиотики продолжают оставаться основой лечебно-профилактических мероприятий в промышленном птицеводстве. Применение антибактериальных средств в системе оздоровительных мероприятий при сальмонеллезе подчинено принципу активного выбора. В статье приводится опыт исследований антибиотико-резистентности сальмонелл, который позволил систематизировать сведения об антибактериальных средствах при сальмонеллезе.

**ABSTRACT**

Universal therapeutic and prophylactic scheme for salmonellosis can not be offered. Antibiotics continue to be the basis of therapeutic and preventive measures in industrial poultry farming. The use of antibacterial agents in the system of health measures for salmonellosis is subject to the principle of active choice. The article presents the experience of studies of antibiotic resistance of salmonella, which allowed to systematize information on antibacterial agents in salmonellosis.

**КЛЮЧЕВЫЕ СЛОВА**

Сальмонеллез птиц, антибиотики, антибиотикорезистентность, оздоровление.

**KEY WORDS**

Salmonellosis of birds, antibiotics, antibiotic resistance, health improvement.

Сальмонеллез является одной из четырех основных токсикокишечных инфекций у человека. Проблема сальмонеллеза отмечена Всемирной Организацией Здравоохранения как глобальная проблема, представляющая опасность человечеству, в связи с ростом числа антибиотико-резистентных штаммов возбудителя и расширения их географической распространенности. Основным источником инфицирования человека

– продукты птицеводства, поэтому профилактика и борьба с сальмонеллезом на предприятиях и в хозяйствах по содержанию птицы является актуальной задачей.

Концепция оздоровления птицеводческих хозяйств при сальмонеллезной инфекции зависит от нозологической формы сальмонеллеза, т.е. непосредственно от вида и сероварианта сальмонеллы-возбудителя, формы хозяйствования, производственного потенциала, вида птицы и других аспектов. Лечебные мероприятия в условиях крупных птицеводческих производств будут направлены, в первую очередь, на ликвидацию очага инфекции и предотвращение распространения заболевания. В условиях мелких ферм и частных хозяйств, вольеров, зоопарков с содержанием высокоценной птицы возможны случаи комбинативных терапевтических подходов к особям первой группы – больных птиц с выраженными клиническими признаками, если Ветеринарное законодательство допускает лечение (например, при пуллорозе-тифе, аризонозе птица с признаками болезни подлежит убою).

Универсальной лечебно-профилактической схемы при сальмонеллезе предложить невозможно в следствие нозологического разнообразия этого зооноза. Этиотропное лечение при сальмонеллезе включает в себя средства и методы специфической и неспецифической терапии. Специфические средства представлены гипериммунными антитоксическими сыворотками и бактериофагами. Применение сывороток в условиях птицеводства с различным типом хозяйствования ограничено экономической целесообразностью и условиями использования.

Неспецифическая этиотропная терапия при сальмонеллезе предусматривает применение активных в отношении сальмонелл антибактериальных средств. К сожалению, на сегодня, антибиотики применяют и для профилактики бактериальных вспышек, особенно в промышленном птицеводстве.

Целью настоящей работы стала систематизация антибактериальных средств для лечения и профилактики сальмонеллезных вспышек в птицеводстве, изучение недостатков и совершенствование принципов антибиотикообработок.

## **МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ**

В ходе работы применяли эпизоотологические, бактериологические методы исследований (определение чувствительности микроорганизмов к антибиотикам). Использовали штаммы сальмонелл и антибактериальные средства. Определение чувствительности антибиотиков к микроорганизмам проводили методами стандартных дисков или разведений. Для терапии применяли препараты, к которым установлена зона задержки роста микрофлоры не менее 20 мм при использовании метода стандартных дисков или к которым установлено отсутствие роста микрофлоры при разведении препарата 1:10000 по действующему веществу.

## **РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ**

Применение антибактериальных средств в системе оздоровительных мероприятий при сальмонеллезе подчинено принципу активного выбора. В основу выбора препарата положено подтверждение его активности в отношении клетки-мишени – возбудителя инфекции. Накопленный опыт исследований антибиотикорезистентности сальмонелл, выделенных из патологического материала, полученного от птиц разных видов и разных условий содержания, позволяет нам систематизировать сведения об антибактериальных средствах, применяемых в системе оздоровительных и профилактических противосальмонеллезных мероприятий.

Для снижения потенциальной возможности развития резистентности микроорганизмов к антибактериальным препаратам необходимо руководствоваться принципами рациональной антибиотикотерапии, которые включают точную диагностику, правильный выбор препаратов и их сочетаний, основанный на результатах определения чувствительности возбудителя к антибиотикам, правильный

выбор режима дозирования и курса применения, своевременное начало, рациональный метод введения, основанный на фармакокинетике в организме животного и действия химиотерапевтического препарата (для промышленного птицеводства при сальмонеллезе в виду массовости одновременного применения рациональным способом является оральный метод введения антибактериальных средств с преимущественным действием в желудочно-кишечном тракте).

По типу влияния на бактериальные клетки действие антибактериальных препаратов может быть бактерицидным и бактериостатическим. Бактерицидное действие лекарственных средств означает способность вызывать гибель микроорганизмов, повреждая клеточные мембраны. Бактериостатическое действие основано на угнетении синтеза белков и подавления размножения микроорганизмов (путем повреждения ДНК, угнетения ДНК-гиразы, подавления активности РНК-полимеразы, ингибирования продукции фолиевой кислоты).

До широкого внедрения в ветеринарную практику антимикробных препаратов бактерии характеризовались высокой природной чувствительностью к ним. Интенсивное использование противомикробных препаратов, в частности, в терапии инфекционных заболеваний, способствовало приобретению микроорганизмами различных механизмов устойчивости и постепенному преобладанию в популяции возбудителей устойчивых штаммов. Обладание высокой способностью к приобретению генетического материала, кодирующего резистентность к антибиотикам, имеет глобальную тенденцию к росту. В связи с этим выбор антимикробных препаратов в настоящее время существенно ограничен.

Кроме того, применение антибиотиков не устраняет бактерионосительство и провоцирует дисбактериоз, т.к. активный компонент препарата безразборчиво губителен и для патогенной микрофлоры, и для сапрофитной (так называемой условно-патогенной), и для полезных лакто-, бифидобактерий, пропионовокислых и других бактерий. Освободившуюся биологическую нишу (полость кишечника) быстро заселяют дрожжи, энтеробактерии и другие сапрофиты, обычно обладающие множественной антибиотикорезистентностью. Поэтому с 3-5 дня после начала применения антибиотиков и 10-14 дней после антибиотикотерапии показано применение пробиотических средств.

Пробиотики – биологические препараты, представляющие собой стабилизированные культуры симбионтных микроорганизмов или продукты их ферментации, которые способствуют росту симбионтных микроорганизмов. Положительный эффект от применения пробиотиков обусловлен участием в процессах пищеварения и метаболизма организма-хозяина, биосинтезом и усвоением белка и многих других биологически активных веществ, обеспечением колонизационной резистентности кишечника. Пробиотики не могут выступать как самостоятельное средство лечения при сальмонеллезе, но должны рассматриваться как важная часть в общем комплексе лечебно-профилактических мер, способствующих повышению сохранности птицепоголовья, а также как естественная альтернатива профилактическим антибиотикообработкам в птицеводстве, позволяющая снизить заболеваемость молодняка желудочно-кишечными болезнями и риск контаминации продукции птицеводства возбудителями пищевых токсикоинфекций человека. Антагонизм к патогенной флоре проявляется в разной степени у разных препаратов за счет продукции органических кислот, перекисей, низкомолекулярных пептидов. Перечень пробиотиков, производители которых позиционируют антагонистическое противосальмонеллезное действие, довольно широк, что определяет большую вариативность терапевтического и профилактического выбора.

Тем не менее, антибиотики продолжают оставаться основой лечебно-профилактических мероприятий в промышленном птицеводстве.

Из активных групп в отношении сальмонелл согласно проведенным нами исследованиям по антибиотикорезистентности наиболее эффективными оказались тетрациклины, фторхинолоны, аминогликозиды, цефалоспорины, нитрофураны. Эти

данные подтверждаются и другими результатами исследований отечественных и зарубежных ученых, доступными в литературе.

Тетрациклины (циклоалканы) действуют как в пищеварительном аппарате, так и системно – в других органах, хорошо всасываясь из желудочно-кишечного тракта. Основу молекулы составляет полифункциональное гидронафтаценовое соединение с родовым названием тетрациклин. Механизм действия тетрациклинов заключается в нарушении биосинтеза белка на рибосомах, тем самым тетрациклины задерживают рост и размножение многих грамотрицательных и грамположительных микроорганизмов. Активность в отношении грамположительных микроорганизмов несколько выше, чем в отношении грамотрицательных, и уменьшается в ряду хлортетрациклин – тетрациклин – окситетрациклин.

Более выражен противомикробный эффект циклоалканов в отношении микроорганизмов, находящихся в фазе активного размножения. Среди них имеются природные тетрациклины – тетрациклин (биовит-80, витатетрин), окситетрациклин (окситетрациклина гидрохлорид, эгоцин 20, нитокс 200, эгоцин LA, терравитин 500) и полусинтетические тетрациклины – метациклин, хлортетрин, доксициклин (ацидокс, доксижат, вибрамицин, Докси WS, Докси 500WS, доксивет 10, Доксилос ОР, польодоксин, мизоксин, хипрадокс 10), миноциклин, ролитетрациклин. Препараты тетрациклинового ряда способны вызывать у микроорганизмов перекрестную устойчивость. Из этой группы препаратов для птицеводства апробированы:

- Ацидокс (в 100 г препарата содержится 10 г доксициклина гидрохлорида, 2 г аскорбиновой кислоты и глюкозы до 100 г), птице препарат задают с водой из расчета 1 г на 1 л воды и выпаивают максимально 5 дней. Используют свежеприготовленный раствор. Убой птицы на мясо разрешен через 7 дней после последнего применения препарата. Яйца можно употреблять в пищу людям через 14 дней после последнего применения препарата;

- Докси WS (доксициклина гиклат 200 мг с наполнителем до 1 г ) и Докси 500 WS (доксициклина гиклат 500 мг) применяют орально в течение 3-5 дней: 1 кг на 2000 л питьевой воды Докси WS и 100 г на 1000 л Докси 500 WS. Период ожидания – период, который вещество находится в организме птиц и выделяется с продуктами – каренция, составляет 7 дней, в этот период запрещается реализовывать продукты птицеводства;

- Доксилос® ОР (в 1 мл лекарственного препарата содержится в качестве действующего вещества доксициклина гиклат, в дозе, эквивалентной 100 мг доксициклина, и вспомогательные компоненты), применяют перорально птице в дозе 0,5-1 мл на литр питьевой воды (эквивалентно 50-100 мг доксициклина на литр воды) в течение 3 – 5 дней. Каренция – 6 дней;

- Доксиор 10 % (доксициклина гиклат; 1-метил-2пирролидон, пропиленгликоль) применяют перорально индивидуально или групповым способом с водой для поения 0,5 – 1,0 мл на 1 литр питьевой воды (эквивалентно 50-100 мг доксициклина на 1 л воды) в течение 3-5 дней. Каренция – 14 дней;

- Докси-10 (доксициклина гиклат; магния хлорид, натрия формальдегид сульфоксилат, пропиленгликоль и вода очищенная) применяют орально с водой, в дозе – 0,5-1 мл на 1 л воды, что соответствует 50-100 мг препарата на литр воды в течение 3-5 дней или применяют из расчета 2 кг препарата на 1 тонну корма. Каренция составляет 7 дней;

- Биовит Р-150 (препарат содержит кормовой белок (15-30 %), глюкозиды, различные аминокислоты, минералы, витамины группы В и хлортетрациклин в количестве 15 %), групповым методом, с кормом или водой один раз в день, на протяжении 5-7 дней из расчета 0,33 г на 1 кг живой массы. Содержащиеся в препарате вещества за счет комплексного действия ускоряют обмен веществ и улучшают аппетит. Применение препарата существенно ускоряет рост птицы (увеличение веса на 30-35 %) и улучшает усвоение корма (более чем на 20 %), убой разрешен через 24 часа после использования препарата;

- Аурогран™ 20 % порошок (содержит в качестве действующего вещества хлортетрациклин в форме гидрохлорида – 200 мг/г, а в качестве вспомогательных

веществ карбонат кальция – 70-100 мг/г, а также продукты ферментации хлортетрациклина – до 1 г) применяют в смеси с кормом в течение 5 суток в дозе 2 кг на тонну корма. Каренция – 10 дней;

- Эгоцин 20 (порошок для перорального применения, содержит в 1 г окситетрациклина гидрохлорида 200 мг, а также кремния диоксид коллоидный, лактозы моногидрат), цыплятам препарат дают в дозе 50-100 г порошка на 100 л воды для питья или 0,5-1,5 кг порошка на тонну корма в течение 4-5 дней. Продукты убоя использовать по истечению 10 дней после курса дачи препарата

И другие.

Фторхинолоны оказывают бактерицидный эффект и принципиально отличаются по механизму действия от других антибактериальных препаратов, что обеспечивает их активность в отношении устойчивых, в том числе полирезистентных, штаммов микроорганизмов. Хинолоны ингибируют ферменты микробной клетки, такие как ДНК-гиразу и топоизомеразу IV, тем самым нарушают синтез ДНК. Нефторированные хинолоны действуют преимущественно на грамотрицательные бактерии семейства *Enterobacteriaceae* (*Salmonella spp.*, *E. coli*, *Enterobacter spp.*, *Proteus spp.*, *Klebsiella spp.*, *Shigella spp.*). Фторхинолоны имеют значительно более широкий спектр. Они активны в отношении ряда грамположительных аэробных бактерий (*Staphylococcus spp.*), большинства штаммов грамотрицательных, в том числе *Salmonella spp.*, *E. coli* (включая энтеротоксигенные штаммы), *Shigella spp.*, *Enterobacter spp.*, *Klebsiella spp.*, *Proteus spp.*, *Serratia spp.*, *Providencia spp.*, *Citrobacter spp.*, *Morganella morganii*, *Vibrio spp.*, *Haemophilus spp.*, *Neisseria spp.*, *Pasteurella spp.*, *Pseudomonas spp.*, *Legionella spp.*, *Brucella spp.*, *Listeria spp.*

Для применения при сальмонеллезе, как правило, эффективны энрофлоксацин (энрофлон, байтрил, Хипралона Энро-S, Колмик-Е, энроксил, джотрил, энромаг-О® и другие), флубактин, норфлоксацин, пefлоксацин, офлоксацин, ципрофлоксацин, левофлоксацин. Внутри группы высока вариабельность активности средств против сальмонелл. Качественного терапевтического эффекта гарантированно можно добиться только после определения чувствительности микроорганизмов к антибактериальным препаратам.

Препараты фторхинолонов, предложенные для птицеводства, основаны преимущественно на энрофлоксацине:

- Энрофлоксацин 100 порошок (действующее вещество – энрофлоксацин, вспомогательное вещество – лактоза) применяют из расчета бройлерам, индейкам, родительскому бройлерному стаду – 10 мг энрофлоксацина на 1 кг массы птицы, из расчета 1 кг препарата на 1 т корма. Продолжительность курса лечения составляет 3-5 дней. Убой птицы на мясо разрешается не ранее чем через 11 после последнего применения препарата;

- Энрофлоксацин 100 раствор для перорального применения (энрофлоксацин; бисульфит натрия, гидроксид калия, этилендиаминтетрауксусная кислота, вода для инъекций) в рекомендуемой дозе 100 мл на 100 л воды и продолжительности курса лечения – 5 дней. Убой птицы на мясо разрешается не ранее чем через 11 дней после последнего применения препарата;

- Джотрил 10 % (энрофлоксацин, вспомогательные вещества: гидроксид калия, глицерол, вода очищенная) 10 мг на 1 кг живой массы тела или 100 мл на 200 л питьевой воды на протяжении 5 суток. Убой на мясо разрешается через 5 дней после последнего применения препарата – Энростим 10 % (энрофлоксацин, этилендиаминтетрауксусная кислота, калия гидроксид, вода очищенная) применяют орально с водой для поения в течение 5 дней в дозе 10 мл препарата на 10 литров воды. Убой на мясо разрешается через 4 дня после последнего приема препарата;

- Энрофлокс 10 % (энрофлоксацин; моногидрат лактозы, кремний коллоидный безводный) применяют перорально в дозе 0,5 л препарата (50 промилле энрофлоксацина) на 1000 л питьевой воды в течение 5 суток. Убой на мясо разрешается через 11 дней после последнего приема препарата;

- Энромаг-О® (в качестве действующего вещества содержит энрофлоксацин – 100 мг, вспомогательные вещества: спирт бутиловый – 30 мг, калия гидроокись, а также воду для инъекций) применяют орально в смеси с водой в течение 3-5 дней из расчёта 5 мл на 10 литров воды. Убой птицы на мясо разрешается не ранее, чем через 11 суток после последнего применения;

- Энросепт раствор оральный (содержит в 100 мл в качестве ДВ 10 г энрофлоксацина, а в качестве вспомогательных веществ – 3 г н-бутанола, 1,5 г гидроксида калия и до 100 мл воду для инъекций) с питьевой водой из расчета 50 мл 10 %-ного раствора на 100 л воды. Лечение продолжается 5 суток. Убой птицы на мясо разрешается не ранее, чем через 11 суток после последнего применения;

- Сиваквинол 10 % оральный раствор (действующее вещество – энрофлоксацин 10 %, вспомогательные вещества гидроксид калия, бензиловый спирт, дистиллированная вода) выпаивают с водой в дозе 500 мл препарата на 1 000 л воды в течение 3-5 суток. Убой птицы на мясо разрешается не ранее, чем через 11 суток после последнего применения;

- Карифлоркс (энрофлоксацин, бензиловый спирт, калия гидроксид, вода очищенная) применяют с водой для поения в дозе 10 мг энрофлоксацина на 1 кг массы птицы в течение 3 - 5 дней. Убой птицы на мясо разрешается не ранее, чем через 11 суток после последнего применения лекарственного средства;

- Колмик-Е (в 1 мл в качестве действующего вещества содержится энрофлоксацин – 100 мг, а также вспомогательные вещества: калия гидроксид ~ 18,5 мг, формальдегид сульфоксилат натрия – 4 мг и вода дистиллированная – до 1 мл) применяют с водой для поения в суточной дозе 5-10 мг энрофлоксацина на 1 кг массы птицы, из расчета 50 мл препарата на 100 л воды. Лечение проводят в течение 5 дней. Сроки выдержки – 11 дней;

- Энроксил® 5 % порошок (действующее вещество – 50 мг энрофлоксацина, и вспомогательные вещества: лактозу – 947 мг и аэросил – 3 мг) применяют в дозе 10 мг на 1 кг массы животного, что соответствует 2,0 кг Энроксила® 5 % порошка на 1 тонну корма. Продолжительность лечения составляет 5 дней. Убой птицы на мясо разрешается не ранее чем через 7 суток;

- Роксацин (в качестве действующего вещества содержит энрофлоксацин – 10,0 г, а в качестве вспомогательных компонентов бензиловый спирт – 0,78 г, гидроксид калия – 4,60 г, кислоту ледяную уксусную – 2 мл, натриевую соль этилендиаминтетрауксусной кислоты – 1 г и очищенную воду до 100 мл) применяют в дозе 0,5 мл на 1 л воды для поения в течение 5 дней. Убой птицы на мясо разрешается не ранее, чем через 11 суток после последнего применения препарата;

- Хипралона Энро-S (энрофлоксацин, вспомогательные компоненты - гидроокись калия, бутиловый спирт, вода очищенная) применяют групповым способом в дозе 0,5 мл на 1 л воды для поения (10 мг энрофлоксацина на 1 кг массы птицы в день) в течение 3-5 дней. Убой птицы на мясо разрешается не ранее, чем через 11 суток после последнего применения препарата.

Также развивается линейка фторхинолоновых препаратов для птицеводства на основе других действующих веществ из группы пероральных и «грамотрицательных» фторхинолонов по *Quintilliani R.* с соавт. 1999 г.:

- Пефловет раствор оральный (пемфлоксацин метан сульфат дигидрат; динатриум эдетат, метабисульфит натрия, пропиленгликоль, дистиллированная вода) используется в смеси с водой: 0.5 мл лекарственного средства растворяют в 1 литре питьевой воды и вводят в течение 3-5 суток. Убой на мясо птицы разрешается не ранее, чем через 7 суток после прекращения введения;

- Ципровет® гранулы (действующее вещество – ципрофлоксацин гидрохлорид 100 мг/г, вспомогательные компоненты – лактулоза, крахмал картофельный, лактоза, поливинилпирролидон) применяют цыплятам-бройлерам, индейкам и родительскому бройлерному стаду индивидуально или групповым способом один раз в сутки 3-5 дней в дозе 1 г гранул на 20 кг массы животного. При групповом способе Ципровет® гранулы

применяют в смеси с комбикормом: птице в дозе 2 кг гранул на 1 т корма. Убой птиц на мясо разрешается через 11 суток после последнего применения препарата;

- Ципровет 10 % (действующее вещество – ципрофлоксацин, вспомогательные компоненты – вода) применяют путем выпаивания с водой в суточной дозе 1 мл на 1 л питьевой воды в течение 5 дней. Убой птицы на мясо разрешается не ранее, чем через 12 суток после последнего применения лекарственного средства;

- Офлосан® (в 1 мл в качестве действующего вещества 100 мг офлоксацина, а также вспомогательные компоненты: спирт бензиловый, 1,2-пропиленгликоль и воду дистиллированную), при сальмонеллезе, смешанных инфекциях и при хронических формах инфекционных заболеваний у птиц рекомендуемая доза Офлосана составляет 100 мл на 100 л воды для поения в течение 5 дней. Убой птицы на мясо разрешается не ранее чем через 11 после последнего применения препарата;

- Флубактин® (действующее вещество – флумеквин) применяют групповым способом цыплятам в возрасте до 14 дней в дозе 25 мл Флубактина® на 100 л воды для поения; цыплятам старше 14 дней – 50 мл Флубактина® на 100 л воды для поения в течение 3-5 дней. Убой цыплят допускается не ранее, чем через 2 суток после последнего применения лекарственного препарата.

Аминогликозиды подавляют синтез белка микробной клеткой на уровне рибосом и имеют широкий спектр антимикробной активности. К ним чувствительны большинство грамположительных и грамотрицательных микроорганизмов. Степень бактерицидного действия зависит от их концентрации в сыворотке крови, т.е. это концентрационно-зависимые препараты. Чем выше концентрация, тем мощнее антибактериальный эффект. Аминогликозиды по структуре сходны со стрептомицином и его производными, представлены неомицином, мономицином, канамицином, тобрамицином, сизомицином, гентамицином, амикацином и др. Аминогликозиды разделены, исходя из их микробиологической активности и способности преодолевать приобретенную лекарственную устойчивость на 3 поколения:

1 поколение – стрептомицин, неомицин, канамицин;

2 поколение – гентамицин, тобрамицин, нетилмицин;

3 поколение – амикацин.

Мониторинг антибиотикорезистентности сальмонелл показал уже сложившуюся устойчивость циркулирующих полевых штаммов сальмонелл к амигликозидам 1 поколения, но действующую активность препаратов 2 и 3 поколения к циркулирующим полевым штаммам сальмонелл. К недостаткам аминогликозидов, которые могут отразиться на продуктивности птицы, относится нефротоксичность.

В данный момент на территории РФ зарегистрированы следующие препараты для птиц из данной антибактериальной группы:

- Гентамицин 100 порошок (содержит в 1 г в качестве действующего вещества гентамицина сульфат – 100 мг, а в качестве вспомогательные вещества лактулозу и лактозу) применяют цыплятам-бройлерам, ремонтному молодняку и индюшатам групповым способом с первых дней жизни из расчета 5 г лекарственного препарата на 100 л воды в течение 5-7 дней. Каренция – 3 дня;

- Гентамицин порошок (гентамицина сульфат; лактоза, кремний коллоидный безводный) применяют перорально с водой для поения молодняка сельскохозяйственной птицы (бройлеры, ремонтный молодняк, индюшата с первых дней жизни). Гентамицин порошок выпаивают с водой из расчета 5 г лекарственного препарата на 100 л воды в течение 5-7 дней. Интересен факт, что препарат-аналог предыдущего по инструкции производителя имеет каренцию 25 дней;

- Неомицина сульфат (680 мг неомицина сульфата) применяют перорально в смеси с кормом или водой (молоком) 2–3 раза в сутки в суточной дозе 10–20 мг на 1 кг массы животного, в том числе и птицы. Курс лечения 3-7 дней. Каренция – 7 дней.

Цефалоспорины относятся к β-лактамам антибиотикам. Большинство из них обладают устойчивостью к β-лактамазам и эффективно воздействуют на широкий спектр микроорганизмов, в том числе и на пенициллиноустойчивые виды: эшерихии, сальмонеллы, шигеллы, спирохеты, лептоспиры, клебсиеллы, протей и др.

Цефалоспорины делят на 4 подгруппы:

1 поколения – цефазолин, цефалексин;

2 поколения – цефуросим, цефаклор;

3 поколения – цефтриаксон, цефотаксим, цефтазидим, цефоперазон, цефиксим, цефтиофур (тиоцефур, эксенел SP, кефтион-50, цефтиосан) и др.;

4 поколения – цефкином (Кобактан, рефкином), цефепим, цефпиром, дардум.

В ряду от 1 к 3 поколению характерна тенденция к расширению спектра действия и повышению уровня антимикробной активности в отношении грамотрицательных бактерий при некотором понижении активности в отношении грамположительных микроорганизмов. Большинство цефалоспоринов применяют для парентерального введения, что ограничивает их распространение в птицеводстве. На сегодня для птицеводства из данной антибактериальной группы зарегистрированы только немногочисленные инъекционные препараты для суточных цыплят в связи с их длительной каренцией (21 день):

- Иноксел (цефтиофур натрия) инъекционный для суточных цыплят, 1 флакон разводится в 124 мл растворителя, из расчёта 0,08 мг препарата на голову;

- Эксенел стерильный порошок (цефтиофур в форме натриевой соли; калия фосфат) инъекционный для суточных цыплят, 1 флакон – 4 грамма рассчитано на 80 мл воды, из расчёта 0,08-0,20 мг препарата на голову.

Производные нитрофурана как акцепторы водорода вступают в конкурентные отношения с естественными акцепторами ионов водорода и нарушают процессы клеточного дыхания микроорганизмов, чем и обуславливают бактерицидное действие в отношении грамположительных и грамотрицательных бактерий. Также их спектр действия включает некоторые крупные вирусы, трихомонады, лямблии. Некоторые нитрофураны (нитрофурилен) обладают фунгистатической активностью. Устойчивость к нитрофуранам у микроорганизмов развивается медленно. По действию на сальмонеллы и шигеллы фуразолидон в большинстве исследований проявил себя активнее левомицетина, тетрациклина и не уступал им по влиянию на эшерихии. Нитрофураны стимулируют защитные силы организма и способствуют активизации обмена веществ. Но нитрофураны уступают по клинической эффективности большинству антибиотиков и имеют значение главным образом при лечении острых неосложнённых форм инфекции мочевыводительных путей, кишечных инфекций и некоторых протозойных инфекций – трихомониаза и лямблиоза. Основной проблемой при применении нитрофуранов является высокая частота нежелательных лекарственных реакций, в т.ч. диспептические реакции и нейротоксичность. Специальных препаратов для птицеводства не зарегистрировано. Это отчасти объяснимо требованиями ВТО на ограничение использования нитрофуранов. Применение нитрофуранов в птицеводстве также ограничено и в связи с необходимостью их введения несколько раз в день пероральным путем. Как правило, сальмонеллез представлен в основном генерализованной формой, а нитрофураны вводятся *per os* при кишечной форме.

С учетом синергидных и антагонистических эффектов на рынке фармпрепаратов против сальмонеллеза птицы предложен ряд комбинированных антибактериальных средств. Комбинативное применение с синергидным эффектом увеличивает возможности противомикробного действия. Отмечена антисальмонеллезная активность препаратов:

- Авидокс (доксциклина хиклат, колистина сульфат; лактоза) применяют орально с водой или кормом в дозе 1 кг 1000 л питьевой воды или 2 кг 1 т корма. Курс лечения: 3-5 дней. Срок выведения из организма – 14 дней;

- Авимутин Гидро (тиамулина гидроген фумарат, колистина сульфат; натрия метилгидроксibenзоат, натрия пропиленгидроксibenзоат, пропиленгликоль, вода дистиллированная) применять орально с питьевой водой в дозе: 0,8 мл 1 л питьевой воды в течение 5 дней. Каренция – 5 дней;

- Акваприм (линкомицин, сульфаметоксазол, триметоприм, колистина сульфат, вспомогательные вещества – пропиленгликоль, вода очищенная) применяется



орально с питьевой водой. Профилактическая доза: 1 мл 1 л питьевой воды 3-5 дней. Лечебная доза: 1,5 мл 1 л питьевой воды 3 дня, затем 1 мл на 1 л 2 дня. Каренция – 10 дней;

- Ализерил WS (эритромицина тиоцианат, окситетрациклина гидрохлорид, стрептомицина сульфат, колистина сульфат, витамины) применяется орально, профилактически 1 кг на 2000 литров питьевой воды в течение 5-7 дней, терапевтически 1 кг на 1000 литров питьевой воды в течение 5-7 дней. Каренция – 7 дней;

- Амоксиклав™ 62,5 % водорастворимый порошок (амоксициллин в форме тригидрата, клавулановая кислота в форме калиевой соли; вспомогательные вещества: лимоннокислый натрий, лимонная кислота, маннитол) применяется перорально с питьевой водой в течение 3-5 дней в суточной дозе: 4 г на 100 кг массы тела. Выведение – 2 дня;

- Бактимаг-О® (в 1 мл в качестве действующих веществ содержит 100 мг энрофлоксацина, 1000000 МЕ колистина сульфата, а в качестве вспомогательных веществ 35 мг кислоты уксусной, 1 мг грилона Б, 200 мг монопропиленгликоля, а также воду для инъекций до 1 мл.) применяется перорально с питьевой водой в течение 5 дней в суточной дозе 0,5-1 мл на 1 литр воды. Элиминация из организма – 11 дней;

- Бромколин®-О (в 1 мл в качестве действующих веществ содержит линкомицина – 100 мг, колистина – 200000 МЕ\*; бромгексина – 3 мг, вспомогательные вещества: пропиленгликоля – 80 мг, поливинилпирролидона – 50 мг, нипагина – 1,8 мг, а также воду для инъекций до 1 мл) применяется орально в дозе 1 мл на 2 л питьевой воды в течение 3-5 дней. Каренция – 11 дней;

- Витроцил (энрофлоксацин – 100 мг и колистина сульфат – 1200000 МЕ, а также вспомогательные вещества: спирт бензиловый – 10,4 мг, молочная кислота – до pH 4,0 и вода очищенная до 1 мл) применяется орально в смеси с водой из расчета 0,5 л на 1000 л питьевой воды в день в течение 5 дней. Каренция – 9 дней;

- Гентафлокс оральный (в 1 мл содержит энрофлоксацин – 100 мг и гентамицина сульфат – 50 мг, а также вспомогательные вещества: молочную кислоту и воду очищенную) применяется орально индивидуально или групповым способом с водой для поения течение 3-5 дней из расчёта 0,5-1,0 мл на 1 л воды. Выведение из организма – 14 дней;

- Гентахинол (энрофлоксацин, гентамицина сульфат, уксусная кислота, бензоат натрия, вода очищенная) применяется орально индивидуально или групповым способом с водой для поения с лечебно-профилактической целью: 500 мл / 1000 л воды в течение 3-5 дней; с лечебной целью: 1000 мл / 1000л воды в течение 5 дней. Каренция – 14 дней;

- ГидроТриприм (в 100 мл содержит: сульфафуразол – 17,8 г; тилозина тартрат – 3,5 г, триметоприм – 3,5 г а в качестве вспомогательных веществ – пропиленгликоль – 65 г и очищенную воду до 100 мл) применяется орально индивидуально или групповым способом с водой для поения 1 мл/1 л воды. В острых случаях – 1,5 мл/1 л воды 2 суток подряд, затем дозу снижают до 1мл/1 л воды. Продолжительность терапии 4-6 дней;

- Гинековир (амоксициллина тригидрат – 120 мг/г, рифампицин – 60 мг/г, метронидазол – 50 мг/г, рибофлавин – 4,5 мг/г, фолиевая кислота – 0,9 мг/г, и вспомогательные вещества: ванилин – 0,2 мг/г, сахараза – до 1 г) применяют орально с водой или с кормом индивидуально или групповым способом из расчета 1 кг препарата на 1000 л воды для поения или 2 кг препарата на 1000 кг корма. Курс применения препарата – 5-7 суток. Выведение – 8 дней;

- Диоксинор оральный раствор (норфлоксацин, диоксидин; поливинилпирролидон низкомолекулярный, 1,2 пропиленгликоль, трилон Б, кислота соляная, вода для инъекций) применяют орально индивидуально или групповым способом ежедневно в течение 3-5 дней 50 мл на 100 литров воды. Каренция – 11 дней;

- Дитрисол 100 (содержит триметоприм, сульфаметоксазол, метилпирролидон, 25 % раствор гидроксида натрия, пропиленгликоль, вода очищенная) применяют орально

индивидуально или групповым способом ежедневно в течение 4-7 дней 0,15-0,3 мл на 1 кг массы. Выведение – 5 дней;

- Докси Форте (доксциклина хиклат 240 мг, колистина сульфат 500000 МЕ, вспомогательные компоненты – сахароза, диоксид кремния коллоидальный) применяют орально индивидуально или групповым способом ежедневно. С лечебной целью: 100 г / 200 л воды, в течение 5 дней; С профилактической целью: 50 г / 200 л воды. Каренция – 2 дня;

- Доксикол (доксциклина гидрохлорид, колистина сульфат; вспомогательные компоненты: лимонная кислота, глюкоза (декстроза)) применяют орально с водой или с кормом индивидуально или групповым способом из расчета 0.5-1 кг на 1000 литров воды в течение 3-5 дней. Каренция – 14 дней;

- Доксин-200 *WS* (в 1 г содержит в качестве действующих веществ: доксциклина хиклат – 100 мг и тилозина тартрат – 100 мг, а также вспомогательное вещество – лактозу до 1 г) применяется орально, 1 кг на 1000 л питьевой воды в течение 3-5 дней. Выведение – 7 дней;

- Доксциклин-комплекс (доксциклина гиклат, бромгексина гидрохлорид; лактулоза, солюфор) применяют перорально с водой для поения в суточной дозе 0,5 мл на 1 л питьевой воды в течение 3-5 дней. Каренция – 7 дней;

- Долинк (доксциклина гидрохлорид, линкомицина гидрохлорид; пропиленгликоль) применяют перорально в дозе 1 мл/л воды в течение 3-5 дней. Выведение – 7 дней;

- Зинаприм (сульфаметазин, триметоприм; лимонная кислота, метабисульфит натрия, соляная кислота, гидроксид натрия, натрия метил р-гидроксibenзоат, натрия р-пропилгидроксibenзоат, вода для инъекций) применяют перорально с кормом или водой для поения с питьевой водой индивидуально или групповым способом в первый день лечения – 1 г/л, в последующие 2-3 дня – 0,5 г/л воды для поения. Каренция – 14 дней;

- Квинокол Гидро (в 1 мл: энрофлоксацин – 100 мг, гентамицина сульфат – 50 мг; а также вспомогательные компоненты: молочная кислота – 45 мг, метабисульфит натрия ~ 0,1 мг, вода очищенная – до 1 мл) применяется орально с питьевой водой. Для профилактики: 0,5 мл на 1 литр питьевой воды, в течение 3-5 дней подряд. При острой форме – 1 мл на 1 литр питьевой воды. Каренция – 14 дней;

- Кепроцерил *WSP* (лактоза, двуокись кремния колистина сульфат – 225 000 MB, окситетрациклина гидрохлорид – 50 мг, эритромицина тиоцианат – 35 мг, стрептомицина сульфат – 35 мг, витамины: А – 3000 МЕ, D<sub>3</sub> – 1500 МЕ, Е – 2 мг, К<sub>3</sub> – 2 мг, В<sub>1</sub> – 2 мг, В<sub>2</sub> – 4 мг, В<sub>6</sub> – 2 мг, В<sub>12</sub> – 10 мкг, С – 20 мг, инозитол – 1 мг, никотиновую кислоту – 20 мг; кальция пантотенат – 10 мг, а также вспомогательные вещества: лактозу – 765,7 мг и двуокись кремния – 5 мг) применяют орально групповым или индивидуальным способом с питьевой водой 1,0 г на 1 л питьевой воды. Препарат применяют ежедневно в течение 7 дней подряд. Водный раствор препарата должен быть использован в течение 24 часов. Выведение – 21 дней;

- Кинокол® (Кинокол® содержит в 1000 мл в качестве действующих веществ 100 г энрофлоксацина и 41,67 г колистина сульфата, а в качестве вспомогательных веществ молочную кислоту – 45 г, пропиленгликоль – 259 г, динатрия этилендиамиинтетрауксусную кислоту – 2 г, очищенную воду – до 1000 мл) применяют перорально, смешивая с питьевой водой, в суточной дозе 0,1 мл на 1 кг живой массы тела в течение 3-5 дней. Раствор готовят ежедневно из расчета потребности в воде на сутки. Каренция – 11 дней;

- Клиндаспектин® водорастворимый порошок (клиндамицина гидрохлорид, спектиномицина гидрохлорид; лактоза) применяют в смеси с кормом из расчета 150 мг/кг массы тела или с питьевой водой из расчета 80 г лекарственного средства на 100 л воды в течение 5-7 дней. Раствор готовят из расчета потребности птицы в воде на одни сутки. Выведение – 4 дня;

- Колидокс (доксциклина гиклат, колистина сульфат, вспомогательные вещества – глюкоза, лимонная кислота) применяется орально групповым способом с кормом или

с водой для поения из расчета 1 кг на 1000 л воды для поения. Продолжительность применения лекарственного препарата – 3-5 суток. Каренция – 14 дней;

- Колимиксин (колистина сульфат, линкомицина гидрохлорид; пропиленгликоль, бензиловый спирт, вода очищенная) применяют перорально с водой для поения или в смеси с кормом 0,5-1 мл на 1 л воды для поения в течение 3-5 суток. Каренция – 3 дня:

- Колифлокс оральный (в 1 мл в качестве действующих веществ содержит энрофлоксацин – 100 мг и колистина сульфат – 1000000 МЕ, а также вспомогательные вещества: метабисульфит натрия – 2 мг, молочную кислоту – 53 мг и воду дистиллированную до 1 мл) применяют перорально с водой для поения или в смеси с кормом 1 мл на 1 л питьевой воды для поения в течение 5 дней. Выведение – 11 дней;

- Колихинол (энрофлоксацин, колистина сульфат, вспомогательные вещества – уксусная кислота, эритроборат натрия, вода очищенная) применяют перорально с водой. С лечебно-профилактической целью 0,5 мл на 1 л воды в течение 3-5 дней. С лечебной целью при сальмонеллезе, смешанных инфекциях, а также при хронических формах заболеваний у кур (бройлеры и ремонтный молодняк, родители бройлеров) производителем рекомендуется увеличить дозу до 1,0 мл на 1 л воды в течение 5 дней. Каренция – 11 дней;

- Линесол (линкомицина гидрохлорид 22,2 %, спектиномицина сульфат – 44,4 %, вспомогательные компоненты – лактоза моногидрат, натрия бензоат) применяют перорально с водой, с профилактической целью в дозе 0,22 г препарата на кг массы птицы (что соответствует 150 мг активного вещества на 1 кг массы птицы) ежедневно в течение первых 3-5 дней жизни, а также после проведения вакцинации в дозе 0,075 г препарата на 1 кг массы птицы (что соответствует 50 мг активного вещества на 1 кг массы птицы), с лечебной целью применяют в дозе 0,75 г на 1 л питьевой воды (что соответствует 500 мг активного вещества на 1 л воды) в течение 5-7 дней, в зависимости от тяжести течения болезни. Выведение – 2 дня;

- Линкоспектин 100 водорастворимый порошок (линкоспектина гидрохлорид, спектиномицина сульфат; бензоат натрия, моногидрат лактозы) применяют перорально в дозе 150 мг лекарственного средства на 1 кг массы тела в день в течение первых 3-5 дней жизни, далее 1- 2 дня в возрасте 4 недель. Для лечения с появления первых клинических признаков заболевания, в течение 3-7 дней, в зависимости от тяжести заболевания. Каренция – 7 дней;

- Макродокс 200 (доксациклина гидрохлорид – 115 мг/г и тилозина тартрат – 115 мг/г, а в качестве вспомогательных веществ – винную кислоту, бензоат натрия и глюкозу) перорально с водой или кормом в дозе 500-1000 г препарата на 1000 л воды (что соответствует 0,5-1 г препарата на 10 кг массы птицы и 1 г препарата на 10-15 кг массы свиньи) в течение 3-5 суток. Выведение – 7 дней;

- Нео-Окси WSP (окситетрациклина гидрохлорид, неомицина сульфат; витамин А, Д<sub>3</sub>, Е, К<sub>3</sub>, В<sub>1</sub>, В<sub>2</sub>, В<sub>6</sub>, В<sub>12</sub>, С, фолиевая кислота, кальция d-пантотенат, никотиновая кислота, DL-Метионин, L-лизин, лактоза, двуокись кремния) применяют птицам групповым способом в смеси с кормом или водой в дозах с профилактической целью – 100 г на 200 л питьевой воды ежедневно в течение одной недели или 1000-1500 г на 1000 кг полноценного тщательно перемешанного корма в течение 1 недели. С лечебной целью применяют 100 г на 100 л питьевой воды в течение 3-5 дней. Каренция – 14 дней;

- Пульмокит® (китасамицина тартрат, триметоприм, сульфадиазин, парацетомол, витамин С и витамин А) применяют перорально с водой для поения или в смеси с кормом: 1-2 кг на 1000 л воды или 1 тонну корма в течение 3-5 дней. Выведение – 15 дней;

- Пульсоколифлокс (энрофлоксацин, колистин, вспомогательные вещества – сорбиновая кислота, ванилин, дистиллированная вода) применяют перорально с водой для поения групповым способом в течение 3-5 дней в дозе 0,5 мл на 1 л воды для поения; при сальмонеллезе, смешанных инфекциях, а также при хронических формах заболеваний дозу рекомендуется увеличить до 1,0 мл на 1 л воды для поения. Каренция – 11 дней;

- Спелинк®-44 (спектиномицина гидрохлорид, линкомицина гидрохлорид; лактоза) применяют орально из расчета 1,1 г на 1 кг массы тела в течение 3-7 дней. Выведение – 2 дня;

- Сультеприм® (сульфаметоксазол, триметоприм, окситетрациклина гидрохлорид; лактоза) применяют перорально в смеси с кормом из расчета 250 мг препарата на 1 кг массы тела в течение 3-7 дней. Каренция – 5 дней;

- Тилодокс-200 (в 1 г содержит доксициклин в форме гидрохлорида – 100 мг и тилозин в форме тартрата (в пересчете на основание) – 100 мг, а в качестве вспомогательного вещества – лактозы моногидрат до 1 г) применяют перорально с водой в дозе 1 кг препарата на 1000-2000 литров питьевой воды. Лечебный раствор готовят ежедневно в течение 3-5 дней. Выведение – 7 дней;

- Триметосульфа орале (сульфадиазин, триметоприм, вспомогательные вещества - N, N-диметилацетамид, ПЭГ 200, сульфоксилат формальдегид натрия, очищенная вода) применяется орально индивидуально или групповым способом ежедневно в течение 3-5 дней с водой для поения из расчета 50 г на 100 литров воды; при тяжелом течении болезни – 75 г на 100 литров воды. Каренция – 5 дней;

- Трисульфон® (40 мг сульфамонетоксина в форме натриевой соли и 20 мг триметоприма, а в качестве вспомогательного вещества - лактозы моногидрат до 1 г) применяется орально индивидуально или групповым способом 200 г на 100 л воды. Продолжительность лечения составляет 5 дней. Выведение препарата – 10 дней;

- Трисульфон® суспензия для орального применения (сульфамонетоксин натрия, триметоприм, вспомогательные вещества - микрокристаллическая целлюлоза, натрия карбоксиметилцеллюлоза, полисорбат 80, натрия кармелоза, сорбитол, натрий сахаристый, бензиловый спирт, симетикон, деминерализованная вода) применяется орально индивидуально или групповым способом 1 мл препарата на 32 кг массы птицы в течение 5 дней. Каренция – 7 дней;

- Тромексин (сульфаметоксипиридазин, триметоприм, тетрациклина гидрохлорид, бромгексина гидрохлорид, цикламат натрия, цитрат натрия, сахарин натрия, кремний коллоидальный безводный, хлорид натрия, лактозы моногидрат) применяют групповым методом орально, предварительно растворенным в воде для поения, из расчета 2 г на 1 л воды в первый день и 1 г на 1 л во 2-й и 3-й дни. Каренция – 5 дней;

- Ципровентор (в 1 г в качестве действующих веществ содержит цiproфлоксацин (в пересчете на основание) – 100 мг и апрамицина сульфат – 500 мг, а в качестве вспомогательного вещества лактозу) применяют перорально с водой для поения в течение 5 дней, 0,5-1 кг на 1000 л воды. Выведение – до 14 дней;

- Ципровет®-пульмо (ципрофлоксацин (в пересчете на основание) 100 мг/г, тиамулина гидроген фумарат 450 мг/г, вспомогательные вещества: сахарная пудра) применяют перорально с водой для поения или кормом, индивидуально или групповым способом. С лечебно-профилактической целью цыплятам-бройлерам, ремонтному молодняку до 16-недельного возраста и родительскому поголовью кур и индеек препарат применяют в дозе 0,11 г на 1 кг массы птицы. Потребление птицей суточной дозы обеспечивается выпаиванием раствора препарата из расчета 550 г порошка на 1 т воды, курс применения 3-5 дней. Каренция – 12 дней;

- Ципроген (ципрофлоксацин, гентамицина сульфат, вспомогательные компоненты - молочная кислота, уксусная кислота, бензиловый спирт, натрия ацетат, натрия метабисульфит, пропиленгликоль, вода очищенная) перорально в дозе 1-2 мл препарата на 1 л воды для поения в течение 5 суток. Выведение из организма – 11 дней;

- Энроколи 10 % (энрофлоксацин, колистина сульфат, вспомогательные вещества – натрия метабисульфит, молочная кислота, вода дистиллированная) применение перорально 0,5 мл / 1 л питьевой воды. Каренция – 11 дней;

- Энронит ®OR (энрофлоксацин, колистина сульфат, вспомогательные компоненты – натрия метабисульфит, молочная кислота, вода дистиллированная) применяют перорально путем выпаивания в суточной дозе 0,5 мл на 1 л питьевой воды

в течение 5 дней. При тяжелой форме заболевания суточную дозу препарата увеличивают до 0,5 мл/кг массы животного. Выведение – 11 дней;

- Энроприм (1 мл содержит энрофлоксацин – 100 мг и триметоприм – 50 мг, а в качестве вспомогательных компонентов – 100 мг молочной кислоты и воду очищенную до 1 мл) применяется перорально, путем выпаивания в суточной дозе 0,5-1,0 мл на 1 литр питьевой воды в течении 5 суток. Каренция – 11 дней;

- Энростин® (энрофлоксацин, колистина сульфат) применяют перорально один раз в сутки в течение 7 дней из расчёта 0,5 мл/л воды для поения. Каренция – 14 дней.

Приведенные нами результаты собственных исследований, согласующиеся с многочисленными литературными данными, ярко иллюстрируют проблему растущей антибиотикорезистентности сальмонелл. Как уже отмечалось, исследования антибиотикорезистентности у 28 изолятов *Salmonella typhimurium*, выделенных из материала птиц европейской части России, на 25 и более антибактериальных препаратах различных фармакологических групп выявили наличие множественной резистентности у всех тестируемых культур. Не эффективными оказались даже препараты группы резерва, что в случае заражения людей представляет серьезную угрозу жизни.

Всемирная организация здравоохранения (ВОЗ) ставит проблему нарастания циркуляции антибиотикорезистентных патогенов наряду с глобальными проблемами человечества. По заключению экспертов ВОЗ сальмонеллез, как зоонозная инфекция, не имеет себе равных по сложности эпизоотологии, эпидемиологии и трудностям борьбы с ней. Эффективность проводимых мероприятий против сальмонеллеза птиц недостаточна. Антибиотикообработки не позволяют избавить птицу от сальмонеллоносительства, не способны профилактировать и ликвидировать инфекцию, а предотвращают лишь массовое клиническое проявление заболевания. Кроме того, применение антибактериальных и других химиотерапевтических препаратов влияет на качество продукции. Остаточные количества антибиотиков снижают качество продукции по контролируемым показателям. Постоянное применение антибиотиков нарушает биоэкологию окружающей среды и провоцирует дальнейшее появление антибиотикоустойчивых форм вирулентных сальмонелл.

Широкое использование антибиотиков в промышленном птицеводстве должно быть ограничено в рамках принимаемых на себя обязательств стран-участниц Всемирной торговой организации. Новые требования к качеству продукции предусматривают повышение ее безопасности: санитарной, экологической, токсической и других.

## ЗАКЛЮЧЕНИЕ

Растущие требования к качеству продукции животного происхождения диктуют новые условия ведения производства и противоэпизоотической борьбы. Ряд недостатков при использовании антибиотиков обусловлен бессистемными подходами в их применении в реальном секторе экономики, а также низкой эффективностью борьбы с микробоносительством. Становятся все более актуальными альтернативные методы, специфичные, эффективные, безвредные. Тем не менее полной альтернативы антибиотикообработкам для профилактики и оздоровления птицепредприятий от бактериальных инфекций и, особенно, сальмонеллеза на сегодня нет. Это определяет их доминирование в реальном производстве – широкое и массовое применение. И, если от этого применения пока отказаться невозможно, необходимо усилить системные подходы в антибиотикообработках: использовать активные группы, соблюдать курс и способ применения, режим дозирования, учитывать сроки выведения препарата из организма – каренцию, избирательно обосновывать выбор.

Для борьбы с сальмонелла-инфекцией из активных групп в отношении возбудителя по антибиотикорезистентности наиболее эффективными оказались тетрациклины, фторхинолоны, аминогликозиды, цефалоспорины, нитрофураны.

**БИБЛИОГРАФИЯ:**

1. Lenev S., Laishevtcev A. et al. Improvement of allocation and identification of Salmonella entericabacteria of arizonae subspecies // International Journal of Pharmaceutical Research & Allied Sciences. – 2016, №5 (2). – P. 342-348.
2. Данилевская Н.В., Пименов Н.В. Новое в антибиотикотерапии: антибиотикорезистентность – угроза реальна // Новейшие разработки в ветеринарии. Клеточная терапия: Мат-лы совм. конф. компании Hill's и РОНЦ им. Н.Н. Блохина, 21 апр. 2006. – М.: ГУ РОНЦ им. Н.Н. Блохина РАМН, 2006. – С. 16-22.
3. Данилевская Н.В., Пименов Н.В. Проблема антибиотикорезистентности на примере лечения сальмонеллеза у домашних голубей // Российский ветеринарный журнал. – М.: КолосС, 2005. – №4. – С. 21-24.
4. Дельцов А.А., Пименов Н.В. Современное состояние фармацевтического рынка лекарственных средств для молодняка животных // Научные исследования молодых ученых – сельскому хозяйству России: Труды Всероссийского совета молодых ученых и специалистов аграрных образовательных и научных учреждений. – М.: ФГБНУ «Росинформагротех», 2014. – С. 51-53.
5. Лаишевцев А.И., Пименов Н.В., Капустин А.В., Якимова Э.А. Микробный профиль пищеварительного канала птиц рода Melopsittacus вида волнистых попугай // Russian Journal of Agricultural and Socio-Economic Sciences. – 2016, №5(53). – P. 76-82.
6. Ленеv С.В., Лаишевцев А.И., Пименов Н.В. Совершенствование методов выделения и идентификации бактерий рода Salmonella подвида Arizonae // Russian Journal of Agricultural and Socio-Economic Sciences. – 2016, №2(50). – P. 14-23.
7. Пименов Н.В. Диагностика, профилактика и меры борьбы с основными инфекциями в голубеводстве: Монография. – М.: Колос, 2010. – 96 с.
8. Пименов Н.В. Сальмонеллез птиц: перспективные направления в лечебно-оздоровительных мероприятиях // Ветеринария и кормление. – 2010, №3. – С. 24-25.
9. Пименов Н.В. Совершенствование средств и методов борьбы с сальмонеллезом птиц // Ветеринария и кормление. – 2012, №4. – С. 32-33.
10. Пименов Н.В. Специфическая борьба с сальмонеллой в условиях птицеводства // Russian Journal of Agricultural and Socio-Economic Sciences: ISSUE. – 2013, №11(23). – P. 16-23.
11. Пименов Н.В. Эффективность оздоровительных мероприятий против сальмонеллеза птиц в условиях зоопарка // Российский ветеринарный журнал. – 2012, №3. – С. 22-24.
12. Пименов Н.В., Татаренко Я.С. Мониторинг микробоносительства у перепелов приусадебного содержания // Молодые ученые - сельскому хозяйству: Труды Всероссийского совета молодых ученых и специалистов аграрных образовательных и научных учреждений. – М.: ФГБНУ «Росинформагротех», 2016. – С. 58-62.
13. Пименов Н.В., Данилевская Н.В. Антибиотикорезистентность сальмонелл, выделенных у домашних голубей // Ветеринария. – 2006, №9. – С. 20-24.
14. Пименов Н.В., Лаишевцев А.И. Современные аспекты борьбы с сальмонеллезной инфекцией в птицеводстве: Монография. – М.: Издательство «Старая Басманная», 2017. – 172 с.
15. Пименов Н.В., Лаишевцев А.И. Современные методы эпизоотического и эпидемического мониторинга в птицеводческой отрасли на примере сальмонеллезной инфекции // Russian Journal of Agricultural and Socio-Economic Sciences. – 2017, №4(64). – P. 257-269.
16. Пименов Н.В., Лаишевцев А.И., Колесникова Ю.Н. Профилактика сальмонеллеза сельскохозяйственных животных и птиц: основные направления и средства //

- Russian Journal of Agricultural and Socio-Economic Sciences. – 2016, №12(60). – P. 247-254.
17. Пименов Н.В., Лаишевцев А.И., Пименова В.В. Особенности аризоноза индеек. Идентификация сальмонелла-инфекции в инкубационном яйце и продуктах индейководства // Russian Journal of Agricultural and Socio-Economic Sciences. – 2015, №10(46). – P. 9-17.
  18. Пименов Н.В., Лаишевцев А.И., Пименова В.В. Роль возбудителей сальмонеллеза птиц в инфицировании и патологии человека // Russian Journal of Agricultural and Socio-Economic Sciences. – 2017, №2(62). – P. 282-289.
  19. Пименов Н.В., Тинаева Е.А., Лаишевцев А.И., Колесникова Ю.Н. Методические рекомендации по профилактике и ликвидации сальмонеллезов сельскохозяйственных животных, в том числе птиц. – М.: ФГБОУ ВО МГАВМиБ – МВА имени К.И. Скрябина, 2016. – 155 с.
  20. Татаренко Я.С., Пименов Н.В. Аспекты ветеринарно-санитарного благополучия в промышленном перепеловодстве // Проблемы ветеринарной санитарии, гигиены и экологии. – 2017, №3 (23). – С. 60-62.
  21. Татаренко Я.С., Пименов Н.В., Лаишевцев А.И. Выявление бактерионосительства перепелов частного сектора в Московской, Тульской и Рязанской областях // Ветеринария, зоотехния и биотехнология. – 2016, №9. – С. 48-52.
  22. Татаренко Я.С., Пименов Н.В., Лаишевцев А.И. Изучение патогенных свойств энтеробактериальных представителей микрофлоры клинически здоровых перепелов для выявления возможного бактерионосительства // Russian Journal of Agricultural and Socio-Economic Sciences. – 2016, №8(56). – С. 67-73.
  23. Татаренко Я.С., Пименов Н.В., Лаишевцев А.И. Определение оптимального средства для оздоровления поголовья перепелов при ассоциированной протейной и стрептококковой инфекции // Ветеринария, зоотехния и биотехнология. – 2017, №2. – С. 38-42.

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**ОСОБЕННОСТИ РОСТА И РАЗВИТИЯ МОЛОДНЯКА ПРИ ПРОМЫШЛЕННОМ  
СКРЕЩИВАНИИ В МОЛОЧНОМ СКОТОВОДСТВЕ**  
CHARACTERISTICS OF GROWTH AND DEVELOPMENT OF YOUNG ANIMALS  
IN INDUSTRIAL CROSSBREEDING IN DAIRY CATTLE

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**АННОТАЦИЯ**

В статье представлена сравнительная оценка показателей роста и экстерьерных особенностей чистопородных бычков айрширской и швицкой пород и их помесей с герефордами. Наибольшей живой массой, отличались швицко-герефордские помеси. В конце опытного периода они достигли живой массы 429 кг, и их превосходство составило над I, II, и III группами – 48; 38 и 20 кг соответственно. По уровню среднесуточных приростов во все возрастные периоды эти животные значительно превосходили сверстников других подопытных групп. По типу телосложения помесные бычки обеих групп приближались к животным специализированных мясных пород. Они отличались компактным типом телосложения, большей живой массой и величиной широтных промеров. В целом, влияние герефордской породы выразилось в более интенсивном росте и улучшении экстерьерно-конституциональных особенностей животных.

**ABSTRACT**

The article presents a comparative assessment of growth performance and exterior features purebred bulls Ayrshire and brown Swiss breeds and their crosses with herefords. The highest live weight was different Swiss-Hereford cross-breeds. At the end of the trial period they reached a live weight of 429 kg and their superiority made up of the I, II, and III groups – 48; 38 and 20 kg, respectively. The levels of average daily increase in all age periods, these animals were significantly superior to their peers from other experimental groups. In the body type of the crossbred calves of both groups were closer to animals specialized meat breeds. They are distinguished by a compact body type, the greater live weight and value of the latitudinal measurements. In general, the impact of Hereford resulted in more intensive growth and improvement of exterior-constitutional peculiarities of animals.

**КЛЮЧЕВЫЕ СЛОВА**

Промышленное скрещивание, индексы телосложения, породы.

**KEY WORDS**

Industrial crossbreeding, build indexes, breeds.



Для обеспечения потребностей населения животноводческой продукцией большое значение имеет повышение объёмов производства мяса. На протяжении десятилетий этому вопросу уделялось особое внимание, но до сих пор, актуальность проблемы не снижает остроту вопроса. Опираясь на мировой опыт, можно проследить, что удовлетворение спроса на говядину невозможно без развития специализированного мясного скотоводства [2-5].

В России основным источником производства говядины является скот молочных и комбинированных пород. Но в последние годы в стране прослеживается снижение молочного поголовья скота, в связи, с чем для производства мяса высокого качества необходимо увеличить долю специализированного мясного скота и его помесей [9,11].

Исходя из этого, для развития мясной отрасли необходимо создание популяции мясного скота с использованием генофонда ведущих пород мира [6,8].

Использование герефордского скота при промышленном скрещивании с коровами молочного и комбинированного направления продуктивности, создаёт новые возможности повышения энергии роста, увеличения живой массы и повышения качества мяса [1,7,10].

## МАТЕРИАЛ И МЕТОДЫ ИССЛЕДОВАНИЙ

Экспериментальная часть работы проводилась в ГНУ Тульский НИИСХ в 2015-2017 годах. Были отобраны и сформированы четыре группы бычков по 15 голов в каждой. Формирование групп проводилось методом пар-аналогов с учетом происхождения, возраста и массы при рождении. В первой группе – чистопородные айрширские бычки, во второй – чистопородные швицкие бычки, в третьей – помесные бычки, полученные от скрещивания айрширских коров с быками герефордской породы, и в четвертой – помеси первого поколения швицких коров с герефордами. Целью данной работы являлся сравнительный анализ и оценка особенностей роста и развития молодняка, полученного на основе скрещивания коров айрширской и швицкой пород с быками герефордской специализированной мясной породы.

## РЕЗУЛЬТАТЫ ИССЛЕДОВАНИЙ

При одинаковых условиях кормления и содержания скота продуктивность определяется его генотипом. В таблице 1 приведены данные, характеризующие изменения живой массы молодняка в различные возрастные периоды.

Таблица 1 – Динамика живой массы подопытных бычков

| Возраст, мес. | Порода и породность |             |                                 |                              |
|---------------|---------------------|-------------|---------------------------------|------------------------------|
|               | айрширская          | швицкая     | 1/2айрширская x 1/2герефордская | 1/2швицкая x 1/2герефордская |
|               | Живая масса, кг     |             |                                 |                              |
| При рождении  | 30,22±0,48          | 32,23±0,35  | 32,89±0,47                      | 33,31±,36                    |
| 3             | 85,89±2,31          | 95,14±2,40  | 93,56±2,60                      | 100,43±2,54                  |
| 6             | 160,75±2,52         | 166,67±2,92 | 168,99±3,10                     | 175,67±3,26                  |
| 9             | 239,23±4,29         | 244,03±4,05 | 254,93±4,49                     | 265,24±5,77                  |
| 12            | 310,73±5,40         | 317,69±5,55 | 337,93±6,05                     | 353,34±6,44                  |
| 15            | 381,16±6,22         | 391,67±6,78 | 409,92±6,68                     | 429,32±6,63                  |

Исследованиями установлено, что при рождении бычки имели определенные межгрупповые различия по живой массе. В этот период помесный молодняк IV группы опережал чистопородных айрширских бычков на 3,09 кг. Следует отметить, что до 6 месячного возраста не существовало ощутимых различий по живой массе между чистопородными и айрширо-герефордскими помесными бычками. В возрасте 9 месяцев разница по группам составила 26,01 кг, 21,21 кг и 10,31 кг в пользу полукровных сверстников IV группы.

Аналогичная закономерность отмечалась и в последующие возрастные периоды. При этом в конце опытного периода наблюдалось преимущество по живой массе помесных бычков над чистопородными сверстниками. Так, в 15 месяцев помесные

бычки 4 группы имели живую массу выше чистопородных бычков I группы на 48,2 кг (12,6%), бычков II группы на 37,7 кг (9,6%). Одновременно помесные бычки III группы превосходили сверстников I группы по величине этого показателя на 28,76 кг, а помесей II группы на 18,25 кг.

О высокой энергии роста молодняка можно судить по уровню среднесуточного прироста живой массы, о чем свидетельствует рисунок 1.

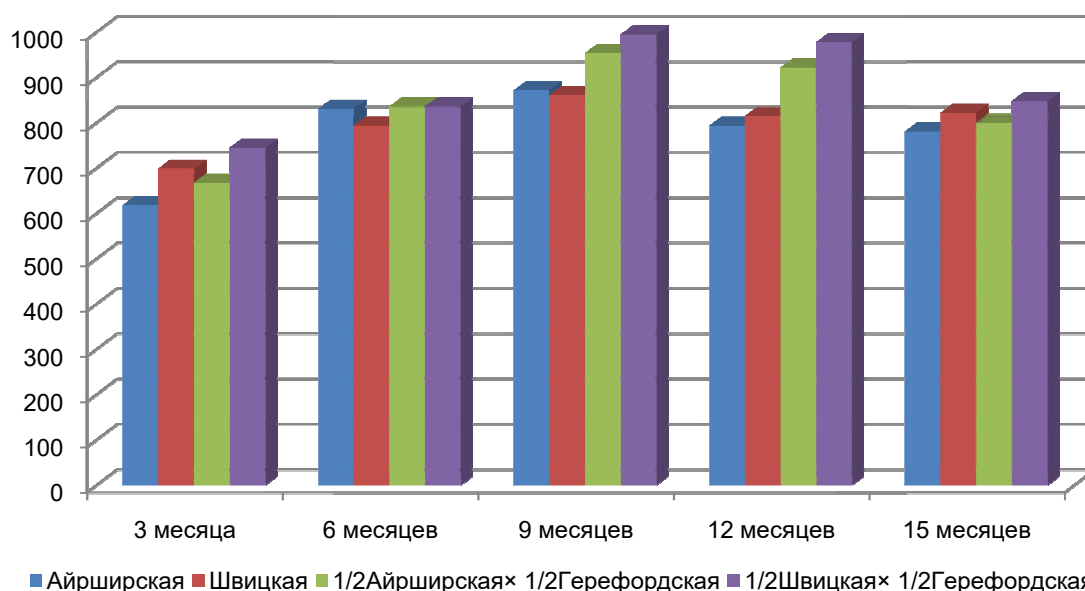


Рисунок 1 – График среднесуточного прироста живой массы подопытных бычков, г.

Наибольшие среднесуточные приросты у подопытных бычков наблюдались в возрасте 6-9 месяцев, в этот период роста помесные особи имели прирост за сутки 954,44 – 995,26 г., против 861,03 – 872,12 г. – у чистопородных сверстников. К концу опытного периода (12-15 месяцев) животные IV группы по этому показателю превосходили животных других групп на 7,78%, 3,03% и 5,6%.

Таблица 2 – Динамика абсолютного и относительного прироста

| Возраст, мес.             | Группа      |             |             |             |
|---------------------------|-------------|-------------|-------------|-------------|
|                           | I           | II          | III         | IV          |
| Абсолютный прирост, кг    |             |             |             |             |
| 0-3                       | 55,67±0,44  | 62,91±0,64  | 60,12±0,69  | 67,12±0,93  |
| 3-6                       | 74,87±0,54  | 71,51±1,01  | 75,24±0,89  | 75,24±1,26  |
| 6-9                       | 78,48±0,63  | 77,49±1,42  | 85,9±0,66   | 89,57±1,03  |
| 9-12                      | 71,54±0,46  | 73,36±0,93  | 82,96±1,26  | 88±0,83     |
| 12-15                     | 70,35±0,48  | 73,96±0,65  | 71,99±1,17  | 76,28±1,03  |
| Относительный прирост, кг |             |             |             |             |
| 0-3                       | 184,75±4,13 | 195,49±3,44 | 184,87±3,79 | 201,79±3,99 |
| 3-6                       | 87,18±0,79  | 75,19±1,39  | 80,71±1,47  | 75,06±1,91  |
| 6-9                       | 48,83±0,54  | 46,57±0,57  | 50,84±0,57  | 51,01±0,72  |
| 9-12                      | 29,91±0,22  | 30,04±0,54  | 32,54±0,54  | 33,17±0,36  |
| 12-15                     | 22,63±0,17  | 23,28±0,72  | 21,31±0,40  | 21,61±0,34  |

Следует отметить, что начиная с 10 месяцев показатели среднесуточного прироста во всех возрастных группах постоянно снижались. На значительное снижение интенсивности роста бычков в этот период, вероятно, повлиял комплекс стресс-факторов: перестройка пищеварительной системы в связи с переходом с молочно-травяного на концентратно-силосно-сенной тип кормления, технологический стресс-фактор, связанный с переводом животных с круглосуточного беспривязного содержания на привязную систему с ограничением движения, что повлекло за собой

гиподинамию. Кроме того, снижение среднесуточных приростов в этом возрасте, по-видимому, следует рассматривать и как результат возрастного изменения обмена веществ, а именно увеличение концентрации половых гормонов.

Для полной оценки скорости роста молодняка были использованы показатели абсолютного и относительного прироста живой массы в отдельные возрастные периоды (табл. 2).

Установлено, что у молодняка уже в первые месяцы жизни наблюдались межпородные различия по абсолютному приросту. При этом наибольшими показателями абсолютного прироста характеризовались помесные бычки IV группы, что обусловлено влиянием генотипа отца. Аналогичная тенденция прослеживается и в последующие возрастные периоды. Во все периоды бычки IV группы превосходили бычков III группы и чистопородных сверстников по данному показателю. Так, абсолютный прирост живой массы в возрасте от 4 до 6 месяцев у бычков IV и III составил 75,2 и это больше показателей II и I групп на 3,7 и 0,37 кг соответственно.

Снижение величины абсолютного прироста в возрасте от 10 до 12 месяцев связано с постановкой животных на привязь, переводом с круглосуточного беспривязного содержания на привязное в помещениях, а также увеличением концентрации половых гормонов.

Характер возрастных изменений относительного прироста у бычков сравниваемых групп за период опыта практически не отличался: наиболее интенсивный рост в первые три месяца жизни и постепенное его снижение к концу опытного периода.

В процессе развития каждое животное приобретает присущую только ему индивидуальность, выражающуюся особенностями его конституции, экстерьера, продуктивности. Для оценки экстерьера были проведены линейные измерения во все периоды опыта.

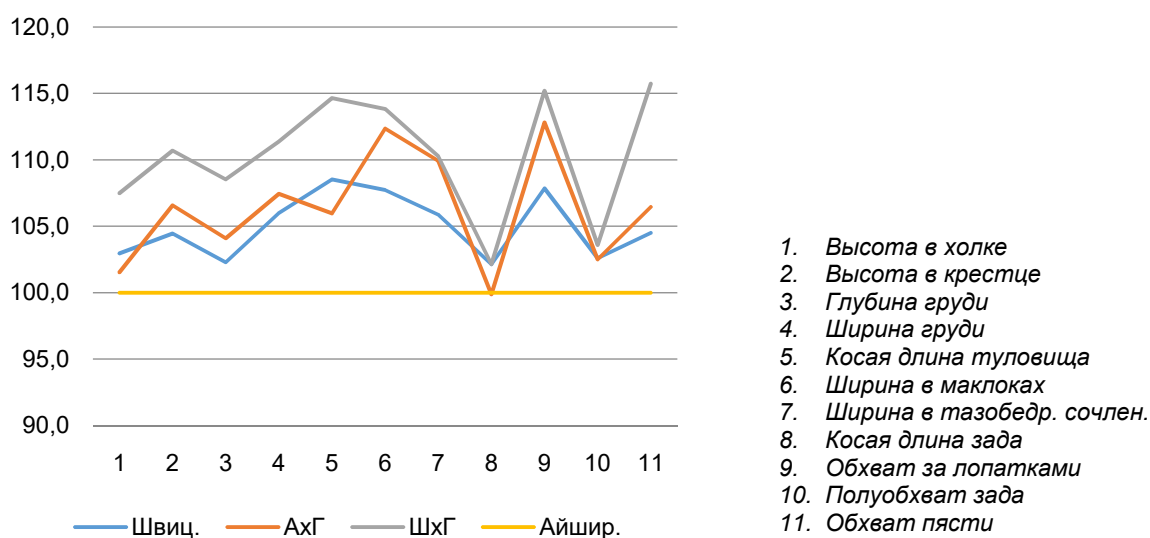


Рисунок 2 – Экстерьерный профиль подопытных бычков в 15 месячном возрасте (за 100% приняты промеры айрширских бычков)

Анализ данных измерений показал, что межгрупповые различия по всем промерам животных при их рождении незначительны. Однако, начиная с 6-ти месячного возраста и до конца опытного периода, экстерьерные особенности животных сравниваемых групп проявлялись более четко.

Помесные бычки III и IV групп с 6-месячного возраста отличались более интенсивным увеличением широтных промеров. Так, бычки IV группы в возрасте 12 месяцев превосходили бычков I и II групп по ширине груди соответственно на 10,5 и 5,5%, а по ширине в тазобедренных сочленениях – на 13,6-5,9%.

Наибольшие межгрупповые различия отмечены по величине обхвата груди за лопатками. Помесные бычки IV группы в возрасте 12 месяцев превосходили сверстников материнской породы по величине указанного промера соответственно на 3,5 и 17,7%, а в возрасте 15 месяцев – на 6,8 и 15,1% (рис. 2).

С целью получения объективной информации об особенностях экстерьера животных рассчитаны индексы телосложения (табл. 3).

Из анализа полученных данных мы видим, что с возрастом индексы телосложения изменяются неравномерно – это связано с неодинаковой скоростью роста отдельных статей организма.

Таблица 3 – Индексы телосложения подопытных животных

| Индекс        | Группа | Возраст, мес. |        |        |        |        |        |
|---------------|--------|---------------|--------|--------|--------|--------|--------|
|               |        | При рождении  | 3      | 6      | 9      | 12     | 15     |
| Длинноногости | 1      | 61,19         | 57,4   | 51,96  | 49,1   | 47,87  | 46,54  |
|               | 2      | 59,99         | 52,08  | 52,56  | 50,65  | 48,24  | 46,88  |
|               | 3      | 59,55         | 49,16  | 52,24  | 48,39  | 47,13  | 45,18  |
|               | 4      | 59,21         | 51,34  | 51,66  | 50,17  | 46,47  | 46,0   |
| Растянутости  | 1      | 99,17         | 124,11 | 109,21 | 113,32 | 116,59 | 119,57 |
|               | 2      | 102,05        | 117,39 | 112,05 | 112,4  | 116,8  | 126,04 |
|               | 3      | 105,73        | 115,24 | 111,34 | 114,82 | 115,94 | 124,79 |
|               | 4      | 105,23        | 115,45 | 117,2  | 114,13 | 121,65 | 127,51 |
| Тазо-грудной  | 1      | 88,75         | 95,08  | 95,32  | 100,5  | 106,41 | 102,04 |
|               | 2      | 94,79         | 110,34 | 100,63 | 100,27 | 100,78 | 100,4  |
|               | 3      | 98,17         | 92,46  | 96,47  | 98,42  | 97,46  | 97,55  |
|               | 4      | 99,11         | 98,15  | 99,68  | 101,19 | 97,39  | 99,81  |
| Грудной       | 1      | 61,52         | 63,55  | 63,92  | 65,87  | 69,67  | 67,12  |
|               | 2      | 64,22         | 66,93  | 66,08  | 67,34  | 69,21  | 69,52  |
|               | 3      | 67,65         | 54,83  | 67,81  | 63,02  | 69,12  | 69,24  |
|               | 4      | 67,82         | 59,93  | 69,91  | 67,3   | 69,43  | 68,86  |
| Сбитости      | 1      | 108,13        | 100,72 | 112,01 | 116,76 | 116,38 | 115,55 |
|               | 2      | 102,69        | 107,76 | 118,2  | 122,84 | 124,2  | 114,89 |
|               | 3      | 106,1         | 108,58 | 119,27 | 117,65 | 127,66 | 123,01 |
|               | 4      | 107,65        | 110,16 | 117,28 | 123,53 | 121,55 | 116,14 |
| Костистости   | 1      | 16,38         | 17,01  | 16,58  | 16,8   | 16,22  | 15,84  |
|               | 2      | 16,43         | 16,92  | 16,36  | 16,23  | 15,66  | 16,08  |
|               | 3      | 17,72         | 17,65  | 16,85  | 16,23  | 15,86  | 16,61  |
|               | 4      | 16            | 16,8   | 17,02  | 16,53  | 16,98  | 17,05  |
| Мясности      | 1      | 57,65         | 56,08  | 59,93  | 86,55  | 90,09  | 89,23  |
|               | 2      | 55,77         | 55,6   | 63,57  | 83,52  | 89,55  | 88,93  |
|               | 3      | 56,77         | 61,45  | 66,15  | 79,02  | 90,42  | 90,07  |
|               | 4      | 55,67         | 58,92  | 74,96  | 80,85  | 89,07  | 85,97  |

Исследования на крупном рогатом скоте показали, что в среднем длина ног у взрослых животных формируется примерно на 70% за счет их роста за время внутриутробного развития и на 30% в послеутробный период, тогда как ширина тазовых костей (промер ширины в маклоках) – на 30% в период внутриутробного развития и на 70% в период послеутробного развития, причем главным образом на втором году жизни.

По мере роста и развития животных индексы растянутости и сбитости значительно увеличивались. Так, индекс растянутости увеличился с 99,1-105,7% при рождении – до 119,6-126,0% в конце опытного периода, а индекс сбитости соответственно с 102,7-108,1% до 114,9-123,0%.

Возрастные изменения величин индексов тазо-грудного и костистости менее выражены. О хорошем развитии задней трети и выполненности мускулатурой бедра у подопытных животных свидетельствует значительное увеличение индекса мясности с 55,6-57,7% при рождении до 85,9-90,0% в конце опыта.

## ЗАКЛЮЧЕНИЕ

Таким образом, использование айрширской и швицкой пород в качестве маточного поголовья для промышленного скрещивания с производителем

геррефордской породы является перспективным и рациональным направлением увеличения роста и развития помесного молодняка первого поколения, и поэтому будет оказывать положительное влияние на повышение уровня мясной продуктивности

Наибольшей живой массой, отличались помеси IV группы, швицкая + геррефордская. В конце опытного периода они достигли живой массы 429 кг и их превосходство составило над I, II, и III группами – 48; 38 и 20 кг соответственно.

По уровню среднесуточных приростов во все возрастные периоды бычки IV группы значительно превосходили сверстников других подопытных групп. Наибольшие среднесуточные приросты получены в группах подопытных животных в возрасте от 7 до 9 месяцев, и они составили в I, II, III и IV группах 872,0, 861,0, 954,4, и 995,26 г соответственно.

По типу телосложения помесные бычки обеих групп приближались к животным специализированных мясных пород. Они отличались компактным типом телосложения, большей живой массой и величиной широтных промеров.

В целом, влияние геррефордской породы на показатели весового и линейного роста подопытных бычков за весь период выращивания – положительно. Оно выразилось в более интенсивном росте и улучшении экстерьерно-конституциональных особенностей животных.

### БИБЛИОГРАФИЯ

1. Гудыменко В.В. Качество двух-трехпородного скота / В. В. Гудыменко, Д. А. Винаков // Молочное и мясное скотоводство. – 2010. – № 6. – С.17-19.
2. Дунин И.М. Перспективы развития мясного скотоводства России в современных условиях / И.М. Дунин, Г.И. Шичкин, А.А. Кочетков// Молочное и мясное скотоводство. – 2014. – №5. – С.2-5.
3. Калашников В.В., Животноводство России. Состояние и направление повышения эффективности / В.В. Калашников, Х.А. Амерханов, И.Ф. Драганов, И.И. Чинаров и др. // Зоотехния. – 2005. – № 6. – С. 2-8.
4. Кибкало Л. Актуальность развития мясного скотоводства в Центральном Черноземье // Молочное и мясное скотоводство. – 2008. – С.16-18.
5. Логинов В. Тенденция развития мясного рынка / В. Логинов // Молочное и мясное скотоводство. – 2002. – № 4. – С. 2-6.
6. Прохоров И. П. Сравнительная оценка продуктивных качеств бычков черно-пестрой породы и ее помесей с геррефордами и лимузинами / И.П. Прохоров // Известия Тимирязевской сельскохозяйственной академии. – 2011. – № 3. – С. 129-138.
7. Прохоров И.П. Динамика роста и экстерьерные особенности симментальского скота, выращиваемого на мясо. / И.П. Прохоров, О.А. Калмыкова // Вестник Мичуринского государственного аграрного университета. – 2016. – № 2. – С.70-80
8. Смирнов Д.А. О разведении скота французских мясных пород в России / Д.А. Смирнов // Молочное и мясное скотоводство. – 1998. – № 6. – С. 13-15.
9. Смирнова М.Ф. Особенности роста и развития молодняка геррефордской породы в разных регионах России / М.Ф. Смирнова, С.Л. Сафронов, А.М. Сулоев, Н.В. Фомина // Молочное и мясное скотоводство. – 2015. – №8. – С.23-26.
10. Умнов К.А. Рост, развитие, мясная продуктивность бычков чёрно-пестрой породы и её помесей с геррефордской и лимузинской при интенсивном выращивании и откорме // Автореф. дис.. канд. с.-х. наук. – Москва: РГАУ-МСХА, 2005 – 37с.
11. Эртуев М.М. Мясная продуктивность и морфологические особенности туш бычков при различных вариантах промышленного скрещивания комбинированных пород с мясными / М.М. Эртуев // Известия ТСХА. – 1980. – вып.1. – С.126-135.

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**ВЛИЯНИЕ БИОТИЧЕСКИХ ФАКТОРОВ НА КАЧЕСТВЕННЫЕ ПОКАЗАТЕЛИ  
РЕЧНОЙ РЫБЫ**  
INFLUENCE OF BIOTIC FACTORS ON QUALITATIVE INDICATORS OF RIVER FISH

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**АННОТАЦИЯ**

Целью работы является проведение ветеринарно-санитарной экспертизы рыбы при анизакидозе. Объектами исследований были карп охлажденный (производитель - ООО «Рыбхоз», Ульяновская область), щука мороженая (производитель - ИП Богатов М.И., Республика Калмыкия). Проведенные исследования показали, что 90% тушки двухлетнего карпа заражены анизакидозом.

**ABSTRACT**

The purpose of the work is to conduct veterinary and sanitary examination of fish with anisakidosis. The research subjects were carp chilled (producer - Rybhoz LLC, Ulyanovsk region), frozen pike (producer - Individual Entrepreneur Bogatov M.I., Republic of Kalmykia). Studies have shown that 90% of the carcass of a two-year-old carp is infected with anisakidosis.

**КЛЮЧЕВЫЕ СЛОВА**

Карп, щука, анизакидоз, гематологические показатели, биохимические показатели.

**KEY WORDS**

Carp, pike, anisakidosis, hematologic indices, biochemical indices.

Развивающееся рыбоводство Ульяновской области – зарыбление водоемов, искусственное разведение, - требует детального ихтиопаразитарных исследований направлено на предупреждение, оздоровление и борьбу с болезнями рыб [1-6]. Наиболее часто встречающиеся патологии рыбы это паразитарные заболевания, а среди них - анизакидоз. Анизакидоз – достаточно недавняя проблема в паразитологии. Долгое время болезнь считали малоопасной для человека, поскольку было установлено, что до половозрелой стадии личинки червя в организме человека не развиваются. Однако вскоре стало известно, что личинки сами по себе не только не безвредны, но и приводят к серьезным нарушениям здоровья заболевшего. До сих пор нет общего мнения по степени опасности анизакидоза для человека. В Ульяновской области практически вся вылавливаемая в Куйбышевском водохранилище рыба заражена анизакидозом. Часто можно встретить пораженную рыбу анизакидозом на прилавках магазинов нашего города, как в свежем виде, так и в переработанном (копченом, соленом). Однако случаев заражения анизакидозом в Ульяновской области не зарегистрировано. Заражение анизакидозом возможно при некачественной переработке рыбы – недосол, низкие температуры копчения [1,2,4-8].

Целью работы являлось изучение влияния биотических факторов на качественные показатели речной рыбы, имеющих наиболее важное рыбохозяйственное значение.

*Объекты и методы исследований.* Пробы отбирали согласно унифицированным правилам отбора проб сельскохозяйственной продукции, продуктов питания и объектов окружающей среды для лабораторных исследований (ГОСТ 7731-85) [1,2,4-8]. Объектами исследований были: карп (охлажденный), щука (мороженая),

выловленные в акватории Куйбышевского водохранилища.

Уровень гемоглобина определяли по Сали, количество эритроцитов путем подсчета клеток в камере Горяева после разбавления в растворе Хендрикса, количество клеток лейкоцитов косвенным методом в мазке при подсчете 1000 клеток эритроцитов. Мазки крови фиксировали этанолом, затем окрашивали по методу Романовского–Гимза. Определение биохимических показателей в пробах сыворотки крови рыб проведено с помощью биохимического фотометра СТАТ ФАКС 1904® ПЛЮС и наборов производства ООО «Эйлитон» по заказу ЗАО «А/О ЮНИМЕД». Концентрацию водородных ионов (рН) определяли с помощью лабораторного рН-метра «Hanna рН-211» с электродом Hill31. Определение содержания токсичных элементов проводили инверсионно-вольтамперометрический метод. Определение содержания пестицидов проводили методом хроматографии. Определение летучих N-нитрозаминов методом выделения летучих N-нитрозаминов (НА). Определение количества микроорганизмов проводили высевом продукта или разведения навески продукта в питательную среду, инкубировании посевов, подсчете всех выросших видимых колоний [1,2,4,5,6,7,8].

*Результаты исследований.* Проведенные исследования показали, что 90% тушки 2-х летнего карпа заражены анизакидозом. Степень заражения анизакидозом разная: у 40% рыб - тяжелая (поражены мышцы, все внутренние органы), 30% - средняя (поражены все внутренние органы), 30% - слабая (частично поражены внутренние органы). Поражение двухлеток карпа анизакидозом (таблица 1,2) не оказало существенного влияния на гематологические показатели. Концентрацию гемоглобина, количество эритроцитов и лейкоцитов, а также насыщение эритроцита гемоглобином практически не превышало условную норму [3-8].

Таблица 1 – Гематологические показатели крови 2-х летнего карпа

| Показатель                           | Норма   | 2016г.      | 2017г.      |
|--------------------------------------|---------|-------------|-------------|
| Эритроциты, * 10 <sup>12</sup> Т в л | 0,5-2,0 | 0,62±0,022  | 1,29±0,068  |
| Лейкоциты, * 10 <sup>9</sup> в л     | 4,9-8,1 | 5,338±0,372 | 9,528±1,077 |
| Гемоглобин, г/л                      | 30-100  | 52,4±3,5    | 126,2±4,764 |
| СГЭ, пг                              | 50-80   | 84,52       | 98,048±2,52 |

Таблица 2 – Лейкоцитарная формула периферической крови карпа

| Показатель | Условная норма | 2016г.      | 2017г.      |
|------------|----------------|-------------|-------------|
| лимфоциты  | 88,0           | 86,31±0,950 | 88,72±0,630 |
| моноциты   | 3,0            | 2,20±0,235  | 5,38±0,415  |
| ПМЯ        | 3,0            | 2,54±0,302  | 2,89±0,428  |
| нейтрофилы | 6,0            | 8,65±0,962  | 3,01±0,332  |
| эозинофилы | -              | 0,30±0,025  | -           |

Лейкограмма карпа зеркального, пораженного анизакидозом практически не отличается от условной нормы (таблица 2). Однако необходимо отметить, что у особей наблюдается увеличение числа моноцитов, что характерно для патологических процессов, главным образом при паразитарных болезнях [3,4,6,7,8].

Таблица 3 – Биохимические показатели крови 2-х летнего карпа

| Показатель          | Норма       | 2016 г.      | 2017г.       |
|---------------------|-------------|--------------|--------------|
| Общий белок, г/л    | 10-30       | 26,18±3,57   | 35,56±3,41   |
| Глюкоза, ммоль/л    | 1,5-4,0     | 1,740±0,152  | 5,402±0,048  |
| Мочевина, ммоль/л   | 1,83- 6,2   | 3,25±0,68    | 3,020±0,166  |
| Креатинин, мкмоль/л | 0,27-0,8    | 0,260±0, 017 | 12,167±1,141 |
| Билирубин, мкмоль/л | 12,0-36,0   | 24,4±0,2     | 24,4±0,2     |
| Холестерин, ммоль/л | 1,94-3,9    | 1,985±0,096  | 5,81±0,049   |
| Фосфор, ммоль/л     | 0,4- 9,6    | 10,99±0,195  | 1,43±0,004   |
| Железо, мкмоль/л    | 13,43-15,94 | 17,52±0,25   | 19,55±0,147  |

При достижении товарной массы карпа проводились биохимические исследования. Поражение рыб анизакидозом не оказало существенного влияния на показатели общего белка, глюкозы, холестерина, мочевины, фосфора. Уровень общего белка, глюкозы, холестерина и других показателей находился в пределах физиологических норм для данного возрастного периода и характеристик среды обитания в исследуемый сезон года. Настоящий уровень показателей физиолого-биохимического статуса организма рыб объясняется мобилизацией пластических и энергетических резервов их организма для достижения соответствующей массы тела в данном возрасте для данного сезона года (табл. 3) [3,4,6,7,8].

Органолептические исследования показали, что тушки щуки не разделанной имеют чистую поверхность, естественный окрас, присущий рыбе данного вида, без наружных повреждений, плотной консистенции, имеет запах свойственный доброкачественной рыбе. При определении паразитарной загрязненности все 10 образцов были поражены анизакидозом.

Физико-химические исследования показали: концентрация водных ионов в фильтрате из щуки мороженой составила от  $6,20 \pm 0,02 \dots 6,40 \pm 0,01$ , что находится в пределах нормы [1,2].

Таблица 4 – Содержание токсичных элементов (свинец, мышьяк, кадмий, ртуть) в щуке мороженой

| № образца | свинец<br>не более 1,0 | мышьяк<br>не более 1,0 | кадмий<br>не более 0,2 | ртуть<br>не более 0,6 |
|-----------|------------------------|------------------------|------------------------|-----------------------|
| 1         | 0,02±0,001             | 0,04±0,001             | 0,001±0,0001           | 0,004±0,0001          |
| 2         | 0,03±0,001             | 0,03±0,001             | 0,002±0,0001           | 0,002±0,0001          |
| 3         | 0,03±0,001             | 0,02±0,001             | 0,001±0,0001           | 0,001±0,0001          |
| 4         | 0,02±0,001             | 0,04±0,001             | 0,003±0,0001           | 0,004±0,0001          |
| 5         | 0,03±0,001             | 0,03±0,001             | 0,002±0,0001           | 0,002±0,0001          |
| 6         | 0,03±0,001             | 0,02±0,001             | 0,001±0,0001           | 0,001±0,0001          |
| 7         | 0,03±0,001             | 0,02±0,001             | 0,002±0,0001           | 0,003±0,0001          |
| 8         | 0,02±0,001             | 0,03±0,001             | 0,002±0,0001           | 0,002±0,0001          |
| 9         | 0,03±0,001             | 0,02±0,001             | 0,003±0,0001           | 0,001±0,0001          |
| 10        | 0,02±0,001             | 0,04±0,001             | 0,001±0,0001           | 0,003±0,0001          |

Таблица 5 – Содержание пестицидов (ГХЦГ, ДДТ, 2-4 Д кислоты) в щуке мороженой

| № образца | ГХЦГ          | ДДТ           | 2,4-Д кислота |
|-----------|---------------|---------------|---------------|
| 1         | не обнаружено | не обнаружено | не обнаружено |
| 2         | не обнаружено | не обнаружено | не обнаружено |
| 3         | не обнаружено | не обнаружено | не обнаружено |
| 4         | не обнаружено | не обнаружено | не обнаружено |
| 5         | не обнаружено | не обнаружено | не обнаружено |
| 6         | не обнаружено | не обнаружено | не обнаружено |
| 7         | не обнаружено | не обнаружено | не обнаружено |
| 8         | не обнаружено | не обнаружено | не обнаружено |
| 9         | не обнаружено | не обнаружено | не обнаружено |
| 10        | не обнаружено | не обнаружено | не обнаружено |

Таблица 6 – Содержание летучих N-нитрозаминов в щуке мороженой

| № образца | щука мороженой |
|-----------|----------------|
| 1         | 0,0001±0,00001 |
| 2         | 0,0002±0,00001 |
| 3         | 0,0002±0,00001 |
| 4         | 0,0001±0,00001 |
| 5         | 0,0001±0,00001 |
| 6         | 0,0001±0,00001 |
| 7         | 0,0002±0,00001 |
| 8         | 0,0001±0,00001 |
| 9         | 0,0001±0,00001 |
| 10        | 0,0002±0,00001 |



Проведены токсикологические исследования рыбы: при определении содержания токсичных элементов (свинец, мышьяк, кадмий, ртуть), установлено, что содержание токсичных элементов во всех исследуемых образцах не превышает допустимых уровней; при определении содержания пестицидов (ГХЦГ, ДДТ, 2,4-Д кислота) в щуке мороженой - содержание пестицидов не превышает допустимых уровней; при определении содержания летучих N-нитрозаминов во всех исследуемых образцах не превышает допустимых уровней (табл. 4,5,6).

Таблица 7 – Результаты бактериологического исследования щуки мороженой на наличие БГКП (бактерии группы кишечной палочки), *S. aureus*, *Salmonella*, *Listeria monocytogenes*

| № образца | БГКП          | <i>S. aureus</i> | <i>Salmonella</i> | <i>Listeria monocytogenes</i> |
|-----------|---------------|------------------|-------------------|-------------------------------|
| 1         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 2         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 3         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 4         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 5         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 6         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 7         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 8         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 9         | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |
| 10        | не обнаружено | не обнаружено    | не обнаружено     | не обнаружено                 |

При проведении бактериологического исследования щуки мороженой установлено отсутствие культур БГКП (бактерии группы кишечной палочки), *S. aureus*, *Salmonella*, *Listeria monocytogenes*.

Таким образом, практически вся речная рыба акватории Куйбышевского водохранилища заражена анизакидозом, что требует обязательного исследования на паразитарную загрязненность. Поражение разной степени анизакидозом не оказывает существенного влияния на пищевую ценность рыбы.

#### БИБЛИОГРАФИЯ

1. Васильев Д.А. и др. Молекулярно- генетические методы исследования осетровых рыб на наличие герпесвируса и ветеринарно-санитарная оценка полученного пищевого сырья // Материалы Международной научно-практической конференции, Ульяновск: Ульяновская ГСХА. – 2013. – С.112-115.
2. Барт Н.Т. и др. Выделение бактериофагов рода *Providencia* // Материалы Международной конференции, Ульяновск: УГСХА. – 2012. – Т.1.- С.236-239.
3. Васина С.Б. и др. Использование амфибий в биоиндикации вод в ООО «Рыбхоз» Ульяновского района // Вестник УГСХА. - 2016. - №4(36). - С. 78-82.
4. Бурыкин А.В. и др. Влияние химического состава воды пруда с. Полдамасово на гематологические показатели рыб // Материалы Всероссийской студенческой научно-практической конференции, Ульяновск: УГСХА. – 2012.- С. 125-128.
5. Бурыкин, А.В. Стресс – реакция организма рыб / А.В. Бурыкин, В.В. Ахметова // Материалы Всероссийской студенческой научно-практической конференции «В мире научных открытий». - Ульяновск: УСХА. – 2012.- С. 128-132.
6. Ахметова В.В. и др. Картина нарушений морфологии эритроцитов периферической крови карпа, выращиваемого в прудах ООО «Рыбхоз» Ульяновского района Ульяновской области // Материалы Международной научно-практической конференции, Курск: ФГБОУ ВО Курская ГСХА. - 2017.- Часть 3. - С. 262-265.
7. Жилкина Н.А. Лейкоцитарная формула крови карпа зеркального, выращиваемого в рыбоводческих хозяйствах Ульяновской области // Материалы международной научной конференции, Ульяновск: УлГАУ. - 2017г. - Том 3, часть 1, - С.162-164.
8. Васина С.Б. и др. Оценка морфологической и биохимической картины крови карповых рыб, выращиваемых в ООО «Рыбхоз» Ульяновского района Ульяновской области // Вестник УГСХА. - 2015. - № 3 - С. 32-59.

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**БАКТЕРИОФАГИ В КОНЦЕПЦИИ ОЗДОРОВЛЕНИЯ ПТИЦЕХОЗЯЙСТВ  
ОТ САЛЬМОНЕЛЛЕЗНОЙ ИНФЕКЦИИ**  
BACTERIOPHAGES IN THE CONCEPT OF REHABILITATION OF POULTRY FARMS  
FROM SALMONELLA INFECTION

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**АННОТАЦИЯ**

Антибиотики продолжают оставаться основой лечебно-профилактических мероприятий в промышленном птицеводстве. Проблема сальмонеллеза не может быть решена без применения эффективных средств специфической профилактики. Бактериофаги в системе противозoonотических мероприятий при сальмонеллезе птиц имеют хорошие перспективы применения. Разработан препарат для лечения сальмонеллеза птиц, основанный на коктейле бактериофагов к двум наиболее распространенным серовариантам *S. enteritidis* и *S. typhimurium*. Эти варианты возбудителя являются наиболее значимыми в этиологии для всех видов промышленных и декоративных птиц, разводимых в России.

**ABSTRACT**

Antibiotics continue to be the basis of therapeutic and preventive measures in industrial poultry farming. The problem of salmonellosis cannot be solved without the use of effective means of specific prevention. Bacteriophages in the system of antiepidemiological measures in case of salmonellosis of birds have good prospects for use. Preparation has been developed for the treatment of salmonellosis of birds, based on a cocktail of bacteriophages to the two most common serovariants of *S. enteritidis* and *S. typhimurium*. These pathogen variants are the most significant in the etiology for all types of industrial and ornamental birds bred in Russia.

**КЛЮЧЕВЫЕ СЛОВА**

Сальмонеллез птиц, бактериофаг, оздоровление, продукция.

**KEY WORDS**

Salmonellosis of birds, bacteriophage, sanitation, products.

Увеличение в последние годы токсичности кормов при сохранении массивной стресс-нагрузки на птицу, особенно цыплят первых дней жизни, привело к повышению эпизоотической значимости инфекций энтеробактериальной этиологии. Большое значение в эпизоотологии сальмонеллеза имеет скрытое сальмонеллоносительство у птиц и вторичная контаминация тушек при переработке птицы. Возбудители сальмонеллеза птиц являются этиологическим фактором пищевых токсикоинфекций человека. В связи с этим сальмонеллоносительство, которое может быть массовым и длительным, представляет определенную угрозу здоровью человека, особенно при хранении тушек в охлажденном состоянии, а также при нарушении режимов хранения птичьего мяса, фарша, мяса механической обвалки.

Применяемые меры не обеспечивают благополучие птицеводческих хозяйств и питомников по сальмонеллезу. Универсальной лечебно-профилактической схемы при сальмонеллезе предложить невозможно. Антибиотики продолжают оставаться основой профилактических мероприятий в промышленном птицеводстве. При этом бессистемное применение антибиотиков способствует циркуляции антибиотикорезистентных штаммов сальмонелл, а остаточное количество антибиотиков в продуктах птицеводства снижает их качество, нарушает экологическое равновесие.

По мнению ряда экспертов ВОЗ проблема не может быть решена без применения эффективных средств специфической иммунопрофилактики сальмонеллеза. Поэтому в разных странах были предложены живые, инактивированные и химические вакцины против сальмонеллеза кур, разработана вакцина и в нашей стране.

Птиц рекомендуется вакцинировать в угрожаемой и неблагополучной зоне, при яичном производстве и воспроизводстве. Вакцинации подлежат только клинически здоровые птицы, а также выздоровевшие после лечения. Однако вакцинопрофилактика имеет ограниченный потенциал эффективности в связи с невозможностью санации восприимчивых птиц и объекты окружающей среды от возбудителя, серовариантной специфической направленностью, вероятностью суперинфекции при вакцинации по инфицированному фону, невозможностью профилактить заболеваемость у цыплят и птенцов первых дней жизни.

Профилактика сальмонеллеза птиц, вызываемого в т.ч. не адаптированными к птице сероварами сальмонелл, включает выполнение технологических, зоогигиенических, ветеринарных и санитарных требований, определенных ветеринарно-санитарными правилами для птицеводческих предприятий во всех категориях хозяйств.

Для предупреждения заражения птицы и контаминации продуктов убоя птиц сальмонеллами необходимо:

- получать и скармливать птице свободные от сальмонелл комбикорма и добавки;
- не допускать на территорию хозяйства поступления необезвреженной мясной и яичной оборотной тары, а также домашних и диких животных;
- истреблять грызунов и голубей;
- проводить меры по недопущению распространения эктопаразитов птиц;
- поддерживать должное санитарное состояние при содержании птицы;
- строго соблюдать технологическую инструкцию по убою и переработке мяса птиц и ветеринарно-санитарные правила для предприятий (цехов) переработки птицы и производства яйцепродуктов.

В качестве средств специфического лечения и специфической профилактики на краткосрочный период в угрожаемой зоне наибольшую ценность, на наш взгляд, представляют препараты на основе бактериофагов. В настоящее время в распоряжении биопромышленности имеются фаговые препараты для лечения сальмонеллеза птиц:

- Бактериофаг против пуллороза и тифа птиц. Бактериофаг применяют и с профилактической и с лечебной целями в хозяйствах, неблагополучных по пуллорозу и тифу птиц.

С профилактической целью препарат дают цыплятам и индюшатам с первого дня жизни ежедневно в течение 10 дней по одному разу в день, а с лечебной целью – по 2 раза в день (утром и вечером), до полного выздоровления. Перед дачей бактериофага и в первые часы после его применения из рациона должны быть исключены молочнокислые корма, а также уменьшен белковый состав корма.

Наряду с применением бактериофага при пуллорозе или тифе птиц обязательно проведение всего комплекса ветеринарно-санитарных и зоогигиенических мероприятий, предусмотренных действующей инструкцией о мероприятиях по борьбе с заразными болезнями птиц.

- Сальмофаг энтеритидис против сальмонеллеза птиц. Препарат состоит из вакцинного компонента – фагоустойчивого аттенуированного штамма и фагового компонента. Вакцинный компонент сальмофага формирует в организме птиц специфический иммунитет к сальмонеллам через 3-5 дней после введения второй дозы препарата и сохраняется до двух месяцев у цыплят и до четырех месяцев у взрослой птицы. Лечебные свойства бактериофага проявляются сразу после введения.

Сальмофаг энтеритидис предназначен для лечения и специфической профилактики сальмонеллеза кур, вызываемого *Salmonella enteritidis*.

Сальмофаг применяют с питьевой водой. Птицу обрабатывают сальмофагом в племенных, товарных хозяйствах и репродукторах второго порядка в возрасте 1-3, 55-60, 140-150 дней, но не позже 3 недель до начала яйцекладки

Цыплятам 1-3-дневного возраста выпаивают дважды по 0,25 дозы вакцинного компонента и по 0,5 дозы бактериофага с интервалом в 3 дня, во все последующие сроки однократно – по 1 дозе вакцины и по 1 дозе бактериофага на выпойку. Кур-несушек, бактерионосителей сальмонелл обрабатывают только бактериофагом по 1 дозе на голову.

Цыплятам-бройлерам 1-3-дневного возраста выпаивают сальмофаг дважды, с интервалом в 3 дня, по 0,25 дозы вакцины и по 0,5 дозы бактериофага на цыпленка. За 5-7 дней до убоя бройлеров обрабатывают только бактериофагом по 1 дозе на голову.

- Сальмофаг бивалентный против сальмонеллеза птиц. Вакцинный компонент сальмофага формирует в организме птиц специфический иммунитет к сальмонеллам через 3-5 дней после введения второй дозы препарата и сохраняется до двух месяцев у цыплят и до четырех месяцев у взрослой птицы. Лечебные свойства бактериофага проявляются сразу после введения.

Бивалентный сальмофаг предназначен для лечения и специфической профилактики сальмонеллеза кур, вызываемого *S. enteritidis* и *S. typhimurium*.

Сальмофаг применяют с питьевой водой. Птицу обрабатывают сальмофагом в племенных, товарных хозяйствах и репродукторах второго порядка в возрасте 1-3, 55-60, 140-150 дней, но не позже 3 недель до начала яйцекладки.

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- Сальмофаг тифимуриум против сальмонеллеза птиц. Вакцинный компонент сальмофага формирует в организме птиц специфический иммунитет к сальмонеллам через 3-5 дней после введения второй дозы препарата и сохраняется до двух месяцев у цыплят и до четырех месяцев у взрослой птицы. Лечебные свойства бактериофага проявляются сразу после введения.

Сальмофаг тифимуриум предназначен для лечения и специфической профилактики сальмонеллеза кур, вызываемого *S. typhimurium*.

Сальмофаг применяют с питьевой водой. Птицу обрабатывают сальмофагом в племенных, товарных хозяйствах и репродукторах второго порядка в возрасте 1-3, 55-60, 140-150 дней, но не позже 3 недель до начала яйцекладки

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- Сальмофаг пуллорум против сальмонеллеза птиц. Вакцинный компонент сальмофага формирует в организме птиц специфический иммунитет к сальмонеллам через 3-5 дней после введения второй дозы препарата и сохраняется до двух месяцев у цыплят и до четырех месяцев у взрослой птицы. Лечебные свойства бактериофага проявляются сразу после введения.

Сальмофаг пуллорум предназначен для лечения и специфической профилактики сальмонеллеза кур, вызываемого *S. gallinarum-pullorum*.

Сальмофаг применяют с питьевой водой. Птицу обрабатывают сальмофагом в племенных, товарных хозяйствах и репродукторах второго порядка в возрасте 1-3, 55-60, 140-150 дней, но не позже 3 недель до начала яйцекладки

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На сегодня применение бактериофагов в птицеводстве локальный характер. Одной из причин этого является специфичность препаратов, а также литическая активность, высокий уровень которой необходимо поддерживать резервными штаммами.

Целью настоящей работы стала разработка и интегрирование бактериофагового препарата в систему противоэпизоотических мероприятий.

## МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ

В ходе работы применяли методы биотехнологии, а также микробиологические методы исследования и методы ветеринарно-санитарной экспертизы. Использовали штаммы сальмонелл и бактериофаги к ним.

Нами разработан препарат для лечения сальмонеллеза птиц, основанный на коктейле бактериофагов к двум наиболее распространенным серовариантам *S. enteritidis* и *S. typhimurium*. Эти варианты возбудителя являются наиболее значимыми в этиологии для всех видов промышленных и декоративных птиц, разводимых в России.

## РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ

Для создания препарата бактериофагов против сальмонеллеза птиц по методу обогащения из сточных вод птицефабрик, пометных вод голубятен и зоопарков были выделены 39 изолятов *Phagum Salmonella typhimurium*. Изучили их происхождение, морфологию вирионов, морфологию колоний, активность, диапазон специфичности, спектр литической активности, что позволило отобрать, паспортизировать и депонировать производственные штаммы. Три наиболее активных штамма – *Ph. S. typhimurium* №5 ТЗ, 8 МЕ, 9 ММ отличались высокими литическими качествами. Их литическая активность составляла  $10^{-8}$ - $10^{-10}$  по методу Аппельмана и превосходила  $10^7$  по методу Грациа. При последующих исследованиях еще 15 бактериофагов тифимуриум паспортизированы в качестве резервных для препарата. У всех фагов отмечен максимальный спектр литического действия при специфичности литической активности к бактериям вида *Salmonella enterica*. По морфологической структуре выделенные и селекционированные бактериофаги отнесены к 4 классификационной группе по Тихоненко, В1 морфотипу и семейству *Siphoviridae*.

Фаги 5 ТЗ и 8 МЕ обладали выраженным лизинообразованием. Кроме того, депонированные фаги обладали выраженными свойствами адсорбции на клетках хозяев. При этом наибольшие показатели скорости адсорбции –  $(4,96 \pm 0,05) \times 10^{-9}$

см<sup>3</sup>мин<sup>-1</sup> и количества адсорбированных фаговых частиц – 91,7±0,25%, отмечены у бактериофага *Ph. S. typhimurium* №8 ME -ДЕП, который также наиболее интенсивно формировал литический фермент.

Проведение опытов одиночного цикла развития осуществляли в трех аналоговых повторностях согласно описанному методу Эллипса и Дельбрюкка на бульонных культурах депонированных штаммов сальмонелл. Учет результатов проводили после инкубации по исследованию посевов методом агаровых слоев, произведенных с интервалом в 2 минуты в течение 1 часа. Отмечено, что среднее число негативных колоний в разведении 1:40 составляет 30-32 на протяжении 22 минут (фаг 5 Т3), с 26 минуты отмечается выраженный рост, на 28 минуте появляются негативные колонии в чашках, засеянных из разведения 1:100, и на 30 минуте проявляется полный лизис колоний в посевах из второго разведения (1:40). Таким образом, конец латентного периода начинает проявляться на 24-25 минутах и стабилизируется за 8 минут. Т.е. у селекционированных фагов выявлен минимальный латентный период внутриклеточного развития. Среднее число негативных колоний, полученных из разведения фага 1:100 – 132, значит, по окончании лизиса бактерий количество фаговых частиц составило 13200 в 0,1 мл материала. Средняя урожайность фагов на одну бактериальную клетку также отмечена на достаточно высоком уровне для производственных штаммов – 185-206 фаговых частиц. Таким образом, проведенные исследования определили характеристики полученным нами сальмонеллезным фагам тифимуриум, которые удовлетворяют требованиям к производственным штаммам для создания лечебно-профилактических препаратов.

Для определения степени антигенного родства производственных штаммов мы проводили исследования серологических свойств фагов, получая к ним антисыворотки методом иммунизации кроликов. Через 7-10 дней после последнего введения антигена у кроликов брали кровь из краевой вены уха и испытывали нейтрализующую активность антисывороток в разведениях 1:25-1:800. Если антисыворотка вызывала нейтрализацию свыше 90% фаговых частиц при пятиминутном контакте, то ее активность считали приемлемой для дальнейшей работы.

Полученные гипериммунные сыворотки на производственные штаммы бактериофагов проявляли нейтрализующую активность в разведениях 1:50-1:400. Константы скорости нейтрализации фагов с гомологичными антисыворотками составили 240,21-270,26 мин<sup>-1</sup>, с гетерологичными антисыворотками – 124,42-163,67 мин<sup>-1</sup>. Т.о. было установлено, что штаммы *Ph. S. typhimurium* №5 Т3, 8 ME, 9 MM являются родственными и обладают выраженной иммуногенностью. Для создания бивалентного бактериофага против сальмонеллеза птиц были использованы фаги к *S. enteritidis*, выделенные нами при исследовании по методу обогащения 52 проб птицефабрик и депонированные нами совместно с С.В. Леневым и Ю.А. Малаховым в качестве производственных – *Ph. S. enteritidis* А-1, ЮН-1, ЮН-2. Их характеризует литическая активность к эталонному штамму *S. enteritidis* №3-2 ВГНКИ по методу Аппельмана 10<sup>-9</sup>-10<sup>-10</sup>, специфичность и широкий спектр литического действия.

Фаговый коктейль против сальмонеллеза птиц готовили, производя высеив в разные емкости с предварительно нагретым до 37 °С разведенным 1:5 МПБ суспензий 6-часовой культуры штамма *Salmonella typhimurium* М-2ф t-ДЕП и фильтрата каждого из бактериофагов: *Ph. S. typhimurium* №5 Т3, 8 ME, 9 MM, а также суспензий 6-часовой культуры *S. enteritidis* 25 Яв e-ДЕП и фильтрата каждого из бактериофагов *Ph. S. enteritidis* А-1, ЮН-1, ЮН-2.

Биотехнология экспериментальной серии препарата предусматривала поэтапное изготовление опытных образцов и промышленное производство. Культивирование фагов на молодых культурах сальмонелл проводили 18 часов, после чего осуществляли очистку биологического препарата бактериофагов от биологической массы сальмонелл, остатков клеток и компонентов питательной среды. Следующим этапом осуществляли центрифугирование при 6000 об./мин. в течение 30 минут, фильтрацию через системы бактериальных фильтров Шамберленда и приготовление концентрированной суспензии бактериофагов. В качестве контроля служили

отсутствие роста при посеве суспензии бактериофагов в разведенный МПБ и рост сальмонеллы без фагов по выраженной мутности питательной среды. Концентрированную суспензию бактериофагов контролировали по методу Аппельмана, доводя концентрацию до уровня  $10^8$  фаговых частиц в  $1 \text{ см}^3$  среды.

В качестве консерванта приготовленной суспензии фагов применяли раствор хинозола до его конечной концентрации в фаголизате – 0,01%. Готовый препарат формировали смешиванием консервированных суспензий бактериофагов в соотношении 1:1:1:1:1, после чего проводили расфасовку, упаковку, маркировку и контроль препарата бивалентный бактериофаг против сальмонеллеза птиц на стерильность, активность, безвредность.

Контроль экспериментальных серий препарата на стерильность осуществляли высевом на МПА, в МПБ, среды Китта-Тароцци и Сабура. Отмечены высокие результаты при постановке контролей на активность бивалентного бактериофага, осуществленных на белых мышах и голубях при подкожном инфицировании, для чего лабораторным объектам внутримышечно вводили культуры *S. typhimurium* М-2ф t -ДЕП (1 группа), *S. enteritidis* 25 Яв е -ДЕП (2 группа) в дозах по 5 LD<sub>50</sub> и смесь культур по 2,5 LD<sub>50</sub> (3 группа), а спустя 20 минут – препарат. Наблюдение и учет заболевших и павших голубей с бактериологическим исследованием проводили в течение 14 дней. Результаты исследования активности бивалентного бактериофага против сальмонеллеза птиц в остром лабораторном опыте на мышах и голубях показали их сохранность 90-100% при сохранности в контрольных группах без фагообработки – 0-10%. При этом единичные летальные случаи в опытных группах могли быть спровоцированы высокой дозой экзо- и эндотоксинов введенных сальмонелл, т.к. гибель по 1 голубю отмечали в первые 1-2 суток после начала эксперимента при введении *S. enteritidis* или смеси с ее присутствием. Причем от погибших голубей в опытных группах сальмонеллу не выделяли, при этом в контроле ее выделяли из материала, как от трупов, так и от клинически здоровых голубей.

Препараты сальмонеллезных фагов: как в моноисполнении, так и в виде бивалентного бактериофага против сальмонеллеза птиц, способы их производства и применения были успешно апробированы в условиях птицеферм, голубятен, зоопарков, частных подворий и вольеров для содержания птиц различных видов, неблагополучных по сальмонеллезу. Основываясь на представленных материалах, Бактериофаг тифимуриум против сальмонеллеза голубей, бивалентный бактериофаг против сальмонеллеза птиц и способ лечения сальмонеллеза птиц при помощи этих препаратов были внедрены в практику и рекомендованы ветеринарным специалистам. Препарат против сальмонеллеза голубей и способ лечения сальмонеллеза голубей запатентованы. Фаговые препараты рекомендованы для борьбы с сальмонеллезом птиц, что нашло отражение в одобренных Департаментом ветеринарии МСХ РФ «Рекомендациях по диагностике, профилактике и ликвидации сальмонеллеза кур» [Куриленко А.Н., Пименов Н.В., Ленев С.В., Малахов Ю.А., Яковлев С.С. Рекомендации по диагностике, профилактике и ликвидации сальмонеллеза кур. – М.: МСХ. / МГАВМиБ. – 2002. – 34 с.], «Рекомендациях по диагностике, профилактике и ликвидации сальмонеллеза голубей» [Пименов Н.В., Куриленко А.Н., Чиркова И.В., Яковлев С.С. Рекомендации по диагностике, профилактике и ликвидации сальмонеллеза голубей. – М.: МСХ. / «МегАрт» – 2008. – 43 с.].

Нами изучено также, что препараты бактериофагов на примере бивалентного бактериофага против сальмонеллеза птиц способствуют профилактике сальмонеллоносительства и снижения вероятности сальмонеллообсеменности продуктов убоя на примере перепелов. Применение бактериофага не снижает биологической ценности перепелиного мяса, соответствует требованиям безвредности и доброкачественности, регламентированным санитарными правилами и другими нормативными документами. Для этого сформировали 2 группы суточных перепелов по 50 голов в каждой, одна из которых служила контролем. Выращивание подопытной птицы осуществляли на базе КФК «Сказка» Скопинского района Рязанской области в соответствии с рекомендациями ВНИТИП по выращиванию молодняка перепелов на

мясо. Откормочное поголовье находилось в одинаковых условиях кормления и клеточного содержания. Птица опытной группы в течение 3 суток перед убоем была подвергнута обработке бивалентным бактериофагом против сальмонеллеза птиц (методом групповой выпойки с водой в разведении 1:20 препарата, содержащего высокоактивные вирулентные фаги *Phagum Salmonella enteritidis* и *Phagum Salmonella typhimurium* в титре не менее  $10^8$  каждого). Убой перепелов проводили в 55-дневном возрасте на убойном пункте с соблюдением санитарно-гигиенических норм.

После убоя нами проведен послеубойный осмотр тушек и внутренних органов согласно нормативным документам. Отбор проб проводили согласно ГОСТ 31467-2012 «Мясо птицы, субпродукты и полуфабрикаты из мяса птицы. Методы отбора проб и подготовка их к испытаниям». Органолептические и лабораторные исследования мяса перепелов проводили согласно ГОСТ 31470-2012 «Мясо птицы, субпродукты и полуфабрикаты из мяса птицы. Методы органолептических и физико-химических исследований», а также ГОСТ Р 54673-2011 «Мясо перепелов (тушки). Технические условия». Микробиологические исследования – по ГОСТ Р 50396.1-2010 «Мясо птицы, субпродукты и полуфабрикаты из мяса птицы. Метод определения количества мезофильных аэробных и факультативно-анаэробных микроорганизмов», по ГОСТ 31468-2012 «Мясо птицы, субпродукты и полуфабрикаты из мяса птицы. Метод выявления сальмонелл» и по ГОСТ Р 51921-2002 «Продукты пищевые. Методы выявления и определения бактерий *Listeria monocytogenes*». При определении химического состава мяса изучали количество белка методом Кьельдаля, количество жира по Сокслету, определяли содержание влаги и содержание золы методом без предварительного высушивания навески. При этом формирование навесок проводили при равном соотношении отбора проб из грудных и бедренных мышц.

Проведенные исследования позволили установить, что применение препарата бактериофагов для профилактики сальмонелла-инфекции в перепеловодстве не снижает биологической ценности продуктов убоя, а по содержанию белка отмечено достоверное повышение показателя в мясе птицы опытной группы. Имеются тенденции к большей энергетической ценности и содержанию сухого вещества, повышению относительной биологической ценности мяса. Органолептическое исследование мяса перепелов контрольной и опытной групп характеризовалось сухой поверхностью тушек в обеих группах с корочкой подсыхания, бледно-желтого цвета с розовым оттенком. Подкожная и внутренняя жировая ткань – бледно-желтого цвета; серозные оболочки грудобрюшной полости – влажные, блестящие, без патологических образований. Мышцы на разрезе – слегка влажные, бледно-розового цвета; по консистенции – плотные, упругие, при надавливании пальцем образующаяся ямка выравнивается в течение 3-8 секунд. Запах мяса тушек перепелов в обеих группах – специфический, свойственный свежему мясу птицы, посторонних запахов в мясе не установлено. Бульон – прозрачный, без хлопьев, ароматный.

Уровень кислотности мяса тушек (в грудной и бедренной мускулярной группе) в опытной группе на протяжении семи суток находился в пределах допустимых значений, а на 9-е сутки приобрел значение мяса сомнительной свежести, тогда как в контроле на 7 сутки pH снизилось до 6,7, что соответствует несвежему мясу. количество летучих жирных кислот возрастало в процессе хранения, так с 1 по 7-е сутки количество летучих жирных кислот находилось в пределах нормы, а на 9-е сутки в контроле резко возросло и превысило допустимые значения. В опытной группе данный показатель не превышал допустимые значения.

При микроскопии мазков-отпечатков из поверхностных слоев бедренных и грудных мышц были обнаружены в единичных случаях кокковые и палочковидные микроорганизмы. Следов распада мышц обнаружено не было. Исследованные образцы мяса перепелов не содержали патогенную микрофлору. Концентрация КМАФАнМ в опытной группе составила  $1,4 \times 10^2$  КОЕ/г; в контроле –  $1,2 \times 10^3$  КОЕ/г.

При изучении химического состава установлено, что применение препарата бактериофагов для профилактики сальмонелла-инфекции в перепеловодстве не снижает биологической ценности продуктов убоя, а по содержанию белка и



энергетической ценности отмечено достоверное повышение показателя в мясе птицы опытной группы. Относительную биологическую ценность определяли согласно «Методическим рекомендациям для использования экспресс-метода биологической оценки продуктов и кормов» (ВАСХНИЛ, 1990). Относительная биологическая ценность мяса перепелов, обработанных бивалентным бактериофагом, составила 102,9%.

### ЗАКЛЮЧЕНИЕ

Для профилактики заболеваемости в птицеводческих хозяйствах активно применяют антибиотики, при этом страдает качество продукции и растёт циркуляция антибиотикорезистентных штаммов. В этой связи бактериофаги в системе противозoonотических мероприятий при сальмонеллезе птиц имеют хорошие перспективы применения. Требования ВТО к качеству продукции, способность санировать организм птицы и продукты убоя от сальмонелл, отсутствие побочных эффектов, экологичность применения и протективные краткосрочные свойства в угрожаемой зоне, на птице первых дней жизни обозначают преимущества фагопрофилактики и фаготерапии сальмонеллеза. Специфичность, которая явилась причиной меньшей конкурентности бактериофагов перед антибиотиками на протяжении нескольких десятков лет, сегодня, в условиях высокой культуры промышленного птицеводства, становится преимуществом препаратов на основе бактериофагов.

Изучение качественных характеристик продуктов убоя птицы на примере перепелов позволяет сделать вывод о том, что препараты бактериофагов способствуют профилактике сальмонеллообсемененности продуктов убоя, не снижают биологической ценности мяса, соответствуют требованиям безвредности и доброкачественности, регламентированным санитарными правилами и другими нормативными документами. Решение проблемы микробоносительства и снижения контаминации продуктов убоя в птицеводстве может достигаться применением препаратов бактериофагов, в частности, разработанным нами бивалентным бактериофагом против сальмонеллеза птиц. При применении препарата отмечено достоверно большее значение содержания белка и энергетической ценности в мясе убойных перепелов породы техасские белые.

### БИБЛИОГРАФИЯ

1. Золотухин С.Н. Результаты контроля изготовления поливалентного бактериофага // Фундаментальные и прикладные проблемы повышения продуктивности животных и конкурентоспособности продукции животноводства в современных экономических условиях АПК РФ: Мат-лы Междунар. науч.-практ. конф., г. Ульяновск / УГСХА. – Т. II. – Ульяновск, 2015. – С. 297-299.
2. Куриленко А.Н., Пименов Н.В., Ленев С.В., Малахов Ю.А., Яковлев С.С. Рекомендации по диагностике, профилактике и ликвидации сальмонеллеза кур. – М.: МСХ / МГАВМиБ. – 2002. – 34 с.
3. Мелехин А.С., Пименов Н.В., Золотухин С.Н. Производство и контроль экспериментальной серии поливалентного фагового биопрепарата. / Вестник Ульяновской государственной сельскохозяйственной академии. – 2014, №4(28). – С. 82-88.
4. Пименов Н.В. Бактериофаги в борьбе с сальмонеллезом птиц // Бактериофаги: Теоретические и практические аспекты применения в медицине, ветеринарии и пищевой промышленности: Мат-лы междунар. науч.-практ. конф.: Ульяновск, 23-25 апреля 2013 г./ УГСХА им. П.А. Столыпина. – Ульяновск, 2013. – Т. II. – С. 51-55.
5. Пименов Н.В. Новые пути решения медико-социальной проблемы сальмонеллеза птиц // Жизнь без опасностей. – 2011, №2. – т. 6. – С. 56-60.
6. Пименов Н.В. Перспективы применения бактериофагов в ветеринарии. / Ветеринария и кормление. – 2009, №5. – С. 34-35.

7. Пименов Н.В. Сальмонеллез птиц: перспективные направления в лечебно-оздоровительных мероприятиях // Ветеринария и кормление. – 2010, №3. – С. 24-25.
8. Пименов Н.В. Система лечебно-профилактических мероприятий, направленных против сальмонеллеза птиц // Животноводство России в условиях ВТО: от фундаментальных и прикладных исследований до высокопродуктивного производства: Мат-лы Междунар. науч.-практ. конф. мол. ученых: Орел, 9-11 апреля 2013 г./ ФГБОУ ВПО ОрелГАУ. – Орел, 2013. – С. 304-308.
9. Пименов Н.В. Специфическая борьба с сальмонеллой в условиях птицеводства // Russian Journal of Agricultural and Socio-Economic Sciences. – 2013, №11(23). – P. 16-23.
10. Пименов Н.В. Совершенствование средств и методов борьбы с сальмонеллезом птиц // Ветеринария и кормление. – 2012, №4. – С. 32-33.
11. Пименов Н.В. Эффективность оздоровительных мероприятий против сальмонеллеза птиц в условиях зоопарка // Российский ветеринарный журнал. – 2012, №3. – С. 22-24.
12. Пименов Н.В. Рекомендации по диагностике, профилактике и ликвидации сальмонеллеза голубей. – М.: МСХ. / «МегАрт» – 2008. – 43 с.
13. Пименов Н.В. Современные аспекты борьбы с сальмонеллезной инфекцией в птицеводстве: Монография. – М.: Издательство «Старая Басманная», 2017. – 172 с.
14. Пименов Н.В., Лаишевцев А.И., Колесникова Ю.Н. Профилактика сальмонеллеза сельскохозяйственных животных и птиц: основные направления и средства // Russian Journal of Agricultural and Socio-Economic Sciences. – 2016, №12(60). – P. 247-254.
15. Пименов Н.В., Лаишевцев А.И., Пименова В.В. Роль возбудителей сальмонеллеза птиц в инфицировании и патологии человека // Russian Journal of Agricultural and Socio-Economic Sciences. – 2017, №2(62). – P. 282-289.
16. Пименов Н.В., Ленева С.В. Бактериофаги в системе мероприятий по борьбе с пуллорозом кур // Инфекция и иммунитет. – сент. 2014, специальный выпуск. – С. 102-103.
17. Пименов Н.В. Эффективность применения бивалентного бактериофага против сальмонеллеза для обезвреживания продуктов убоя в птицеводстве // Ветеринария, зоотехния и биотехнология. – 2014, №1. – С. 31-35.
18. Пименов Н.В. Лечение и профилактика сальмонеллеза голубей и животных зоопарков с использованием фаготерапии и пробиотика // Российский ветеринарный журнал: мелкие домашние и дикие животные. – 2013, №6. – С. 6-8.
19. Пименов Н.В. Методические рекомендации по профилактике и ликвидации сальмонеллезных сельскохозяйственных животных, в том числе птиц. – М.: ФГБОУ ВО МГАВМиБ – МВА имени К.И. Скрябина, 2016. – 155 с.
20. Пименов Н.В., Чиркова И.В. Фаговыведение, профилактика и терапия сальмонеллеза голубей // Ветеринария. – 2007, №10. – С. 24-28.
21. Пименова В.В. Ветеринарно-санитарная характеристика мяса перепелов при применении бактериофагового препарата Фаговет. / Проблемы ветеринарной санитарии, гигиены и экологии. – 2017, №3 (23). – С. 24-26.
22. Татаренко Я.С., Пименов Н.В. Аспекты ветеринарно-санитарного благополучия в промышленном перепеловодстве // Проблемы ветеринарной санитарии, гигиены и экологии. – 2017, №3 (23). – С. 60-62.
23. Kovaleva E. Phage detection of pathogen microorganisms in agricultural ecosystems monitoring as part of sectoral foresight / IJRAP. – 2016, №7(2). – P. 247-249.
24. Kovaleva E.N., Vasilyev D.A., Plygun S.A. et al. Ecosystems Monitoring With Purpose For Phage Detection Of Pathogen Microorganisms As Part Of Agricultural Foresight. / Advances in Environmental Biology. – 2016, №10(3). – P. 1-3.
25. Lenev S., Laishevtcev A. et al. Improvement of allocation and identification of Salmonella entericabacteria of arizonae subspecies // IJPRAS. – 2016, №5(2). – P. 342-348.

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**КОНТРОЛЬ И ТЕНДЕНЦИИ ИЗМЕНЕНИЯ ЭПИЗООТИЧЕСКОЙ СИТУАЦИИ  
ПО ЛЕЙКОЗУ КРУПНОГО РОГАТОГО СКОТА В 2000-2016 ГОДАХ**  
CONTROL AND TRENDS IN THE EPIZOOTIC SITUATION OF BOVINE LEUKEMIA  
IN 2000-2016

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**АННОТАЦИЯ**

Эпизоотическая ситуация по инфекционным, протозойным и паразитарным болезням сельскохозяйственных животных, рыб и пчёл в различных субъектах РФ имеет свои характерные особенности и все противоэпизоотические мероприятия зависят от уровня ветеринарного контроля, проведения санитарно-профилактических мероприятий основанных на результатах диагностических исследований, выполненных в ветеринарных лабораториях. В статье приведены данные мониторинга эпизоотологической ситуации по лейкозу крупного рогатого скота в 2000-2016 гг. по Российской Федерации.

**ABSTRACT**

The epizootic situation of infectious, protozoal and parasitic diseases of agricultural animals, fish and bees in various regions of the Russian Federation has its own characteristics and all anti-epizootic measures depend on the level of veterinary control, the conduct of sanitary and preventive measures based on the results of diagnostic studies performed in veterinary laboratories. The article provides data on monitoring the epizootic situation of cattle leukemia in 2000-2016 for the Russian Federation.

**КЛЮЧЕВЫЕ СЛОВА**

Лейкоз, КРС, эпизоотическая ситуация, мониторинговые исследования.

**KEY WORDS**

Leukemia, cattle, epizootic situation, monitoring studies.

Эпизоотическая ситуация по инфекционным, протозойным и паразитарным болезням сельскохозяйственных животных, рыб и пчёл в различных субъектах РФ имеет свои характерные особенности и все противоэпизоотические мероприятия зависят от уровня ветеринарного контроля, проведения санитарно-профилактических мероприятий основанных на результатах диагностических исследований, выполненных в ветеринарных лабораториях. Разрыв эпизоотической цепи при инфекционных и протозойных болезнях связан с комплексными ветеринарно-санитарными мероприятиями, проводимыми в неблагополучных пунктах, а также с применением средств специфической профилактики (вакцины, сыворотки), что, несомненно, обеспечивает устойчивое эпизоотическое благополучие животноводческой отрасли страны. Роль этих мероприятий неоспорима: предотвращает падёж и приносит большой хозяйственно-экономический эффект владельцам животных. Распространённость зоонозных инфекций в большинстве стран мира уменьшается благодаря активным программам по контролю за здоровьем животных. Угроза заноса и распространения особо опасных, в том числе карантинных болезней на территории

Российской Федерации в современных условиях ведения животноводства существует постоянно [2,6,7,14,15,17,18,19,20].

Во многих скотоводческих хозяйствах племенного, молочного, а также мясного направления, в том числе и на крупных откормочных комплексах, регистрируются заболевания вирусной, бактериальной, протозойной этиологии: ринотрахеит, вирусная диарея, парагрипп-3, рото-, короновиральные инфекции, лейкоз крупного рогатого скота, пастереллез, сальмонеллез, микоплазмоз, туберкулез, бруцеллез и др. В основном эти заболевания протекают по смешанному типу и вызываются несколькими возбудителями как вирусной, так и бактериальной этиологии. Преобладает инфекция, индуцированная ВЛКРС (рис.1).

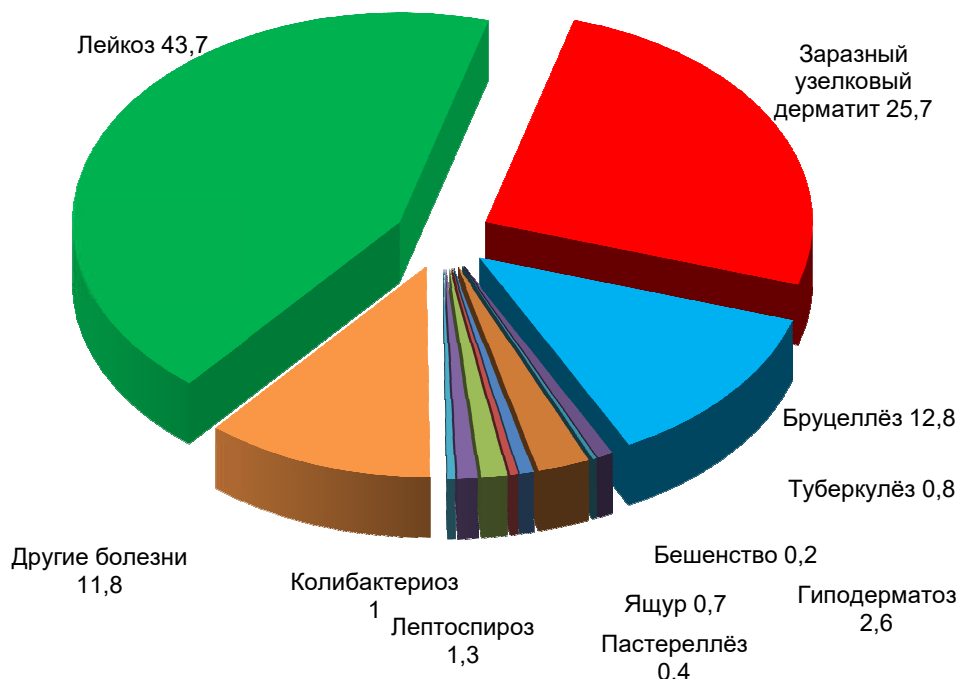


Рисунок 1 – Удельный вес значимых и особо опасных болезней животных в Российской Федерации в 2016 г.

В связи с этим, согласно решению об «Обеспечении продовольственной безопасности Российской Федерации», принятому на совместном заседании Президиума Научно - экспертного совета при Председателе Совета Федерации Федерального Собрания Российской Федерации и Совета по вопросам агропромышленного комплекса и природопользования при Совете Федерации Федерального Собрания Российской Федерации 4 октября 2016 года, Правительству Российской Федерации рекомендовано разработать с учетом рекомендаций Международного эпизоотического бюро (МЭБ) специальные программы по ликвидации особо опасных болезней животных и антропозоонозов, регистрируемых на территории Российской Федерации (африканская и классическая чума свиней, ящур, оспа овец и коз, болезнь Ауески, болезнь Ньюкасла, сальмонеллез, бруцеллез, туберкулез и др.). [4,6,13,16].

Вопрос о борьбе с лейкозом крупного рогатого скота в нашей стране в настоящее время, стал не только ветеринарной проблемой, но и государственной.

Решения этой проблемы для промышленной скотоводческой отрасли страны, прежде всего, должно базироваться на мониторинге вышеперечисленных особо опасных, экономически и социально значимых болезней, позволяющем контролировать ситуацию, определять эффективность противоэпизоотических мероприятий и оперативно их корректировать. Угроза заноса и распространения

карантинных и особо опасных болезней животных на территории Российской Федерации в современных условиях ведения животноводства существует постоянно. Это подтверждает анализ эпизоотической обстановки в Российской Федерации за последние годы, из которого следует, что основные усилия практической ветеринарии и научных учреждений ветеринарного профиля должны быть направлены на обеспечение охраны территории страны от заноса заразных болезней животных, распространения болезней внутри страны, отдельных субъектов, а также в необходимости своевременной реализации мероприятий, направленных на ликвидацию этих болезней. Система эпизоотологического мониторинга и система профилактических и противоэпизоотических мероприятий (эпизоотологический контроль) являются компонентами одной системы целенаправленного воздействия на эпизоотический процесс [5, 6].

В письме Первого заместителя Министра сельского хозяйства Российской Федерации Д.Х. Хатуова «О подготовке Плана мероприятий по борьбе с лейкозом крупного рогатого скота», направленном руководителям высших исполнительных органов власти субъектов РФ, отмечено, что в исполнении поручения Правительства Российской Федерации от 07.02.2016 г. №АД-П-11-1935 Минсельхоз России просит разработать и ввести в действие региональную программу по борьбе с лейкозом крупного рогатого скота, которая предусматривает немедленный убой имеющихся на передержке больных лейкозом животных и поэтапное освобождение подведомственных территорий от инфицированных ВЛКРС животных до 2020 года. В структуре инфекционной патологии доля лейкоз крупного рогатого скота неуклонно снижается (рис. 1, 2).

Однако учитывая широкое распространение этой инфекции, полная ликвидация её на территории Российской Федерации потребует значительных усилий и капиталовложений.

Со времени первого выявления лейкоза крупного рогатого скота в СССР пройден длинный путь, включавший такие вехи как изучение причин, разработка диагностики, эпизоотологических аспектов и мер борьбы с этой болезнью. В настоящее время система противоэпизоотических мероприятий отшлифована настолько, что позволяет использовать её для оздоровления регионов страны диагностики, контроля и мер борьбы с этой болезнью можно считать, хорошо зарекомендовавшая себя в ряде регионов РФ.

Если в середине прошлого века единичные случаи падежа и вынужденного убоя животных с опухолевыми поражениями объясняли развитием спорадического лимфаденоза, что не вызывало особого беспокойства, то в дальнейшем болезнь получила повсеместное распространение, что свидетельствовало о её инфекционной природе. В СССР и странах Восточной Европы болезнь появилась вследствие завоза поголовья из неблагополучных по лейкозу стран Западной Европы [10, 13].

В тот период времени для прижизненной диагностики (на которой, в основном, будет сконцентрировано внимание в данной статье) гемабластозов крупного рогатого скота применялся в ветеринарных лабораториях гематологический анализ, в основу которого был положен количественный подсчет лейкоцитов в 1 мм крови и процент лимфоцитов с учетом возраста животных. Ганноверский «лейкозный ключ», разработанный в 1954 г. R. Gotze, с соавторами, был одним из первых. Затем в различных странах мира были разработаны нормативы гематологических показателей для диагностической оценки больного и подозреваемого в заболевании лимфолейкозом крупного рогатого скота, которые были названы «лейкозными ключами». С 1954 г по 1976 г было предложено 13 «лейкозных ключей», которые применялись в различных странах Европы и в СССР.

В лаборатории по изучению лейкозов ВИЭВ в 1965 году был разработан «лейкозный ключ» (Советский), который был внесен во Временную инструкцию по борьбе с лейкозами крупного рогатого скота, утвержденную ГУВ МСХ СССР 11 марта 1965г. в 1969 году Советский «лейкозный ключ» был усовершенствован и в основу

которого было положено количество лейкоцитов, процент лимфоцитов и абсолютное количество их в  $1 \text{ мм}^3$  крови.

Применение гематологической диагностики не остановило распространение индуцированной ВЛКРС инфекции по всему миру и не могло помочь оздоровлению от лейкоза в рамках одной страны или региона, однако, сильно снизило смертность и вынужденный убой скота от этого заболевания и, поскольку позволяло диагностировать болезнь до наступления терминальной стадии [9]. Гематологический метод диагностики используется до сих пор и приносит как определённую пользу, и, вместе с тем, служит тормозом для проведения противоэпизоотических мероприятий, поскольку позволяет не выбраковывать инфицированных ВЛКРС животных, а до появления у них гематологических признаков болезни [10, 13].

По материалам VII доклада МКНВ в 2000 году, вирус лейкоза крупного рогатого скота (ВЛКРС, BLV) включен в семейство *Retroviridae* и входит в род *Deltaretrovirus*, в который также входят Т-лимфотропные вирусы человека и обезьян 1, 2 типа и вирус лейкоза обезьян.

Дельтаретровирус лейкоза крупного рогатого скота обладает рядом особенностей, в частности, отсутствием в крови вирусных белков и/или вирионов ВЛКРС. Однако, уже через 14 дней (часто – намного позже; сроки появления антител обусловлены, как правило, дозой провируса, полученной при заражении) после инфицирования в крови можно обнаружить антитела к наружному гликопротеиду вируса, что неоспоримо свидетельствует об экспрессии вирусных антигенов в организме инфицированного животного и является основой серологической диагностики индуцированной ВЛКРС инфекции. Из всего спектра иммунологических методов диагностики, апробированных при этой инфекции, только два – РДП (реакция диффузионной преципитации) и ИФА (иммуноферментный анализ, ELISA) – нашли широкое применение для контроля инфекции. В РФ диагностические наборы для проведения этих реакций были разработаны сотрудниками лаборатории лейкологии ВИЭВ и Курской биофабрики и налажено их промышленное производство в объёмах, достаточных как для проведения мониторинга, так и противоэпизоотических мероприятий, имеющих конечную цель оздоровления всей Российской Федерации от этой инфекции. Применение этих методов регламентировано МЭБ и основано на успешном опыте применения серологической диагностики для оздоровления стран Западной Европы от ВЛКРС [1]. Серологические методы РДП и ИФА при оздоровлении от лейкоза и контроле за распространением – основные. В последнее время как дополнительный используется метод полимеразной цепной реакции (ПЦР) [1,3].

Ранее, проводимые оздоровительные мероприятия в неблагополучных по лейкозу КРС хозяйствах, с использованием клинико-гематологической диагностики (лейкозный ключ) болезни (с 1960 по 1980 гг.), не принесли заметного положительного результата, т.е. практически не было достигнуто оздоровления хозяйств. Наряду с такими попытками борьбы с лейкозом, в тот период времени, следует особенно остановиться и на негативной деятельности ветеринарной науки и практики. Так, не зная вирусной этиологии лейкоза, реализация племенного молодняка осуществлялась на основании гематологических исследований, т.е. без учета их инфицирования ВЛКРС. Поэтому инфицированных животных (серопозитивных) отправляли в другие регионы страны, тем самым распространяя ВЛКРС по всей территории страны.

Большой вклад в создание системы мер борьбы внесла лаборатория по изучению лейкоза ВИЭВ, организованная в 1961 году. Ученые лаборатории разработали несколько инструктивных и нормативных материалов (1965, 1969, 1984, 1989 гг.), на основании которых в стране была развернута борьба с этим инфекционным заболеванием. Последние из них – действующие в настоящее время Правила по профилактике и борьбе с лейкозом крупного рогатого скота, утвержденные МСХ РФ 11.05.1999 г. и Методические указания по диагностике лейкоза крупного рогатого скота, утвержденные Департаментом ветеринарии МСХ РФ 23.08.2000 г. [2,3]. Противоэпизоотические мероприятия, проводимые на основании разработанных нормативных документов, позволили оценить их достоинства и недостатки в

производственных условиях, способствовали совершенствованию нормативных документов и поиску результативных методов оздоровления, наработать опыт в проведении противолейкозных мероприятий при использовании разных методологий [4 7,8].

Таблица 1 – Ситуация по лейкозу крупного рогатого скота в Российской Федерации в 2000-2016 гг.

| Годы  | Неблагополучные пункты |                       |                    |                        | Движение больного скота |            |                    |                             | Исследовано (тыс. гол.) |             | Положительно реагировало (гол.) |             |
|-------|------------------------|-----------------------|--------------------|------------------------|-------------------------|------------|--------------------|-----------------------------|-------------------------|-------------|---------------------------------|-------------|
|       | Имелось на начало года | Выявлено новых за год | Оздоровлено за год | Осталось на конец года | Заболело голов          | Пало голов | Сдано на убой гол. | Осталось на конец года гол. | РИД                     | Гематология | РИД                             | Гематология |
| 2000  | 2516                   | 411                   | 220                | 2707                   | 47 146                  | 883        | 48 834             | 4 676                       | 12 897,6                | 4 079,1     | 1 257 480                       | 98 638      |
| 2001  | 2707                   | 463                   | 181                | 2989                   | 64 085                  | 4170       | 56 991             | 11 770                      | 14 146,5                | 4 493,4     | 1 457 312                       | 111 428     |
| 2002  | 2989                   | 353                   | 217                | 3125                   | 65 585                  | 404        | 61 060             | 16 295                      | 15 056,4                | 4 487,0     | 1 613 530                       | 121 336     |
| 2003  | 3125                   | 190                   | 255                | 3060                   | 67 645                  | 415        | 67 820             | 16 120                      | 14 678,6                | 4 463,0     | 1 618 700                       | 122 055     |
| 2004  | 3060                   | 258                   | 433                | 2885                   | 67 511                  | 357        | 68 026             | 15 605                      | 13 429,0                | 4 579,5     | 1 401 084                       | 107 687     |
| 2005  | 2885                   | 154                   | 398                | 2649                   | 59 939                  | 367        | 63 523             | 12 021                      | 13 390,5                | 4 388,1     | 1 459 058                       | 105 358     |
| 2006  | 2649                   | 332                   | 408                | 2573                   | 59 293                  | 222        | 57 529             | 13 785                      | 11 876,1                | 4 008,5     | 1 213 663                       | 98 099      |
| 2007  | 2573                   | 196                   | 358                | 2411                   | 53 993                  | 173        | 56 821             | 10 963                      | 12 291,8                | 4 005,7     | 1 162 581                       | 93 757      |
| 2008  | 2411                   | 190                   | 292                | 2309                   | 43 214                  | 55         | 44 110             | 10 067                      | 12 948,1                | 3 920,3     | 1 119 597                       | 82 503      |
| 2009  | 2309                   | 152                   | 242                | 2219                   | 35 868                  | 50         | 38 890             | 7 045                       | 13 714,7                | 3 939,9     | 1 138 131                       | 73 982      |
| 2010  | 2219                   | 248                   | 245                | 2222                   | 31 880                  | 69         | 31 507             | 7 418                       | 13 518,6                | 3 690,4     | 1 017 976                       | 34 839      |
| 2011  | 2222                   | 117                   | 193                | 2146                   | 27 530                  | 10         | 29 154             | 5 794                       | 13 485,1                | 3 390,3     | 936 146                         | 54 229      |
| 2012  | 2146                   | 314                   | 259                | 2201                   | 29 083                  | 12         | 29 697             | 5 180                       | 14 157,2                | 3 449,8     | 949 398                         | 52 508      |
| 2013  | 2201                   | 461                   | 449                | 2213                   | 39 061                  | 13         | 37 672             | 6 569                       | 14 379,5                | 3 082,7     | 957 564                         | 45 675      |
| 2014  | 2213                   | 405                   | 505                | 2113                   | 37 159                  | 4          | 37 161             | 6 567                       | 14 838,3                | 2 950,7     | 980 615                         | 38 638      |
| 2015  | 2113                   | 271                   | 418                | 1974                   | 34 216                  | 32         | 35 834             | 4 949                       | 15 071,8                | 2 598,1     | 942 953                         | 34 104      |
| 2016  | 1974                   | 135                   | 304                | 1805                   | 30 954                  | -          | 32 785             | 3118                        | 14 952,8                | 2 301,9     | 951 786                         | 30 945      |
| ВСЕГО | 42 312                 | 4650                  | 5377               | 41 601                 | 794 162                 | 7236       | 797 423            | 157 942                     | 36 940,8                | 87 445,8    | 20 177 574                      | 1 305 781   |

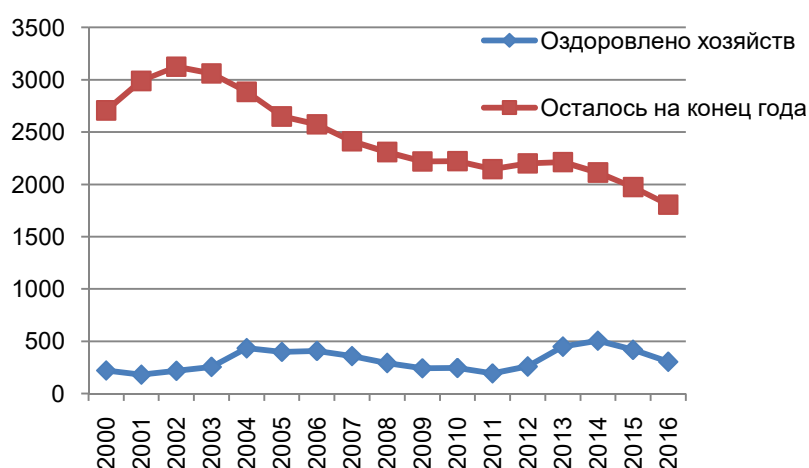


Рисунок 2 – Количество неблагополучных по лейкозу пунктов в 2000-2016 гг.

В СССР заметное распространение лейкозы получили в Прибалтийской зоне и на юго-востоке европейской части, преимущественно среди животных, происходящих от красного датского скота (бурого латвийского, красного латвийского, красного эстонского), а также среди черно-пестрого скота.

Таким образом, после первых сообщений об обнаружении ВЛКРС началось интенсивное изучение свойств самого вируса и особенностей вызываемого им инфекционного процесса.

Источником возбудителя болезни являются животные, зараженные ВЛКРС. В естественных условиях передача вируса осуществляется, в основном, с молоком кровососущими насекомыми и внутриутробно через плаценту. Как и в случае Т-клеточного лейкоза человека, низкая патогенность и низкие заражающие дозы вируса, не приводили к серьезным последствиям для популяции, соответственно, человека и крупного рогатого скота. Отсутствие смертельных последствий вследствие развития терминальной стадии, позволили дельтаретровирусам распространиться по всему миру. В случае лейкоза крупного рогатого скота для его распространения критическую роль сыграло развитие зооветеринарных технологий, которые на начальном этапе не предполагали дезинфекции инструментария и рук врачей. По-видимому, заражающие дозы провируса, оставшегося на инструментарии значительно превышают таковые при естественной передаче. Животные с изменениями крови, характерными для лейкоза. Последние представляют особую опасность в распространении инфекции. Появление и распространение лейкоза в ранее благополучных хозяйствах, связано с завозом животных из неблагополучных по этому заболеванию мест и зон. Совместное содержание больных или зараженных ВЛКРС животных со здоровыми, ведет к постоянному увеличению в стаде серопозитивных животных.

Это наглядно подтверждается результатами, полученными при исследовании животных, где не выполнялись требования по изоляции инфицированных животных. Так, за 5 лет наблюдений количество инфицированных животных достигло 37,7 % из 400 голов, содержащихся на ферме (таблица 2).

Таблица 2 – Динамика инфицирования животных лейкозом в хозяйстве

| Годы исследования | Количество исследованных животных | Количество инфицированных животных | Процент инфицированных животных |
|-------------------|-----------------------------------|------------------------------------|---------------------------------|
| 2010              | 814                               | 34                                 | 4,1                             |
| 2011              | 945                               | 49                                 | 5,2                             |
| 2012              | 829                               | 222                                | 26,7                            |
| 2013              | 783                               | 191                                | 24,4                            |
| 2014              | 609                               | 205                                | 37,7                            |

Здоровые животные заражаются от инфицированных ВЛКРС животных при контакте в скотных дворах, выгульных площадках, родильных отделениях, на пастбищах, а также при несоблюдении правил асептики при ветеринарных и зоотехнических операциях (взятие крови, введение лекарственных препаратов, вакцин, сывороток, удаление рогов, мечение, трансплантация эмбрионов, искусственное осеменение, родовспоможение, ректальное исследование), при скармливании необеззараженного сборного молока, при доении коров. Факторами передачи вируса могут стать любые биологические жидкости (кровь, молоко и проч.), содержащие инфицированные лимфоциты.

Введение Правил по профилактике и борьбе с лейкозом крупного рогатого скота в 1999 г. привело к интенсификации противоэпизоотических мероприятий и диагностических исследований, при этом динамика изменений различных эпизоотологических показателей примерно одинакова: если в начале периода наблюдений, совпадающем с началом действия «Правил», показатели несколько ниже, через 1-2 года они достигают максимума (интенсификация диагностики), а затем неуклонно снижаются. В качестве примера на рис. 2 приведён график изменения количества зарегистрированных неблагополучных по лейкозу пунктов и количества оздоровленных пунктов. Из таблицы №1 и рис. 1 видно, что в РФ за период с 2000 г. оздоровлено 5073 неблагополучных пунктов и выявлено новых 4515. За 2016 г. выявлено 135 новых неблагополучных пунктов, оздоровлено 304, осталось на конец года 1805. Кроме того, заметна тенденция к снижению падежа крупного рогатого скота



от лейкоза. Если в 2000 г. от лейкоза пало 883 головы, 2001 г.- 4170, то в 2016 г. падеж от лейкоза не зафиксирован. Инфицированность скота за период наблюдений снизилась с 1257480 в 2000 г. и 1613530 в 2002 г. до 951787 гол в 2016 г. Количество гематологически положительных снизилось с 98638 в 2000 г. и 122055 в 2003 г. до 30945 в 2016 г.

В 2016 г. не удалось проанализировать ситуацию, т.к. не были представлены данные, в республиках Кабардино-Балкарской, Чеченской, Карачаево-Черкесской, Северная Осетии.

Свободны от лейкоза 15 субъектов: Архангельская, Мурманская, Сахалинская, Ленинградская, Вологодская, Волгоградская области, Республики Коми, Алтай, Саха (Якутия), Башкортостан, Мордовия, Автономные Округа Ненецкий, Ямало-Ненецкий, Чукотский, Камчатский край

Инфицированность до 1%: Костромская обл., Орловская область, Ярославская область, Республика Карелия, Республика Ингушетия, Новгородская область, Пермский край, Кировская область, Саратовская область. Республика Тыва, Республика Хакасия, Республика Калмыкия, Свердловская обл., Республика Бурятия, Ханты-Мансийский Автономный округ – Югра - всего 15 субъектов, 93 неблагополучных пункта;

Инфицированность от 1 до 3%: Тульская обл., Псковская обл., Республика Крым, Иркутская область, Томская область, Красноярский край, Чувашская Республика, - всего 7 субъектов, 126 неблагополучных пункта;

инфицированность от 3 до 10%: Брянская, Белгородская, Ивановская, Калужская, Курская, Смоленская., Владимирская, Воронежская, Московская области, Краснодарский край, Астраханская, Ростовская, Тюменская, Самарская, Кемеровская, Амурская, Магаданская области, Алтайский край, Забайкальский край, Ульяновская область, Хабаровский край, г. Севастополь, г. Москва - всего 22 субъекта и 2 города, 767 неблагополучных пунктов;

Инфицированность от 10 до 30%: Тверская, Тамбовская, Калининградская, Курганская, Челябинская, Нижегородская области, Республика Татарстан, Республика Дагестан, Республика. Марий Эл, Оренбургская, Пензенская, Новосибирская, Омская, Еврейская Автономная области., Приморский край, - всего 15 субъектов, 794 неблагополучных пункта.

В целом по России поголовье крупного рогатого скота по сравнению с 2015 г. уменьшилось на 1,6%, в т.ч. коров – на 1,9% Снижение поголовья допущено во всех Федеральных Округах, особенно в Уральском и Сибирском ФО.

Намеченные сроки оздоровления поголовья крупного рогатого скота от лейкоза к 2021 году (т.е. за 3 года) означают, что интенсивность проведения противоэпизоотических мероприятий должна быть максимально высокой. Известно, что в бывшей ГДР, где мероприятия базировались на тех же принципах, что и в СССР (а теперь и в Российской Федерации), учитывался психологический фактор. Так, если за первые 1-3 года проведения оздоровительных мероприятий руководство хозяйства и зооветеринарные работники не видели реальных результатов, они теряли интерес к проводимой работе, и она начинала пробуксовывать. Однако интенсификация мероприятий означает необходимость включения административного ресурса, инфраструктуры АПК и капиталовложений, т.е. всего того, что было использовано в ряде уже оздоровленных от лейкоза областей.

## **ФИНАНСИРОВАНИЕ**

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## БИБЛИОГРАФИЯ

1. World Organization of Animal Health (OIE)/ Enzootic bovine leucosis / Manual of standards for diagnostic tests and vaccines.2008;2:729-738
2. Правила по профилактике и борьбе с лейкозом крупного рогатого скота / Утв. Минсельхозпродом России 11.05.1999 г., зарег. в Минюсте РФ, рег. №1799.
3. Методические указания по диагностике лейкоза крупного рогатого скота / Утв. Деп. вет. МСХ России, 23.08.2000 г.
4. Гулюкин М.И. Разработка эффективных методов диагностики и средств специфической профилактики против наиболее распространенных заболеваний сельскохозяйственных животных, рыб, пчел / Труды ВИЭВ, том 78, 2015 г., С. 10-37.
5. Гулюкин М.И. и соавт. Мониторинг эпизоотической ситуации по лейкозу крупного рогатого скота в товарных и племенных хозяйствах Российской Федерации за 2014 и 2015 годы / «Ветеринария и кормление», №4, 2016 г, С. 3-41
6. Гулюкин М.И. История и этапы становления лаборатории лейкозов животных и птиц / Мат-лы Межд. научно-практич. конф. «Актуальные проблемы инф. болезней молодняка и других возрастных групп с/х жив., рыб и пчел», М., 26-27 апреля, 2011 г., С. 13-23
7. Гулюкин М.И. Лейкоз крупного рогатого скота. Основные причины и пути решения проблемы / мат-лы VI Междунар. ветеринар. конгресса. - Сочи, 2016, С. 80-85
8. Гулюкин М.И. и соавт. Практическое пособие по мониторингу бруцеллеза, туберкулеза, паратуберкулеза и лейкоза крупного рогатого скота: организационно - хозяйственные, ветеринарно-санитарные и зооигиенические аспекты профилактики и ликвидации этих инфекций / М., 2014 г., 74 с.
9. Гулюкин, М.И. Ситуация уже кризисная / М.И. Гулюкин, В.А. Ведерников // Ветеринарная жизнь. - 2008. - №12. - С.6-8.
10. Гулюкин, А.М. Эпизоотологические геоинформационные системы. Возможности и перспективы // Ветеринария. - 2016. - №7. - С.21-24.
11. Гулюкин, А.М. Значимость современных методов лабораторной диагностики и идентификации возбудителя бешенства для иммунологического мониторинга данного зооноза // Вопросы вирусологии. - 2014. - Т. 59. - №3. - С. 5-10.
12. Гулюкин, М.И. Анализ эпизоотической ситуации по лейкозу крупного рогатого скота в Российской Федерации за 2014 год // Реализация достижений ветеринарной науки для обеспечения ветеринарно-санитарного и эпизоотического благополучия животноводства Брянской области в современных условиях: материалы науч.-произв. конф. Брянск, 2015. С. 78-89.
13. Л.А. Зиневич. Гематологическая диагностика гемобластозов крупного рогатого скота / Дисс. Работа на соиск. уч. ст. к.вет.н. / М., 1978
14. Козырева Н.Г. Филогенетический анализ участка провирусного гена POL изолятов вируса лейкоза крупного рогатого скота, обнаруженных у животных из различных регионов Российской Федерации / Н.Г. Козырева, М.И. Гулюкин, Л.А. Иванова и др. // Доклады РАСХН. - 2011. - №6. - с. 48-51.
15. Хисматуллина Н.А. Информационно-образовательная работа по профилактике бешенства // В сборнике: «Актуальные вопросы инфектологии». 2010. С. 72-73.
16. Хисматуллина Н.А. Ускоренный метод диагностики бешенства в культуре клеток невриномы Гассерова узла крысы // Гены и клетки. 2014. Т. 9. №3. С. 276-280.
17. Belimenko V.V., Gulyukin A.M. Prospects for the use of Geographic Information Systems for risk-based monitoring of natural focal diseases of animals and humans // Russian Journal of Agricultural and Socio-Economic Sciences. 2016. Т. 56. №8. С. 22-25.
18. Svtina M.A. Epizootiological characteristics of animal rabies in the West Kazakhstan region // Biology and Medicine. 2015. Т. 7. №5. С. BM-152-15.
19. Vedernikov V.A. Summary of Rabies in the Russian Federation -Particularities of the Present Situation. Rabies Bulletin Europe -V. 23 -N. 4 -1999: 13-15.
20. Vedernikov V.A. Rabies in individual countries (Russia, European part only) // Rabies bulletin Europe. 1998. Т. 22. №4. С. 9-10.

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**КЛИНИКО-МОРФОЛОГИЧЕСКОЕ ПРОЯВЛЕНИЕ РИЕМЕРЕЛЛЁЗА  
ВОДОПЛАВАЮЩЕЙ ПТИЦЫ И БИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ  
ВОЗБУДИТЕЛЯ ЗАБОЛЕВАНИЯ**  
CLINICO-MORPHOLOGICAL MANIFESTATION OF WATERFOWLS' RIEMERELLOSIS  
AND BIOLOGICAL FEATURES OF DISEASE CAUSATIVE AGENT

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#### **АННОТАЦИЯ**

В работе представлено описание первых официально зафиксированных случаев риимереллёза на территории Российской Федерации, а также особенности его клинико-морфологического проявления среди поголовья уток и гусей. Нами установлено, что основными клиническими признаками свойственными инфекции стали обильные носовые и глазные истечения, диарея, атаксия, потеря координации движения, западание глаз, опухание суставов, утолщение и уплотнение кожных покровов на спине или на брюшной стенке.

#### **ABSTRACT**

The paper describes the first officially recorded cases of riemerellosis in the territory of the Russian Federation, as well as features of its clinical and morphological manifestation among ducks and geese. We found that the main clinical signs associated with infection were abundant nasal and ocular discharge, diarrhea, ataxia, loss of coordination of motion, eye sagging, swelling of the joints, thickening and thickening of the skin on the back or abdominal wall.

#### **КЛЮЧЕВЫЕ СЛОВА**

Болезни водоплавающей птицы, внезапная гибель молодняка, инфекционный серозит уток, эпизоотическое благополучие.

#### **KEY WORDS**

Diseases of waterfowls, sudden death of young animals, infectious serositis of ducks, epizootic well-being.

Достижение продовольственной безопасности и обеспечение эпизоотического благополучия Российской Федерации должно являться приоритетной задачей для ветеринарных специалистов страны. При этом стоит обращать внимание на важность одновременного поддержания всех отраслей и направлений животноводческой деятельности, так как в случае возникновения эпизоотии, свойственной для воспроизводимого вида животных, имеется риск частичной или полной потери

объемов производства, например при африканской чуме в свиноводстве, ящуре в скотоводстве, птичьим гриппом в птицеводстве и т.д. Для избежания данной ситуации в масштабах страны необходимым является внедрение и развитие новых направлений, в особенности птицеводства, так как именно данная отрасль позволяет это сделать. Так, в настоящее время в России активно развивается производство мяса индеек, перепелов, гусей, уток, фазанов, цесарок в промышленных масштабах [17, 18, 20]. Негативной стороной всенаправленного развития птицеводства является увеличение рисков возникновения новых инфекционных заболеваний, ранее не свойственных для Российской Федерации, что подрывает возможность обеспечения эпизоотического благополучия. В качестве примера стоит рассмотреть аризонский индеек [6, 9, 11, 13, 16, 19], оспу перепелов или риимереллез гусей, уток и индеек. Для минимизации рисков возникновения и распространения новых эпизоотий актуальной становится задача по получению структурированных отечественных научных данных о возможных инфекционных патологиях отдельных видов промышленной птицы.

Настоящая работа акцентирует внимание на риимереллезе водоплавающей птицы, ввиду практического подтверждения циркулирования данной инфекции на территории РФ, а также отсутствия достаточных научных данных об этом заболевании и его возбудителе.

Цель исследования заключалась в изучении особенностей клинико-морфологического проявления риимереллеза водоплавающей птицы, зафиксированного на территории Российской Федерации, описание особенностей проведения лабораторной диагностики данного заболевания, а также изучение физико-биологических свойств изолятов возбудителя заболевания.

## МАТЕРИАЛ И МЕТОДЫ ИССЛЕДОВАНИЙ

Исследование проводилось на базе ФГБНУ «Всероссийский научно-исследовательский институт экспериментальной ветеринарии имени Я.П. Коваленко». Проведение клинического осмотра птицы, отбор клинического и секционного материала было реализовано на территории утиных и гусиных ферм республик Татарстан и Башкортостан в 2016-2017 году.

В работе использовали эпизоотологические, клинические, патолого-анатомические, бактериологические и молекулярно-биологические методы исследования. При проведении комплексной бактериологической диагностики инфекционных болезней были использованы следующие питательные среды: агар Эндо, агар Мак-Конки, агар Сабуро, агар Мюллер-Хилтона, бульон Сабуро, агар Шедлера, забуферная пептонная вода, бульон Раппапорта–Василиадиса, МПА, МПБ, MRS-агар, колумбия агар – основа для кровяного агара, цитратный агар, среда Кит-Тароцци, висмут-сульфитный агар, SS-агар, XLD-агар, хромогенный агар см 1007, KF Streptococcal Agar, основа бульона с бромкрезоловым пурпурным M284.

Для идентификации культур использовали тест-системы Microbact Staphylococcus12S, HiStaph набор для биохимической идентификации стафилококков, HiIMViC набор для биохимической идентификации энтеробактерий, Microbact12E/A и 24E, STREPTOtest 16, а также углеводы: адонитол, арабинозу, галактозу, D-глюкозу, дульцитол, инозитол, инулин, ксилозу, лактозу, мальтозу, маннитол, маннозу, мелибиозу, раффинозу, рамнозу, салицин, сорбитол, сахарозу, трегалозу, фруктозу, целлобиозу фирмы Himedia, с использованием бромкрезолового пурпурного бульона в качестве индикаторной среды.

Для контроля питательных сред и диагностикумов использовали эталонные культуры микроорганизмов, находящихся в распоряжении лаборатории микробиологии с музеем типовых культур ФГБНУ ВИЭВ имени Я.П. Коваленко.

Дополнительно подтверждение видовой принадлежности культур *Riemerella spp.* проводили благодаря масс-спектрометрическому анализу MALDI-ToF на приборной базе ООО "Лаборатория Гемотест".

## РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ

В течение 2016-2017 годов в лабораторию микробиологии с музеем типовых культур ФГБНУ ВИЭВ имени Я.П. Коваленко со стороны птицеводческих предприятий были неоднократные обращения по поводу внезапной массовой гибели птенцов уток и гусей. На выездных мероприятиях, направленных на изучение патологии, были зафиксированы клинико-морфологические признаки, одновременно свойственные для нескольких инфекционных заболеваний. Так, нами было определено, что заболеванию наиболее подвержен молодняк уток и гусей в возрасте от 14 до 40 дней. Смертность молодняка этой возрастной группы достигала 30-60 % в зависимости от своевременного назначения антибактериальной терапии. Массовая гибель птицы в возрасте более 40 дней не фиксировалась ни на одном из предприятий. Основными клиническими признаками заболевания молодняка птицы являлись обильные носовые и глазные истечения, диарея, атаксия, потеря координации движения, западание глаз, опухание суставов, утолщение и уплотнение кожных покровов на спине или на брюшной стенке. При этом инфекция наблюдалась у птиц независимо от степени их упитанности.

При проведении патологоанатомического исследования вынужденно убитой птицы, принадлежащей различным птицеводческим предприятиям, преобладающими признаками со стороны кожных покровов и подкожной клетчатки стало их уплотнение со стороны брюшной стенки и/или со стороны спины, наиболее чётко проявляющееся к 25-40 дневному возрасту [фото 1]. При этом в области поражения наблюдалась ускоренное отслоение частиц кожи, проявляемое в виде большого количества перхоти. В большинстве случаев отмечался отёк подкожной клетчатки с отложением студенистого инфильтрата в области грудной стенки [фото 2]. В отдельных случаях у птицы в возрасте 40-ти дней и более отмечалось скопление гнойного экссудата в подкожной клетчатке в области и брюшной стенки.



Фото 1 – Уплотнение кожных покровов со стороны спины у 25 дневного гусёнка с развитием гиперкератоза, алопеции и дерматита



Фото 2 – Отёк подкожной клетчатки с наличием студенистого инфильтрата грудной стенки

Общий вид внутренних органов больного гусёнка приведён на фото 3. Наиболее часто фиксируемыми изменениями в органах брюшной полости зафиксированы признаки застойной гиперемии печени с явлениями белково-зернистой дистрофии или жировой дистрофии [фото 5]. При этом увеличение печени с жировой дистрофией

было зафиксировано у птиц всех возрастных категорий и, ввиду интенсивности производственного цикла, это явление ассоциировалось с типом кормления птицы. Но в случаях белково-зернистой дистрофии речь вели исключительно об инфекционной или токсической этиологии заболевания, при этом данные патологоанатомические изменения фиксировались преимущественно у птицы в возрасте до 3-ёх месяцев. Белковая дистрофия также наблюдалась в почках.

Во всех случаях отмечали гиперемию и отек селезёнки.

Исследование органов пищеварительной системы показало превалирование среди всех признаков катарального воспаления желудка, кишечника с инъекцией сосудов и иногда кровоизлияниями [фото 4].



Фото 3 – Общий вид патологоанатомических изменений органов и тканей у вынужденно убитого гусёнка



Фото 4 – Острый катарально-геморрагический энтерит

При вскрытии грудной полости чаще всего фиксировали фибриновый перикардит и эпикардит, дряблость сердечной мышцы с явлениями дистрофии, с отложением фибрина [фото 6].

Со стороны органов респираторного аппарата выявили наиболее типичные признаки острого интерстициального отёка лёгких, серозную пневмонию и серозно-фибринозный плеврит.

Приведённые клинические признаки и патологоанатомические изменения имели схожие черты с эшерихиозом, сальмонеллёзом, пастереллёзом и хламидиозом, поэтому данные инфекционные патологии должны быть исключены при диагностике лабораторными методами. Хламидиоз и вирусные заболевания, свойственные для данных видов птицы, исключали при проведении молекулярно-биологических исследований в ПЦР. Кроме того во всех обследуемых хозяйствах был исключён пастереллёз и сальмонеллёз микробиологическими исследованиями, но в большинстве случаев были выделены культуры *Escherichia coli*. В обследованных хозяйствах региональными лабораториями был поставлен диагноз эшерихиоз. Назначенный для борьбы с заболеванием антибиотик (колистин) не демонстрировал положительного терапевтического эффекта, поэтому для снижения смертности среди молодняка ветеринарными специалистами предприятий опытным путем были подобраны более эффективные антибактериальные средства. Применяли флорфеникол, доксициклин и энрофлоксацин. Но, не зависимо от длительности курса обработок, эффект наблюдался лишь при использовании антибиотиков, а при их отмене клинические признаки заболевания возобновлялись, что подтверждало

бактериальную природу и недостаточно установленный диагноз. Таким образом, основная задача заключалась в выявлении возбудителя болезни.

С целью постановки окончательного диагноза нами были осуществлены лабораторно-диагностические исследования клинического и секционного материала. При этом особое внимание было уделено установленной на практике возможности передачи возбудителя с обработанным перекисью водорода инкубационным яйцом. Для микробиологического исследования отбирали живых утят и гусят с признаками болезни в возрасте от 14 до 40 дней, а также инкубационное яйцо. От вынужденно убитых птиц после патологоанатомического исследования отбирали кусочки печени, сердца, лёгочных тканей, селезенка, кишечник и кровь из сердца.



Фото 5 – Белковая (зернистая) дистрофия и застойная гиперемия печени.

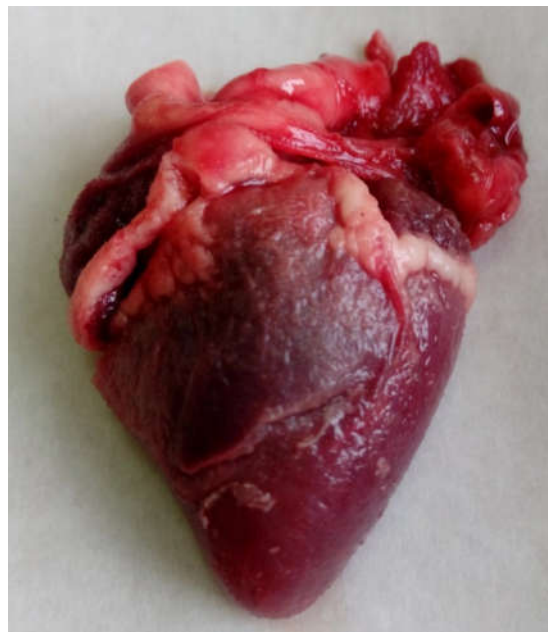


Фото 6 – Фибринозный эпи-перикардит у 25 дневного гусёнка

Для получения наиболее полных и достоверных результатов, бактериологические посевы проводили несколькими методами.

Во-первых, использовали посев-отпечаток на кровяной агар сердечной мышцы, легких, печени, селезенки.

Во-вторых, проводили бульонное накопление на сердечно-мозговом бульоне с последующим рассевом на дифференциально-диагностические питательные среды. Для выявления анаэробной микрофлоры кусочки печени и кишечника засевали в бульон Китт-Тароцци. Культивирование чашек с кровяным агаром проводили при 37 °С в условиях доступа кислорода и 5%-ной CO<sub>2</sub> атмосферы в течение 48 часов, с учётом результатов на первые и вторые сутки.

В результате проведённого комплексного микробиологического исследования тканей и органов уток и гусей в возрасте от 14 до 40 дней из обоих хозяйств был выделен широкий спектр видов микроорганизмов, а именно: *Escherichia coli*, *Staphylococcus gallinarum*, *Staphylococcus aureus*, *Pseudomonas oryzae*, *Klebsiella mobilis*, *Bacillus cereus*, *Proteus mirabilis*, *Micrococcus luteus*, *Riemerella anatipestifer*, *Bacillus subtilis*, *Morganella morganii*, *Aerococcus viridans*, *Acinetobacter Iwoffii*, *Providencia alcalifaciens*, *Enterococcus faecalis* (все выделенные изоляты микроорганизмов были сохранены в коллекции ФГБНУ ВИЭВ им. Я.Р. Коваленко с целью их последующего изучения). Таким образом, отмеченные клинико-морфологические проявления заболевания оказались наиболее свойственными для риемеереллёза, возбудитель которого был выделен при диагностике.

*Riemerella anatipestifer*, в соответствии с современной классификацией относится к семейству *Flavobacteriaceae*. В ранней научной литературе данный вид имел синонимичные названия *Pfeifferella anatipestifer*, *Moraxella anatipestifer*, *Pasteurella anatipestifer* [1, 3, 4, 7, 10].

*Riemerella anatipestifer* представляет собой неподвижные грамотрицательные коккопалочки, не образующие капсулу и споры, расположенные в мазках одиночно, парно или в виде небольших цепочек [фото 7].

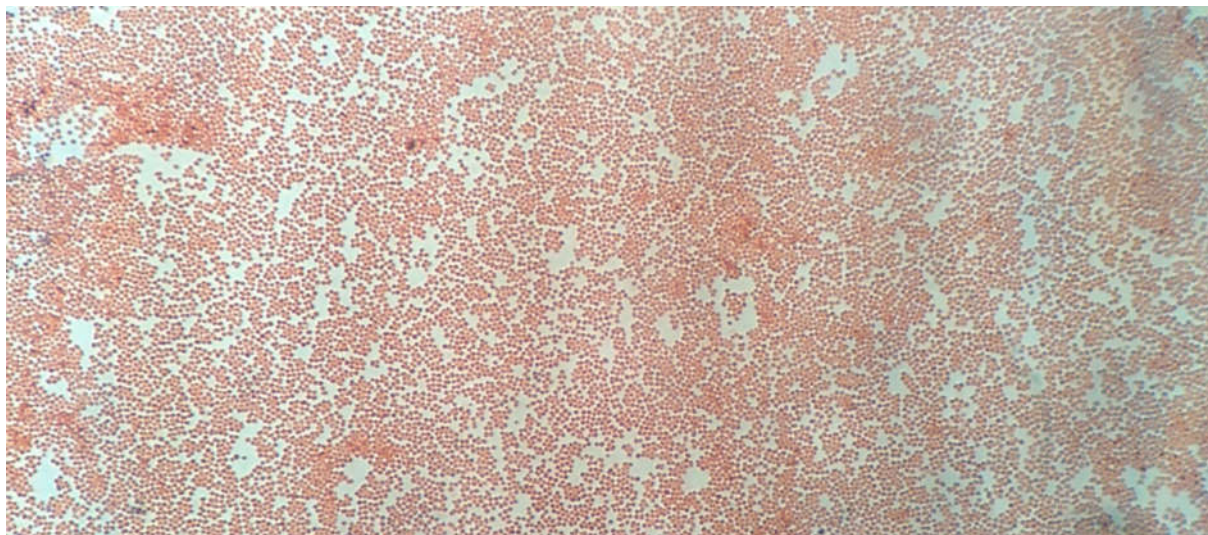


Фото 7 – Клетки *Riemerella anatipestifer* при окрашивании методом Грама (x100)

Как видно из фото 8, клетки *Riemerella anatipestifer* имеют схожие морфологические и тинкториальные свойства с бактериями рода *Pasteurella* и *Moraxella*, что и объясняет раннюю классификацию микроорганизма как *Pasteurella anatipestifer* и *Moraxella anatipestifer*.

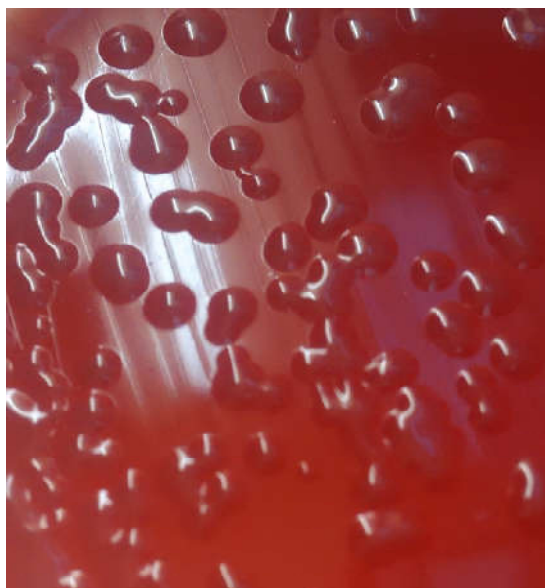


Фото 8 – Рост отдельных колоний *Riemerella anatipestifer* на кровяной среде



Фото 9 – Сплошной рост *Riemerella anatipestifer* на кровяной среде

На плотных питательных средах при культивировании в 5%-ной  $CO_2$  атмосфере в течение 48 и более часов и температуре  $37^\circ C$ , наблюдается рост гладких, непигментированных колоний, мукоидной консистенции. При культивировании на



средах, содержащих дефибрированную кровь барана, гемолиз может являться переменным свойством для описываемого вида бактерий. При этом в ходе выполнения работы было установлено, что рост *Riemerella anatipestifer* на агаризированных средах может проявляться в виде крупных отдельных колоний средним размером 2-5 мм на 2-ой день культивирования или в виде сплошного роста [фото 8, 9].

Выделенные изоляты *Riemerella anatipestifer* на кровяном агаре не имели гемолиза и не образовывали пигмент, культуры были оксидазо-, каталазо-, альфа-глюкоронидазо- и аргининдекарбоксилазо- положительными, бета-галактозидазо-, орнитин- и лизиндекарбоксилазо- отрицательными, образовывали индол и сероводород, разжижали желатин, не ферментировали арабинозу, глюкозу, маннозу, маннитол, мальтозу, сорбитол, сахарозу, трегалозу и ксилозу. Изоляты обильно росли в условиях CO<sub>2</sub> атмосферы в течение 48 часов и плохо росли в условиях без CO<sub>2</sub>. В бульоне культура накапливалась плохо.

### ЗАКЛЮЧЕНИЕ

В ходе выполнения исследования нами были установлены и изучены случаи риимереллёза среди поголовья уток и гусей на территории Российской Федерации. При этом то, что некоторыми авторами отмечают возможности инфицирования фазанов [2], кур [12], цесарок, перепелов [14] и куропаток [15], включает данные виды птиц в группу риска по рассматриваемой патологии. Помимо перечисленных видов птицы, возбудитель встречается у свободно живущих птиц, в частности, лебедей, крякв, чаек [5, 8], на основании чего они могут рассматриваться как источники распространения заболевания. Приведенные данные позволяют предположить наличие широкого циркулирования возбудителя на территории РФ.

Сложность борьбы с данной инфекционной патологией заключается в отсутствии современных отечественных данных по её распространённости, отсутствием регламентирующих документов по проведению лабораторно-диагностических исследований с целью подтверждения диагноза, а также отсутствием средств специфической профилактики. Для минимизации экономических затрат производителей и сохранения эпизоотического благополучия страны сотрудниками ФГБНУ ВИЭВ им. Я.Р. Коваленко в настоящее время ведутся активные работы связанные с разработкой методических указаний по диагностике риимереллёза птицы, а также по изучению серотиповой распространённости *Riemerella anatipestifer* на территории различных регионов Российской Федерации с целью дальнейшей разработки первой отечественной вакцины против риимереллёза.

### БИБЛИОГРАФИЯ

1. Bruner DW and Fabricant J. A strain of *Moraxella anatipestifer* (*Pfeifferella anatipestifer*) isolated from ducks. *The Cornell Veterinarian* (1954) 44, 461-464
2. Bruner DW, Angstrom CI and Price JI (1970) *Pasteurella anatipestifer* infection in pheasants. A case report. *The Cornell Veterinarian* 60, 491-494.
3. Hendrickson JM and Hilbert KF (1932) A new and serious septicaemic disease of young ducks with a description of the causative organism, *Pfeifferella anatipestifer*, N.S., *The Cornell Veterinarian* 22, 239-252.
4. Higgins D.A., Henry R.R., Kounev Z.V. Duck immune responses to *Riemerella anatipestifer* vaccines // *Developmental & Comparative Immunology*. 2000. T. 24. №2-3. С. 153-167.
5. Hinz K-H, Ryll M, Köhler B and Glünder G (1998) Phenotypic characteristics of *Riemerella anatipestifer* and similar micro-organisms from various hosts. *Avian Pathology* 27, 33-42.

6. Huang B., Kwang J., Loh H., Frey J., Tan H.M., Chua K.L. Development of an ELISA using a recombinant 41 kDa partial protein (p45n') for the detection of *Riemerella anatipestifer* infections in ducks // *Veterinary Microbiology*. 2002. T. 88. №4. С. 339-349.
7. Huang B., Subramaniam S., Frey J., Loh H., Tan H.-M., Fernandez C.J., Kwang J., Chua K.-L. Vaccination of ducks with recombinant outer membrane protein (OmpA) and a 41 kDa partial protein (P45N') of *Riemerella anatipestifer*//*Veter. Microbiol.*-2002.-Vol.84, iss.3.-P. 219-230.
8. Karstad L, Lulis P and Long JR (1970) *Pasteurella anatipestifer* as a cause of mortality in captive wild waterfowl. *Journal of Wildlife Diseases* 6, 408-413.
9. Lenev S., Laishevtsev A., Pimenov N., Semykin V., Pigorev I., Eremenko V., Sein O., Glinushkin A., Ali Shariati M. Improvement of allocation and identification of salmonella Entericabacteria of Arizonae subspecies // *International Journal of Pharmaceutical Research and Allied Sciences*. 2016. №5 (3). С. 342-348.
10. Pathanasophon P., Phuektes P., Tanticharoenyos T., Narongsak W., Sawada T. A potential new serotype of *Riemerella anatipestifer* isolated from ducks in Thailand//*Avian Pathol.*-2002.-Vol.31,N 3.-P. 267-270
11. Pimenov N.V., Laishevtcev A.I., Pimenova V.V. The identification of salmonella infection in hatching eggs and products of turkey-keeping // *Russian Journal of Agricultural and Socio-Economic Sciences*. 2015. T. 46. №10. С. 9-17.
12. Rosenfeld LE (1973) *Pasteurella anatipestifer* infection in fowls in Australia. *Australian Veterinary Journal* 49, 55-56.
13. Rubbenstroth D., Ryll M., Behr K.-P., Rautenschlein S. Pathogenesis of *Riemerella anatipestifer* in turkeys after experimental mono-infection via respiratory routes or dual infection together with the avian metapneumovirus//*Avian Pathology*. -2009. -Vol.38, N 6. -P. 497-507.
14. Sandhu TS (2008) *Riemerella anatipestifer* infection. In *Diseases of Poultry* 12th Edition, 2008, Ed Saif YM, Blackwell Publishing, 758-764.
15. Wyffels R and Hommez J (1990) *Pasteurella anatipestifer* geïsoleerd uit ademhalingsletsels bij grijze patrijzen (*Perdix perdix*). *Vlaams Diergeneeskundig Tijdschrift* 59, 105-106.
16. Пименов Н.В., Лаишевцев А.И. Совершенствование ветеринарно-санитарной экспертизы продукции индейководства, основанное на биохимических особенностях *Salmonella arizonae* // В сборнике: Сборник научных трудов международной учебно-методической и научно-практической конференции, посвященной 95-летию кафедры паразитологии и ветеринарно-санитарной экспертизы 2015. С. 244-248.
17. Пименова В.В., Петрова Ю.В., Пименов Н.В. Ветеринарно-санитарная характеристика мяса перепелов при применении бактериофагового препарата Фаговет. / Проблемы ветеринарной санитарии, гигиены и экологии. – 2017, №3 (23). – С. 24-26.
18. Татаренко Я.С., Пименов Н.В. Аспекты ветеринарно-санитарного благополучия в промышленном перепеловодстве. / Проблемы ветеринарной санитарии, гигиены и экологии. – 2017, №3 (23). – С. 60-62.
19. Пименов Н.В., Лаишевцев А.И., Пименова В.В. Особенности аризоноза индеек. Идентификация сальмонелла-инфекции в инкубационном яйце и продуктах индейководства. / *Russian Journal of Agricultural and Socio-Economic Sciences*. – 2015, №10(46). – Р. 9-17.
20. Пименов Н.В., Лаишевцев А.И. Современные аспекты борьбы с сальмонеллезной инфекцией в птицеводстве: Монография. – М.: Издательство «Старая Басманная», 2017. – 172 с.

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**ПОДХОДЫ К РАЗРАБОТКЕ И УСОВЕРШЕНСТВОВАНИЮ МЕТОДОВ  
МОЛЕКУЛЯРНО-ГЕНЕТИЧЕСКОЙ ДИАГНОСТИКИ ЭНЗОТИЧЕСКОЙ ПНЕВМОНИИ  
СВИНЕЙ**

APPROACHES TO THE DEVELOPMENT AND IMPROVEMENT OF METHODS  
FOR MOLECULAR GENETIC DIAGNOSIS OF PIGS ENZOOTIC PNEUMONIA

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**АННОТАЦИЯ**

В статье представлены подходы к разработке и усовершенствованию методов молекулярно-генетической диагностики энзоотической пневмонии свиней. Проведен филогенетический анализ генотипов *M.hyopneumoniae* с использованием фрагмента генома, кодирующего 16S рибосомную РНК. Результаты анализа показали, что *M.hyopneumoniae*, циркулирующая в Томской области, генетически близка к патогенам, циркулирующим в Канаде и США. *M.hyopneumoniae*, циркулирующая в Белгородской области, генетически близка к патогенам, циркулирующим в США и Бразилии.

**ABSTRACT**

Improved approaches towards diagnostics of swine enzootic pneumonia are addressed in this study. A phylogenetic analysis of different genotypes of *M.hyopneumoniae* was carried out based on genome fragment coding for 16S RNA. The results demonstrated that *M.hyopneumoniae* isolated in Tomsk Region of Russia was genetically close to the strains circulating in Canada and USA. At the same time, *M.hyopneumoniae* isolated in Belgorod Region of Russia was genetically close to the strains circulating in USA and Brasil.

**КЛЮЧЕВЫЕ СЛОВА**

Энзоотическая пневмония свиней, *Mycoplasma hyopneumoniae*, полимеразная цепная реакция.

**KEY WORDS**

swine enzootic pneumonia, *Mycoplasma hyopneumoniae*, Polymerase chain reaction

Энзоотическая (микоплазменная) пневмония свиней (лат. - *Pneumonia enzootica suum*, EPS; грипп поросят, энзоотическая бронхопневмония, вирусная пневмония, микоплазменная пневмония, респираторный микоплазмоз свиней) - инфекционная хроническая энзоотическая болезнь свиней всех возрастов, проявляющаяся ремиттирующей лихорадкой, катаральной бронхопневмонией, сухим кашлем. Болезнь вызывает значительные экономические потери вследствие замедления роста и развития поросят из-за плохой усвояемости корма (зараженные животные расходуют на единицу прироста живой массы на 18-20% кормов больше, чем здоровые). Показатели смертности составляют от 2 до 15%, заболеваемость 38-100% [10].

Этиологическим агентом энзоотической пневмонии свиней является *Mycoplasma hyopneumoniae* (*M. hyo*). По морфологическим и ферментативным свойствам возбудитель имеет сходство с некоторыми другими видами микоплазм (микоплазмы являются самыми мелкими клетками, способными размножаться в бесклеточной

питательной среде, и обладают крайне короткими геномами, ограничивающими биосинтетические возможности), однако отличается от них высокой требовательностью к питательным средам и медленной репликацией (до 30 дней). Возбудитель распространен повсеместно, особенно в регионах интенсивного свиноводства, и играет важную роль в развитии респираторного симптомокомплекса свиней (РСКС) — многокомпонентного заболевания, одной из актуальных проблем современного свиноводства. Кроме того, возбудитель открывает «ворота инфекции» для условно-патогенной микрофлоры, а также увеличивает тяжесть и продолжительность респираторных заболеваний вирусной и бактериальной этиологии (прежде всего таких, как цирковирусные болезни и репродуктивно-респираторный синдром свиней, а также стрептококкоз, гемофилез и пастереллез) [1, 2, 6, 10].

Патогенез *M. hyo* представляет собой сложный процесс: в течение длительного времени в эпителиальном слое дыхательных путей образуются колонии, возникает продолжительная воспалительная реакция, иммуносупрессия, а также играет роль взаимодействие с другими инфекционными агентами вирусного и бактериального происхождения.

Источником инфекции являются больные и переболевшие животные, в организме которых *M. hyo* может сохраняться до 15 месяцев. Возбудитель выделяется с частицами слизи при кашле и чихании, а также с молоком и влагалищным секретом, заражение происходит преимущественно воздушно-капельным путем и при прямом контакте. Содержание зараженных и незараженных животных в одном стаде приводит к раннему и часто повторному заражению. К болезни восприимчивы свиньи всех возрастов, но особенно чувствителен молодняк. Инфицирование поросят происходит свиноматками-носителями во время опороса и при прямом контакте, при этом клинические признаки у поросят-сосунов могут отсутствовать, проявляясь только к 2-3-м месяцам. В этом возрасте происходит отъем поросят и объединение их для доращивания, что в свою очередь может вызывать энзоотические вспышки заболевания. Зараженность стада может сохраняться годами, вызывая значительный экономический ущерб.

Проникнув в легкие аэрогенным путем, микоплазмы в течение первых 2 недель после заражения активно размножаются на слизистой оболочке трахеи, бронхов и бронхиол, вызывая образование очажков серозно-катаральной бронхопневмонии. Затем они постепенно проникают в более глубокие части дыхательных путей и в альвеолы, вызывая воспалительные процессы, препятствующие нормальному дыханию. Вследствие этого, а также угнетения возбудителем иммунной системы, представители условно-патогенной микрофлоры (*P. multocida*, *S. suis*, *H. parasuis*, *A. Pleuropneumoniae* и другие) начинают неконтролируемо размножаться в альвеолах, становясь вторичными патогенами. Такая бронхопневмония, представляющая собой коинфицирование *Mycoplasma hyopneumoniae* и вторичными патогенами, называется энзоотической пневмонией. Патологоанатомически заболевание характеризуется серозно-катаральным воспалением легких с локализацией патологического очага в основном верхушечных и сердечных долях, воспалением плевры и перикарда, увеличением бронхиальных лимфоузлов. Трупы истощены и анемичны.

Штаммы *M. hyo* различаются по генетическим и антигенным свойствам. Геном *M. hyo* впервые был секвенирован в 2004 году для штамма 232 и затем в 2005 году для штаммов J и 7448 [11]. Роль генетического и антигенного разнообразия от штамма к штамму до конца не выяснена ни для вирулентности, ни для возможности перекрестных реакций между изолятами [15]. Заражение одним из низковирулентных изолятов *M. hyo* не обеспечивало защиту при последующем заражении высоковирулентным изолятом [12].

Диагностику заболевания проводят с учетом эпизоотологических, клинических, патологоанатомических данных [6,11,17]. В лаборатории направляют фрагменты пораженных легких, средостенные и бронхиальные лимфатические узлы, сыворотку крови больных поросят.

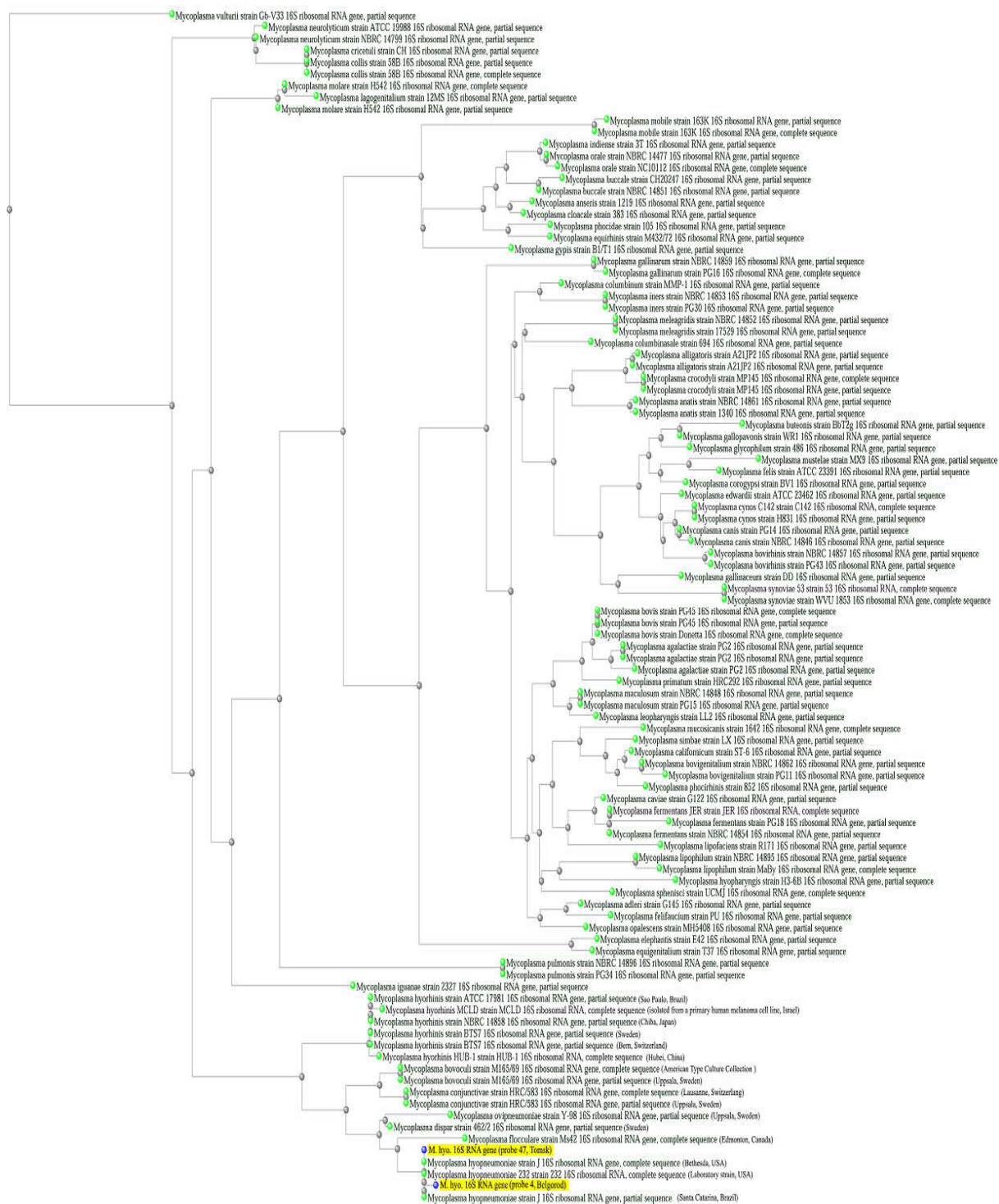


Рисунок 1 – Филогенетическая дендрограмма, построенная на основании фрагментов генома, кодирующую 16S рибосомную РНК *M. hyorhontoniae*. Желтым цветом выделены исследуемые консенсусные последовательности.

Для установления диагноза используют микроскопическое обнаружение возбудителя в легких (методами прямой и непрямой РИФ, окраски по Гимзе); выделение чистых культур на средах Фриза, Гудвина и других с последующей идентификацией по культурально-морфологическим и биохимическим тестам [5,6]; определение антигенных свойств (РА); выявление специфических антител (микроагглютинация, РСК, латексагглютинация, ИФА) [4,6,13], иммуногистохимические исследования [16,18], постановку биопробы на поросятах 2-2,5-месячного возраста из

хозяйств, благополучных по энзоотической пневмонии свиней. Гибридизация *in situ* позволяет выявлять и определять конкретное расположение ДНК *M.hyo* в фиксированных препаратах легких инфицированных свиней. Возможность только посмертной диагностики и длительность выполнения методики существенно ограничили ее применение [10,11]. Широко применяемый метод оценки распространенности и тяжести пневмонии – измерение коэффициента поражения легких при обследовании приблизительно 30 животных. Системы измерения поражений легких имеют несколько модификаций и разные единицы измерения, но для любой из них характерен один и тот же недостаток: высокая субъективность визуальной оценки и возникающая в связи с этим необходимость дополнительных методов диагностики [6,7].

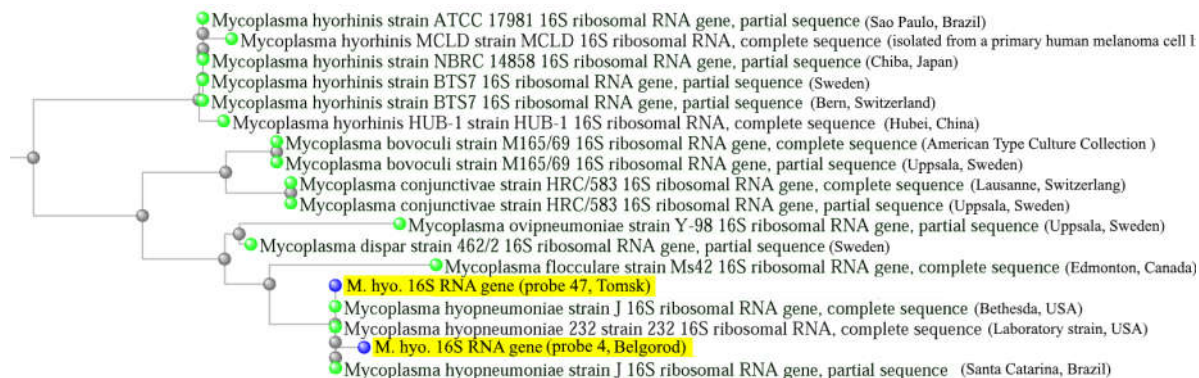


Рисунок 2 – Филогенетическая дендрограмма, построенная на основании фрагментов генома, кодирующую 16S рибосомную РНК *M. hyopneumoniae*, (выделенная область). Желтым цветом выделены исследуемые консенсусные последовательности.

Для выявления непосредственно возбудителя энзоотической пневмонии свиней во всем мире широко используется метод полимеразной цепной реакции. Этот метод обладает высокой чувствительностью, специфичностью и достоверностью [3,11,14]. Кроме того, ПЦР позволяет обнаружить *M.hyo* на более ранней стадии, чем методы, для применения которых должна произойти сероконверсия. Материалом для исследования методом ПЦР являются образцы сыворотки крови, легочной ткани, трахеобронхиальные, носоглоточные смывы и мазки. С помощью этого метода изучается масштаб распространения *Mycoplasma hyopneumoniae* в свиноводческих хозяйствах России и молекулярно-биологические особенности отечественных изолятов данного патогена [13,14,19].

Геномы различных штаммов *M.hyo* различаются между собой, поэтому, необходимо проводить молекулярное типирование для оценки филогенетического родства и выявления молекулярных особенностей штаммов, циркулирующих в поголовье. Таким образом, проведение исследований молекулярной структуры возбудителя энзоотической пневмонии свиней, помогает получить новые знания о генетическом разнообразии *M.hyo* и разработать новые, более эффективные методы диагностики.

Исследовательская работа выполнена в лабораториях эпизоотологии, диагностики и профилактики вирусных болезней свиней, молекулярной биологии и биохимии, в лаборатории эпизоотологии ФГБНУ ВИЭВ в 2016-2017гг в рамках исполнения государственного задания по теме №0578-2014-0027.

Были проведены исследования свиноводческих хозяйств Томской, Белгородской, Смоленской, Московской области и Краснодарского края. В результате исследования были получены филогенетические дендрограммы *M. hyopneumoniae*, циркулирующей в различных областях Российской Федерации (рис. 1, рис.2). Результаты анализа показали, что *M. hyopneumoniae*, циркулирующая в Томской области, по фрагменту генома, кодирующему 16S рибосомную РНК, генетически близка к патогенам,

циркулирующим в Канаде и США. *M. hyopneumoniae*, циркулирующая в Белгородской области по фрагменту генома, кодирующему 16S рибосомную РНК, генетически близка к патогенам, циркулирующим в США и Бразилии.

### БИБЛИОГРАФИЯ

1. Жбанова Т.В., Дрыгин В.В., Дудникова Н.С. Микоплазмозы свиней. 2005. 75 стр.
2. Орлянкин Б.Г. Инфекционные респираторные болезни свиней: этиология, диагностика и профилактика // Свиноводство. 2010. №3. С. 67 – 69.
3. Artushin S. Development of polymerase chain reaction primers to detect *Mycoplasma hyopneumoniae* // Molecular and Cellular Probes. 1993. №7. P. 381– 385.
4. Erlandson K. Evaluation of three serum antibody ELISA tests for *Mycoplasma hyopneumoniae* // J. Swine Health and Production. 2005. №13(4). P. 198 – 203.
5. Friis N.F. Some recommendations concerning primary isolation of *Mycoplasma suis pneumoniae* and *Mycoplasma flocculare* a survey // Nord. Vet. Med. 1975. №27. P. 337 – 339.
6. Maes D., Segales J., Meyns T. et al. Control of *Mycoplasma hyopneumoniae* infections in pigs // Vet. Microbiol. 2008. №126(4). P. 297 – 309.
7. Sibila M., Nofrarias M., Lopez-Soria S. et al.. Chronological study of *Mycoplasma hyopneumoniae* infection, seroconversion and associated lung lesions in vaccinated and non-vaccinated pigs // Vet. Microbiol. 2007. №122. P. 97 – 107.
8. Thacker E.L. Diagnosis of *Mycoplasma hyopneumoniae* // Anim. Health Res. Rev. 2004. №(2). P. 317 – 320.
9. Thacker E.L. Diagnosis of *Mycoplasma hyopneumoniae* / E.L. Thacker // Anim. Health Res. Rev. - 2004. – N5(2) – P. 317-320.
10. Villarreal I, Maes D, Meyns T, Gebruers F, Calus D, Pasmans F, Haesebrouck F.// Vaccine. 2009 Mar 13;27(12):1875-1879
11. Алексеева С.В. Типирование *dichelobacter nodosus* по гену *fima*/ Алексеева С.В., Сидорчук А.А., Панасюк С.Д., Забережный А.Д., Соколов М.Н., Соколова Н.А.// Ветеринария. 2011. №5. С. 27-29.
12. Алипер Т.И. ПЦР в реальном времени для диагностики туберкулеза // Ветеринарная жизнь. 2006. №7-8. С. 13.
13. Гребенникова Т.В. Молекулярные методы исследования в диагностике туберкулеза/Гребенникова Т.В., Кальнов С.Л., Забережный А.Д., Алипер Т.И., Непоклонов Е.А.// Ветеринарная патология. 2004. №1-2. С. 92-93.
14. Егорова И.Ю. Генодиагностика сибирской язвы/ Егорова И.Ю., Селянинов Ю.О., Колбасов Д.В., Жигалева О.Н., Цыбанов С.Ж., Потапова Н.И., Гребенникова Т.В., Забережный А.Д.// Российский ветеринарный журнал. Мелкие домашние и дикие животные. 2006.№4. С. 26-28.
15. Zaberezhny A.D. Differentiation between vaccine strain and field isolates of classical swine fever virus using polymerase chain reaction and restriction test/ Zaberezhny A.D., Grebennikova T.V., Aliper T.I., Nepoklonov E.A., Kurinnov V.V., Tsybanov S.G., Vishnyakov I.F., Biketov S.F.// DTW. Deutsche tierärztliche Wochenschrift. 1999. T. 106. №9. С. 394-397.
16. Стаффорд В.В. Иммуногистохимическая диагностика репродуктивного и респираторного синдрома свиней // Ветеринария. 2017. №2. С. 26-30
17. Стаффорд В.В. Патоморфологические изменения паренхиматозных органов поросят, экспериментально зараженных вирусом репродуктивно-респираторного синдрома свиней и цирковирусом свиней типа 2 // Ветеринария. 2016. №9. С. 24-27
18. Stafford V.V. Application of immunohistochemistry in diagnostics/ Stafford V.V.//Russian Journal of Agricultural and Socio-Economic Sciences. 2016. T. 56. №8. С. 18-21
19. Svtina M.A., Absatirov G.G., Shalmenov M.Sh., Sidorchuk A.A., Gulyukin A.M. Epizootiological characteristics of animal rabies in the West Kazakhstan region // Biology and Medicine. 2015. T. 7. №5. С. BM-152-15.

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**ИНЦИДЕНТНОСТЬ ВЫЯВЛЕНИЯ ВИРУСА ЛЕЙКОЗА У ДОМАШНИХ КОШЕК  
В МОСКВЕ**

**THE INCIDENCE OF DETECTING THE DOMESTIC CATS' LEUKEMIA VIRUS  
IN MOSCOW**

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**АННОТАЦИЯ**

В структуре эпизоотической ситуации на территории РФ доминирующее положение занимают болезни продуктивных животных, наносящие значительный экономический ущерб товарному производству, либо социально значимые заболевания, в основном антропозоозы, которые, зачастую, угрожают человеческой жизни. Ликвидации этих заболеваний государство уделяет большое внимание и выделяет на профилактику и борьбу с ними необходимые ресурсы. В статье приведены данные мониторинга эпизоотической ситуации по распространению вирусного лейкоза кошек в популяции домашних кошек г. Москвы и гематологические показатели положительных по данной инфекции животных.

**ABSTRACT**

In the structure of the epizootic situation on the territory of the Russian Federation, diseases of productive animals that cause significant economic damage to commodity production, or socially significant diseases, mainly anthroozoonoses, which often threaten human life, occupy a dominant position. The state pays a lot of attention to elimination of these diseases and allocates necessary resources for prevention and control. The article presents monitoring data of the epizootic situation on the spread of leukemia of cats in the Moscow cats population and hematological parameters of positive animals for this infection.

**КЛЮЧЕВЫЕ СЛОВА**

Вирус лейкоза кошек, эпизоотологические исследования, гематологические исследования, Москва.

**KEY WORDS**

Feline leukemia, epizootic examinations, hematological studies, Moscow.

В последнее время особую актуальность приобрели заболевания разной этиологии у животных – компаньонов, таких как собаки, кошки, различные грызуны и пр., что связано с многократным увеличением их численности. В тоже время социально-экономические факторы позволяют проводить с этими животными гематологические, серологические, иммунологические, иммуногистохимические, молекулярно-биологические и другие виды исследований для дифференциации и постановки точного диагноза [18].

Домашние кошки часто являются носителями хронических вирусных инфекций. Во всем разнообразии хронических вирусных заболеваний кошек - три стоят особняком от всех прочих, поскольку они протекают скрытно и являются летальными. К ним



относятся вирусный лейкоз (ВЛК, Feline leukemia, FeLV), вирусный иммунодефицит (ВИК, Feline immunodeficiency, FIV) и инфекционный перитонит кошек (ВПК, Feline infectious peritonitis, FIP) [1].

В связи с увеличением количества животных в популяции увеличивается риск широкого распространения заразных болезней, что впоследствии приводит к значительному экономическому и моральному ущербу для владельцев животных. Т.к. возбудители этих заболеваний не всегда вызывают клиническое проявление болезни, в этом состоит основная сложность в диагностике, интерпретации результатов исследований и прогнозировании этих заболеваний. Также данные инфекции крайне редко учитываются официальной ветеринарной статистикой [9,13].

Вирус лейкоза кошек (FeLV) – РНК-содержащий лентивирус семейства Retroviridae. В настоящее время ретровирусы обнаружены у всех основных таксонов позвоночных и беспозвоночных, что свидетельствует об их убиквитарности [4]. Впервые вирус лейкоза кошек был обнаружен с помощью электронной микроскопии в мембране злокачественных лимфобластов кошки с естественной лимфомой в 1964 году. Доказано, что вирус продуцировал аналогичные опухоли при экспериментальном введении здоровым кошкам и, таким образом, оказался способным передавать неоплазию. К заболеванию кроме домашних кошек восприимчивы и дикие представители этого семейства.

Особенностью ретровирусов является характерная морфология, в частности, наличие электронноплотного нуклеопротеида, а также наличие ревертазы, обратной транскриптазы (РНК- зависимой ДНК – полимеразы) [10].

Нуклеокапсид окружен оболочкой, которая создается из внешней оболочки инфицированной клетки, так как вирусная частица обретает свой вид посредством почкования. Вирусам свойственны лабильность и длительная персистенция [12]. FeLV эпителиотропен, обладает выраженными иммунодепрессивными свойствами т. к. поражает, прежде всего, клетки иммунной системы. Свою репродукцию осуществляет в гранулярных лейкоцитах, в Т – лимфоцитах, в лимфоцитах. В организме хозяина вызывает синтез преципитирующих и вирус-нейтрализующих антител. Гемагглютинирующих и гемадсорбирующих свойств у вируса не установлено. При комнатной температуре он сохраняется до 4 суток.

Вирус инактивируется сразу при кипячении или в течение 30 минут при нагревании до 60°C. Обработка спиртом, эфиром, гипохлоритом приводят к инаktivации вируса через 5-10 минут. К ультрафиолетовому облучению вирусы относительно устойчивы [5].

Геном FeLV состоит из трех основных генов: ENV – кодирует гликопротеин gp70 и трансмембранный белок p15; POL – ген, кодирующий обратную транскриптазу, протеазу и интегразу, и группу специфических антигенов; GAG – кодирует структурные белки вируса, включая p27.

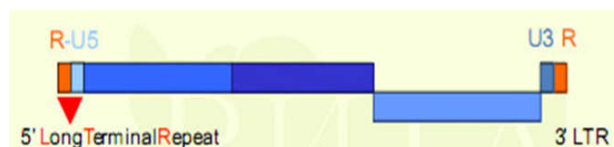


Рисунок 1 – Геном вируса лейкоза кошек (схематичное изображение)

При репликации вирус лейкоза кошек проходит стадию обратной транскрипции в ДНК, которая обычно интегрируется в геном клетки хозяина с помощью фермента интегразы. После того, как произошла обратная транскрипция, начинается синтез вирусных белков и сборка вирионов в цитоплазме, а затем почкование вируса из клетки.

При этом заражение клетки ретровирусом, как правило, не приводит к ее гибели. Поэтому инфекция долгое время может находиться в латентном состоянии (эндогенный тип), при этом передаваясь трансгенно от поколения к поколению.

У домашних кошек существует две формы эндогенных ретровирусов – эндогенный вирус лейкемии enFeLV и вирус RD114.

Существует четыре подтипа вируса FeLV: А, В, С и Т, каждый из которых использует разный рецептор для входа в клетки хозяина и, соответственно, поражает определенный тип клеток, хотя иммунологически все подтипы тесно связаны. Подтип А распространен повсеместно. Подтип В произошел в результате рекомбинации вирусов FeLV и enFeLV. Подтип С является результатом мутации гена ENV, а подтип Т имеет тропизм к Т-лимфоцитам. Кошки, инфицированные FeLV-В и FeLV-С, коинфицированы FeLV-А, и только FeLV-А передается между животными, Так же известно, что FeLV-В и FeLV-С более патогенны, чем FeLV-А [3].

Источником инфекции являются кошки с виремией. Такие животные выделяют вирус в окружающую среду со слюной, назальными секретами, фекалиями, мочой и молоком, основными путями заражения является контактный, аэрогенный, а также через укусы блох и ятрогенный (через загрязненные иглы, хирургические инструменты или при переливании крови). Факторами риска при данной инфекции являются: возраст (котята более восприимчивы), высокая плотность популяции кошек и плохая гигиена.

У кошек с виремией беременность обычно заканчивается эмбриональной смертью, рождением мертвых котят или котят с виремией, которые погибают в течение короткого периода времени. У кошек с латентной инфекцией передача вируса происходит через отдельные молочные пакеты в которых вирус реплицировался в последний период беременности [2].

Патогенез FeLV-инфекции так же чрезвычайно изменчив и сильно зависит от штамма вируса, его количества, способа заражения и таких факторов хозяина как: иммунная функция, возраст, генетика, наличие коинфекции, стресса и лечения иммунодепрессантами.

В большинстве случаев инфекция начинается в ротовой части глотки, где вирус поражает миндалины и отдельные лимфоциты, которые перемещаются в другие лимфоидные ткани и в костный мозг. Как только быстро делящиеся клетки костного мозга подвергаются воздействию вируса, происходит массовая репликация, вследствие которой в течение нескольких недель после заражения развивается виремия. При этом типичные клинические признаки инфекции обычно развиваются у кошек с виремией иногда в течение нескольких лет. У кошек в питомниках виремия может развиваться несколько позже, в течение нескольких месяцев. Виремия приводит к заражению слюнных желез и выстилающего эпителия кишечника, после этого вирус начинает в больших количествах выделяться со слюной и калом. Зачастую виремия подавляется иммунной системой и активная инфекция элиминируется, давая начало временной виремии, которая продолжается от 2 дней до 8 недель. У таких кошек развития заболевания не происходит. В приютах для животных, в которых не проводят плановых диагностических процедур, порядка 30-40% кошек имеют стойкую виремию, у такого же количества кошек виремия не постоянная, и около 20-30% животных имеют антитела без явной виремии. Примерно у 5% кошек возможно атипичное течение, когда наблюдается антигенемия, но нет виремии. В питомниках, где не проводятся специальные профилактические меры, распространенность может достигать 20% и более [6].

Кошка, иммунная система которой преодолела виремию, остается латентно инфицированной, когда даже несколько клеток могут содержать провирус. В этом случае вирус-нейтрализующие антитела могут сохраняться на протяжении многих лет при отсутствии явной инфекции. При этом кошки без виремии, по всей видимости, имеют такую же продолжительность жизни, как и здоровые. Повторная активация вируса может происходить при подавлении иммунной системы, при хроническом тяжелом стрессе и развития вторичных, бактериальных инфекций.

У кошек, не элиминировавших вирус, развивается персистирующая инфекция. У этих животных проявляются клинические симптомы, и они становятся источником инфекции для других кошек.

Провирусная ДНК FeLV была обнаружена в опухолях у кошек, у которых не был подтвержден лейкоз. Предполагается, что вирус может быть инициатором развития опухоли, а затем сохраняются только в виде провируса, возможно, в дефектной форме.

Точный диагноз инфекции важен, т.к. идентификация и изолирование инфицированных кошек считается наиболее эффективным методом профилактики вирусного лейкоза. Чтобы полностью устранить любой риск, связанный с возможным воздействием FeLV на домашнюю кошку, тестирование должно проводиться не ранее чем через 90 дней после контакта с носителем вируса, поскольку кошки могут находиться на ранней стадии инфекции во время первого теста. Поскольку скрининг-тесты обнаруживают антиген, а не антитела, ни материнские антитела, ни антитела от вакцинации или предшествующего вирусного воздействия не мешают тестированию.

Выделение вируса в культуре клеток считается высшим критерием определения болезни. Действительно, на ранней стадии инфекции, выявление инфекционных частиц часто является наиболее чувствительным методом [15]. С учетом сложной логистики, этот тест уже не используется для рутинных исследований.

Современные ИФА тесты на вирусный белок p27 имеют высокую диагностическую чувствительность и специфичность, но нуждаются в подтверждении ПЦР на наличие провирусной ДНК. Исследования показали, что диагностическая чувствительность ИФА составляет примерно 90%. То есть примерно 10% кошек оказались позитивными в ПЦР и дали отрицательный результат в ИФА, что говорит об отсутствии антигенемии. Специфичность ПЦР близка к 100%, поскольку каждый позитивный ИФА тест подтвердился в ПЦР. Таким образом, ПЦР обладает диагностической чувствительностью более чем 90%, а специфичность составляет более 98%.

Выявление вирусной РНК стало новым аспектом в диагностике лейкоза. С помощью этого теста возможно обнаружить и провести количественный анализ вирусной РНК в цельной крови, сыворотке, плазме, слюне или фекалиях. Выявление РНК в ПЦР не дает ту же информацию, что и определение ДНК провируса [12]. Достаточно много кошек, содержащих провирус, иммунная система которых преодолела виремию. У таких животных РНК вируса не будет определяться в крови, слюне и фекалиях. Обнаружение вирусной РНК является надежным показателем виремии.

В большинстве случаев ПЦР анализ проводится индивидуально. Тем не менее, в определенных условиях, когда стоимость анализа высока, например, для тотального тестирования кошек в питомнике, можно использовать ПЦР для исследования объединенных проб, так как тест достаточно чувствителен для выявления одной инфицированной кошки в 30-ти объединенных пробах.

Так как каждая клетка кошки содержит от 12 до 15 копий генетического материала эндогенных вирусов FeLV, оказалось, довольно трудно определить последовательности, специфичные для экзогенного провируса. Значение метода ПЦР в значительной степени возросло с появлением ПЦР в реальном времени, которая позволяет проводить количественный анализ провируса [11].

Первый метод, который позволил обнаруживать вирус в полевых условиях, был непрямой иммунофлуоресцентный анализ, разработанный в 1973 г. Он был основан на наблюдении, что гранулоциты, лимфоциты и тромбоциты у инфицированных кошек содержат вирусные компоненты, которые могут быть обнаружены с помощью реакции непрямой иммунофлуоресценции в мазках крови. Диагностическая чувствительность метода по сравнению с выявлением вируса в ПЦР значительно ниже, но положительный результат, как правило, говорит о стойкой виремии. Если у кошки наблюдается лейкопения или инфицирован небольшой процент лейкоцитов периферической крови, наличие инфекции может остаться незамеченным.

Наиболее широко используемые тесты для диагностики инфекции FeLV на практике – это иммунохроматографические экспресс тесты для определения свободного антигена в циркулирующей крови. Но в этом случае существует тенденция

к увеличению ложно положительных результатов. Поэтому сомнительный и положительный результат у здоровой кошки должен быть всегда подтвержден, желательно с использованием ПЦР [14].

Как правило, до 10% всех образцов крови, доставляемых в диагностическую лабораторию, оказываются провирус-положительными (ПЦР), но отрицательными на присутствие вирусного белка (экспресс-тесты). Такие животные должны рассматриваться как латентно инфицированные.

Кошки с положительным результатом могут преодолеть виремию в течение 2-16 недель, в редких случаях дольше. Поэтому каждая положительно реагирующая кошка без клинических признаков должна быть изолирована и через несколько недель или месяцев исследована повторно.

Достоверной информации о распространенности вирусного лейкоза кошек в разных странах нет. Распространенность заболевания может зависеть от плотности популяции домашних кошек; наличием надежных диагностических тестов, географической зоны и экономических условий в стране – наличия законодательства, регулирующего условия содержания домашних животных и традиционных систем ухода за ними (например, наличие свободного выгула, отношение населения к профилактическим мерам и осведомленность о них и проч.) [17,18]. Задачей нашего исследования было оценить распространенность FeLV в популяции домашних кошек г. Москвы.

## **МАТЕРИАЛЫ И МЕТОДЫ ИССЛЕДОВАНИЙ**

Исследовательская работа выполнена в лаборатории молекулярной биологии и биохимии, в лаборатории эпизоотологии и ветеринарной клинике ФГБНУ ВИЭВ в 2016-2017гг в рамках исполнения государственного задания по теме №0578-2014-0010.

Было отобрано для исследования 1282 кошек, которые согласно анамнезу имели вероятные контакты с другими животными и по состоянию клинического здоровья могли считаться подозреваемыми в заражении вирусом FeLV.

Выделение нуклеиновых кислот проводилось на магнитных частицах с силикатной оболочкой готовыми наборами реагентов (ЗАО «Силекс», Россия). Для этого 50мкл цельной крови помещали в пробирку с антикоагулянтом ЭДТА и далее проводили исследование согласно протоколу производителя. После выделения с магнитных частиц НК смывали в 75мкл элюирующего буфера. Затем инкубировали при 60<sup>0</sup>С 10 минут, после этого готовый образец ДНК переносили в чистую пробирку без магнитных частиц.

ПЦР в реальном времени делали на аппарате AnalytikJena qTover 2.0. (AWTech, Россия) готовыми тест-системами (ООО «Нанодиагностика», Россия), согласно протоколу производителя. Режим амплификации: денатурация ДНК 95<sup>0</sup>С; отжиг праймеров 65<sup>0</sup>С; элонгация 70<sup>0</sup>С 40 циклов.

Гематологические исследования проводили на гематологическом анализаторе XF9030B (Perlong, Китай).

## **РЕЗУЛЬТАТЫ И ИХ ОБСУЖДЕНИЕ**

Из множества инфекционных патологий кошек вирусный лейкоз является одной из самых редко учитываемых официальной ветеринарной статистикой, и как результат нет точных данных по распространенности этих болезней. Заболевания часто приводят к гибели животных или к необратимым повреждениям тканей и органов, благодаря сопутствующим инфекциям, что в свою очередь ухудшает качество и сроки жизни животных.

Эпизоотологическая ситуация по инфекционным патологиям кошек в нашей стране не изучена в силу многих обстоятельств. Основной трудностью в ее изучении является то, что даже примерное количество ни домашних, ни бродячих животных не учитывается. Все выше перечисленное приводит к неконтролируемости заболевания.

Анализ распространенности FeLV показал, что в отобранной группе животных выявление генома возбудителя вирусной инфекции регистрировалось в 15,8% (203 головы).

Для исследования особенностей пространственного распространения ретровирусов кошек в московском мегаполисе, случаи выявления инфицированных животных были показаны на карте города с использованием градиентной заливки, отражающей плотность встречаемости признака через интенсивность окрашивания карты.

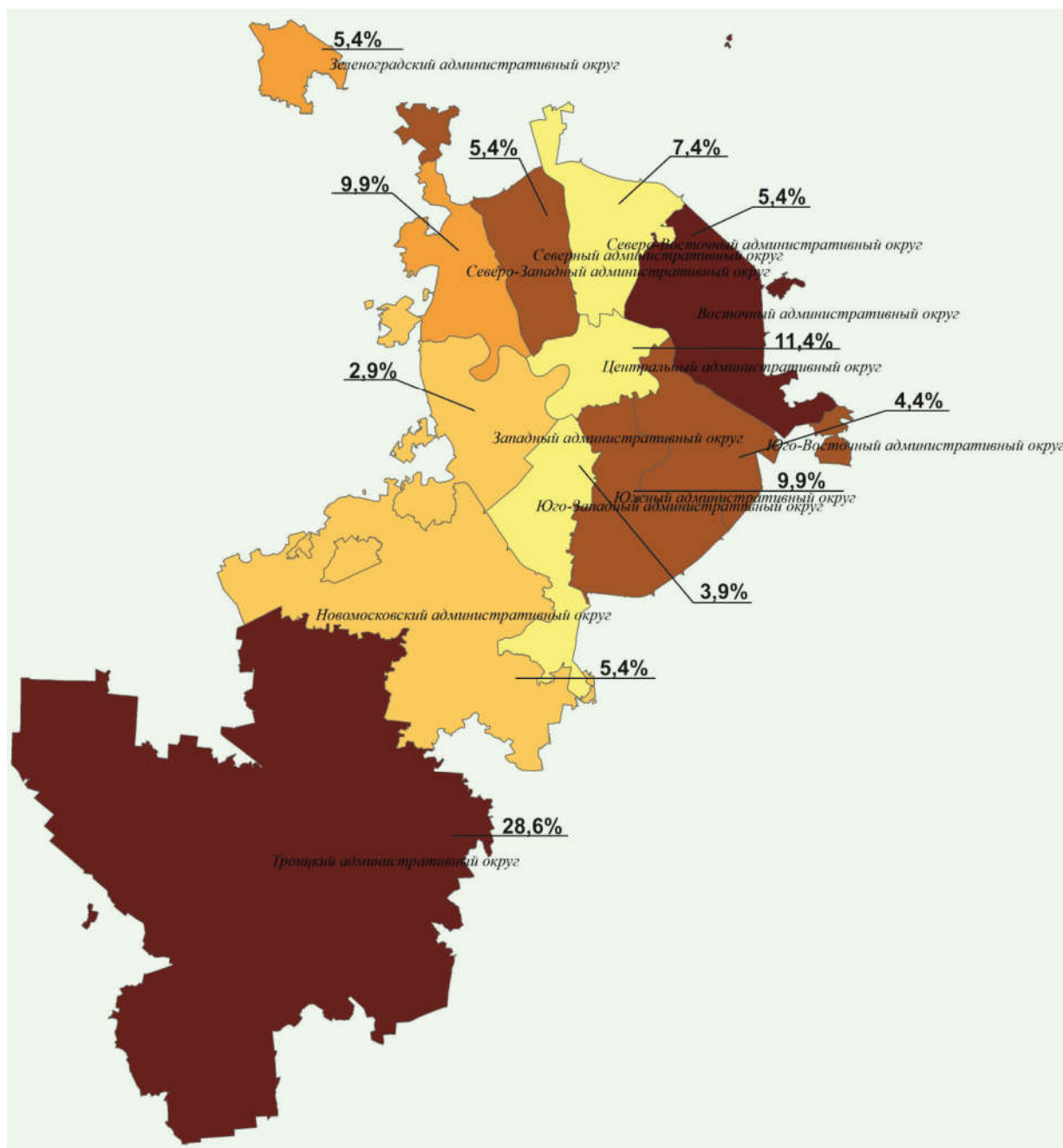


Рисунок 2 – Распространенность FeLV по округам Москвы

Данные показатели инфицированности кошек FeLV являются довольно значимыми, и, учитывая размер исследованной выборки животных, настоящие результаты позволяют сделать вывод о высокой доле распространенности ретровирусов во всей популяции кошек Московского мегаполиса.

Таблица 1 – Распространенность FeLV по округам Москвы

| Количество больных животных | Округ                                   | %     |
|-----------------------------|---|-------|
| 20                          | Южный административный округ            | 9.9%  |
| 8                           | Юго-западный административный округ     | 3.9%  |
| 6                           | Западный административный округ         | 2.9%  |
| 20                          | Северо-западный административный округ  | 9.9%  |
| 11                          | Северный административный округ         | 5.4%  |
| 15                          | Северо-восточный административный округ | 7.4%  |
| 11                          | Восточный административный округ        | 5.4%  |
| 9                           | Юго-восточный административный округ    | 4.4%  |
| 23                          | Центральный административный округ      | 11.4% |
| 11                          | Зеленоградский административный округ   | 5.4%  |
| 11                          | Новомосковский административный округ   | 5.4%  |
| 58                          | Троицкий административный округ         | 28.6% |
| 203                         | Всего                                   | 100%  |

Следующим этапом исследования была оценка тяжести поражения кроветворной и лимфоретикулярной системы у животных, у которых обнаружен геном вируса. Ретровирусные инфекции, находясь в организме животного могут длительное время пребывать в латентном состоянии, не вызывая патологических изменений в организме. Для выявления из общего числа инфицированных животных клинически больных, проводят гематологические исследования.

В исследуемую выборку было рандомно отобрано 71 FeLV положительных кошек.

Таблица 2 – Гематологические показатели FeLV-инфицированных кошек с заниженным гематокритом (животные 1-10)

| Показатель                  | Норма        | Единицы измерений | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | Среднее (по таблице) |
|-----------------------------|--------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|
| СОЭ                         | 2,0-3,5      | мм/час            | 79  | 75  | 71  | 87  | 33  | 18  | 86  | 70  | 1   | 81  | 64,1                 |
| Гематокрит НСТ              | 30-45        | %                 | 12  | 17  | 15  | 10  | 16  | 13  | 7,5 | 13  | 7,2 | 9   | 12,2                 |
| Гемоглобин HGB              | 80-150       | г/л               | 42  | 50  | 54  | 35  | 66  | 37  | 24  | 48  | 23  | 29  | 40,4                 |
| Эритроциты RBC              | 5,0-10,0     | млн/мкл           | 2,5 | 2,9 | 3   | 2   | 2,5 | 1,6 | 1,1 | 3,6 | 1,3 | 1,6 | 2,3                  |
| Тромбоциты PLT              | 300-630      | 1000/мкл          | 4   | 14  | 95  | 100 | 14  | 82  | 19  | 74  | 26  | 14  | 41,7                 |
| Лейкоциты WBC               | 5,5-19,5     | 1000/мкл          | 9,1 | 5,5 | 35  | 16  | 244 | 12  | 21  | 2,2 | 9,6 | 8,7 | 24,9                 |
| Палочкоядерные              | 0-3          | %                 | 1   | 3   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 1   | 3,1                  |
| Палочкоядерные, абс. к-во   | 0 - 0,59     | 1000/мкл          | 0,1 | 0,2 | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0,1 | 0,3                  |
| Сегменто-ядерные            | 35-75        | %                 | 65  | 81  | 59  | 88  | 21  | 57  | 33  | 69  | 66  | 6   | 60,3                 |
| Сегменто-ядерные, абс. к-во | 1,93 - 14,63 | 1000/мкл          | 5,9 | 4,5 | 21  | 14  | 51  | 6,7 | 6,8 | 1,5 | 6,3 | 0,5 | 9,8                  |
| Лимфоциты                   | 20-55        | %                 | 18  | 12  | 30  | 9   | 59  | 38  | 66  | 31  | 21  | 91  | 29,6                 |
| Лимфоциты, абс. к-во        | 1,1 - 10,73  | 1000/мкл          | 1,6 | 0,7 | 11  | 1,4 | 144 | 4,5 | 14  | 0,7 | 2   | 7,9 | 11,3                 |
| Моноциты                    | 1-4          | %                 | 16  | 4   | 5   | 3   | 20  | 3   | 1   | 0   | 10  | 2   | 5,6                  |
| Моноциты, абс. к-во         | 0,055 - 0,78 | 1000/мкл          | 1,5 | 0,2 | 1,8 | 0,5 | 49  | 0,4 | 0,2 | 0   | 1   | 0,2 | 3,3                  |

В анализах животных с подтвержденной FeLV-инфекцией у всех значительно повышено СОЭ (49-85%), что служит косвенным признаком текущего воспалительного или иного патологического процесса, в данном случае хронической инфекции. Установлено, что в более чем 50% случаев уменьшено количество эритроцитов (эритроцитоз), что говорит о гемолитической анемии, то есть сокращения жизненного цикла красных кровяных телец. У 19 животных так же был сильно занижен гематокрит (13-27%), соответственно объем красных кровяных клеток в крови значительно ниже нормы (30-45%). Изменения гематокрита и эритроцитов косвенно указывают на поражение клеток красного костного мозга. Гематокрит чаще занижен, что, видимо, связано с латентной стадией течения болезни, когда патологические изменения проявляются слабо. Для оценки показателей клинического анализа крови,

инфицированных кошек FeLV с низким гематокритом, была проведена выборка, показанная в таблицах 2 и 3.

У 8 животных было патологически увеличено абсолютное количество лимфоцитов, при этом у 2 кошек с лимфоцитозом отмечено повышение числа гранулоцитов. Было выявлено 20 животных с выраженной лимфопенией. Для оценки показателей клинического анализа крови инфицированных кошек с лимфоцитозом и лимфопенией сформированы таблицы 4 и 5-6 соответственно [7,8].

Таблица 3 – Гематологические показатели FeLV-инфицированных кошек с заниженным гематокритом (животные 11-19)

| Показатель                 | Норма        | Единицы измерений | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | Среднее (по табли-це) |
|----------------------------|--------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----------------------|
| СОЭ                        | 2,0-3,5      | мм/час            | 71  | 68  | 75  | 71  | 87  | 71  | 18  | 75  | 81  | 64,1                  |
| Гематокрит НСТ             | 30-45        | %                 | 9   | 13  | 17  | 9   | 10  | 15  | 13  | 17  | 9   | 12,2                  |
| Гемоглобин HGB             | 80-150       | г/л               | 30  | 45  | 50  | 30  | 35  | 54  | 37  | 50  | 29  | 40,4                  |
| Эритроциты RBC             | 5,0-10,0     | млн/мкл           | 2,1 | 2,8 | 2,9 | 2,1 | 2   | 3   | 1,6 | 2,9 | 1,6 | 2,3                   |
| Тромбоциты PLT             | 300-630      | 1000/мкл          | 10  | 24  |     | 26  | 8   | 93  | 36  | 82  | 30  | 41,7                  |
| Лейкоциты WBC              | 5,5-19,5     | 1000/мкл          | 4,7 | 8,1 |     | 9,6 | 3,9 | 18  | 7,2 | 12  | 22  | 24,9                  |
| Палочкоядерные             | 0-3          | %                 | 0   | 50  |     | 0   | 0   | 1   | 0   | 0   | 0   | 3,1                   |
| Палочкоядерные, абс. к-во  | 0 - 0,59     | 1000/мкл          | 0   | 4,1 |     | 0   | 0   | 0,2 | 0   | 0   | 0   | 0,3                   |
| Сегментоядерные            | 35-75        | %                 | 94  | 35  |     | 66  | 87  | 88  | 39  | 57  | 74  | 60,3                  |
| Сегментоядерные, абс. к-во | 1,93 - 14,63 | 1000/мкл          | 4,4 | 2,8 |     | 6,3 | 3,4 | 16  | 2,8 | 6,7 | 16  | 9,8                   |
| Лимфоциты                  | 20-55        | %                 | 5   | 9   |     | 21  | 6   | 7   | 57  | 38  | 15  | 29,6                  |
| Лимфоциты, абс. к-во       | 1,1 - 10,73  | 1000/мкл          | 0,2 | 0,7 |     | 2   | 0,2 | 1,3 | 4,1 | 4,5 | 3,3 | 11,3                  |
| Моноциты                   | 1-4          | %                 | 1   | 6   |     | 10  | 2   | 3   | 4   | 3   | 8   | 5,6                   |
| Моноциты, абс. к-во        | 0,055 - 0,78 | 1000/мкл          | 0,1 | 0,5 |     | 1   | 0,1 | 0,6 | 0,3 | 0,4 | 1,8 | 3,3                   |

Таблица 4 – Гематологические показатели FeLV-инфицированных кошек с повышенным, в сравнении с нормой, абсолютным числом лимфоцитов (лимфоцитоз)

| Показатель                 | Норма       | Единицы измерений | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | среднее |
|----------------------------|-------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|---------|
| СОЭ                        | 2,0-3,5     | мм/час            | 25  | 33  | 86  | 62  | 16  | 3   | 35  | 57  | 39,6    |
| Гематокрит НСТ             | 30-45       | %                 | 24  | 16  | 7,5 | 24  | 30  | 33  | 28  | 28  | 23,9    |
| Гемоглобин HGB             | 80-150      | г/л               | 78  | 66  | 24  | 81  | 101 | 112 | 92  | 94  | 81,0    |
| Эритроциты RBC             | 5,0-10,0    | млн/мкл           | 2,9 | 2,5 | 1,1 | 4,9 | 5,6 | 7,8 | 5,4 | 5,9 | 4,5     |
| Тромбоциты PLT             | 300-630     | 1000/мкл          | 130 | 14  | 19  | 16  | 171 | 130 | 19  | 95  | 74,3    |
| Лейкоциты WBC              | 5,5-19,5    | 1000/мкл          | 227 | 244 | 21  | 38  | 66  | 227 | 21  | 35  | 109,7   |
| Палочкоядерные             | 0-3         | %                 | 0   | 0   | 0   | 1   | 0   | 0   | 0   | 0   | 0,1     |
| Палочкоядерные, абс. к-во  | 0 - 0,59    | 1000/мкл          | 0   | 0   | 0   | 0,4 | 0   | 0   | 0   | 0   | 0,0     |
| Сегментоядерные            | 35-75       | %                 | 2   | 21  | 33  | 6   | 6   | 2   | 33  | 59  | 20,3    |
| Сегментоядерные, абс. к-во | 1,93- 14,63 | 1000/мкл          | 4,5 | 51  | 6,8 | 2,3 | 4   | 4,5 | 6,8 | 21  | 12,6    |
| Лимфоциты                  | 20-55       | %                 | 98  | 59  | 66  | 92  | 92  | 98  | 66  | 30  | 75,1    |
| Лимфоциты, абс. к-во       | 1,1 - 10,73 | 1000/мкл          | 222 | 144 | 14  | 35  | 61  | 222 | 14  | 11  | 90,1    |
| Моноциты                   | 1-4         | %                 | 0   | 20  | 1   | 1   | 2   | 0   | 1   | 5   | 3,8     |
| Моноциты, абс. к-во        | 0,055- 0,78 | 1000/мкл          | 0   | 49  | 0,2 | 0,4 | 1,3 | 0   | 0,2 | 1,8 | 6,6     |

Как видно из таблиц 2 и 3, при FeLV происходит увеличение абсолютного числа лимфоцитов. Лейкопения сама по себе свидетельствует о снижении костномозгового кроветворения и, кроме того, не гарантирует адекватного иммунного ответа на антитела. У животных с лейкопенией выше риск развития оппортунистических инфекций, присоединение вторичных инфекций за счет изменения субпопуляций лейкоцитов и возникновения дисбаланса, в частности между Т-супрессорами и цитотоксическими клетками. Полное отсутствие моноцитов указывает на угнетение костномозгового кроветворения. Моноцитоз, выявленный в гемограмме у кошек с хроническими вирусными инфекциями, свидетельствует о выраженной вирусемии, поскольку именно моноциты – первичное звено, распознающее все агенты (как вирусные, так и бактериальные), присутствующие в крови. Моноцитоз является частым

сопутствующим признаком вирусемии. Количество эритроцитов при FeLV составляет 2,3 млн/мкл, что ниже нормы (5,0-10,0 млн/мкл) и говорит о анемии. Как было сказано выше, значительно завышено СОЭ.

Следующим этапом анализа полученных данных было сравнение показателей животных с отклонениями от нормы по абсолютному числу лимфоцитов.

Таблица 5 – Гематологические показатели FeLV-инфицированных кошек с заниженным, в сравнении с нормой, абсолютного числа лимфоцитов (лимфопения), животные 1-10

| Показатель                 | Норма       | Единицы измерений, | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | Среднее (по таблице) |
|----------------------------|-------------|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------------------|
| СОЭ                        | 2,0-3,5     | мм/час             | 75  | 35  | 68  | 1   | 4   | 18  | 70  | 57  | 4   | 72  | 46,7                 |
| Гематокрит НСТ             | 30-45       | %                  | 17  | 28  | 26  | 22  | 28  | 74  | 13  | 28  | 51  | 27  | 27,4                 |
| Гемоглобин HGB             | 80-150      | г/л                | 50  | 92  | 92  | 66  | 88  | 250 | 48  | 94  | 175 | 99  | 92,0                 |
| Эритроциты RBC             | 5,0-10,0    | млн/мкл            | 2,9 | 5,4 | 5,8 | 3,6 | 5,7 | 10  | 3,6 | 5,9 | 12  | 4,7 | 5,4                  |
| Тромбоциты PLT             | 300-630     | 1000/мкл           | 14  | 40  | 8   | 9   | 43  | 282 | 74  | 186 | 284 | 13  | 89,0                 |
| Лейкоциты WBC              | 5,5-19,5    | 1000/мкл           | 5,5 | 6,1 | 3,9 | 5,5 | 18  | 7,1 | 2,2 | 5,8 | 15  | 6   | 6,5                  |
| Палочкоядерные             | 0-3         | %                  | 3   | 14  | 0   | 0   | 0   | 0   | 0   | 18  | 0   | 0   | 5,5                  |
| Палочкоядерные абс. к-во   | 0- 0,59     | 1000/мкл           | 0,2 | 0,9 | 0   | 0   | 0   | 0   | 0   | 1   | 0   | 0   | 0,4                  |
| Сегментоядерные            | 35-75       | %                  | 81  | 68  | 87  | 90  | 90  | 86  | 69  | 79  | 97  | 70  | 81,2                 |
| Сегментоядерные, абс. к-во | 1,93-14,63  | 1000/мкл           | 4,5 | 4,2 | 3,4 | 5   | 16  | 6,1 | 1,5 | 4,6 | 15  | 4,2 | 5,4                  |
| Лимфоциты                  | 20-55       | %                  | 12  | 16  | 6   | 2   | 4   | 11  | 31  | 1   | 0   | 17  | 8,7                  |
| Лимфоциты, абс. к-во       | 1,1 - 10,73 | 1000/мкл           | 0,7 | 1   | 0,2 | 0,1 | 0,7 | 0,8 | 0,7 | 0,1 | 0   | 1   | 0,5                  |
| Моноциты                   | 1-4         | %                  | 4   | 2   | 2   | 4   | 6   | 1   | 0   | 2   | 2   | 12  | 3,4                  |
| Моноциты, абс. к-во        | 0,05-0,78   | 1000/мкл           | 0,2 | 0,1 | 0,1 | 0,2 | 1,1 | 0,1 | 0   | 0,1 | 0,3 | 0,7 | 0,2                  |

Таблица 6 – Гематологические показатели FeLV-инфицированных кошек с заниженным в сравнении с нормой абсолютного числа лимфоцитов (лимфопения), животные 11-20

| Показатель                 | Норма      | Единицы измерений, | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | Среднее по таблице |
|----------------------------|------------|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------------|
| СОЭ                        | 2,0-3,5    | мм/час             | 71  | 68  | 20  | 56  | 56  | 68  | 87  | 49  | 28  | 27  | 46,7               |
| Гематокрит НСТ             | 30-45      | %                  | 9   | 13  | 22  | 27  | 27  | 26  | 10  | 27  | 32  | 40  | 27,4               |
| Гемоглобин HGB             | 80-150     | г/л                | 30  | 45  | 84  | 87  | 87  | 92  | 35  | 88  | 115 | 123 | 92,0               |
| Эритроциты RBC             | 5,0-10,0   | млн/мкл            | 2,1 | 2,8 | 4,5 | 4,9 | 4,9 | 5,8 | 2   | 7,1 | 6,4 | 8,1 | 5,4                |
| Тромбоциты PLT             | 300-630    | 1000/мкл           | 10  | 24  | 14  | 270 | 10  | 282 | 8   | 9   | 186 | 14  | 89,0               |
| Лейкоциты WBC              | 5,5-19,5   | 1000/мкл           | 4,7 | 8,1 | 5,5 | 4,7 | 4,7 | 7,1 | 3,9 | 5,5 | 5,8 | 5,5 | 6,5                |
| Палочкоядерные             | 0-3        | %                  | 0   | 50  | 3   | 0   | 0   | 0   | 0   | 0   | 18  | 3   | 5,5                |
| Палочкояд., абс. к-во      | 0 - 0,59   | 1000/мкл           | 0   | 4,1 | 0,2 | 0   | 0   | 0   | 0   | 0   | 1   | 0,2 | 0,4                |
| Сегментоядерные            | 35-75      | %                  | 94  | 35  | 81  | 80  | 94  | 86  | 87  | 90  | 79  | 81  | 81,2               |
| Сегментоядерные, абс. к-во | 1,93-14,3  | 1000/мкл           | 4,4 | 2,8 | 4,5 | 3,8 | 4,4 | 6,1 | 3,4 | 5   | 4,6 | 4,5 | 5,4                |
| Лимфоциты                  | 20-55      | %                  | 5   | 9   | 12  | 10  | 5   | 11  | 6   | 2   | 1   | 12  | 8,7                |
| Лимфоциты абс. к-во        | 1,1 - 10,3 | 1000/мкл           | 0,2 | 0,7 | 0,7 | 0,5 | 0,2 | 0,8 | 0,2 | 0,1 | 0,1 | 0,7 | 0,5                |
| Моноциты                   | 1-4        | %                  | 1   | 6   | 4   | 7   | 1   | 1   | 2   | 4   | 2   | 4   | 3,4                |
| Моноциты, абс. к-во        | 0,055-0,78 | 1000/мкл           | 0,1 | 0,5 | 0,2 | 0,3 | 0,1 | 0,1 | 0,1 | 0,2 | 0,1 | 0,2 | 0,2                |

При вирусном лейкозе происходит выраженное поражение кроветворной системы, хотя в целом у животных с выраженными изменениями в абсолютном числе лимфоцитов, гематокрит и абсолютное число эритроцитов занижены незначительно. Это подтверждает предположение, что в ходе развития болезни при ретровирусных



инфекциях поражаются не все виды клеток кроветворной и лимфоретикулярной системы, а только их определенные клоны.

Таблица 7 – Гематологические показатели инфицированных кошек с отклонением от нормы по абсолютному числу лимфоцитов

| Показатель                   | Норма        | Лейкоз лимфоцитоз | Лейкоз лимфопения |
|------------------------------|--------------|-------------------|-------------------|
| СОЭ                          | 2,0-3,5      | 39,6              | 46,7              |
| Гематокрит НСТ               | 30-45        | 23,9              | 27,4              |
| Гемоглобин HGB               | 80-150       | 81,0              | 92,0              |
| Эритроциты RBC               | 5,0-10,0     | 4,5               | 5,4               |
| Тромбоциты PLT               | 300-630      | 74,3              | 89,0              |
| Лейкоциты WBC                | 5,5-19,5     | 109,7             | 6,5               |
| Палочкоядерные               | 0-3          | 0,1               | 5,5               |
| Палочкоядерные, абс. кол-во  | 0 - 0,59     | 0,0               | 0,4               |
| Сегментоядерные              | 35-75        | 20,3              | 81,2              |
| Сегментоядерные, абс. кол-во | 1,93 - 14,63 | 12,6              | 5,4               |
| Лимфоциты                    | 20-55        | 75,1              | 8,7               |
| Лимфоциты, абс. кол-во       | 1,1 - 10,73  | 90,1              | 0,5               |
| Моноциты                     | 1-4          | 3,8               | 3,4               |
| Моноциты, абс. кол-во        | 0,055 - 0,78 | 6,6               | 0,2               |
| Доля животных в общей группе |              | 24%               | 29%               |

Вирус лейкоза кошек обладает тропностью к лимфоцитам, энтероцитам, макрофагам, астроцитам, эндотелиоцитам и др. Ввиду широкой распространённости вируса лейкемии кошек некоторые его количества могут разово или периодически попадать в организм кошек, вызывая иммунный ответ. Учитывая данную особенность, условно можно выделить первичные факторы, от которых зависит, каким образом будет происходить развитие FeLV-инфекции при заражении: количество попавшего в организм вируса; сила и качество иммунного ответа организма в ответ на проникновение вируса; количество антител к вирусу лейкемии кошек, выработавшихся в предыдущие случаи инфицирования; условия содержания и состояния здоровья животного в момент инфицирования вирусом лейкемии кошек.

В зависимости от сочетания вышеуказанных факторов при попадании вируса лейкемии кошек в организм могут развиваться следующие формы течения инфекции: абортивная; хроническая с развитием виремии и последующим полным выздоровлением; хроническая с развитием виремии и последующим пожизненным вирусоносительством; хроническая с развитием виремии, медленным прогрессированием и неминуемой гибелью.

Развитие болезни также может пойти несколькими путями: постоянная персистенция вируса в крови с развитием анемии, иммунодефицита и гибелью; развитие лейкемии; развитие лимфосаркомы; развитие аутоиммунных поражений (стоматита, гломерулонефрита, гепатита).

Путь развития заболевания зависит от первичных факторов заражения, формы течения инфекции, патогенности и вирулентности вируса, условий содержания кошки.

Показатели инфицированности кошек FeLV (15.8%) в Московском мегаполисе являются довольно значимыми и, учитывая, что размер исследованной выборки по инфекции был около тысячи животных, то настоящие результаты позволяют сделать вывод о высокой доли распространенности FeLV во всей популяции кошек. Характер территориального распределения инфицированных животных в Московском мегаполисе показывает большую частоту встречаемости заболевания в периферийных районах, что наиболее вероятно, говорит о привязке к спальным районам и районам Новой Москвы, где животные могут находиться на полувольном содержании.

Заметные патологические изменения в кроветворной и лимфоретикулярной системах наблюдаются меньше чем у половины обследованных животных, что объясняется длительным латентным периодом ретровирусных инфекций. У животных с выраженным понижением гематокрита при FeLV происходит преимущественно увеличение абсолютного числа лимфоцитов. Однако, снижение гематокрита и числа эритроцитов далеко не всегда коррелирует с изменениями в лимфоцитарной системе.

При вирусном лейкозе у кошек лимфоциты могут оставаться в пределах нормы, так могут или патологически повышаться (24% от всей выборки) или понижаться (29 % от всей выборки). Одновременно, у животных с выраженными изменениями в абсолютном числе лимфоцитов, гематокрит и абсолютное числа число эритроцитов часто занижены незначительно. Это подтверждает предположение, что в ходе развития болезни при ретровирусных инфекциях поражаются не все виды клеток кроветворной и лимфоретикулярной системы, а только их определенные клоны – либо стволовые клетки эритроцитов, либо лимфоциты.

#### БИБЛИОГРАФИЯ

1. Бажибина, Е.Б. Лейкемия и иммунодефицит – скрытые вирусные инфекции кошек // РВЖ. МДЖ. – 2010 – №1 – с.14-16.
2. Чандлер Э.А., Гаскелл К.Дж., Гаскелл Р.М. Болезни кошек // Москва, Аквариум ЛТД, 2002, с.688.
3. Забережный А.Д., Гулюкин А.М., Полякова И.В., Дроздова Е.И. Современные способы модификации вакцинных вирусных штаммов. // В сборнике: Научные перспективы XXI века. Достижения и перспективы нового столетия. X Международная научно-практическая конференция. Серия «Медицинские науки. Биологические науки», 2015, с.155-158.
4. Забережный А.Д., Костина Л.В., Южаков А.Г. и др. Современная таксономия вирусов // Ветеринария и кормление – 2017 – №6 – с.24-34.
5. Тихонов И.В., Гаврилов В.А., Девришов Д.А. и др. Практикум по биотехнологии. МГАВМиБ, 2010, с.330.
6. Урбан В.П., Сафин М.А., Сидорчук А.А. и др. // Практикум по эпизоотологии и инфекционным болезням с ветеринарно-санитарной санитарией. Москва, КолосС, 2003, с.280.
7. Островский, В.К. Мащенко А.В., Янголенко Д.В. и др. Показатели крови и лейкоцитарного индекса интоксикации в оценке тяжести и определении прогноза при воспалительных, гнойных и гнойно-деструктивных заболеваниях. // Клиническая лабораторная диагностика – 2006 – №6 – с.50-53.
8. Сперанский В.В., Дмитриева И.И., Зарипова Р.М. Иммунологическая информативность лейкоцитограммы // Клиническая лабораторная диагностика – 1999 – №12 – с.6-7.
9. Степанова Т.В. Анализ экономического ущерба при заболевании лейкозом крупного рогатого скота за период с 2010 по 2014 годы в Российской Федерации // Russian Journal of Agricultural and Socio-Economic Sciences, 8(56), August 2016, pp. 49-56.
10. Иванова Л.А., Козырева Н.Г., Степанова Т.В., Гулюкин М.И. Некоторые аспекты воспроизведения ретровирусной инфекции в эксперименте на гетерологичных видах животных // «Инфекционные болезни», том14, №S1, Материалы VIII Ежегодного Всероссийского Конгресса по инфекционным болезням с международным участием, Москва, 28-30 марта 2016, стр. 117
11. Иванова Л.А., Козырева Н.Г., Степанова Т.В., Гулюкин М.И. Тест-система для выявления ДНК провируса ВЛКРС инфекции методом полимеразной цепной реакции в режиме реального времени // «Веткорм», №4, 2013 г., стр. 45-47
12. Козырева Н.Г., Иванова Л.А., Степанова Т.В., Клименко А.И., Коваленко А.В., Дробин Ю.Д. Межвидовая передача вируса лейкоза крупного рогатого скота в эксперименте // «Вопросы вирусологии», № 5, том 60, 2015 г., стр. 32-37
13. Белименко В.В., Новосад Е.В., Гулюкин А.М. Экономический ущерб, причиняемый пироплазмидозами сельскохозяйственных животных в России // Ветеринария Кубани. 2017. №2. С. 6-7
14. Гулюкин А.М. Значимость современных методов лабораторной диагностики и идентификации возбудителя бешенства для иммунологического мониторинга данного зооноза // Вопросы вирусологии. 2014. Т.59. №3. С. 5-10

15. Хисматуллина Н.А., Гулюкин А.М., Шуралев Э.А., Хаертынов К.С. и др. Ускоренный метод диагностики бешенства в культуре клеток невриномы Гассерова узла крысы (НГУК-1) // Гены и клетки. 2014. Т.9. № 3-В. С. 276-280
16. Гулюкин А.М., Шабейкин А.А., Белименко В.В. Эпизоотологические геоинформационные системы. Возможности и перспективы // Ветеринария. 2016. №7. С.5-10
17. Belimenko V.V., Gulyukin A.M. Prospects For The Use Of Geographic Information Systems For Risk-based Monitoring Of Natural Focal Diseases Of Animals And Humans // Russian Journal of Agricultural and Socio-Economic Sciences, 8(56), August 2016, pp. 22-25
18. Stafford V.V. Application of Immunohistochemistry in Diagnostics // Russian Journal of Agricultural and Socio-Economic Sciences, 8(56), August 2016, pp. 18-21
19. Гулюкин М.И. и соавт. Практическое пособие по мониторингу бруцеллеза, туберкулеза, паратуберкулеза и лейкоза крупного рогатого скота: организационно - хозяйственные, ветеринарно-санитарные и зоогигиенические аспекты профилактики и ликвидации этих инфекций / М., ООО «Агентство творческих технологий», 2014 г., 74 с.
20. Shabeykin, A.A. Overview of the epizootic situation on rabies for 2015 in the Russian Federation / A.A. Shabeykin, A.M. Gulyukin // Russian Journal of Agricultural and Socio-Economic Sciences. 2- 016. - Т. 56. -№ 8. - С. 57-66.

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## THE LINE OF VITAMINIZED BAKERY FOR THE REGIONS OF FAR NORTH

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### ABSTRACT

Now marked out 11 categories of non-alimentary substances for which their pharmacological effect are proved (food fibers, oligosaccharides, phenolic compounds, polyunsaturated fatty acids, glycolipids, isoprenoids, vitamins, phospholipids and etc). At the same time, food engineering for health products and food products with specialized purposes are developing. To develop the domestic economy, the problem of complex processing of agricultural raw materials is urgent.

### KEY WORDS

Bakery products, production, thermal energy, line of products, continuous cycle.

A constructive solution that partially solves the issue of the consistency of the individual stages of the baking process and the compact placement of individual assemblies is proposed.

Vitaminization with fish minced meat is ensured by the fact that in the line for baking goods with filling, containing forms made as separate elements, articulated by a flexible connection to form an endless belt, a heating element, a dough dispenser and mechanisms for preparing and removing molds in the form of levers with electromagnets placed in them. In addition, the individual elements are made in the form of hollow cylinders of non-magnetic material, the upper and lower parts of which are made through grooves with the upper and lower covers installed in them with the possibility of longitudinal displacement, and the annular substrate of ferromagnetic material placed between them; removing the pushers with electromagnetic actuators are installed with the possibility of reciprocating movement, and the mechanisms of preparation and removal of molds and reciprocating pushers with an electromagnet drive synchronized with each other, while the mechanism of removal of forms is synchronized with the filling dispenser installed above it.

Technical result during the using of the proposed line is provided by the implementation of separate elements in the form of hollow cylinders of non-magnetic material, in the upper and lower parts of which are made through grooves with upper and lower covers installed in them with the possibility of longitudinal displacement. The arrangement between these covers of an annular substrate of ferromagnetic material allows realizing in a single continuous production cycle the forming of test billets, filling of them and making the necessary final heat treatment. This is facilitated by the fact that for the preparation and removal of the covers, the pushers with electromagnetic drive are installed with the possibility of reciprocating movement. Since the mechanisms for the preparation and removal of molds and the reciprocating pushers with electromagnetic drive are synchronized with each other, the mechanism for removing the molds is synchronized with the filling dispenser installed above it. The bakery products meet the necessary quality requirements, and the time for their

production is significantly reduced. The efficiency of the device is determined by the fact that the entire baking process up to obtaining the finished product is made in a continuous cycle on a single conveyor line. This ensures the natural synchronization of individual stages. On the other hand, this design allows more complete use of the heat energy of the tunnel kiln and significantly reduces the production area. In addition, the unification of individual parts of the device facilitates its manufacture and further reduces operational costs, for example, during the repairing process.

The main scheme of the line is presented on the Figure 1. Such line for baking products with a filling contains forms completed in as separated elements, articulated with a flexible connection to form an endless line 1, the heating element 2, the dough dispensers 3 and the filler dispenser 4, the mold preparation mechanisms 5 and the mold removal mechanism 6, the individual elements 1 being made in the form of hollow cylinders of non-magnetic material, the upper and lower parts of which are made through grooves with the grooves the possibility of longitudinal displacement of the upper and lower covers, between which is placed an annular substrate of ferromagnetic material. For the preparation and removal of the covers, the electromagnetically driven pushers 7 are arranged for reciprocating movement, the preparation mechanism and the mold removal mechanism being in the form of levers with the electromagnets arranged therein and synchronized with each other and with the reciprocating pushers 7, and the mechanism for removing the molds synchronized also with the filler dispenser installed above it.

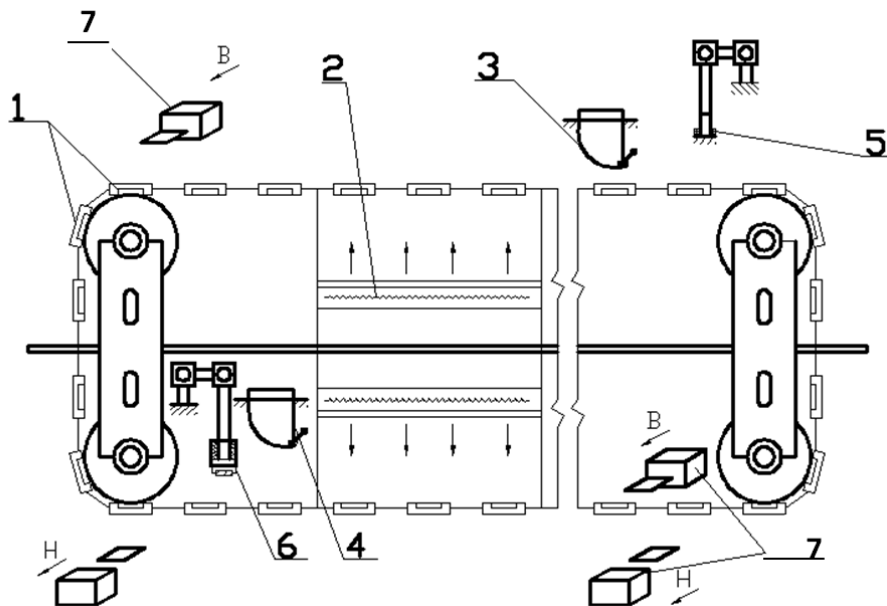


Figure 1 – The principal scheme of the line for baking products with filling: 1 – the line; 2 – the heating element; 3 – the dough dispenser; 4 – the filler dispenser; 5 – the mold preparation mechanisms; 6 – the mold removal mechanism; 7 – the pusher

The baking line works as follows. When the endless belt 1 is moving along the upper transport section of the installation, a separate element of the tape 1 enters the area of the mechanism for preparing the molds 5, made in the form of a hollow cylinder of non-magnetic material, the upper and lower parts of which are made through grooves with one in them with the possibility of longitudinal move of the bottom cover.

The mechanism for preparing the molds 5 places an annular substrate of a ferromagnetic material on this cover. With further transfer of the endless belt from the dough dispenser 3, a certain dose of dough is placed on this substrate, which, filling the gaps, takes the form of a test billet, and then enters the area of action of the heating element 2. After the heat treatment of the test billet, the element 1 is moved to the zone of action of the first reciprocating pusher, which in the free slot of the cylinder places the top cover. When the

element 1 is moved to the lower transport portion of the installation, the lower cover, on which the ferromagnetic annular substrate was previously supported, is removed to the zone of the second reciprocating pusher 7. Then, the removal mechanism of the molds 6 removes this ferromagnetic annular substrate, after which a certain amount of filling is placed on the test billet. The semi-finished product enters the zone of the heating element 2, where it passes the final heat treatment.

When the element 1 is moved to the zone of operation of the third and fourth reciprocating pushers 7 from the cylinder, the lid on which the finished article rests is removed and it is unloaded from the element 1, and instead of this, at the same time, a lid is placed in the slots, 5 will place an annular substrate of ferromagnetic material. Then the cycle of baking is repeated. It is important that the synchronization of the mechanisms 5 and 6 with the pushers 7 makes it possible to provide a practically continuous movement of the mold in the form of separate elements articulated by a flexible connection to form an endless belt, and the synchronization of the mechanism for removing the molds also with the filler metering device installed above it provides baking products of required quality.

The described design of the device allows to obtain finished products in a single technological cycle with high quality and minimal use of production areas and energy resources, ensuring at the same time, through the unification of nodes, insignificant operating costs, for example, during repair and maintenance.

Successful operation of the described line for baking open bakery products filled with fish products requires careful calculation of its individual elements, including dispensers, the most critical part of which is a screw compressor.

Considering the given above data of the study of the structural and mechanical characteristics of combined fish-groats and fish-vegetable masses, which can be used as fillings, the following methodology for calculating the screw supercharger can be recommended.

The simplified linear theory of worm-blowers uses a model of the movement of the food medium between parallel plates. It is assumed that the environment has a linear viscosity, is incompressible, the process of displacement of the environment is isothermal and laminar. The channel of the screw feeder in this case is represented as a horizontal cylinder of rectangular cross section with one movable wall, the principle of inverted relative movement of the auger and auger channel is used (Fig. 2).

Let us also assume that the outer diameter of the auger and the inner diameter of the auger cylinder coincide, i.e. There is no gap in which there may be a reverse flow of material. The flow in this gap can be taken into account separately. Then the velocity of the upper plate in the rectangular channel.

$$V_z = \frac{\pi D n}{60} \cos \varphi \quad (1)$$

Where:  $V_z$  – the projection of the velocity of the points of the screw with  $y=h$  on the axis  $z$ ;  $n$  – angular velocity of the screw in revolutions per minute ;  $D$  – outer diameter of the auger;  $\varphi$  – the angle of the helix of the auger.

The equation of motion in the projections on the  $z$  axis:

$$\rho \left( \frac{\partial v_z}{\partial t} + v_x \frac{\partial v_z}{\partial x} + v_y \frac{\partial v_z}{\partial y} + v_z \frac{\partial v_z}{\partial z} \right) = - \frac{\partial P}{\partial z} + \left( \frac{\partial \tau_{xz}}{\partial x} + \frac{\partial \tau_{yz}}{\partial y} + \frac{\partial \tau_{zz}}{\partial z} \right) + \rho g_z \quad (2)$$

The rheological equations of the Newtonian fluid in rectangular coordinates for this case (taking into account that the coefficient  $\lambda$  of bulk viscosity is 0) have the form:

$$\tau_{xz} = \mu \left( \frac{\partial v_z}{\partial x} + \frac{\partial v_x}{\partial z} \right) \quad (3)$$

$$\tau_{yz} = \mu \left( \frac{\partial v_y}{\partial z} + \frac{\partial v_z}{\partial y} \right) \quad (4)$$

$$\tau_{zz} = \mu \left[ \frac{\partial v_z}{\partial z} - \frac{2}{3} \left( \frac{\partial v_x}{\partial x} + \frac{\partial v_y}{\partial y} + \frac{\partial v_z}{\partial z} \right) \right] \quad (5)$$

Where:  $\tau_{xz}, \tau_{yz}, \tau_{zz}$  - components of the components of the tensor of tangential stresses (deviator of the stress tensor).

Let's substitute expressions (3) - (5) in equation (2) and take into account the following simplifications:

- in view of the stationarity of the flow  $\frac{\partial v_z}{\partial t} = 0$  ;
- in a plane-parallel channel model  $v_x = v_y = 0$  ;
- the geometry of the channel along the z axis does not change, where  $\frac{\partial v_z}{\partial z} = 0$  ;
- the fluid is incompressible, where  $\lambda = 0; \rho = const.$  ;
- the horizontal channel, where  $g_z = 0$  .

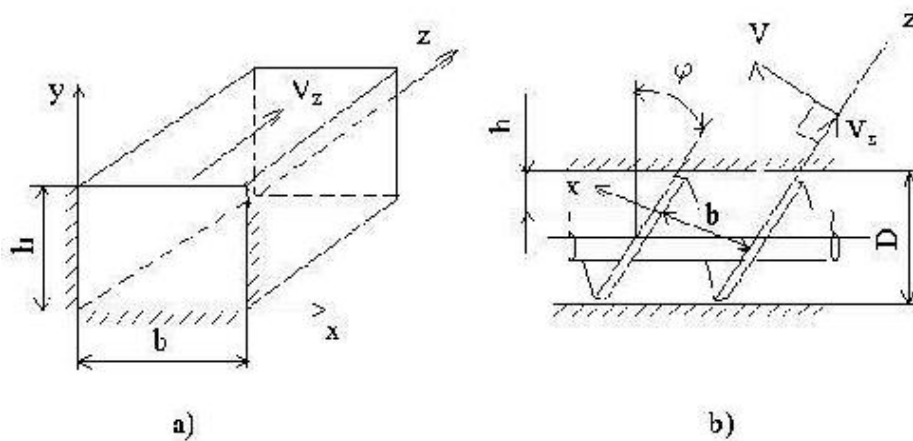


Figure 2 – Schematic diagram of auger feeder

Taking into account the above simplifications, the differential equation of motion for the theory of worm-blowers will have the form:

$$\frac{\partial^2 v_z}{\partial x^2} + \frac{\partial^2 v_z}{\partial y^2} = \frac{1}{\mu} \left( \frac{\partial P}{\partial z} \right) \quad (6)$$

Let's suppose that for shallow and wide channels the flow velocity depends little on the coordinate  $x$ . Then equation (6) becomes even simpler and leads to a boundary-value problem of the form:

$$\frac{d^2 v_z}{dy^2} = \frac{1}{\mu} \left( \frac{\partial P}{\partial z} \right); v_z(0) = 0; v_z(h) = V_z \tag{7}$$

Solving this boundary-value problem, let's obtain an expression for the distribution of the flow velocities of the medium in the helical channel, as a function of the coordinate  $y$ :

$$v_z(y) = y \left( \frac{V_z}{h} \right) - \frac{y^2}{2\mu} \left( \frac{\partial P}{\partial z} \right) \tag{8}$$

By integration, let's obtain a formula for constructing the discharge-pressure characteristic of a worm-blower:

$$Q = b \int_0^h v_z(y) dy = \frac{V_z b h}{2} - \frac{b h^3}{12\mu} \left( \frac{\partial P}{\partial z} \right) \tag{9}$$

Of course, in the derivation of the obtained formulas, significant simplifications were made, but the main regularities of worm-blowers in the food industry describe these dependencies quite satisfactorily, especially if the effective viscosity coefficient for a non-Newtonian food medium at a certain effective shear rate is used instead of the dynamic viscosity coefficient of the Newtonian fluid model, which especially important for example for fish minced meat and pastes.

After the additional integration, let us obtain a formula for the flow rate of the medium, caused by the pressure drop:

$$Q_1 = - \frac{b h^3}{12\mu} \left( \frac{\partial P}{\partial z} \right) \left[ 1 - \frac{192h}{\pi^5 b} \sum_{n=1,3,5}^{\infty} \frac{1}{n^5} \cdot th \left( \frac{n\pi b}{2h} \right) \right] \tag{10}$$

To interpolate the values of the correction factors for other values of the ratio of the depth and width of the worm channel, it is possible to use the program in Mathcad and plot the graph (Fig. 3)

N := 50

$$f(x) := \frac{16 \cdot \sum_{n=1}^N \frac{1}{n^3} \cdot \frac{1 - \cos(n \cdot \pi)}{2} \cdot \tanh\left(\frac{n \cdot \pi \cdot x}{2}\right)}{(\pi)^3 \cdot x}$$

$$f1(x) := \left[ 1 - \frac{192x}{\pi^5} \cdot \left( \sum_{n=1}^N \frac{1}{n^5} \cdot \frac{1 - \cos(n \cdot \pi)}{2} \cdot \tanh\left(\frac{n \cdot \pi}{2 \cdot x}\right) \right) \right]$$

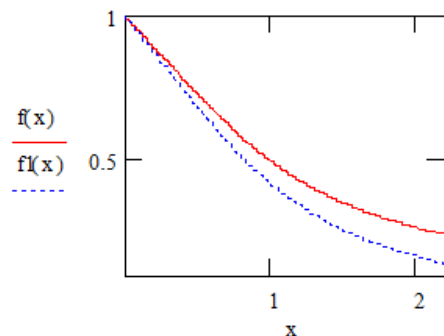


Figure 3 – The dependence of the refinement coefficients on the ratio of depth and width of the channel

The obtained results allow to design screw dispensers for completing the proposed line and to ensure the release of fortified bakery products in the form of open pies.



## REFERENCES

1. Romanchikov S.A. Perspektivy razvitiya modifitsirovannykh vidov prodovol'stviya [Tekst] / S.A. Romanchikov, A.V. Grishin, E.M. Sidorov // Sbornik Materialov IX Mezhdunarodnoj zaochnoj nauchno-prakticheskoy konferencii: «Problemy vosproizvodstva obshhestvennogo kapitala v kontekste global'nogo neravenstva» (Krasnodar, 15.07.2014) FGBU «Rossijskoe ehnergeticheskoe agentstvo» 2014. S. 131-138.
2. Romanchikov S.A. Innovacionnye resheniya v sfere proizvodstva produkcii agropromyshlennykh predpriyatij [Tekst] / A.A. Sychev, S.A. Romanchikov // Sbornik nauchnoj konferencii s mezhdunarodnym uchastiem «Nedelya nauki v SPBPU» (Sankt-Peterburg 14-19.11.2016 g.)- ch. 1 CPb.: Izd-vo «Sankt-Peterburgskij politexnicheskij universitet Petra Velikogo» 2016. S. 61-63.
3. Akulich A.A., Vasyukova A.G., Nekrasova S.O. Vliyanie tradicionnykh sposobov teplovoj obrabotki na soxrannost' belkovykh veshhestv ryby // Industrial'nye tekhnologii proizvodstva produkcii obshhestvennogo pitaniya. – M.: 1985 /1987/. – s. 158-162.
4. Aret V.A., Azarov B.M. Inzhenernaya reologiya pishhevyykh proizvodstv.-M.: MTIPP, 1978.- 112 s.
5. Artemenko V.E., Zdobnov A.I. Razrabotka tekhnologicheskix sxem proizvodstva myasnykh i rybnykh izdelij s ehmul'siyami na osnove ovoshhej // Uskorenie nauchno-tekhnicheskogo progressa v obshhestvennom pitanii. – Kiev, 1987. – Vyp. 22. – s. 86-89.
6. Berezovikova I.P. Razrabotka tekhnologii kulinarnoj produkcii s vysokim sodержaniem pishhevyykh volokon: Avtoref. dis. ... kand. texn. nauk /LIST im. F. Ehngel'sa. – L., 1989. – 16 s.
7. Bidenko M.S., Artyuxova S.A. Perspektivy razvitiya tekhnologii konservov iz ob"ektov okeanicheskogo promysla. – Kaliningrad: AtlantNIRO, 1987. – s. 4-10.

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## CONSUMER PREFERENCE ANALYSIS TOWARDS CORN MILK USING KANO MODEL

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### ABSTRACT

The objective of this study is to describe level of acceptance and customer satisfaction towards corn milk produced by ABEC (Agroindustrial Business and Entrepreneurship Center). It utilized the Kano model. The findings showed based on CSC (Customer Satisfaction Coefficient) score that indicated the customer preference, the attributes of the corn milk with the highest CSC was its nutritional value. Its IBT was 0.48 and IWT was -0.58. The nutritional value contained information related to storage instruction, nutritional content, expiration date, producer contact number, halal label, and production permit (P-IRT). The corn milk packaging should convey those information otherwise customer satisfaction level was getting lower.

### KEY WORDS

Customer, preference, satisfaction, corn milk.

Nutrition plays such a pivotal role in human survival. Nutrition can be obtained from daily consumption of food and beverages; one of which is milk. Despite plentiful nutrition it contains, some people cannot digest milk as it may cause intolerance, either lactose intolerance or protein intolerance (Widodo, 2002). In addition, Harianja, et.al (2015) stated that milk from animal is generally more expensive and therefore, some people may not afford it. Therefore, more affordable, accessible and more importantly nutritious type of milk is needed.

Therefore, it takes the raw material of milk maker besides animal milk which is cheap and easy to get but has high nutritional value.

Milk produced from vegetable milk, such as corn milk, can be an alternative to milk from animals more particularly individual with lactose intolerant. As a type of beverage, corn milk is able to provide much needed nutrition because it does not contain any cholesterol (Ikawati, 2013). One of the companies producing corn milk in Malang is ABEC (Agroindustrial Business and Entrepreneurship Center). ABEC is a business unit under the Department of Agricultural Industrial Technology, Faculty of Agricultural Technology, Brawijaya University. ABEC has not conducted any test market yet and as the consequence, the company does not understand whether or not customer are satisfied with their product.

During this time, corn milk produced by ABEC has never been tested consumer acceptance, so the producers have not yet know whether corn milk has met the expectations of consumers or not.

As an innovation, corn milk should be able to meet customer expectation more particularly lactose intolerant individual's need for nutritious milk substitute. Prior to purchase, consumers will make timely and various consideration. Success of a company in introducing product to the market will depend on level of acceptance from customers (Juanda, et.al, 2011). One method that can be used to find out customer perspective towards quality of a product is Kano Method. Kano method is a method that aims to categorize attributes of a product or service based on how well the product or service meeting customer needs or satisfaction (Widiawan, 2004). Advantage of Kano method is that it is able to describe satisfaction and dissatisfaction of consumers towards product attributes simultaneously. However, it has some shortcomings in terms of classification; the method is able to classify every attribute a product has but not a combination of several attributes (Tan, 2004). The

objective of this study is to obtain information on corn milk customer level of acceptance and customer satisfaction.

## METHODS OF RESEARCH

As many as 100 respondents were involved in the study. Sample size (minimum samples) is determined once the questionnaire had been valid and reliable. Asnawi and Masyhuri (2011) suggested that minimum samples for descriptive study is 100 samples. David Garvin's 8 (eight) dimension of qualities, namely performance, feature, reliability, conformance, durability, serviceability, aesthetic and perception were used to improve the corn milk attributes. Those eight dimensions were then elaborated into several attributes. Table 1 described the questionnaire used to improve customer satisfaction and level of acceptance of the corn milk.

Table 1 – Operational Definition of Corn Milk Attributes

| No | Attribute      | Operational Definition                               |
|----|----------------|--|
| 1  | Performance    | Flavor<br>Price<br>Corn aroma                        |
| 2  | Feature        | No artificial sweetener<br>No preservative           |
| 3  | Reliability    | Storage information<br>Serving instructions          |
| 4  | Conformance    | Thickness<br>Nutritional Content                     |
| 5  | Durability     | Expired date   |
| 6  | Serviceability | Producer or customer service                         |
| 7  | Aesthetic      | Good packaging<br>Good design                        |
| 8  | Perception     | Halal brand<br>Production permit information (P-IRT) |

Kano model was used in data analysis method. The data were obtained from the questionnaire. Amran (2010) explained that Kano model was developed based on several analyses, namely:

*Designing and trying out questionnaire.* The questionnaire aimed at describing customer's opinion towards certain attribute of a product. To describe customer's opinion, questionnaire should be able to reveal two types of information, functional (customer's perception when product has certain attributes) and dysfunctional (customer's perception when product does not have certain attributes). Likert scale, of which score ranges from 1 to 5, was used for the questionnaire. The scores in the scale conveyed the following information:

- 1 = agree and preferable
- 2 = strongly agree
- 3 = neutral
- 4 = indifferent
- 5 = disagree

*Evaluation and Interpretation.* Having distributed the questionnaire to the samples, the data were evaluated in three stages, namely:

Combining the samples' responses on both the functional and dysfunctional questions. The Kano category was used for classifying the responses. The results were several categories describing the product attributes;

Tallying frequency of the Kano categories and then determining the Kano category using Blauth's formula with the following requirements: when frequency of (O + A + M) category > that of (I + R + Q) category, grade obtained was the maximum grade of the (O, A, M) category (Ramadhani, 2011); when frequency of (O + A + M) < that of (I + R + Q), grade obtained was the maximum grade of the (I, R, Q) category (Ramadhani, 2011).

Analyzing the Customer Satisfaction Coefficient (CSC) to describe the customer satisfaction level. The formula for CSC was:

$$IBT = \frac{A+O}{A+O+M+I} \qquad IWT = - \left( \frac{M+O}{A+O+M+I} \right)$$

Sauerwein as cited in Mufti (2012) stated that IBT referred to “if better than” indicating that average customer satisfaction level would increase if a product had A (attractive) and O (one-dimensional) attributes.

IWT referred to “if worse than” indicating that average customer satisfaction level would increase if a product contained all of the attributes of M (must be) and O (one-dimensional).

Once the Kano coefficients for customer satisfaction had been obtained, the scores were transformed into a graph (Amran, 2010). The closer a score was to (0,1), (-1,1) and (-1,0) of the graph, the influence of the attributes was more significant for both customer satisfaction and dissatisfaction (Wijaya, 2009).

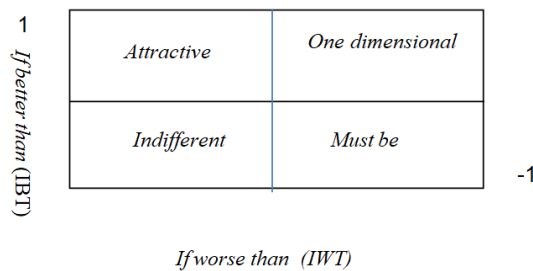


Figure 1 – Kano Coefficient for Customer Satisfaction Graph

The criteria used to decide alternatives in improving product attributes were as follow:  
 Producers should pay close attention to attributes that customers considered as must be, one dimensional, and attractive;  
 Taking “indifferent,” one of the attributes, into consideration since the attribute does not have any influence towards either customer satisfaction or dissatisfaction;  
 Avoid “reverse” attribute because it is the attribute customers do not like the most.

**RESULTS AND DISCUSSION**

*Validity Testing Results.* Validity testing was conducted using the product moment correlation formula, making comparison between  $r_{ratio}$  and  $r_{table}$ . When  $r_{ratio} > r_{table}$ , variable was considered valid.

Table 2 – Validity Testing Result

| No | Product Attribute   | $R_{ratio}$ |               | $r_{table}$ | Description               |
|----|---|-------------|---------------|-------------|---------------------------|
|    |   | Functional  | Dysfunctional |             |                           |
| 1  | Change in flavor  | 0.321       | 0.319         | 0.183       | Valid                     |
| 2  | Change in pricing   | 0.233       | 0.218         | 0.183       | Valid                     |
| 3  | Change in aroma   | 0.382       | 0.378         | 0.183       | Valid                     |
| 4  | Artificial sweetener                                      | 0.146       | 0.222         | 0.183       | F (Not Valid) / D (Valid) |
| 5  | Preservatives   | 0.217       | 0.208         | 0.183       | Valid                     |
| 6  | Serving instruction                                       | 0.505       | 0.627         | 0.183       | Valid                     |
| 7  | Storage instruction                                       | 0.566       | 0.654         | 0.183       | Valid                     |
| 8  | Change in thickness                                       | 0.410       | 0.362         | 0.183       | Valid                     |
| 9  | Nutrient content  | 0.665       | 0.677         | 0.183       | Valid                     |
| 10 | Expiration date   | 0.589       | 0.648         | 0.183       | Valid                     |
| 11 | Producer’s contact number or customer service information | 0.507       | 0.613         | 0.183       | Valid                     |
| 12 | Change in packaging                                       | 0.530       | 0.496         | 0.183       | Valid                     |
| 13 | Change in design  | 0.609       | 0.578         | 0.183       | Valid                     |
| 14 | Halal label   | 0.571       | 0.600         | 0.183       | Valid                     |
| 15 | Production permit information (P-IRT)                     | 0.514       | 0.500         | 0.183       | Valid                     |

The SPSS output was used to obtain the  $r_{ratio}$ . Table 2 described the validity testing on the respondents' responses towards the functional and dysfunctional questions.

Based on Table 2, there was one invalid variable, artificial sweetener (attribute 4) categorized as functional attribute. The invalid variable was removed or excluded in the reliability testing.

*Reliability Testing Result.* The objective of the reliability testing is to describe how consistent an instrument is. In this study, the instrument was reliable if the Alpha Cronbach ( $\alpha$ ) score  $> 0.6$ . Table 3 described the result of the reliability testing.

Table 3 – Reliability Testing Result

| Type of Question | Total Item | Alpha Cronbach ( $\alpha$ ) | Description |
|------------------|------------|-----------------------------|-------------|
| Functional       | 15         | 0.725                       | Reliable    |
| Dysfunctional    | 15         | 0.753                       | Reliable    |

*Customer's Preference using Kano Model.* Based on the customer's preference, the categories for each of the product attribute were must be, attractive, one dimensional, reverse and indifferent. The categories were selected based on the Blauth's Formula or the highest of must be, one dimensional, attractive, indifferent, reverse and questionable. The attributes classified as one dimensional should be prioritized since customer satisfaction level is strongly related to performance of the attributes (Nofirza and Indrayani, 2011). The attributes categorized as one dimensional were storage information, nutritional content, producer's or customer service contact information, halal label and production permit information (P-IRT). The highest percentage was the production permit information (P-IRT) of which percentage was 39.13%.

The attributes categorized as attractiveness should be maintained as the level of customer satisfaction will increase as these attributes were getting higher and at the opposite, the customer satisfaction would decline if these attributes were getting lower (Nofirza and Indrayani, 2011). The attributes categorized as attractiveness were serving instruction and the percentage was 18.27%. At the same, they were also categorized as must-be. Must-be referred to attributes customers find necessary and their satisfaction would decrease as their performance was getting lower. Customers consider attributes that fall within this category as a necessity in a product. However, at the same time, customer satisfaction will not increase far above neutral even though the performance of these attributes is high. Must-be was a weak statement of satisfaction but more positive than neutral (Nofirza and Indrayani, 2011). The attributes classified as the must-be category were serving instruction and expiration date. The expiration date had the highest percentage that was 40.87%.

The customers did not pay close attention towards the indifferent category since it does not influence increase or decrease in the customer satisfaction (Nofirza and Indrayani, 2011). The attributes categorized as indifferent were change in flavor, price, and aroma as well as artificial sweetener, change in thickness, packaging and design of the packaging. Change in packaging had the highest percentage that was 62.6%.

Attributes categorized as reverse should be eliminated as they would decrease customer satisfaction. The attribute fell into the category was artificial sweetener. The percentage of the attribute was 62.61%.

*Customer Satisfaction Coefficient in the Kano Customer Satisfaction Coefficient Graph.* CSC (Customer Satisfaction Coefficient) showed both satisfaction and dissatisfaction coefficient; the coefficient represented customer preference towards certain product. IBT score represented how much attribute of a product influence customer satisfaction. The closer IBT score is to 1, the more significant influence an attribute has towards customer satisfaction. IWT score means there is not any product attribute that has influence towards customer satisfaction. The closer IWT score to -1, the more significant influence an attribute has towards customer satisfaction. Table 5 described the IBT and IWT scores of the product attributes.

Table 4 – Kano Category Frequency and Kano Category Results of the Corn Milk Attributes

| No | Product Attributes  | A      | O      | M      | I      | R      | Q     | A+O+M  | I+R+Q  | Total | Category |
|----|---|--------|--------|--------|--------|--------|-------|--------|--------|-------|----------|
| 1  | Change in flavor  | 16.50% | 6.09%  | 1.74%  | 49.50% | 23.48% | 2.69% | 24.33% | 75.67% | 100   | I        |
| 2  | Change in pricing   | 6.95%  | 4.35%  | 10.43% | 58.27% | 16.52% | 3.48% | 21.73% | 78.27% | 100   | I        |
| 3  | Change in aroma   | 7.83%  | 3.48%  | 5.22%  | 50.43% | 33.04% | 0     | 16.53% | 83.47% | 100   | I        |
| 4  | Artificial sweetener                                      | 3.48%  | 0.87%  | 0.87%  | 31.30% | 62.61% | 0.87% | 5.22%  | 94.78% | 100   | R        |
| 5  | Preservatives   | 6.09%  | 1.74%  | 0.87%  | 46.08% | 43.48% | 1.74% | 8.70%  | 91.30% | 100   | I        |
| 6  | Serving instruction                                       | 18.27% | 17.39% | 18.27% | 42.6%  | 2.6%   | 0.87% | 53.93% | 46.07% | 100   | A & M    |
| 7  | Storage instruction                                       | 13.91% | 26.10% | 22.61% | 33.04% | 4.34%  | 0     | 62.62% | 37.38% | 100   | O        |
| 8  | Change in thickness                                       | 11.3%  | 7.83%  | 5.22%  | 53.91% | 20%    | 1.74% | 24.35% | 75.65% | 100   | I        |
| 9  | Nutrient content  | 13.91% | 32.17% | 23.47% | 26.1%  | 3.48%  | 0.87% | 69.55% | 30.45% | 100   | O        |
| 10 | Expiration date   | 2.61%  | 38.26% | 40.87% | 11.3%  | 5.22%  | 1.74% | 81.74% | 18.26% | 100   | M        |
| 11 | Producer's contact number or customer service information | 12.17% | 26.96% | 23.48% | 31.3%  | 2.61%  | 3.48% | 62.61% | 37.39% | 100   | O        |
| 12 | Change in packaging                                       | 18.27% | 7.83%  | 6.95%  | 62.6%  | 3.48%  | 0.87% | 33.05% | 66.95% | 100   | I        |
| 13 | Change in design  | 26.10% | 13.04% | 9.56%  | 49.56% | 0.87%  | 0.87% | 48.70% | 51.30% | 100   | I        |
| 14 | Halal label   | 12.17% | 33.91% | 26.10% | 25.21% | 2.61%  | 0     | 72.18% | 27.82% | 100   | O        |
| 15 | Production permit information (P-IRT)                     | 6.09%  | 39.13% | 30.43% | 21.74% | 1.74%  | 0.87% | 75.65% | 24.35% | 100   | O        |

Table 5 – CSC Scores of the Corn Milk Attributes

| No | Product Attribute   | A+O | M+O | A+O+M+I | IBT  | IWT   |
|----|---|-----|-----|---------|------|-------|
| 1  | Change in flavor  | 26  | 9   | 79      | 0.33 | -0.11 |
| 2  | Change in pricing   | 13  | 17  | 92      | 0.14 | -0.18 |
| 3  | Change in aroma   | 13  | 10  | 77      | 0.16 | -0.13 |
| 4  | Artificial sweetener                                      | 5   | 2   | 42      | 0.12 | -0.04 |
| 5  | Preservatives   | 9   | 3   | 63      | 0.14 | -0.04 |
| 6  | Serving instruction                                       | 41  | 41  | 111     | 0.37 | -0.37 |
| 7  | Storage instruction                                       | 46  | 56  | 110     | 0.41 | -0.51 |
| 8  | Change in thickness                                       | 22  | 15  | 90      | 0.24 | -0.17 |
| 9  | Nutrient content  | 53  | 64  | 110     | 0.48 | -0.58 |
| 10 | Expiration date   | 47  | 91  | 107     | 0.44 | -0.85 |
| 11 | Producer's contact number or customer service information | 45  | 58  | 108     | 0.41 | -0.53 |
| 12 | Change in packaging                                       | 30  | 17  | 110     | 0.27 | -0.15 |
| 13 | Change in design  | 45  | 26  | 113     | 0.4  | -0.23 |
| 14 | Halal label   | 53  | 69  | 112     | 0.47 | -0.61 |
| 15 | Production permit information (P-IRT)                     | 52  | 80  | 112     | 0.46 | -0.71 |

Based on the IBT scores, the nutritional value had the highest IBT score that was 0.48. Halal label had the second highest attribute or 0.47. Production permit information (P-IRT) had the third highest IBT score or 0.46. The IBT scores of the product attribute revealed the following information:

- 1 Nutritional content would increase the customer service by 48%;
- 2 Halal label would increase the customer service by 47%;
- 3 Production permit information (P-IRT) would increase the customer service by 46%;
- 4 Expiration date would increase the customer service by 44%;
- 5 Storage information and producer or customer service contacts would increase the customer service by 41%.

Based on IWT scores, the expiration date had the highest IWT score or -0.85. Production permit information (P-IRT) was the attribute with the second highest IWT score or -0.71. Halal label was the attribute with the third highest IWT score or -0.61. The IWT scores of the product attribute revealed the following information:

- 1 Expiration date would increase the customer service by 85%;
- 2 Production permit information (P-IRT) would increase the customer service by 71%;
- 3 Halal label would increase the customer service by 61%;
- 4 Nutritional content would increase the customer service by 58%;
- 5 Producer or customer service information would increase the customer service by 53%;
- 6 Storage information would increase the customer service by 51%.

The Kano customer satisfaction coefficient (IBT and IWT) of each of the product attributes was later transformed into a graph. Figure 1 described graph describing Kano customer satisfaction coefficient. The graph provided information revealing position of an attribute towards the Kano category and how much influence it had towards the customer satisfaction or dissatisfaction.

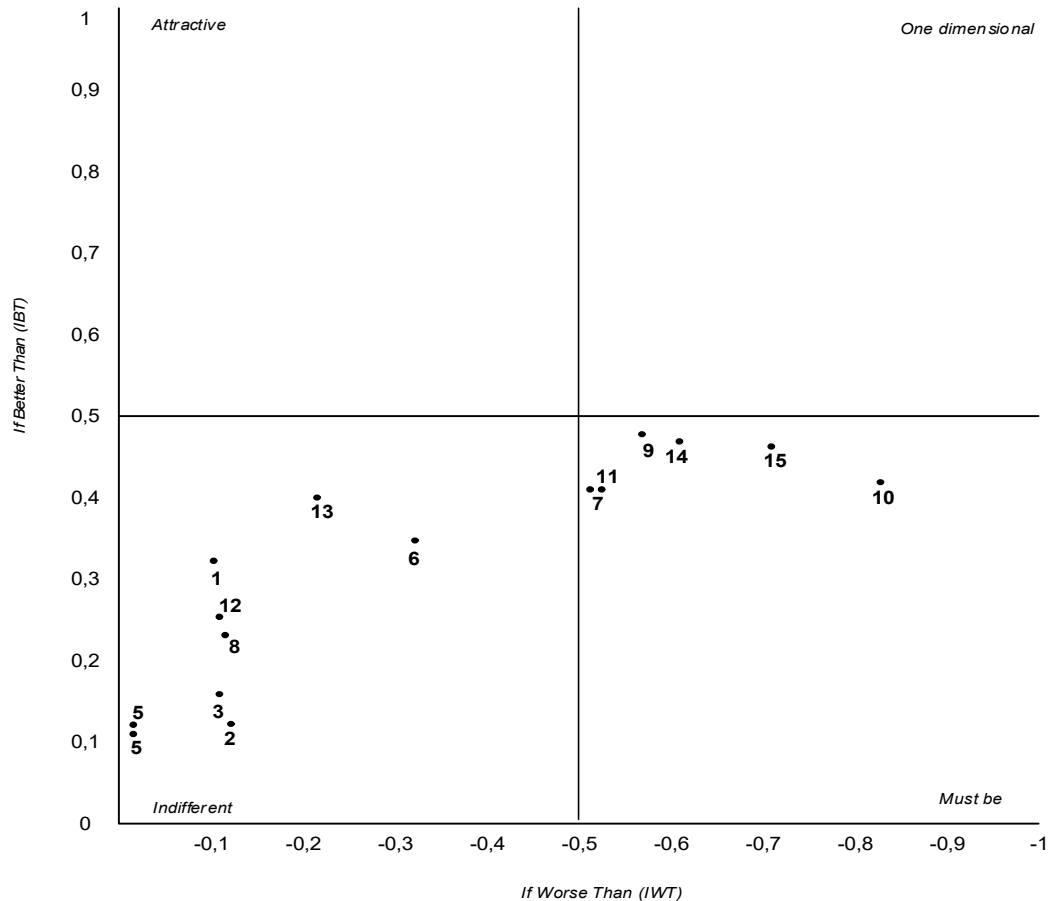


Figure 2 – Kano Customer Satisfaction Coefficient Graph

Based on Figure 2, the attributes categorized as must-be were storage instruction (attribute 7), nutritional content (attribute 9), expiration date (attribute 10), producer or customer service contacts (attribute 11), halal label (attribute 14), and production permit information (attribute 15). Product should provide all of these attributes because they influenced customer satisfaction; when these attributes had high performance, customer satisfaction increased and vice-versa. The attributes considered as indifferent were change in flavor (attribute 1), change in price (attribute 2), change in aroma (attribute 3), artificial sweetener (attribute 4), preservatives (attribute 5), serving instruction (attribute 6), thickness (attribute 8), change in packaging (attribute 12), and change in packaging (attribute 13). These attributes did not have any influence towards an increase or decrease in customer satisfaction.

## CONCLUSION

Based on the findings and discussions, the conclusions are:

Based on the IBT score, the attribute that has really significant influence towards the customer satisfaction is nutritional value of which percentage is 48%;

Based on the IWT score, the attribute that has really significant influence towards the customer satisfaction is expiration date of which percentage is 85%;

Based on the Kano coefficient graph mapping, the attributes categorized as must-be are the storage instruction, nutritional content, expiration date, producer or customer service contacts, halal label, and production permit information. Product should provide all of these attributes because they influence customer satisfaction; when these attributes have high performance, customer satisfaction increases and at the opposite when they have poor performance, the customer satisfaction will decrease.

## REFERENCES

- 1 Amran, T. G and Ekadeputra. 2010. Pengukuran Kepuasan Pelanggan Menggunakan Metode Kano dan Root Cause Analysis (Studi Kasus PLN Tangerang). Jurnal Jurusan Teknik Industri. FTI. Trisakti University. Jakarta.
- 2 Asnawi & Masyhuri. 2011. Metodologi Riset Manajemen Pemasaran. Malang: UIN Maliki Press
- 3 Harianja, C. H., Rusmarilin, H., and Yusraini, E. 2015. Pembuatan Susu Jagung dengan Pengayaan Kacang Hijau Bergerminasi dan Penambahan Cmc Sebagai Penstabil. Jurnal Rekayasa Pangan dan Pertanian 3(1).
- 4 Ikawati, M. N. 2013. Pemanfaatan Sukun (*Arthocarpus Altilis*) dan Susu Jagung (*Zea Mays*) dalam Pembuatan Es Krim dengan Penambahan CMC (Carboxy Methyl Cellulose). Published Manuscript. Department of Biology Education, Faculty of Education and Teacher Training. Muhammadiyah University of Surakarta. Surakarta.
- 5 Juanda, J., Cut E., and Hanum V.M. 2011. Studi Preferensi Konsumen Terhadap Roti Tawar Labu Kuning (*Cucurbitamoschata*). Jurusan Teknologi Hasil Pertanian. Faculty of Agriculture. Syiah Kuala Darussalam University. Banda Aceh.
- 6 Nofirza, I. K. 2011. Aplikasi Metode Kano Dalam Analisis Indikator Kualitas Pelayanan di Rumah Sakit Arifin Ahmad Pekanbaru. Jurnal Sains, Teknologi dan Industri. 9(1): 1-8.
- 7 Tan, K. C. 2004. Optimizing Product Design Using Teh Kano Model and QFD. IEE. International Engineering Management Conference, 8e21 Oct., pp1085e1089.
- 8 Widodo, W. 2002. Bioteknologi Fermentasi Susu. Center for Biotechnology Development, Muhammadiyah University of Malang. Malang.
- 9 Wijaya, T. 2011. Manajemen Kualitas Jasa. PT. Index. Yogyakarta.



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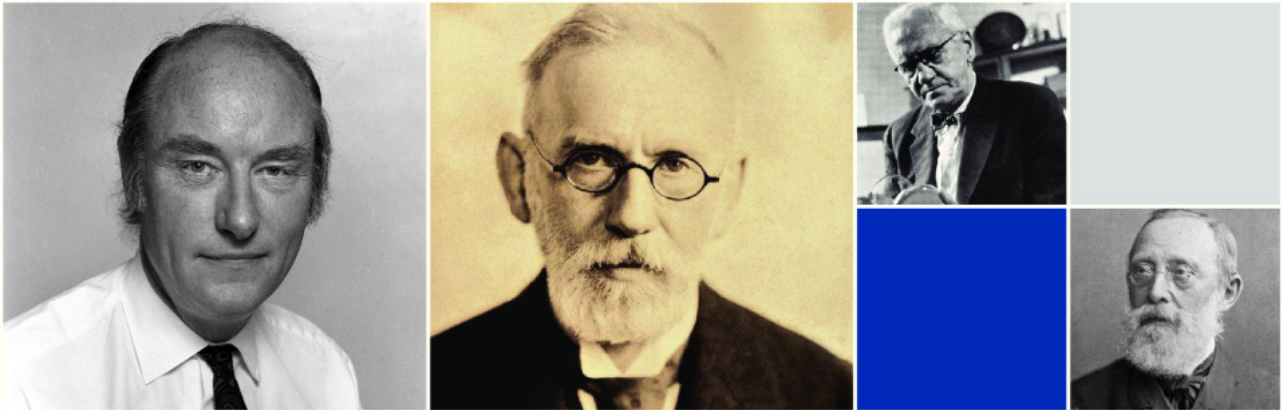
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