Motivation of Farmers in Controlling Powdery Mildew *(Peronospora destructor)* on Shallot in Food Estate *Hortikultura,* Humbang Hasundutan Regency

Tama Sari Kartikasih Napitupulu$^{(\boxtimes)}$, Tience Elisabet Pakpahan, and Elrisa Ramadhani

Politeknik Pembangunan Pertanian Medan, Deli Serdang, Indonesia
tamanapitupulu70@gmail.com

Abstract. This country has a big responsibility to the National food fulfillment. Food Estate is a big step taken by the Government to maintain the sustainability of food security in the country as well as a certain step to anticipate the occurrence of a food crisis especially in horticulture sector. Shallot is one of commodity that planted in Food Estate Hortikultura, Humbang Hasundutan Regency. Shallot that infected by the powdery mildew can make a big disadvantage for farmers. This study aims to determine the motivation of farmers and the factors that influenced the motivation of farmers in controlling the powdery mildew on shallot. This research was conducted in Food Estate Hortikultura, Humbang Hasundutan Regency which had aims of developing an integrated and competitive horticultural area, environmentally friendly and modern, encouraging collaboration with stakeholders, and encouraging corporate-based farmer institution. This location was determined purposive. Sampling was done by census that was taking the entire population of shallot farmers in Food Estate *Hortikultura.* The method of collecting data that used were questionnaires, interviews, and documentation, while the data analysis methods were using Likert scale and multiple linear regression. The research results showed that the motivation level of farmers in controlling the powdery mildew on Shallot was categorized very high which in 84,36%, and the factors that had a very significant effect on farmers' motivation in controlling Powdery mildew on Shallot were the Intensity of Following the Extension, Facilities and Infrastructure, Government Assistance, and Number of Family Dependents.

Keywords: Motivation · Shallot · Powdery mildew · Food estate · Humbang Hasundutan

1 Introduction

A country has a great responsibility in fulfilling its food. Sustainability and food security in Indonesia is not only the responsibility of the government and farmers, but involves full participation by all Indonesian people. The concept of food security in this era focuses more on the level of households and individuals than at the regional, national, and even international levels [1]. Vice Minister of Environment and Forestry, Alue Dohong

mentioned that securing domestic food needs had been carried out in China, India and Vietnam. This idea is very important to do because it is considered that there will be food scarcity in the future so that the Government seeks to maintain food security in Indonesia [2].

One of the locations of Food Estate development is carried out in Humbang Hasundutan Regency, North Sumatra Province. Shallot (*Allium ascalonicum* L.) is one of the three horticultural commodities in the Food Estate Hortikultura, Humbang Hasundutan Regency. There was an increase in the number of shallot production from 2018–2019. In 2018, the output of shallot was 163 and 368 quintals, and in 2019 it was 180 and 717 quintals. At the same time, Humbang Hasundutan Regency harvested 186 ha in 2018 and 189 ha in 2019 [3].

In February 2021, shallots were harvested at the Food Estate location, Humbang Hasundutan Regency. Even though the harvest had been done, not all of the cultivated land could be harvested properly due to the extreme weather. Shallot are very sensitive to environmental conditions that are humid, foggy, and high rainfall so that the fungus will form a large mass of spores that can infect the leaves and stems [4]. The Food Estate *Hortikultura* area was located in Pollung District with an altitude of 1400–1500 m above sea level (masl) with rainfall ranging from 1.131 mm/year which is evenly distributed from December to August and air humidity (RH) is 85.94% [5]. This might indicated that the development of fungi that could disserve shallot farmers during the planting period was quite high.

Downy Mildew (Peronospora destructor) is one of the diseases found in shallot in the Horticultural Food Estate, Humbang Hasundutan Regency. This disease is transmitted by wind and thrives at 15 °C with high humidity lasting for 6–12 h [6]. It is very possible that there was a massive attack on shallot plants caused by this fungus *Pseudoperonospora cubensis.*

Farmers as subjects who play a direct role in carrying out cultivation activities are expected to be able to carry out a good cultivation process, including controlling Plant Pest Organisms (PPO). Losses caused by Plant Pest Organisms (OPT) can reach Rp. 40.000.0000,00 [7]. This shows that farmers must have a big role in maintaining and controlling the shallot that are planted.

Everyone must have a motive to be their own motivation, reason and promoter, so that the individual wants to do something for his own life [8]. There is enthusiasm and the urge to work harder arises because of motivation [9]. Shallot farmers at Food Estate *Hortikultura* in Humbang Hasundutan Regency also need a clear motivation so that they can take care of the shallot plants.

The purpose of this study was to determine the motivation level of farmers in controlling powdery mildew on shallot and what factors could influence the motivation of farmers to control.

2   Materials and Methods

2.1   Presentation of the Study Area

The study was conducted at Food Estate *Hortikultura* in Humbang Hasundutan Regency, North Sumatra, from March 29 to May 23, 2021. Astronomically, this district was

located between 2°13'–2°28' North Latitude and 98°10'–98°57' East Longitude. Pollung District was located at an altitude of 1400–1500 masl with rainfall ranging from 1.131 mm/year which was evenly distributed from December to August and air humidity (RH) was 85.94% [5].

Topographically, the area of Humbang Hasundutan Regency had a wavy and hilly terrain. The soil types in this district were Lithosol, Andosol, and Latosol which have soil pH ranging from 4.5 to 7.5.

2.2 Sampling Methods

Determination of the place was done by purposive methods or intentionally with a specific purpose. The population in this study was shallot farmers who worked on their farming by joining the Food Estate program in Humbang Hasundutan Regency, which consisted of 85 people. The sample used was a saturation sample because if the population was smaller than 100 people, then the entire population was sampled [10].

2.3 Methods of Data Collection

There were two types and sources of data used, namely primary data obtained from respondent farmers and secondary data obtained from related agencies and institutions. The method of collecting data that used were questionnaires, interviews, and documentation.

The dependent factors used in this study were Age, Education, Number of Family Dependants, Land Area, Government Assistance, Facilities and Infrastructure, and intensity of attending counseling. While the independent factors were the Aspects of the Economic Environment, Social Environment Aspects, and Aspects of the Natural Environment.

2.4 Data Analysis

Before the questionnaire was given to respondents, there had been a validity and reliability test of the questionnaire which was used as a test tool for the respondents. Data collected using the sing the questionnaire was coded, classified, analyzed and interpreted using SPSS software version 25. To analyze the level of motivation of farmers in controlling powdery mildew on shallot at Food Estate Hortikultura, Humbang Hasundutan Regency was using a Likert Scale. The Likert model score or questionnaire used in this study refer to four alternative answers, namely Very High (VH) = 4, High (H) = 3, Low (L) = 2 and Very Low (VL) = 1.

In order to analyze the factors that influenced the level of motivation of farmers in controlling powdery mildew on shallot at Food Estate Horticulture, Humbang Hasundutan Regency was using multiple linear regression analysis based on ordinary least squares with the following equation:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + e$$

3   Results and Discussions

3.1   Respondent's Characteristics

Based on the results of the study, it was found that the characteristics of the respondents needed to know some of the background of the respondent's life. The average age of respondent farmers who were in the productive age range, that is, 15–64 [11] accounts for 94.12% of the total population. The percentage of male farmers was as high as 78.82%. Even so, gender does not determine a person's productivity in carrying out their activities [12]. The proportion of farmers with high school education was the highest, 52.94%. The land area of farmers who joined the Food Estate program in Humbang Hasundutan Regency also varies. However, the land area of 1.1–1.5 ha had the largest proportion, at 32.94%. The farming experience of the interviewed farmers was also relatively diverse, but the proportion of 1–7 years of farming experience was the highest, which was 24.71%.

3.2   The Motivation Level of Farmers

The motivations studied here were economic aspect, social aspect, and environment aspect. These aspects were used as a reference to see the motivation carried out in this study (see Figs. 1 and 2).

3.3   Economic Aspect

Based on the results of this study, it can be seen that the level of motivation of farmers in controlling powdery mildew on shallot at the Food Estate *Hortikultura*, Humbang Hasundutan Regency was 84.36%. From the economic point of view, respondents stated that this aspect was in accordance with the large number of family dependents and
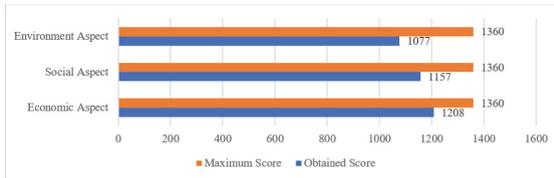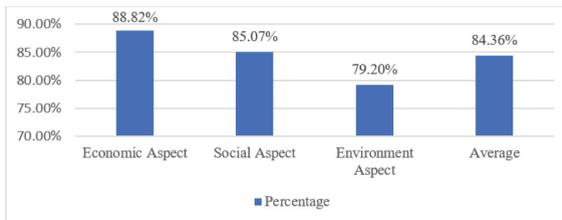

Fig. 1.   Level of farmer's motivation.

Fig. 2.   Percentage of farmer's motivation.

education. All respondents who had the same cultural background, that is the Batak tribe, hold the hereditary principle of this tribe itself, that is, "*Anakhonhi Do Hamoraon Di Ahu*" which means that their descendants are wealth for them. If farmers control powdery mildew properly, of course the tubers produced will be good, healthy, and can be harvested with a heavy weight.

This would certainly made the income of farmers could be higher. Moreover, the motivation of farmers in the level of production can be seen in the level of income and income that could meet daily needs, and finance children for school and could also buy household equipment and valuable items as savings [13].

3.4   Social Aspect

From the social point of view, can be seen that this aspect classified has a very high interval, that is 85,07%. Respondents stated that establishing good relations with people around them would have a very good impact on all lines of activities related to the social environment. As was known, powdery mildew is very easy to spread in humid places and has high rainfall. If it is not handled quickly, it will result in huge losses. The location of cultivation was at a fairly close distance, so that if it was affected in one place, it would easily spread to other plants. In this case, good cooperation between farmers and their assistants were needed so that the dissemination of this disease was quickly suppressed.

So, by collaborating with many people, of course, relationships would be established with various groups. By having many relationships, and establishing good cooperation, of course between farmers and assistants could exchange opinions and thoughts on how to control powdery mildew disease. The social conditions of the community support the farming systems, so that the farmers would be full of willingness to continue farming. Otherwise, it would be difficult for farmers to maintain agricultural land [14].

3.5   Environment Aspect

From the environment point of view, can be seen that this aspect classified had a very high interval, that was 79,12%. Respondents stated that the shallot was very suitable to be planted in the Humbang Hasundutan Regency because this location was in the highlands. However, unpredictable climatic conditions had discouraged farmers from cultivating shallot because they were susceptible to diseases, especially powdery mildew. However, because of the horticulture-based Food Estate Program and assistance from related parties, farmers were motivated to join this program and work on it. One of the things that is considered important to be considered in site selection and land management is the aspect of land suitability [15].

3.6   Factors that Influenced the Motivation of Farmers

The analysis of the factors that influenced the motivation of farmers in controlling powdery mildew on shallot in Food Estate *Hortikultura,* Humbang Hasundutan Regency was carried out in two stages of testing, namely simultaneous or overall testing (F test) and partial testing (T test). This analysis used Multiple Linear Regression test with a

Table 1. Analysis of factors that influenced farmer motivation

No	Variables	Coefficient	t value	Sig	Note
1.	Age	0,253	1,518	0.133	Unaffected
2.	Education	−0,115	−1,038	0,303	Unaffected
3.	Number of Family Dependents	0,543	2,797	0,007**	Definitely Affected**
4.	Land Area	−0,017	−0,084	0,933	Unaffected
5.	Government Assistance	0,441	3,601	0,001**	Definitely Affected**
6.	Facilities and Infrastructure	0,587	4,732	0,000**	Definitely Affected**
7.	Intensity of Following the Extension	0,773	6,489	0,000**	Definitely Affected**
	R: 0,777 R Square:0,604 Constanta: 5,392 F table: 2,88 F value: 16. 795 T table: 2,6412 (sig 1%)				

Source: Primary Data Analysis (2021)

confidence level of 99% ($\alpha = 0.01$). Based on the results of data processing for this study, an R Square of 0.604 was obtained. Then the value of the coefficient of determination obtained was 60.4%. This means that the variable X (age, education, number of family dependents, land area, government assistance, facilities and infrastructure, and intensity of following the extension) had a contribution value of 60.4% to the Y variable (Farmers' Motivation) and 39.6% others were influenced by other factors outside the variable X (Predictor). The results of this analysis can be seen in Table 1.

The effect of the variable X (independent) on the variable Y (dependent) partially using the T test. The results of the T test obtained inform the regression equation with constant coefficients and variable coefficients in the Unstandardized Coefficients B column. The equations of the multiple linear regression can be explained that the values in this equation.

$$Y = \alpha + \beta1X1 + \beta2X2 + \beta3X3 + \beta4X4 + \beta5X5 + \beta6X6 + \beta7X7 + e$$
$$Y = 5,392 + 0,253\ X1 - 0,115\ X2 + 0,543\ X3 - 0,017\ X4 + 0,441\ X5 + 0,587\ X6 + 0,773\ X7 + e$$

The regression equation can be explained as follows:

- The constant value (α) was 5.392, meaning that if all X variables are 0 then the farmer's motivation value is 5.392.
- The regression coefficient value for the Age variable (X1) was positive, namely 0.253, it means that each age variable will increase by 1 point, then the motivation value of farmers will increase by 0.253 assuming the value of the other X variables is constant.

- The regression coefficient value of the Education variable (X2) was negative, namely −0.115, it means that each education variable will increase by 1 point, then the motivation value of farmers will decrease by 0.115 assuming the value of the other X variables is constant.
- The regression coefficient value of the Number of Family Dependents variable (X3) was positive, namely 0.543, it means that each variable of the number of family dependents will increase by 1 point, the motivation value of farmers will increase by 0.543 assuming the value of the other X variables is constant.
- The regression coefficient value of the Land Area variable (X4) was negative, namely −0.017, it means that each Land Area variable will increase by 1 point, the motivation value of farmers will decrease by 0.017 assuming the value of the other X variables is constant.
- The regression coefficient value of the Government Assistance variable (X5) was positive, namely 0.441, it means that each government assistance variable will increase by 1 point, then the motivation value of farmers will increase by 0.441 assuming the value of the other X variables is constant.
- The regression coefficient value for the Facilities and Infrastructure variable (X6) was positive, namely 0.587, it means that each facility and infrastructure variable will increase by 1 point, so the motivation value of farmers will increase by 0.587 assuming the value of the other X variables is constant.
- The regression coefficient value of the Intensity of Following the Extension variable (X7) was positive, namely 0.773, meaning that each variable intensity of following the extension will increase by 1 point, the motivation value of farmers will increase by 0.773 assuming the value of the other X variables is constant.

3.7 F-Test

Based on the results of SPSS output, it can be seen that the F-value was 16.795. Then the value was compared with the F table, which is 2.88. Then it was found that 16.795 > 2.88 and the significance value was 0.000 which is smaller than 0.01. This means that the X variable simultaneously affected the Y variable, meaning that from the test results together, the independent factors, namely internal and external factors consisting of age, education, number of family dependents, land area, government assistance, facilities and infrastructure, and the intensity of following the extension affected the motivation of farmers in controlling powdery mildew on shallot.

3.8 T-Test

Based on this, the t table was 1.9925. The results of the T test in Table 1 showed that partially there were 4 variables that had a significant effect on farmers' motivation in controlling powdery mildew on shallot. The variables that have an effect were the number of family dependents (X3), government assistance (X5), facilities and infrastructure (X6) and intensity of following the extension (X7) which explain in this following explanation.

3.8.1   Age

The results of statistical analysis in the table showed the value of tvalue < ttable with a significance value was 1.518 < 2.6412 at an error rate of 1% obtained a significance value was 0.133 which is bigger than a significance level of 0.01 (0.133 > 0.01). This was showing that partially the age variable had no effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires and interviews with farmers, age was not a very influential reason for him to continue his farming activity. It is because motivation does not have to be based on age, but awareness of one's priorities can lead to motivation itself from within [8].

3.8.2   Education

The results of statistical analysis in the table showed the value of tvalue < ttable with a significance value was −1,038 < 2,6412 at an error rate of 1% obtained a significance value was 0.303 which is bigger than a significance level of 0.01 (0.303 > 0.01). This was showing that partially the education variable had no significant effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires and interviews with farmers, the motivation of farmers, either the latest education in elementary school or bachelor's degree, both had high motivation in running their farming business. Farming activity is the common routine that they have been doing since they were a kid, it is because they help their parents doing farming. Therefore, there is no correlation between the level of education and the motivation of farmers, because motivation that came from within a person does not have to be based on his educational background [16].

3.8.3   Number of Family Dependents

The results of statistical analysis in the table showed the value of tvalue > ttable with a significance value was 2,797 > 2,6412 at an error rate of 1% obtained a significance value was 0.007 which is smaller than a significance level of 0.01 (0,007 < 0,01). This was showing that partially the number of family dependents had very significant effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires and interviews with farmers, the number of dependents in the family required the farmers to fulfilled the needs of their family. In seeking to fulfill family needs, farmers were very enthusiastic about increasing sources of income. Hereafter, family income can be saved as savings for future family needs. The number of dependents in a family and the high level of household needs can encourage farmers to doing farming harder to fulfil the family's economic needs [17].

3.8.4   Land Area

The results of statistical analysis in the table showed the value of tvalue < ttable with a significance value was −0,084 < 2,6412 at an error rate of 1% obtained a significance value was 0.933 which is bigger than a significance level of 0.01 (0.933 > 0.01). This was showing that partially the land area variable had no significant effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires

and interviews with farmers, either the land area narrow or wide, they would still work on it maximally. It is very clear, because even though a narrow land can not give much profit, but it still can be food sources for the family and be additional income for farmer who has another job and professions [14].

3.8.5   Government Assistance

The results of statistical analysis in the table showed the value of tvalue > ttable with a significance value was 3,601 > 2,6412 at an error rate of 1% obtained a significance value was 0.001 which is smaller than a significance level of 0.01 (0,001 < 0,01). This was showing that partially the government assistance had very significant effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires and interviews with farmers, most of the farmers were just planting shallot for the first time because of the Food Estate Program in Humbang Hasundutan Regency. This was based on the availability of all physical and non-physical needs that supported the farming activities, especially to control the powdery mildew on shallot. They also mentioned that if there were not this program in their area, it would be impossible for them to planted shallot in their field, it is because they don't have any capability to planted this commodity. The support that government had been doing such as land clearing and training that going on consistently made the farmers got more motivated controlling the disease. The Government's role in providing convenience in supporting farming activity is a big factor for farmers to be motivated in doing farming [18].

3.8.6   Facilities and Infrastructures

The results of statistical analysis in the table showed the value of tvalue > ttable with a significance value was 4,732 > 2,6412 at an error rate of 1% obtained a significance value was 0.000 which is smaller than a significance level of 0.01 (0,000 < 0,01). This was showing that partially the facilities and infrastructures had very significant effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires and interviews with farmers, they felt so motivated if there was supported facilities and infrastructures. Those were refer to good road access, proper production facilities, proper agricultural tools and machinery, and also adequate market access. The good road access gave convenience for farmers to mobilized form and to the area. Proper production facilities definitely would help them in maintaining the shallot from powder mildew, so that it would keep grow and thrive well. Proper agricultural tools and machinery that used in farming activities, started from land clearing until maintaining. Proper market access gave certainty to the farmers in distribute the harvest. The availability of production facilities and infrastructure, it will increase the work productivity of farmers [19].

3.8.7   Intensity of Following the Extension

The results of statistical analysis in the table showed the value of tvalue > ttable with a significance value was 6,489 > 2,6412 at an error rate of 1% obtained a significance value was 0.000 which is smaller than a significance level of 0.01 (0,000 < 0,01). This

was showing that partially the intensity of following the extension had very significant effect on the motivation of farmers in controlling powdery mildew on shallot. Based on the results of questionnaires and interviews with farmers, they realized that following the extension is an important thing because it can give them a lot of new and beneficial information, give new insight to adopt newest innovation that related to shallot cultivation. Good knowledge of the management of something is a good reference for farmers so that the planned program can run because the availability of new information will provide progress for agricultural businesses [20].

4 Conclusions

From this study, can be concluded that:

- The level of motivation of farmers in controlling powdery mildew on shallot in Food Estate Hortikultura, Humbang Hasundutan Regency was very high with a percentage 84.36%.
- Simultaneously, the X variable simultaneously affected the Y variable, meaning that from the test results together, the independent factors, namely internal and external factors consisting of age, education, number of family dependents, land area, government assistance, facilities and infrastructure, and the intensity of following the extension affected the motivation of farmers in controlling powdery mildew on shallot.
- Partially, that significantly affect the motivation of farmers in controlling powdery mildew on shallot were all of the external factors that used in this study, namely Intensity of Following Extension (X7), Facilities and Infrastructure (X6), and Government Assistance (X5) and also one internal factor used in this study was The Number Of Dependents In The Family (X3). While the factors that did not affect the motivation of farmers in controlling powdery mildew on shallot were Age (X1), Education (X2), and Land Area (X4).

References

1. N.I. Hapsari and I. Rudiarto, Factors Influencing Food Insecurity and Security and Their Policy Implications in Rembang Regency. Regional and Environmental Journal, vol. 5(2), pp. 125, 2017.
2. M. Nasution Bangun, O., V., Challenges of the Horticultural Food Estate Program in Maintaining Food Security. State Budget Bulletin. Center for Budget Studies. DPR RI Expertise Board, 2020.
3. Badan Pusat Statistik (BPS) Sumatera Utara 2020.
4. Ministry of Agriculture, Farmers that Located in Food Estates Start Harvesting. Article. www.pertanian.go.id, 2021.
5. Programa Pollung District 2018

6. Y.F. Da-Lopez, Powdery mildew disease. MPLK major. Polytechnic State Agricultural Kupang, East Nusa Tenggara, 2017.
7. H.P. Susetyo, Handling Shallot Pest Organisms Attacks in Cirebon Regency. Article. Directorate General of Horticulture, Ministry of Agriculture, 2017.
8. R. Wahyudi, L. Widjayanthi, and S. Subekti, Factors Related to Farmers' Motivation to Plant Mangroves in Mayangan Village, Gumukmas District, Jember Regency, East Java. JKMP (Journal of Public Policy and Management), vol. 6(2), p. 105, 2020.
9. E. Sutrisno, Human Resource Management. Jakarta: Kencana, 2017.
10. T. Nadeak, Farmers' Motivation for the Conversion of Upland Rice Commodities into Corn Crops in Purba District, Simalungun Regency. Agriprimatech, vol. 2.1, pp. 38–46, 2018.
11. Ministry of Health of the Republic of Indonesia. 2020. Indonesia Health Profile 2019. Jakarta. Indonesian Ministry of Health.
12. J.P. Hutajulu, Analysis of the Role of Women in Agriculture ii Rasau Jaya District, Kuburaya Regency. Journal of Social Economics of Agriculture. Tanjungpura University, vol. 4(1), pp. 83–90, 2015
13. L. Delvita, Farmers' Motivation to Plant Chili (Capsicum Annum L) in Lembah Gumanti District, Solok Regency. Spatial Journal: Research, Applied Geography, and Geography Education, vol. 6(2), pp. 131–231, 2017.
14. B.R. Aprildahani, A.W. Hasyim, and T.A. Rachmawati, Farmers' Motivation to Maintain Agricultural Land in the Outskirts of Malang City (Study Case of Karangploso Urban Area, Malang Regency). Journal of Regional and Rural Development Planning. Brawijaya University, vol. 1(3), pp. 258–269, 2017.
15. Widiatmaka, Land Resource Analysis for Land Use and Regional Planning. Publisher. Bogor Agricultural University Graduate School, Bogor, 2013.
16. E. Aprilia and R.A.B. Kusumo, Farmers' Motivation in Achieving Household Food Security for Rice Farmers in Jatiragas Hilir Village, Patok Besi District, Subang Regency. Agroinfo Galuh Student Scientific Journal Agroinfo Galuh, vol. 4(3), pp. 819–827, 2018.
17. Suherdi, Amanah, S., and P. Muljono, Motivation of Farmers in Community Forest Business Management in Cingambu Village, Cingambul District, Majalengka. Extension Journal. Department of Communication and Community Development Sciences and PAPPI (Perhimpunan Ahli Penyuluh Pertanian Indonesia), vol. 10(1), 2014.
18. Y. Daramawani, Farmers' Motivation in Increasing the Productivity of Oil Palm Plants (Elaesis guineensis Jacq) in Binjai District, Langkat Regency. Thesis. Polytechnic Agricultural Development Medan, 2019.
19. BAPEDA Balangan Regency, Tracing the Impact of Land and Water Utilization Post-Development of Agricultural Facilities and Infrastructure in Balangan Regency. http://bappeda.balangankab.go.id/web/pdf_berita/Penelusuran_dampak.pdf., 2015.
20. 21. A.E. Waluyo, A. Ulya and E. Martin, Social planning in the context of community forest development in South Sumatra. Journal of Forest Research and Nature Conservation, vol. 7(3), pp. 271–280, 2013.