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The Analysis of Production Factors and Income of Potato Farming

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Abstract

Banjarnegara Regency has the highest potato productivity in Central Java Province. However, not all sub-districts in Banjarnegara produce potatoes, there are only four from 20 Sub-districts. One of them is Batur sub-district. This study chose Batur sub-district because it is the largest producer of potatoes from three Sub-districts in Banjarnegara. Unfortunately, the huge amount of production did not affect the fluctuation which tended to decrease. Through this problems, this study aimed to determine the determinant of production and income analysis of potato farming in Batur sub-district. The sample of this study were 97 people in Batur sub-district selected from calculation by using the Slovin formula. Then, the variables of this study were land area (X1), labor (X2), fertilizer (X3), pesticides (X4) and production yields (Y). To collect the data, this study used questionnaires, interviews and documentation. The data were analyzed by using multiple regression analysis and R / C ratio analysis. The results showed that the variables of land area, fertilizer, and pesticides had positive and significant influence on potato production. Meanwhile, the labor variable was insignificant by having the return to scale value of 0.89. Further, the average income of potato farming was Rp 7,099,612 / planting season with R / C ratio of 1.77. Shortly, potato farming in Batur sub-district is profitable to continue.

Key words : potato farming, production factors, income.

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INTRODUCTION

Indonesia is an agrarian country in which the majority of the population works as farmers, both as landowners and sharecroppers. Thus, agriculture sector has an important role. It can be seen from the Gross Domestic Product (GDP) data of the Central Bureau of Statistics of Republic of Indonesia. It reveals that the GDP of the agricultural sector in 2017 was Rp. 1,256,894.30 (Trillions of Rupiah). This sector was in the third rank after the processing and trade industries. Along with the development of theories about human capital, it can be seen that education plays an important role in determining the quality of the workforce and will ultimately affect the income and productivity (Nihayah, 2010), especially in terms of employment.

People in Indonesia earn income in the agricultural sector without regard to their education and skill. Consequently, it makes the agricultural sector absorbs a lot of labor. Based on data from the Central Bureau of Statistics, in 2017 Indonesian population whose age were 15 years and above and worked on the agricultural sector were 35,923,886 people. The data proved that the agricultural sector is the main employer of employment rather than other sectors.

In addition, the strategic geographical location of Indonesia makes it have a lot of fertile lands and many other natural resources which are capable to support the activities in the agricultural sector. The results of the agricultural sector are in the form of food crops, vegetables, fisheries, and others. One of the potential commodities in the development of agribusiness is Horticultural. A good geographical environment can affect the productivity of horticultural commodities. This commodity is considered as millennial superior as Suwandi (2018) as General Director of Horticulture of Agricultural Ministry says that all horticultural business activities from upstream to downstream are very challenging to be developed by millennial generation.Also, the downstream business system for horticultural exports is very promising.

Nowadays, there are many fast food restaurants and snack food industries which use potato as the raw material. It goes without saying that it affects the demand of potatoes in terms of quantity and safety quality to consume. Thus, potato becomes one of the potential horticultural commodities. Potato contains a lot of carbohydrate which can be alternative for basic needs of Indonesian community. Based on agricultural statistics in 2018, potato was in the third rank (after onions and cabbage) for the most productive vegetable production in Indonesia in 2017, namely 1.164.738 tons. However, potato is also one of vegetables that is in the third place as the largest volume of product import in Indonesia after garlic and onion. The following table presents the largest vegetable import volume in Indonesia in 2017.

Table 1. The Largest Import Volume of Vegetables in Indonesia in 2017

No	Commodity	Total (Tons)
1	Garlic	559,728
2	Onion	155,799
3	Potato	140,087
4	Chili	43,844
5	Peanuts	14,828

Source: Agricultural Statistics, 2018

Table 1 informs that in 2017 garlic, onions, potatoes, chilies and peas were the largest import volume vegetable. In 2017, potato was in the third rank, but its commodity was also the largest in terms of import volume. In contrast, onion and garlic which were the first and the second position of biggest vegetable production in Indonesia in 2017, were not included as the largest import volume commodity. Therefore, this circumstance makes potatoes commodity is interesting to analyze.

Furthermore, Central Java is one of province with the largest potato production in Indonesia that is in the second rank after West Java province (Ministry of Agriculture of Republic of Indonesia, 2018). It is supported by the condition of fertile land. The following table shows the data of potato production in Central Java Province in 2017.

Table 2. Harvested Area and Potato Production of Regencies/Cities in Central Java in 2017

No	Regency/Municipality	Harvested Area (ha)	Production (ku)
1.	Purbalingga Regency	163	26,822
2.	Banjarnegara Regency	7,296	1,185,797
3.	Wonosobo Regency	3,467	557,506
4.	Magelang Regency	252	41,211
5.	Boyolali Regency	17	2,160
6.	Wonogiri Regency	3	450
7.	Semarang Regency	100	22,246
8.	Temanggung Regency	387	88,355
9.	Batang Regency	679	136,360
10.	Pekalongan Regency	175	22,801
11.	Pemalang Regency	69	6,120
12.	Tegal Regency	406	87,380
13.	Brebes Regency	2,565	517,555
	Jawa Tengah	15,579	2,694,763

Source: Central Java Statistic Agency, 2018

Based on table 2, not all regencies/cities in Central Java produce potatoes. From 35 regencies/cities, there are only 13 regencies which produce potatoes. The three main producers are located in Central Java, namely Banjarnegara, Brebes, and Wonosobo. Banjarnegara is the superior one. One of supporting factor is its geographical location that is in plateau. Plateau is able to support agricultural activities such planting vegetables.

Plateau area has volcanoes that make the soil becomes fertile and supports the vegetable planting activities. One of plateau area in Central Java is Dieng. In this area, farmers have advantages in form of abundant natural resources. Even though Banjarnegara becomes producer of the high grade potatoes, from 20 sub-districts there are only 4 sub-districts which produce potatoes namely Pejawaran, Batur, Wanayasa, and Kalibening sub-district. Apparently from 20 sub-districts, there are only 4 sub-districts which are geographically located in plateau and proper for potatoes to grow well. Besides potatoes, other sub-districts also produce other agricultural commodities such as rice, salak fruit, sweet potatoes, chili, etc. The production development of potatoes in Banjarnegara regency from 2012 – 2016 is presented on the following figure.
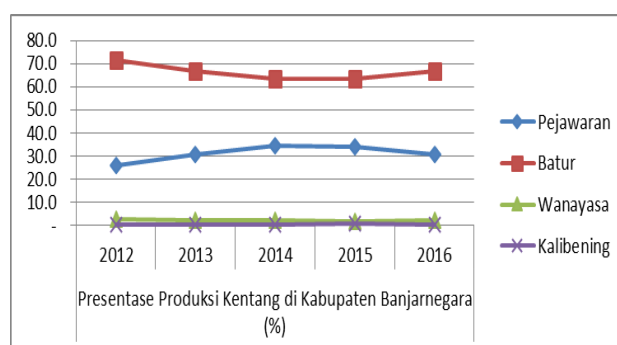

Figure 1. Development of Potato Production in Banjarnegara Regency in 2012-2016 (%)
Source: Central Bureau of Statistics of Banjarnegara Regency, processed data

Figure 1 shows the development of potato production in Banjarnegara Regency from 2012-2016. Potato production in Banjarnegara Regency has fluctuated. The largest potato production in Banjarnegara was from Batur sub-district. Surprisingly, the area which has the most significant decrease was also from Batur.

In Indonesia, the agricultural problem is still quite a lot. One of them is the limited land. Most of farmers in Java Island have less than 1 hectare land. It certainly makes the profit becomes less optimum (Prajanti, 2012). The current condition of agriculture in Batur is the potatoes are planted in the hilly area. It is increasingly expanding and encroaching the forest. Indeed, the hilly is slopping area which should be planted with the hard plants to keep the soil stable and has good water infiltration.

Batur is geographically located in the highest plateau of Banjarnegara. Potato is one of vegetables which is suitable to cultivate in plateau with low temperatures. Thus, potato becomes the main commodity of Batur sub-district. In fact, the harvest of potato in Batur from year to year has not always decreased, yet fluctuated. It makes the farmers and the sharecroppers worry. The fluctuating production surely affects their income to meet their daily needs.

The farmers are complaining about being potato farmers are not as prosperous as before. The earnings are not worth with the cost they have spent. The increasing production input price requires them to pay more. In addition, the potatoes' price is still fluctuating, sometimes the price is low when the harvest comes although the farmers still have to sell them. It is because potato is a kind of less durable or rotten vegetable. As informed by Tribun news Jateng that farmers in Dieng plateau complain about the drop in potato prices. It has happened for a year. Many farmers feel disadvantaged and are not able to cover the capital with the drop in selling price of potato. This condition is influenced by several factors. One of them is the effect of harvest that occurs in some areas all at once. Consequently the goods are abundant in the market.

Widyayati (2017) in her study entitled "The Analysis of the Efficiency of Production Factors Use in Potato Farming in Dieng, Central Java" discusses about the condition of economic efficiency, the technique efficiency, and the strategies to improve the efficiency of farming in Dieng plateau. The production factors in this study include land area, chemical fertilizer, fungicide, insecticide, CM fertilizer, and labors. The results of this research show that the land area of Dieng plateau is still good and meets the standard. The estimation of technique efficiency shows potato farming in Dieng is not efficient yet. Meanwhile, the calculation of economic efficiency shows that the use of production factors that can be improved are land area and seeds, while other factors should be reduced.

Based on the preliminary discussion, there are several problems of this study (1) How does the use of production factors influence the production of potato farming in Batur sub-district, Banjarnegara regency?. (2) How much income do Batur sub-district potato farmers earn?

The objectives of this study are (1) to analyze the influence of production factors use to potato farming production in Batur sub-district, Banjarnegara regency. (2) To analyze the level of potato farming income in Batur sub-district, Banjarnegara regency.

Production is the final result of an economic process or activities, and is done by utilizing several inputs. Production activity combines various inputs to produce outputs. According to Fergusan and Gould (1975: 40) in Joesron (2003), the function of production is an equation of maximum amount produced and combination of particular inputs.

Cobb Douglas theory of production is most often used in empirical studies. It became famous after being introduced by Cobb, C.W. and Douglas, P.H. in 1928 on their article entitled "A theory of Production". This article was firstly appeared in scientific magazine of American Economic Review 18 (Suplement) (Soekartawi 1994 in Joesron, 2003). According to Soekartawi in Joesron (2003), there are 3 main

reasons why Cobb Douglass production function theory is often used by many researchers, as follows: (1) The completion of Cobb Douglas function is relatively easier rather than other functions; for instance it is more easily transferred into linear form. (2) The results of line hypothesis through Cob Douglas production function will produce regression coefficient which also shows the number of elasticity. (3) The number of elasticity also shows the level of return to scale number.

According to Joesron (2003), return to scale number is the condition of long-term production that makes all inputs are variables, so changes in inputs will cause the outputs. The explanation of how the output reaction occurs if the input changes can be analyzed by using isoquant analysis. According to Nicholson (1995: 322), if the production function is given by Q = f (k, L) and all inputs are multiplied by the same positive constant, m (where m>1), we classify the return to scale of the production function by constant, increasing, and decreasing.

Furthermore, the level of income can be the criteria of community welfare in current area. The higher level of income they get will determine how they can meet their needs. Harnanto (1993) in Pangemanan (2011) suggests several measurements of farmer's income as follows: (1) Farmer's income is obtained by calculating the income comes from sales consumed by family and the increase in inventory value. After that, it is reduced with all expenses both cash and non-calculation; (2) Farmer's income is obtained from the earning plus cashless income; (3) Family farmer's income is remuneration from farmer to family; (4) family income is obtained by adding all farmer and family income from many sources.

The structure of farmers' income is difference between total income and total costs which farmers pay in one planting period (Pakage, 2018). To calculate the total income of farmers, the researchers used the following formula.

$$\pi = TR - TC$$

Notes:
π = farmer's income
TR = total income
TC = total cost

Cost in farming can be divided into two types, namely cash or paid cost and cashless or unpaid cost. Paid cost is to pay irrigation, zakat, non-family labors, and production input payment such as seeds, fertilizer, pesticides and harvest pests (Daniel, 2004). Sometimes, it includes costs for water usage etc.

METHOD

This study is a quantitative study that used statistic data. Also, this study used primary data which were directly obtained from the original source without intermediary. The source of this study was Batur sub-district.

The sample was randomly chosen. The characteristics of respondents were potato farmers in Batur sub-district, Banjarnegara regency. In this study, the sample was not classified based on the ownership of land area or the use of particular technology input. The amount of sample used was measured by using Slovin formula and the results were 97 Batur sub-district farmers as the sample.

To collect the data, this study used questionnaire and documentation. The form of questionnaire as the main method was used to find out whether land area, labors, fertilizer and pesticide influenced potato production and to find out the income level of Batur sub-district potato farmers. Additionally, the study data used documents that had been collected and

analyzed from the data of previous studies, books, etc. For more, to analyze the data, this study used descriptive analysis, multiple regression analysis by using Eviews 9 program, and R/C analysis to find out whether potato farming is still profitable to continue or not.

There were 2 variables in this study, namely dependent variable (Y) which covered potato production and independent variable covered land area (X₁), Labor (X₂), fertilizer (X₃), and pesticides (X₄).

The model used in this study is as follows:

$LnY = \beta_0 + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + e$

Notes:
Y   : potato production variable
a   : constanta
Ln   : linier log
X₁   : land area
X₂   : labors
X₃   : the number of fertilizer
X₄   : pesticide
e   : disturbance error

RESULTS AND DISCUSSION

Determination Coefficient Test (R2)

This test was carried out to see how well the independent variable explained the dependent variables. The smaller value of R2 indicates the more limited the model ability in explaining its variables variations. Conversely, the greater R2 value means the greater independent variable ability to explain dependent variables (Denziana, 2014). The following is the determination coefficient (R2) of study findings:

Table 3. Determination Coefficient Test

R-squared	Adjusted R-squared
0.865362	0.859508

Source: the results of Eviews output 9.0, 2019

Table 3 shows that R-Squared gained the value of 0.865362, meaning that the proportion of the influence of the log variable (land area), log (labor), log (fertilizer), and log (pesticides) on log variable (production) was 86.53%. It meant that land area, number of labor, amount of fertilizer and pesticides influenced the number of potato production of 86.53%. Meanwhile, the rest 13.47% was explained by other variables outside the model.

After the statistical test was carried out, the researchers presented further discussion and analyses in the following:

Table 4. Estimation Results

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.639387	0.385826	1.657.188	0.1009
Ln_LAHAN	0.285363	0.061459	4.643.180	0.0000
Ln_TK	0.055615	0.068291	0.814385	0.4175
Ln_PUPUK	0.364276	0.111380	3.270.557	0.0015
Ln_PESTISIDA	0.190905	0.090917	2.099.775	0.0385

Sumber: Output Eviews 9

Notes:
LAHAN   : land area
TK   : labor
PUPUK   : fertilizer
PESTISIDA   : pesticides

The researchers have transformed the data of estimation results in table 4 into Natural Algorithm so that the unit used was in form of percent. Based on the table 4, the researchers obtained the following model:

LnProd = 0,64 + 0,28LnLAHAN + 0,05LnTK + 0,37LnPUPUK + 0,19LnPESTISIDA + e

According to the results of regression, the land area variable gained the value of 0.28, meaning that when the input of land area gains an increase of 1%, the production would increase by 0.28% by assuming that the variables of labor,

fertilizer, and pesticides remain the same. For more, the regression results of land area showed that t-statistics > t-table, namely (4.643180> 1.98609) and probability <α (5%) which was equal to (0.0000 <0.05). Thus, Ho was rejected, and H2 was accepted. This result showed that land area variable had positive influence on potato production. Its correlation was in line with hypothesis, and statistically significant. Therefore, land area variable had significant influence on the potato production of Batur Sub-district.

Land is the major thing in farming. It is based on a theory saying that the larger land area, the greater productivity would be (Ambarita and Kartika, 2015) in (Arimbada, 2017). In line with this, Mubyarto (1989) in Arimbawa (2017) states that land is one of production factors, and is a place for producing farming products which have significant contribution on farming. It is because the number of farming products truly depends on land area occupied. Farmers who have larger land area will gain more crops. It proves that by having larger land area farmers can grow crops with more capacity, so the opportunity to produce potato will also be greater. In addition, Batur Sub-disctrict whose geographical location is in the plateau that is surrounded by mountains makes its land suitable to cultivate vegetables such as carrot, leeks, chilies from Dieng, and celery.

Land use depends of the situation and environment where it is located. Its efficient use would influence the potato production. Also, land area truly determined the amount of potato yield. The land area use was chosen by considering that the respondents would more understand about providing the information of land area than the harvest area. The area of land in Batur Subdistrict is not much different from the harvested area because the intercropping plantations were only on the edge, so it did not interfere with the area of land for growing potatoes.

The significant influence of land area on potato production is in line with a study by Lutfi (2018). The study shows that the variable of land area significantly influences tobacco production in Polagan Village, Galis Sub-district, Pamekasan Regency. This was evidenced by the t-value of 2.334> 2.028 at a 95 percent confidence level. The study obtained coefficient value of 0.143, meaning that an increase in land area of 1 percent will increase tobacco production by 0.143 percent. The larger the area of land used in tobacco farming, the higher production will result.

Unfortunately, Sita's study (2016) reveals that land area has significantly negative influence by having 5% percentage. The larger the land area of tomato farming, the lower the production being produced. It is because technically larger land area makes farmers having less control.

The results of regression showed that labor variable value was 0.05, meaning that when the labor input has an increase of 1%, the production will increase by 0.05% by assuming the variables of land area, fertilizer, and pesticides are stable. The results also revealed that labor variable obtained t-statistics < t-table of (0.814385 <1.98609) and probability> α (5%) that was equal to (0.4175> 0.05). Thus, Ho was accepted and Ha was rejected. It can be concluded that the labor variable was not significant to potato production in Batur Sub-district. The insignificant labor showed that any addition of labor in potato farming in Batur Sub-district could not increase the production because the labor employed was generally elderly.

The productive-age labors in Batur Sub-district chose to work in other sectors than agriculture, so those who are still working in agricultural sector are elderly. This age factor surely affects their works because generally old people do not really contribute significant production. Another possibility of the insignificant results of this variable was the researchers did not enter other inputs such as the technology used by the farmers into the study model. Even, not all farmers have the same skills in using technology. They can choose less labors but use more technological tools so that it would still influence the potato production. It is such as a study by Bhattacharyya (2016) which was carried out in two different places, namely flood prone area and area which was rarely affected by flooding. The production results in her study were found greater in the flood prone area because it has the human resources and the quality use of technology were better.

Labor is an important factor in production. It will contribute positive impact if it gives optimality in the production. According to Hernanto (1993) in Pangemanan (2011) there are two kinds of labor in farming, namely labor in the family and labor outside the family. Labors in the family are those who do not earn wages in farming, while labors outside the family are workers in farming who are given wages so they are called wage labors. The use of labor must be considered carefully because excessive use of labor will increase production costs and even cause losses. The influence of insignificant labor is in line with a study by Habib (2013) that the use of labor does not have a significant effect on corn production. It is in contrast to a study conducted by Yusuf (2014) that labor has a significant effect. It was proved by the results of the analysis showing that labor production factors are significant on corn production. The use of labor in Yusuf's study has been efficient or sufficient.

The regression results showed that fertilizer variable gained the coefficient value of 0.37, indicating that when the input of fertilizer has increased by 1%, production will increase by 0.37% with the assumption that the variables of land area, labor and pesticides remain the same. Based on the regression results, land area variable had t-statistics> t-table, namely (3.270557> 1.98609) and probability <α (5%) which was equal to (0.0015 <0.05). It proved that Ho was rejected and Ha was accepted. The results also indicated that the fertilizer variable had a positive influence on potato production, correlation which was in line the hypothesis and was statistically significant. It could be concluded that the fertilizer variable had a significant influence on potato production in Batur Sub-district.

The fertility of land in Dieng plateau has decrease or can be considered critical (Jannata, 2017). It is similar to the law of diminishing return by David Ricardo. It says that agricultural land will continue to experience fertility decline over time because it is often used. The land that is continuously used decreases its nutrient content. Therefore, Batur Sub-district farmers used fertilizer to stabilize the nutrient content so that the land remains fertile although it is used continuously.

Fertilizer is a material that is added to the planting media or plants to meet the nutrient requirements of the soil needed by the plant so that it can affect the production (Dwicaksono, 2013). Right composition of fertilization would result good quality products. The use of fertilizer in this study was based on the variables used in the previous studies by Yusuf (2014), and Nurul (2018)

Fertilization is aimed at maintaining the nutrient status in the soild, providing balanced nutrient for the growth of plants, improving the quality and productivity of plants. By considering the soil condition in Dieng, the researchers used fertilizer as one of independent variables. The fertilizers in this study were food

ingredients or substance given to the potatoes to make them fertile.

The fertilizer used by potato farmers in Batur Sub-district were urea and manure fertilizers. Even though fertilizer contributed positive and significant influence, its usage is supposed to be sufficient, meaning that it must be in accordance with its dose. It is because excessive use of fertilizer is also not good for soil fertility. The significant influence of fertilizer on potato production is in line with Yusuf's study (2014) that the use of fertilizer in production factors significantly influences corn production in Southeast Aceh Regency with a regression coefficient of 1.062. This means that if fertilizer input increases by 1 unit, production will increase by 1,062 units. Oppositely, (Nurul C, 2018) reveals that the use of fertilizer in its site is less varied so that the effect is not apparent or insignificant.

Based on regression results, pesticides variable obtained the coefficient value of 0.19. It mean that every 1% increase of pesticides will results in 0.19% production by assuming the variables of land area, labor, and fertilizer remains the same. Based on the regression results land area variables had t-statistics> t-table that is (2.09975> 1.98609) and probability <α (5%) which was equal to (0.0385 <0.05). These results made Ho rejected and Ha accepted. It indicated that pesticides variable had positive influence on potato production, correlation in line the hypothesis and was statistically significant. Therefore, this variable had a significant influence on potato production in the Batur Sub-district.

Pesticides are used to kill pests in plants. If these animals are not immediately killed, the plants cannot be produced optimally. Additionally, pesticides are chemical substance which can be used for various pests, and be useful for farmers. They are used to optimize production results.

According to Rahim and Retno (2007) in Mega (2013) pesticides are needed by plants to prevent and get rid of pests, diseases, and weeds in the crop fields. Also, pesticides apparently influenced potato production. If the potato is given optimum pesticides, it would be protected from pests, and produce high amount of production.

Farmers in Batur Sub-district considered that pesticides were important to deal with any farming problems. Pest is one of problems they faced. This kind of animal can slow down the growth or damage the potatoes so that it is very disadvantageous to farmers. Kinds of pests found in Dieng were such as cutworm, psyllidae, phytophthora infestans, and others. These diseases and pests did not only appear in seedling, but also in tubers. When cutworms eat these tubers, the yield can fail because their products have poor quality. Therefore, farmers in Batur Sub-district spray pesticides regularly, 2 to 3 times a week. In addition to pest problems, pesticides also function to kill pests that grow around potato plants. The increasing use of pesticides would decrease the chance of pests or diseases so that the production of potatoes produced will increase. However, the excessive use of pesticides would harm farmers because the chemicals contained in pesticides can damage the land quality and cause environmental pollution. The significant influence of pesticides on potato is in line with Hartati's study (2012) that pesticides have a positive and significant influence on potato production in Karangreja Sub-district, Purbalingga Regency, Central Java.

The above findings are in contrast to Sita's study (2016) which found that the use of pesticides contributes negative influence by having 10% percentage. The more pesticides use, the more decrease tomato production would be. It is because of the inefficiency use of pesticides by the farmers, namely above the recommended dose.

F statistical test proved that all independent variables added in the model simultaneously had influences on the dependent variable. The test was done by calculating the F value ratio, comparing it to Critical F obtained from F table at a particularly significant level (Gujarati, 2015). It is strongly recommended to evaluate the influence of all independent variables on dependent variable by using F test. This test can be explained by using variance analysis (ANOVA) (Basuki, 2017).

Based on the results of regression F-count> F-table was 147.8283> 2.47. Prob value of F (Statistics) in this study amounted to 0,000000 less than a significant level of 0.05. It meant that Ho was rejected and Ha was accepted. Hence, simultaneously the variables of land area, labor, fertilizer and pesticides had an influence on the production of potato in the Batur Sub-district. Meanwhile, the value of the constant was 0.63, meaning that potato production in Batur Sub-district will increase by 0.63% with the assumption of the variables of land area, labor, fertilizer and pesticides remain the same.

The discussion of production factors can also be used to determine the value of return to scale. It is done by summing up the regression coefficient of the four independent variables (Habib, 2013). The coefficient gained in this current study was 0.28 + 0.05 + 0.37 + 0.19 = 0.89. This result indicates that the addition of 1% land area inputs, labor, fertilizer, and pesticides exceeds the production increase of 0.89%. Potato farming in Batur Sub-district was in a decreasing return to scale because the equation coefficient was 0.89 <1. This condition occurs when all factors of production are summed up proportionally (for example by m times). The amount of output will increase in a smaller amount than the additional number of inputs. In the same way, the initial input used by the producers was Q output, the use

was K, and L. If the inputs are multiplied two times, it turns into 2K and 2L, causing the output drops.

Farm analysis can be used to see how success the business is, and as a benchmark for the future plan (Normansyah, 2014). The amount of income and the average cost of potato farming in one planting period is explained in the following table.

Table 5. Average Income and Costs of Potato Farming in the One-Time Planting Period

No.	Notes	Average	Percentages
1.	A. Income	Rp 16,359,794	
2.	B. Cost		
	1. Land (land lease/tax)	Rp 157,880	2%
	2. Labor	Rp 3,439,639	37%
	3. Fertilizer	Rp 2,064,725	22%
	4. Pesticides	Rp 3,597,938	39%
3.	C.Total Cost	Rp 9,260,182	100%
4.	D. Income	Rp 7,099,612	
5.	E. R/C Rasio	1.766681719	

Source: Primary data processed, 2019

Table 5 shows the average income, cost, earnings, and R/C value. In relation to potato price, the cost of potato production in the study was fluctuating, so the amount of farmers income truly depended on the selling price. Moreover, based on the findings, it was known that the selling price of potatoes at the time of the study was quite low at Rp. 4,000 - Rp. 7,000 per kilogram, the average income obtained was Rp. 16,359,794 with the costs spent at Rp. 9,260,182, so the average income of Rp. 7,099,612 for each planting season. Ratio was obtained by dividing revenue or income with total costs, namely the revenue of Rp 16,359,794 and the cost spent of Rp 9,260,182. It resulted 1.77 R/C, meaning that every Rp 1,00 spent, potato farmers will earn Rp 1,77. Therefore, they got a profit of Rp. 77.00. The value of R / C obtained from the study was more than 1, so it can be said that the

potato farming in the study area was profitable to continue.

Based on the value of return to scale, the potato farming in Batur Sub-district was in the decreasing return to scale condition, but the analysis of R/C ration considered this condition as beneficial. These results were contradictory because they did not fit any theories. The decrease output scale was supposed to make potato farming in the disadvantageous condition, but in this study the decreasing return to scale remained advantageous.

This findings were supported by farmers' statement saying that they still got profit from this farming. Even, the current condition was more profitable than before according to the analysis results. The profits gained by the farmers were not as much as their past income, and sometimes were only enough for one-time period of planting capital. It possibly occurred because there was no other choices for the farmers other than planting potatoes. This is related to the geographical condition of the area, namely plateau which is suitable only for horticultural crops. The farmers continued to choose potato because its price is the most stable one. This findings are in line with Setiawan's study (2011) that corn farming in Grobogan Regency is on a decreasing yield scale. Based on the calculation of return to scale results, it obtained the value of 0.984, meaning that that the proportion of additional inputs used will reduce the output obtained. However, from the calculation of the R / C ratio, the corn farming obtained 1.15317 value, indicating that the corn farming is actually still profitable to continue to be managed.

CONCLUSION

Based on the aforementioned description, the researchers draw some conclusions as follows:

1) The variables of land area, fertilizer, and pesticides partially have significant influence on the potato production of Batur Sub-district, Banjarnegara Regency, while the variable of labor is insignificant. Further, the variables of land area, labor, fertilizer and pesticides simultaneously influence the potato production of Batur Sub-district. The potato farming in Batur Sub-district is in the decreasing return to scale since its coefficient equation is (0.89 < 1).

2) This business is still profitable to continue because the R / C ratio> 1 is 1.77.

Besides conclusions, some suggestions given are such as: 1) farmers need to consider the number of labor in the potato farming. It is because continuous additions in each unit does not merely contribute to significant results. The excessive input even will cost more on the production. 2) It is necessary to improve the human resources regarding the regeneration of labor in order to improve the potato production. 3) There is a need for further studies about potato plants by filling the gaps in this study. Lastly, this study has a limitation, namely the sampling was not classified based on the land area and technology used by the farmers. The future studies are expected to classify the sampling, and add technology variable in the study models.

REFERENCES

Arimbawa, P. D., & Widanta, A. A. B. P. (2017). Technology and Training on Rice Farmer Income with Productivity as Intervening Variable in Mengwi District. E-Jurnal EP Unud, 1601-1627.

Basuki, A. T. (2017). Introduction to Econometrics (Equipped with Use of Eviews).. Yogyakarta: Danisa Media.

Bhattacharyya, A., & Mandal, R. (2016). A generalized stochastic production frontier analysis of technical efficiency of rice farming A case study from Assam, India. Indian Growth and Development Review, 114-128.

Vifi, N. C., Mustadjab, M. M., & Fahriyah. (2018). Allocative Efficiency Analysis of Production Factors in Rice Farmers (Oryza Sativa L.) (Case Study in Puhjarak Village, Plemahan District, Kediri District).Jurnal Ekonomi Pertanian dan Agribisnis (JEPA) , 10-18.

Gujarati, D. N., & Porter, D. C. (2015). Basic Econometric. Jakarta: Salemba Empat.

Habib, A. (2013). Analysis of Factors Affecting Corn Production. Agrium , 79-87.

Hartati, A . K. S. (2012). Level of Efficiency of Production Factors in Potato Farming in Karangreja District, Purbalingga Regency. Agrin , 19-26.

Jannata, P.F. & Ma'rif, S. (2017). Study on Diminishing Return of Production Factors Use in Potato Farming in Dieng Area. Jurnal Teknik PWK , 153-168.

Joesron, T. S. & Fathorrozi, M. (2003). Microeconomic Theory (1st ed.). Jakarta: Salemba Empat.

Ministry of Agriculture of the Republic of Indonesia. (2018). Agricultural Statistics. Jakarta: Center for Agricultural Data and Information Systems Ministry of Agriculture Republic of Indonesia.

Pangemanan, K. G. L., & Watung, M. (2011). Analysis of Income of Cut Flower Farming (Case Study of White Chrysanthemum Farmers in Kakaskasen Dua Village, North Tomohon District, Tomohon City). ASE, 5-14.

Lutfi, M., & Baladina, N. (2018). Technical Efficiency Analysis of the Use of Agricultural Production Factors in Tobacco Farming (Case Study in Polagan Village, Galis District, Pamekasan Regency). Jurnal Ekonomi Pertanian dan Agribisnis (JEPA) , 226-233.

Nihayah, D. M., & Kusumantoro, K. (2010). Regional Wage Determine: Skilled Labor (Unskilled Labor) in Indonesia. JEJAK: Jurnal Ekonomi dan Kebijakan, 3(1).

Normansyah, D., Rochaeni, S., & Humaerah, A. D. (2014). Analysis of Vegetable Farming Income in the Tani Jaya Group of Ciaruteun Ilir Village, Cibungbulang District, Bogor Regency. Jurnal Agribisnis , 29-44.

Prajanti, S. D. W., & Setiawan, A. B. (2012). Agriculture Economics (An Empirical Approach). Semarang: UNNES PRESS.

Setiawan, A. B., & Prajanti, S. D. W. (2011). Analysis of the efficiency of the use of production factors of corn farming in the grobogan district in 2008. JEJAK: Jurnal Ekonomi Dan Kebijakan, 4(1).

Sita, B.R. & Hadi, S. (2016). Productivity and Factors Affecting the Production of Tomato Farm (Solanum Lycopersicum Mill) in Jember Regency. JSEP , 67-78.

Widyayati, T. (2017). Efficiency Analysis of the Use of Production Factors in Potato Farming in the Dieng Region of Central Java. Proceedings of the 2017 National Seminar & Call For Papers, 173-193.

Yusuf, H., Hasnudi & Lubis, Y. (2014). Analysis of Factors Affecting Corn Production in

Southeast Aceh District. *Agrica (Jurnal Agribisnis Sumatera Utara)* , 65-73.