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ALLOCATIVE EFFICIENCY OF THE USE OF PRODUCTION FACTORS: EMPIRICAL STUDY ON RED CHILI FARMING IN PAKEM SUBDISTRICT

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ABSTRAK

Produksi cabai di Indonesia sejatinya terus mengalami peningkatan secara akumulatif, walaupun peningkatan yang terjadi tidak dengan persentasi yang begitu besar. Pada umumnya usahatani cabai di Indonesia adalah usahatani dengan skala kecil pada penggunaan lahan, hal serupa juga terjadi pada kegiatan usahatani di Kecamatan Pakem Kabupaten Sleman. Tujuan dari penelitian ini adalah untuk (1). Mengetahui faktor yang mempengaruhi produksi cabai merah di kecamatan Pakem Kabupaten Sleman. (2). Mengetahui efisiensi alokatif faktor produksi cabai merah di kecamatan Pakem Kabupaten Sleman D.I. Yogyakarta. Jumlah responden yang dipilih dalam penelitian ini adalah 60 petani. Metode penelitian menggunakan analisis fungsi Cobb-Douglas dan analisis efisiensi alokatif. Hasil penelitian menunjukkan bahwa faktor luas lahan dan pengalaman berpengaruh negatif terhadap produksi cabai merah sedangkan faktor produksi benih, pupuk kandang, insektisida dan tenaga kerja berpengaruh positif terhadap produksi cabai merah di kecamatan Pakem. Efisiensi alokatif penggunaan faktor produksi menunjukkan bahwa penggunaan luas lahan tidak efisien sedangkan penggunaan benih, pupuk kandang, insektisida dan tenaga kerja belum efisien secara alokatif.
Kata kunci: *cabai merah, Cobb-douglas, efisiensi alokatif, produksi, usahatani*

ABSTRACT

Chili production in Indonesia is increasing accumulatively, although the increase is not in such a large percentage. Generally, chili farming in Indonesia is a small-scale agricultural business on land use. The same applies to agricultural activities in Pakem Subdistrict of Sleman Regency. This research aimed to (1) determine the factors that affect chili production in Pakem Subdistrict of Sleman Regency, (2) determine the allocative efficiency of chili production factor in Pakem Subdistrict of Sleman Regency. The number of respondents selected in this study was 60 farmers. The research method uses Cobb-Douglas function analysis and allocative efficiency analysis. The results showed that land area factors and experience of farmers negatively affected the production of red chili. While the production factors of seeds, manure, insecticides, and labor positively affected chili production in Pakem Subdistrict. The allocative efficiency of the use of production factors indicates that the widespread use of land is inefficient while seeds, manure, insecticides, and labor are not yet efficient.
Keyword: *red chili, cobb-douglas, allocative efficiency, production, farming*

INTRODUCTION

Chili production in Indonesia is increasing accumulatively, although the increase is not in such a large percentage. This is proven by the average growth of red chilies by 2.38% and cayenne peppers by 6.94% from 2012-2016 (Ministry of Agriculture of the Republic of Indonesia, 2017). The Special Region of Yogyakarta is

the second smallest province after Jakarta, with a total area of 3.133,15 hectares (Central Bureau of Statistics, 2018).

Global chili production in Indonesia is increasing continuously. Likewise, chili production in the Special Region of Yogyakarta has also experienced an accumulative increase in recent years. The average percentage of chili production growth in Yogyakarta Province from 2012 to 2016 was more than 10% ((Ministry of Agriculture of the Republic of Indonesia, 2017). It looks so much different from the average growth of Indonesia's national chili production. The increase in growth in the Special Region of Yogyakarta is seen from production and harvested area and is also followed by productivity growth.

Two types of chili are produced in the Special Region of Yogyakarta, including red chili and cayenne pepper. However, red chilies production dominates more at 24,482 tons and cayenne peppers at 3,897 tons (Ministry of Agriculture of the Republic of Indonesia, 2017). The harvested area and productivity of red chili in the Special Region of Yogyakarta is also much more significant than cayenne pepper. Kulon Progo Regency and Sleman Regency dominate the Red chili production in the Special Region of Yogyakarta. These two regencies are known as the center of red chili production. However, they have different land characteristics. Kulon Progo has sandy farming lands characteristics, while Sleman has mountain slope rice field characteristics (Nugroho *et al.*, 2018).

Sleman Regency was chosen as the research site due to the newly opened chili auction market. Therefore, farmers have high motivation in chili farming. Chili production in Sleman Regency reached 5,554.9 tons in 2016 and made Sleman Regency the second-largest producer in Yogyakarta (B. I. P. D. Statistics, 2017). Pakem Subdistrict is the largest producer of red chili in Sleman Regency, totaling 907.8 tons and harvested area reaching 174 hectares in 2016 (Sleman Central Bureau of Statistics, 2017). The largest chili producers in Sleman Regency are Pakem Subdistrict, Turi Subdistrict, and Ngaglik Subdistrict. Pakem Subdistrict develops its red chili farming in five villages. Chili farming in Indonesia in general and in Pakem Subdistrict of Sleman Regency in particular is small-scale farming on land use. Small-scale farming will certainly generate small results, either production or income. The characteristics of chili farming are mostly cultivated on small land using a not too modern farming system. Red chili farming activities involve a large number of workers and the use of massive production facilities that require a large enough capital (Saptana *et al.,* 2010).

The use of production factors in chili farming activities, in general, is to support the success of farming. Falatehan & Rifqie (2008) stated that the use of the land area could reduce production, while according to Nugroho *et al.* (2018), Sangurjana *et al.* (2016), and Wosor & Nimoh (2012), the use of seeds affects the production of red chili.

Manure in red chili farming activities affects the increasing number of red chili production. (Saptana *et al.,* 2010). According to Andayani (2016) and Saptana *et al.* (2010), generally, the use of pesticides affect the production of red chili. In addition, according to (Ni'mah *et al.*, 2017) and (Sangurjana *et al.,* 2016), the use of labor production factors affects production, while according to Naibaho *et al.* (2012), the socioeconomic factor of farming experience shows a negative effect on production.

The success of red chili farming in practice is the ultimate goal of farmers. When harvesting, farmers are certainly expecting that the resulting products are large enough and commensurate with their hard work. Even though sometimes, in reality, this is not in line with the conditions at the farmer level because price instability is a major problem and becomes the source of concern for chili farmers (Nugroho *et al.*, 2018). The same thing also happened at the farmer level in Pakem Subdistrict of Sleman Regency. The uncertainty to get success at farming and

price also becomes the source of concern for farmers.

It is crucial to conduct research related to the effect of production factors on chili farming. It is aimed that the information produced always stay updated, so it can be a reference for farmers in carrying out their farming activities in Pakem Subdistrict of Sleman Regency. The objectives of this study were (1) to determine the factors that affect the production of red chili in Pakem Subdistrict of Sleman Regency, (2) to determine the allocative efficiency of red chili production factors in Pakem Subdistrict of Sleman Regency.

RESEARCH METHODS

The research was conducted in Pakem District, Sleman Regency. The research site was chosen deliberately by considering that Pakem Subdistrict is one of the largest producers of red chili in Sleman Regency. Proportional random sampling method was used in selecting the respondents as a sample, and as many as 60 respondents were taken from the two research villages. Candibinangun Village and Harjobinangun Village were chosen as the research site. These two villages were selected because they are the largest chili production villages at the subdistrict level. In addition, the close location between these two villages also becomes a consideration for the similarity of information and technology applied at the farmer level. Data collection in this study used an interview with questionnaires. The research was carried out from July to August 2019.

This study used Cobb-Douglas function analysis in measuring the factors that affect the production of red chili in Pakem Subdistrict of Sleman Regency. The Cobb-Douglas function is an equation that involves the relationship between independent variable and dependent variable consisting of two or more variables (Rahim *et al.,* 2012). The writing of the Cobb-Douglas function is mathematically made in the form of an equation as follows:

$$Y = aX1^{b1}, X2^{b2},\ldots, Xi^{bi},\ldots, Xn^{bn}e^{u}$$

Where
Y : Dependent variable,
X : Independent variable),
a : Intercept/constant,
b : Regression coefficient,
u : Error (disturbance term),
e : Natural logarithm.

In obtaining convenience in the hypothesis equation, the Cobb-Douglas equation can be converted into multiple linear regression. The values in the equation are transformed in the form of double logs (Rahim *et al.,* 2012), and the following equation is obtained:

$$LnY = Ln\ a + b_1 LnX_1 +,\ldots, + b_i LnX_i +,\ldots, + b_n LnX_n + u$$

The Cobb-Douglas functions used in the hypothesis in this study are:

$$LnY = Ln\ a + b1 LnX_1 + b_2 LnX_2 + b_3\ LnX_3 + b_4\ LnX_4 + b_5\ LnX_5 + b_6\ LnX_6 + b_7 LnX_7 + b_8\ LnX_8 + b_9\ LnX_9 + b_{10}\ LnX_{10} + b_{11}\ LnX_{11} + b12\ LnX_{12} + b_{13}\ LnX_{13} + u$$

Where
a : constant (intercept),
b : regression coefficient,
Y : production of red chili,
X_1 : land area,
X_2 : seeds,
X_3 : NPK fertilizer,
X_4 : manure,
X_5 : herbicide,
X_6 : insecticide,
X_7 : fungicide,
X_8 : labor,
X_9 : farmer's age,
X_{10} : education,
X_{11} : experience,
X_{12} : number of family members,
X_{13} : land use dummy and,
u : error.

The condition of allocative efficiency occurs when the value of the marginal product (NPMx) is the same as the price of the production factor X (Px) used (Soekartawi, 2010). In calculating the allocative efficiency, the use of factors of production is measured based on the comparison between NPMxi (the value of the marginal product Xi) to Pxi (the price of the input Xi). It can be formulated as follows:

$$NPMx = Px \text{ or } \frac{NPMxi}{Pxi} = ki = 1$$

Where

ki : the value of the allocative efficiency of the use of production factors.

The condition of the allocative efficiency equation can be explained as follows:

ki = 1 which means that the use of production factor X is efficient

ki > 1 which means that the use of production factor X is not efficient.

ki < 1 which means that the use of production factor X is not yet efficient.

RESULT AND DISCUSSION

Results

The red chili planting season in Pakem Subdistrict is generally carried out from April to June and September to November (Nugroho et al., 2018). The use of production facilities in red chili farming process is very large, especially the use of labor for maintenance and harvesting purposes. In addition, the use of production facilities such as fertilizers and pesticides are also very important to be fulfilled and provided because it will affect the production results. It should be noted that harvesting activities in red chili farming are carried out between 8-20 times each season.

Allocation of the Use of Production Factors

In the red chili farming process carried out in Pakem Subdistrict, Sleman Regency, there are several types of production facilities used such as fertilizers, seeds, pesticides, and so on, all of which play a role in the success of farming activities carried out by farming communities, especially in the production of red chili in Pakem Subdistrict, Sleman Regency.

The main production factor in farming activities is land. Farmers in Pakem Subdistrict have different land tenure statuses in carrying out red chili farming activities. There are three types of land tenure, including self-owned land, leased land, and profit-sharing land. In self-owned land, farmers are required to pay taxes on the use of agricultural land. In leased land, farmers are required to pay rent for land use. In profit-sharing land, farmers are required to share their harvests with landowners for land use. The average use of land processed by farmers in Pakem Subdistrictfor farming is 1.135 m^2. It can be seen from the average land use that, in general, red chili farmers in Pakem Subdistrict operate on a relatively small area of land.

Farmers in Pakem Subdistrict use 96.03 gr/ha seeds in red chili farming activities. This number is not in accordance with the recommendations recommended by the relevant agriculture office because, according to the DIY Agriculture Office (2009a), the use of appropriate and recommended seeds is 100 g/ha. Edi & Bobihoe (2010) asserted that the use of seeds in red chili farming could reach 180 g/ha. Meanwhile, according to DIY Agriculture Office (2009b), the highest use of red chili seeds was 200 g/ha. This is based on the circular letter of the standard operating procedure issued by the DIY Agriculture Office.

The use of NPK fertilizers by farmers in Pakem subdistrict has been in accordance with the recommendations for red chili farming activities, where the average use of NPK fertilizer is 474 kg/ha. In its application, NPK fertilizer is one type of fertilizer used as basic fertilizer in farming activities. According to (Sumarni & Muharam, 2005), the lowest use of NPK fertilizer is 300 kg per ha, and the highest use of NPK fertilizer

according to (D.I.Y Agriculture Office, 2009) in red chili farming activities can reach 750 kg/ha.

In the use of manure, farmers apply fertilization of 13.55 tons/ha, which is still not in accordance with the recommended standard applied. Based on the recommendations, the use of manure in red chili farming activities is 20 tons/ha (Yogyakarta, 2009) up to 30 tons/ha, where they use horse manure or cow manure (Sumarni & Muharam, 2005).

The average use of pesticides, including herbicides, insecticides, and fungicides, is 1,103.52 ml/ha for the use of herbicides, 1,213,4 ml/ha for the use of insecticides, and 7,888.45 g/ha for the use of fungicides. As it is known that the use of pesticides is intended to support the success of farming carried out by farming communities in Pakem subdistrict. However, there is no standard reference or recommendation in its application that limits the standard use of pesticides from the three groups. In the use of insecticides, the type of insecticide used contains the active ingredient abamectin, which is intended to control insect pests and fleas. The fungicide used contains the active ingredient mancozeb and propineb, which is used to control anthracnose disease caused by Colletotrichum fungus. The anthracnose disease can infect red chili plants, especially the fruit (Salim, 2012).

Red chili farming activities also absorb a great deal of labor, especially in land processing, maintenance, and harvesting activities. The average use of labor in red chili farming activities is 437,88 HKP/ha. In its activities, the harvesting process is the activity that absorbs a great deal of labor. Meanwhile, for other production facilities used in farming activities, the farmers on average spend 11.941.483,08 rupiah. Further details can be seen in table 1.

Discussion

Red Chili Production Factors in Pakem Subdistrict of Sleman Regency

The Cobb-Douglas production function is used to measure the effect of the factors of production included in the analysis model. The use of production factors is intended to measure how far the effect of each factor of production on farming results, either partially or as a whole. The regression test results of the use of production factors in red chili farming activities in the Pakem subdistrict can be seen in table 2.

The analysis results show that the coefficient of determination obtained from the analysis of the model used is 0.917. The coefficient of determination is used to show the accuracy and variation of the model used. The model used shows that the overall factors of land area, seeds, NPK fertilizer, manure, herbicides, insecticides, fungicides, labor, age of farmers, experience, education, number of family members, and dummy land use are able to explain red chili production in Pakem subdistrict by 91.7 percent. Another 8.3 percent is explained by production factors outside the model used.

Table 1. Descriptive statistics of input use in chili farming in Pakem Subdistrict.

	Unit	Minimum	Maximum	Mean	Recommendation /ha
Land area	m^2	500,00	3000,00	1.135	-
Seeds	gr	4,00	30,00	10,90	100-200 g
NPK	Kg	10,00	185,00	53,82	300-750 Kg
Manure	Kg	280,00	5.880,00	1.539,83	20-30 Ton
Herbicide	ml	0,00	500,00	125,25	-
Insecticide	ml	0,00	550,00	137,72	-
Fungicide	gr	0,00	2.500,00	895,34	-
Labor	HKP	19,42	126,17	49,70	-
Other Input	Rupiah	332.500,00	3.185.000,00	1.355.358,33	-

Source: Primary data analysis (2019)

Table 2. Analysis of the Cobb-Douglas production function factors that affect chili production in Pakem subdistrict

Variables	Coefficient	Std. Error	t stat	Sig
(Constant)	1,860 ^{ns}	1,302	1,428	,160
Ln Land Area	-,649 ***	,199	-3,258	,002
Ln Seeds	,309 **	,137	2,265	,028
Ln NPK Fertilizer	-,084 ^{ns}	,057	-1,477	,146
Ln Manure	,104 *	,054	1,916	,062
Ln Herbicide	,059 ^{ns}	,105	,558	,580
Ln Insecticide	,098 *	,057	1,741	,088
Ln Fungicide	,016 ^{ns}	,059	,266	,792
Ln Labor	1,535 ***	,188	8,144	,000
Ln Farmer's Age	,268 ^{ns}	,171	1,573	,123
Ln Education	,068 ^{ns}	,107	,634	,529
Ln Experience	-,066 *	,039	-1,706	,095
Ln Number of Family	-,085 ^{ns}	,096	-,882	,382
Members	-,074 ^{ns}	,069	-1,070	,290
Ln Dummy land use				
R^2	,917			
R_{adj}	,894			
F	39,131 ***			,000

Source: Primary data analysis (2019)
Information:
*** = Significant at 99% confidence level
** = Significant at 95% confidence level
* = Significant at 90% confidence level
ns = Not significant

Meanwhile, based on adjusted R^2 with a value of 0.894 or 89.4 percent, which means red chili production in Pakem subdistrict with the addition of other production factors included in the regression model will be able to explain the variation in the diversity of red chili production by 89.4 percent.

Simultaneous significance test or F test shows that overall production factors, including land area, seeds, NPK fertilizer, manure, herbicides, insecticides, fungicides, labor, farmer's age, experience, education, number of family members, and dummy land use included in the model has a significant effect on red chili production in Pakem subdistrict at a confidence level of 99 percent, where the F test value obtained is 39.131.

Based on the partial test, it is found that the land area has a negative coefficient value of -0.649. This means that an increase in the use of the land area by farmers in Pakem subdistrict by 1 percent will reduce the production of red chili by 0.649. From the results of the t-test, it is found that an increase in the land area of red chili farming will significantly reduce the production of red chili at the 99 percent confidence level. The decrease in production that occurs due to an increase in the land area can occur because of the interrelated use of production facilities. Thus, the overall use of other production factors is still insufficient. For example, an increase in land area is not accompanied by the addition of production facilities such as fertilizers and lack of pest control.

Furthermore, the increase in the land area will also certainly make it difficult for farmers to control pests and diseases, which certainly will also affect the decrease in red chili production. Based on research conducted by Falatehan & Rifqie (2008), the regression coefficient value of land use in cabbage

commodities significantly showed a negative direction, which means that the use of the land area can reduce production. The decline in production is due to pest attacks.

The partial test on the use of seeds showed that increased use of seeds would increase the production of red chili in Pakem subdistrict. Based on the t-test, it is found that an increase in the use of seeds by one percent will significantly affect the increase in red chili production by 0.309 percent with a confidence level of 95 percent. In its activities, it is crucial to pay attention to the use of seeds because it will affect production results. Good quality seeds certainly have advantages related to resistance to pests and diseases and the ability to produce more red chilies. Research conducted by Nugroho *et al.* (2018), Sangurjana *et al.* (2016), and Wosor & Nimoh (2012) stated that the use of seeds has a significant effect on red chili production.

The use of manure in red chili farming activities in Pakem subdistrict shows a positive coefficient, which means that an increase in the use of manure by one percent will significantly affect the increase of red chili production by 0.104 percent with a confidence level of 90 percent. In this case, the use of manure is a basic fertilizer in red chili farming activities and supplying plant needs to produce red chili production. The increased use of manure will certainly increase soil fertility, which at the same time will increase the production of red chili. In relation to land use which has a negative effect, it is necessary to increase the use of manure, which will restore land conditions for the better. According to Saptana *et al.* (2010), the addition of the use of manure will significantly increase the production in red chili farming.

The regression coefficient of the use of insecticides shows a positive direction, which means that an increase in the use of insecticides by one percent will have a significant effect on the increase in red chili production in Pakem subdistrict by 0.098 percent, with a confidence level of 90 percent. The use of insecticides is intended to control and reduce pest attacks that damage and interfere with red chili plants, including fruit, stem, or plant leaves. Hence, it will reduce the impact of production failure. In several studies, such as the research conducted by Andayani (2016) and Saptana *et al.* (2010), pesticides have generally affected the production of red chili. In the analysis model, the insecticide referred to is an insecticide that contains the active ingredient abamectin, which serves to suppress attacks from ticks. In addition, according to Meilin (2014), abamectin insecticides function to reduce the impact of thrips, aphids, and mites attacks. Research shows that seasonal changes significantly affect the breeding of ticks, where some farmers experience the impact of seasonal changes that affect the production of red chilies they cultivate.

The regression coefficient of the use of labor shows a positive direction, which means that an increase in the use of labor by one percent will affect the increase of production by 1.535 percent, with a confidence level of 99 percent. An increase in the number of workers will certainly affect the success of farming, especially in maintenance and harvesting activities. Another study conducted by Ni'mah *et al.* (2017) and Sangurjana *et al.* (2016) stated that the use of labor production factors significantly affects production with a positive coefficient. The use of labor in red chili farming activities in Pakem subdistrict is more focused on land processing, maintenance, and harvesting activities. The absorption of labor used in these types of activities is considerable, reaching 94.55. The higher use of labor in maintenance and harvesting activities will certainly improve the quality of plants and the production results in red chili farming activities.

The only socioeconomic factor that affects the production of red chili in Pakem subdistrict is the farming experience factor. Meanwhile, the farmer's age, farmer's education, and the number of farmer's family members do not affect the production of red

chili in Pakem subdistrict. The regression coefficient value from farming experience shows a negative direction. It shows that an increase in experience by one percent will significantly affect a decrease in production by 0.066 percent, with a confidence level of 90 percent. The experience factor that shows a negative direction towards production is possible because it will hinder the rate of adoption and technological innovation. This is because the higher the level of experience, the farmers will get used to and be more oriented to the same method every time they do red chili farming. The level of experience will also affect the length of land use where farming activities are carried out. Farmers with a high level of experience will undoubtedly carry out farming activities on the same land, which will certainly affect the quality of the land used. The research results of (2012) also show that socioeconomic factors of farming experience negatively affect the resulting production.

Allocative Efficiency of the use of Red Chili Production Factors in Pakem Subdistrict of Sleman Regency

Allocative efficiency is the ratio between the values of the marginal product to the price of inputs used in farming activities. Achieving allocative efficiency will occur when the value of the marginal product of the resulting product is equal to the price of the inputs used. Allocative efficiency testing is carried out on production factors that have a significant test value on the resulting production. The production factor in question is a production factor that has a value (input price).

Based on the results of the allocative efficiency analysis conducted, it is found that the use of land area production factors is inefficient, with a value of -5.93. In this case, the right step to take is to try to change the value of the regression coefficient so that it has a positive effect on red chili production. The inefficient situation in land use is not due to the use of costs or land area that must be reduced, but rather towards efforts to restore land fertility in order to provide maximum production with a positive effect on production by utilizing more organic fertilizers. The maximum production in question is when farmers can increase the productivity of their land because of a decrease in production.

Based on the results of the allocative efficiency analysis, it is found that the use of seed production factors in red chili farming activities in Pakem subdistrict is still not efficient, with a value of 6.81. Based on land use, which negatively impacts production, it is still not possible to increase the number of seeds used. Therefore, in this case, the solution that must be done is to optimize the quality of the seeds used by using superior seeds that are tested and maximizing the care for chili plants.

The value obtained from calculating the allocative efficiency of the use of manure production factors is 2.42. Based on the calculation results, it is found that the use of manure production factors is also not allocatively efficient.

Table 3. Allocative efficiency of the use of production factors in red chili farming in Pakem Subdistrict

Variables	Coefficient	ki	Information
Land Area	-,649	-5,93	Not efficient
Seed	,309	6,81	Not yet efficient
Manure	,104	2,42	Not yet efficient
Insecticide	,098	7,00	Not yet efficient
Labor	1,535	4,31	Not yet efficient
Experience	-,066	-	-

Source: Primary data analysis (2019)

In this case, it is important to increase the use of manure to achieve efficient results. Based on the state of the land, increased use of manure can be one solution in restoring the land for a better condition with at least reaching the recommended standard set by the agriculture office, which is 30-30 tons per hectares.

The use of insecticides in farming activities has not yet been efficient in the allocative use of production factors. The value obtained from the calculation results is 7.00. This inefficient situation requires farmers to increase the use of insecticides. The increased use of insecticides is expected to be able to increase production yields obtained by red chili farmers in Pakem subdistrict. Farmers who experience a decrease in production due to seasonal changes need to increase the use of insecticides because it helps them reduce pest attacks.

Based on the results of the allocative efficiency analysis, it is found that the use of labor production factors in red chili farming activities in Pakem subdistrict is still not efficient, with a value of 4.31. This situation allows farmers to make additions to the use of labor production facilities in order to maximize the profits obtained in farming activities. The increased use of labor can be done in the maintenance process. Good maintenance will certainly improve the quality of the plant so that it will increase production. Maintenance that is directed at controlling pests and diseases will certainly have a positive impact on plants. This will certainly reduce the risk of a decline in production.

CONCLUSION AND SUGGESTION

Conclusion

1. Factors that affect red chili production in Pakem subdistrict of Sleman Regency are land area, seeds, manure, insecticides, labor, and socioeconomic factors of farming experience
2. Based on the efficiency of the use of production factors, the use of the land area is inefficient, while the use of seeds, manure, insecticides, and labor is still not allocatively efficient.

Suggestion

1. Farmers should improve the fertility of agricultural land by using manure to increase production. Regarding the use of the land area, which has a negative effect, the role of climate becomes one of the factors that cause a decline in production. Farmers should consider the risks of climate change and should prepare several alternatives to prevent production cuts.
2. Based on the calculation of allocative efficiency related to the use of production factors, seeds can be improved, especially in terms of quality. The use of manure, insecticides, and labor is not optimal. Therefore, its use can still be increased to achieve optimal profits. Improvement can be done by increasing the number of production factors used, especially in the use of manure, insecticides, and labor.

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