

Determinant Factors of Income of Cocoa Farmers in Batuparigi Village, Mamuju Tengah District

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ABSTRACT

Cocoa farming is a business developed by the community in Batuparigi Village, Tobadak District, Central Mamuju Regency so that cocoa is one of the leading agricultural sectors there. However, there are several inhibiting factors, such as; The increasing price of cocoa seedlings has made it difficult to obtain quality seeds. In addition, the cost of fertilizers and pesticides has increased in price from year to year and has become an obstacle for cocoa farmers. This study uses a quantitative approach with a survey method. The sample in the study was 30 people. The data collection techniques used were observation, documentation, and questionnaires. The data analysis technique used is multiple linear regression analysis. The results showed that simultaneously the independent variables (land area, fertilizer costs, seed costs, pesticide costs, and labor) had a significant and positive effect on the dependent variable (farmer income). Partially, land area has a significant effect and is positively related, while the variable cost of fertilizer, cost of seeds, cost of pesticides, and labor has no significant effect on farmers' income.

Keywords: Cocoa farmer income, land area, costs, labor

INTRODUCTION

As one of the countries with a large plantation area, Indonesia is a major producer of cocoa (*Theobroma cacao* L.). Initially, Indonesia was the third-largest cocoa producer in the world after Ivory Coast and Ghana (Prastowo et al., 2010). However, Indonesia's cacao production, which has continued to decline since 2015, has caused Indonesia's position to shift to the fifth largest position in the world, displaced by Ecuador and Nigeria in 2017. (IEI dan UNIED, 2019). However, the cocoa trade can bring in foreign exchange and income of the people, thereby placing cocoa as one of the important commodities in the Indonesian economy, (Munarso, 2016).

Examining the previous years, the Ministry of Agriculture established cocoa as one of the leading commodities in agricultural development in 2015–2019 along with rubber, palm oil, coconut, coffee, pepper, and other commodities, (Direktorat Jenderal Perkebunan, 2015). The growth rate target for cocoa production at that time was set at 3.9% per year. This target setting shows the government's desire to continue encouraging efforts to increase cocoa production. Furthermore, the government has also established the cocoa processing industry as one of the prioritized sectors for development according to RIPIN 2015-2035.

As one of the leading plantation commodities, cocoa plays an important role in the source of income for Indonesian smallholder farmers. It is estimated that there are not less than 1.84 million families whose main income depends on cocoa. In addition, approximately 1 million families rely on their income from the downstream cocoa industry. This position shows that the

role of cocoa farmers in the national economy is quite significant (Directorate General of Plantation, 2014). One thing that needs attention is that the composition of ownership of cocoa plantations in Indonesia is dominated by smallholder plantations (PR) with a share of 97.8% of the total cocoa area in Indonesia. (Badan Pusat Statistik, 2018). This means that the success of the Indonesian cocoa industry can directly improve the welfare of cocoa farmers.

West Sulawesi is one of the main suppliers/producers of cocoa in Indonesia. Development programs to increase cocoa production and quality in West Sulawesi continue to be carried out by the provincial and district governments in West Sulawesi. The program is carried out by increasing the land area and intensification (rehabilitation and replanting of old cacao plants). The low production and productivity of Cocoa in West Sulawesi is caused by several things, including lack of care, CPB pests, and VSD disease, as well as old plants. (Balitbangtan Sulawesi Barat, 2020).

As one of the largest cocoa-producing provinces in Indonesia, West Sulawesi has an area of 153,694.32 ha of cocoa planted in 2015 with a production of 83,566.48 tons, its productivity has only reached 0.55 t/ha, (Badan Pusat Statistik, 2016). Cocoa cultivation is widespread in all districts in West Sulawesi, namely Majene covering an area of 13,184.50 ha, Polewali Mandar covering an area of 49,167.77 ha, Mamasa covering an area of 15,499 ha, Mamuju covering an area of 41,076.05 ha, Mamuju Utara covering an area of 12,801 ha, and Mamuju Tengah covering an area of 21,966. Ha (Balitbangtan Sulawesi Barat, 2020).

Mamuju Tengah, to be precise in Batuparigi Village, Tobadak Subdistrict, which is the location in this study has several obstacles related to cocoa crops, one of which is the lack of counseling on cocoa production to farmer groups. Therefore, a lot of cocoa land was taken for oil palm cultivation so that a few years ago cocoa was very far behind because cocoa farmers were more interested in oil palm farming. However, over time oil palm revenues have decreased considerably due to volatile prices.

Cocoa is currently starting to develop in Batuparigi Village because many superior seeds have appeared and of very good quality. Farmers have also started to form farmer groups to make it easier to get information about cocoa care starting from seeding, planting, to treating cocoa to produce superior beans to increase farmer income. Based on the above points, this research takes the title "Determinant Factors of Cocoa Farmers' Income in Batuparigi Village, Tobadak District, Central Mamuju Regency.

METHOD

The type of research used in this research is quantitative with a survey approach. The research sample was 30 people. The data collection techniques used were observation, documentation, and questionnaires. The data analysis technique used is descriptive analysis (multiple linear regression) with the help of SPSS version 22.0 software. Furthermore, a classic assumption test is carried out which is a statistical requirement in multiple linear regression analysis based on Ordinary Least Square (OLS), Nachtsheim, Neter, Li, & Kutner (2004), namely: Data Normality Test, Multicollinearity Test, Heteroscedasticity Test Hypothesis Test, Correlation Coefficient Analysis (R), Coefficient of determination (R²).

RESULT AND DISCUSSION

Land Area

The area of land for cocoa farmers who were respondents in this study can be seen in table 1:

Table 1.
Respondents' Land Area

No.	Land Area	Frequency (n)	Percentage (%)
1	1 ha	21	70,0
2	2 ha	7	23,3
3	3 ha	2	6,7
Total		30	100

Source: Primary data after processing, 2020

Based on table 1.1 above shows that the distribution of respondents based on land area, namely most cocoa farmers have a land area of 1 Ha, namely 21 respondents or 70.0%. This shows that the cocoa farmers in Batuparigi Village use a large area of land to grow cocoa. Furthermore, there are 7 respondents or 23.3% who own 2 hectares of land, and 2 respondents or 6.7% who own 3 hectares of land.

Fertilizer Costs (X₂)

Fertilizer functions to provide nutrients in the soil that plants need so that they can produce good production. The productivity and quality of yields on the cocoa plant are strongly influenced by various elements, one of which is fertilizer. Following is the respondent's data regarding fertilizer costs.

Table 2.
Respondent Fertilizer Costs

No.	Fertilizer Costs (Rp)	Frequency (n)	Percentage (%)
1	Rp. 200.000 - Rp. 399.000	8	26,7
2	Rp. 400.000 - Rp. 599.000	17	56,6
3	Rp. 700.000 - Rp. 999.000	2	6,7
4	Rp. 1.000.000 - Rp.1.180.000	3	10,0
Total		30	100

Source: Primary data after processing, 2020

Based on table 1.2 it can be seen that the largest respondent frequency is 17 respondents or 56.6% with the expense for fertilizers of Rp. 400,000 - Rp. 599,000. Furthermore, there were 8 respondents, or 26.7% who spent the fertilizer cost of Rp. 200,000 - Rp. 399,000, 3 respondents or 10.0% who spent the fertilizer cost of Rp. 1,000,000 - Rp. 1,180,000, and 2

respondents or 6.7% who spent the fertilizer cost of Rp. 700,000 - Rp. 999,000. The percentage of fertilizer costs incurred by cocoa farmers is quite a lot, due to the relatively expensive price of fertilizer.

Cost of Seeds

The seed cost expenditures made by cocoa farmers significantly affect farmers' income. The higher the price of seeds, of course, will affect farmers' income. The following is a table of prices for cocoa seeds.

Table 3.
Respondent Cost of Seeds

No.	Cost of Seeds (Rp)	Frequency (n)	Percentage (%)
1.	Rp. 500.000 – Rp. 1.000.000	18	60,0
2.	Rp. 2.000.000 – Rp. 3.000.0000	12	40,0
Total		30	100

Source: Primary data after processing, 2020

Based on table 1.3, shows the distribution of respondents with the largest cost of seeds incurred by farmers of Rp. 2,000,000 - Rp. 3,000,000 with a total of 12 respondents (40.0%) while the costs incurred are Rp. 500,000 - Rp. 1,000,000 there were 18 respondents (60.0%). This shows that the cost of seeds incurred by farmers is relatively high

Pesticide Costs

The pesticide expense incurred by farmers significantly affects the income of cocoa farmers. Because pesticides can kill pests or diseases in plants whose benefits are proven, even their use can save at least a third of the loss of yield due to disease. The costs incurred by cocoa farmers can be seen in the following table.

Table 4.
Pesticide Cost of Respondents in Batuparigi Village

No.	Pesticide Costs (Rp)	Frequency (n)	Percentage (%)
1	Rp. 100.000 – Rp. 199.000	14	46,7
2	Rp. 200.000 – Rp. 299.000	9	30,0
3	Rp. 300.000 – Rp. 399.000	3	10,0
4	Rp. 400.000 – Rp. 500.000	4	13,3
Total		30	100

Source: Primary data after processing, 2020

Based on table 1.4, shows that the number of pesticide costs incurred by farmers. A total of 14 respondents (46.7%) spent Rp. 100,000 - Rp. 199,000, 9 respondents (30.0%) spent Rp. 200,000 - Rp. 299,000, 3 respondents (10.0%) spent Rp. 300,000 - Rp. 399,000, and as many as

4 respondents (13.3%) spent Rp. 400,000 - Rp. 500,000. The expenditure on pesticides is directly proportional to the area of land owned by each farmer.

Labor

To get an overview of the labor used by cocoa farmers in Batuparigi Village, it can be seen in the following table.

Table 5.
The labor used by the Respondents

No.	Total Labor	Frequency (n)	Percentage (%)
1	1 – 2	8	26,7
2	3 – 4	17	56,6
3	5 – 6	5	16,7
Total		30	100

Source: Primary data after processing, 2020

Based on table 1.5, shows that as many as 8 respondents (26.7%) used 1 to 2 workers, 17 respondents (56.6%) used 3 to 4 people, and 5 respondents (16.7%) used to labor. 5 to 6 people. The lower the labor, the lower the costs. Labor that is employed (used) only at harvest time. In other words, the more labor is used, the more efficient the time is used at harvesting.

Income

Income is the result received from the process of economic activity to meet daily needs. The average income that each person has is called per capita income and is a measure of economic progress and development. The following is the respondent's data based on the income earned during the harvest season.

Table 6.
Respondent Income

	Income	Frequency (n)	Percentage (%)
1.	Rp. 1.000.000 – Rp. 5.000.000	22	73,3
2.	Rp. 5.500.000 – Rp. 10.000.000	5	16,7
3.	Rp. 15.000.000 – Rp. 20.000.000	3	10,0
Total		30	100

Source: Primary data after processing, 2020

Based on table 1.6, it can be seen that the distribution of income obtained by respondents in Batuparigi Village is the most dominant, namely cocoa farmers with an income of Rp. 1,000,000 - Rp. 5,000,000 as many as 22 respondents (73.3%). Furthermore, 5 respondents (16.7%) had an income of Rp. 5,500,000 - Rp. 10,000,000, and 3 respondents (10.0%) have an income of Rp. 15,000,000 - Rp. 20,000,000. In other words, this is a tangible result of the benefits of increased production and productivity of cocoa farmers' income in Batuparigi Village, Tobadak District, Central Mamuju Regency.

Classic Assumption Test

The normality test aims to determine whether in the regression model confounding or residual variables have a normal distribution. There are several ways to detect whether the residuals are normally distributed or not, one of which is by using graph analysis. Graph analysis is used by looking at the histogram and pp-plot on normality testing. If the residual on the histogram forms a bell and the residual on the pp-plot follows the diagonal line, it can be assessed that the research data is normally distributed. (Ghozali, 2016).

Based on the results of normality testing using the histogram graph analysis method and PP-Plot, it is known that the residuals on the histogram form a bell, and the residuals on the PP-Plot follow the diagonal line, which means that the research data is normally distributed.

Multicollinearity test

The multicollinearity test aims to test whether the regression model determines the correlation between the independent variables. A good regression model is that there is no correlation between the independent variables. To detect the presence or absence of multicollinearity in the regression model by looking at the tolerance value > 0.10 and the opposite of Variance Inflation Factor (VIF) < 10.00 means the data has no multicollinearity problem. (Ghozali, 2018). The multicollinearity test results can be seen in Table 1.7 below.

Table 7.
Multicollinearity Test

Variable	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Land area	0.421	2.375
Fertilizer	0.653	1.531
Seeds	0.395	2.531
Pepticides	0.917	1.090
Labor	0.765	1.307

Source: Processed data, 2020

Based on the results of the multicollinearity test shown in the table above, it is known that all variables have a tolerance value > 0.10 and a VIF value < 10.00 . So it can be concluded that there is no correlation between the independent variables, so the regression model of this study is considered good.

This test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another. The test in this study used a plot graph between the predictive value of the dependent variable, namely ZPRED and its residual SRESID. Heteroscedasticity does not occur if there is no clear pattern, and the dots spread above and below the 0 on the Y-axis (Ghozali, 2018).

Based on the results of heteroscedasticity testing, it is known that the residuals spread and do not form a pattern on the scatterplot. So it can be concluded that the data of this study meet the heteroscedasticity testing criteria.

Hypothesis Testing

Multiple regression analysis is a study of the dependence of the dependent variable (bound) with one or more independent variables (explanatory or independent variables), to estimate the population average or the average value of the dependent variable based on the known value of the independent variable. (Narimawati, 2008). The results of multiple linear regression testing can be seen in Table 8 below.

Table 8.
Multiple Linear Regression Analysis

	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
	B	Std. Error			
(Constant)	-0.990	1.010		-0.980	0.338
Land area	1.285	0.546	0.518	2.353	0.028
Fertilizer	0.377	0.304	0.219	1.240	0.229
Seeds	0.076	0.292	0.059	0.261	0.797
Pesticide	-0.143	0.158	-0.136	-0.908	0.374
Labor	0.397	0.402	0.161	0.987	0.335

Source: Processed data, 2020

Based on the above results, it can be explained that a constant of 0.990 states that if the value of the independent variable, namely land area, fertilizer, seeds, pesticides, and labor is constant (0), the level of income (Y) increases by 0.990; The regression coefficient for the land area is 1.285, meaning that if the variable value of land area increases by 1, it will have an impact on the increase in income levels by 1.285; The fertilizer regression coefficient is 0.377, meaning that if the fertilizer variable value increases by 1, it will have an impact on an increase in the income level of 0.377.

The seed regression coefficient is 0.076, meaning that if the variable value of the seeds increases by 1, it will have an impact on the increase in income levels by 0.076; The pesticide regression coefficient is -0.143, meaning that if the value of the pesticide variable increases by 1, it will have an impact on the increase in the level of income by -0.143; The labor regression coefficient is 0.397, meaning that if the value of the labor variable increases by 1, it will have an impact on the increase in the income level of 0.397.

The t-test is used to determine the effect of the independent variables on the dependent variable. In the significance test, there are two criteria to be measured, namely the t-value compared to the t-table value and the significance value compared to the standard of significance. If the t value is more > the t table value and the significance value < 0.05, it is stated that the independent variables have a significant effect on the dependent variable. (Sugiyono, 2014).

Based on table 1.8 above, it is known that the t-value of the land area is 2.353 > 2.073 and the significant value of the independent variable is 0.028 < 0.05. That is, it can be said that there is a positive and significant effect of land area on the income of cocoa farmers in Batuparigi Village, Tobadak District, Central Mamuju Regency. Furthermore, the fertilizer variable is known that the t-value of the land area is 1.240 < 2.073 and the significant value of the

independent variable is $0.229 > 0.05$. Thus, it can be concluded that there is no positive and significant effect of fertilizers on the income of cocoa farmers. In the seed variable, it is known that the t-value of the land area is $0.261 < 2.073$ and the significant value of the independent variable is $0.797 > 0.05$. This means that there is no positive and significant effect of seeds on the income of cocoa farmers. Meanwhile, the pesticide variable shows that the t-value of the land area is $-0.908 < 2.073$ and the significant value of the independent variable is $0.274 > 0.05$. This means that there is no positive and significant effect of pesticides on the income of cocoa farmers. For the labor variable, it is known that the t-value of the land area is $0.987 < 2.073$ and the significant value of the independent variable is $0.335 > 0.05$. This means that it can be concluded that there is no positive and significant effect of labor on the income of cocoa farmers.

The simultaneous test criterion is if the F-count value is greater than the F-table or if the significant level F is smaller than the significant level used (α) 0.05, the results of the analysis simultaneously have a significant effect. If the results obtained are the opposite, then the analysis does not have a significant effect simultaneously (Sugiyono, 2014).

Table 9.
F test

	Sum of Squares	df	Mean Square	F	Sig.
Regression	36.922	5	7.384	5.589	.002 ^b
Residual	27.745	21	1.321		
Total	64.667	26			

Source: Processed data, 2020

The table above shows that the F-count value is $5.589 > F$ Table 2.816 and the p-value (Sig.) Is 0.002. Because the p-value < 0.05 , H_0 is rejected, which means that there is a positive and significant influence on the independent variable, namely the area of land, fertilizer, seeds, pesticides, and labor together on the income of cocoa farmers in Batuparigi Village, Tobadak District, Central Mamuju Regency.

This analysis is used to show the speed of the relationship between the independent variables and the dependent variable. The results of testing the correlation coefficient analysis can be seen in the table below.

Table 10.
Correlation coefficient analysis (R)

		Land area	Fertilizer	Seeds	Pesticide	Labor	Income
Land area	Pearson Correlation	1	0.54	0.732	0.256	0.304	0.694
	Sig. (2-tailed)		0.004	0.000	0.197	0.123	0.000
Fertilizer	Pearson Correlation	0.54	1	0.53	0.178	0.342	0.562
	Sig. (2-	0.004		0.004	0.375	0.081	0.002

	tailed)						
Seeds	Pearson Correlation	0.732	0.53	1	0.217	0.451	0.598
	Sig. (2-tailed)	0.000	0.004		0.277	0.018	0.001
Pesticide	Pearson Correlation	0.256	0.178	0.217	1	0.201	0.082
	Sig. (2-tailed)	0.197	0.375	0.277		0.315	0.686
Labor	Pearson Correlation	0.304	0.342	0.451	0.201	1	0.393
	Sig. (2-tailed)	0.123	0.081	0.018	0.315		0.042
Income	Pearson Correlation	0.694	0.562	0.598	0.082	0.393	1
	Sig. (2-tailed)	0.000	0.002	0.001	0.686	0.042	

Source: Processed data, 2020

Based on the table above, it is known that the land area has a significance value of 0.000 <0.05, which means that the land area has a fast relationship with the income of cocoa farmers in Batuparigi Village, Tobadak District, Central Mamuju Regency. For the fertilizer variable, it has a significant value of 0.002 <0.05, which means that fertilizer has a fast relationship with the income of cocoa farmers. The seed variable has a significant value of 0.001 <0.05, which means that the seeds have a fast relationship with the income of cocoa farmers. While the pesticide variable has a significant value of 0.686 <0.05, which means that the pesticide does not have a past relationship with the income of cocoa farmers. Finally, the labor variable has a significant value of 0.042 <0.05, which means that labor has a fast relationship with the income of cocoa farmers.

Classification test of determination used where the value of determination can be grouped as follows: 0.41 to 0.70 correlation is strong, 0.71 to 0.90 is very strong, 0.91 to 0.00 is very strong, and if 1 means perfect (Sugiyono, 2014). The results of the correlation analysis test can be seen in the following table 1.11.

Table 11.
Determination Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.756 ^a	0.571	0.469	1.149

Source: Processed data, 2020

The table above shows that the R2 value which is the value of the contribution of independent variables, namely the area of land, fertilizers, seeds, pesticides, and labor to the

income of cocoa farmers in Batuparigi Village, Tobadak District, Mamuju Tengah Regency is 0.571 or 57.1 percent. This shows that the independent variable contributes to the increase in the income of cocoa farmers, while the remaining 42.9 percent is the value of the contribution of the influence that comes from other variables not examined in this study.

Discussion

The Influence of Land Area on Income of Cocoa Farmers

From the research results, it can be seen that the land area has a positive and significant effect on the income of cocoa farmers. It can be seen that the t-count value is greater than the t-table ($2.353 > 2.073$) with a significance of 0.000 from the significant level of 0.05. Thus, land area is one of the most important factors in the amount of income earned by cocoa farmers. Land area is an important thing in agriculture because it will affect income. In other words, the larger the land area, the higher or higher the yield. This is following research Pali (2016), Wonda & Tomayahu (2018), Yormawi (2019), Nopiyanti (2020).

The Influence of Fertilizer Costs on Cocoa Farmers' Income

Fertilizer is what is needed in a plant such as cocoa because it will produce quality fruit, but if they use of fertilizers is not regular, it will have a bad impact on the cocoa plant. This is following the opinion Adisarwanto, (2008) said that applying fertilizers with the right composition can produce quality products, but if they use of fertilizers is not according to the right composition it can produce low-quality products.

Based on table 8, it can be seen that the cost of fertilizer does not have a significant effect on the income of cocoa farmers. This is following the research of Cut & Irwanto (2017), but different from the research conducted Ambarita & Kartika (2015). Fertilizer affects income because applying fertilizer to plants can maintain the nutrients in the plant and improve and provide plant content that is lacking or even unavailable on the ground to support plant growth. To be able to increase higher income, it must be followed by the use of fertilizers regularly and correctly, because the use of high doses of fertilizer for cocoa plants will reduce productivity in the cocoa plant itself, thus affecting income.

The Influence of Seed Costs on Cocoa Farmers' Income

The use of seed costs incurred by farmers quite influences farmers 'income, although the test results show that the effect of seed costs incurred by farmers affects cocoa farmers' income. High-quality cocoa seeds come from superior varieties which is one of the factors that ensure qualitative cocoa farmers' yields play an important role in increasing production. The cocoa seeds in Batuparigi Village are superior seeds that are imported from outside the region so that they affect the income of cocoa farmers. If farmers can take good care of the planted cocoa seeds, the farmer's income will also increase.

From table 8 it can be seen that the cost of seeds affects, but not significantly, on the income of cocoa farmers. This can be seen from the t-value which is smaller than the t-table $0.261 < 2.073$ with a significance of $0.797 > 0.05$. This is following the research by Cut & Irwanto (2017).

The Influence of Pesticide Costs on Cocoa Farmers' Income

In table 8 it can be seen that the cost of pesticides does not have a positive and significant impact on the income of cocoa farmers. This can be seen from the t-count value which is smaller than the t-table $-0.908 < 2.073$, with a significance of $0.274 > 0.05$. In general, the use of pesticides plays a role in the income of cocoa farmers. The use of pesticides as a production factor has proven that pesticides rapidly reduce pest populations so that attacks can be prevented, and crop loss can be prevented. However, this study found that pesticides did not have a positive and significant effect on cocoa farmers' income, as in the study (Cut & Irwanto, 2017).

The Influence of Labor on the Income of Cocoa Farmers

In table 8, it can be seen that labor has no positive and significant effect on cocoa farmer income. This is different from research by Miswar, (2017) who argues that labor has a positive and significant effect on the income of cocoa farmers in Peunaron District. In other words, the direction of the relationship between the number of workers and income is unidirectional, where an increase or decrease in the number of workers will result in an increase or decrease in the income of cocoa farmers.

Labor is one of the variables that affect the income of cocoa farmers. Skills and knowledge are needed to further increase the income of cocoa farmers so that they do not find it difficult to care for cocoa plants. According to previous research Pali (2016) labor is an important factor in cocoa farming. Labor is a supporting factor for other products because it also determines the production process in numbers which are not only seen from the availability of labor but also the quality and type of labor that need to be considered.

CONCLUSION

The determinant factors of income of cocoa farmers in Batuparigi Village, Tobadak District, Central Mamuju Regency, are land area, cost of fertilizer, cost of seeds, cost of pesticides, and labor. The land area has a significant effect on the income of cocoa farmers because the more land they have, the more land they have, the more land is planted by farmers. Meanwhile, the cost of fertilizers, the cost of seeds, the cost of pesticides, and labor do not have a significant effect on the income of cocoa farmers because the use of large amounts of fertilizers that do not match the dosage and type of fertilizer will reduce income. Likewise with the cost of seedlings, although the more seeds planted, the higher the production yields, but the maximum limit on the use of seeds must also be considered carefully because if it crosses the limit it will affect the production and income of cocoa farmers. The cost of pesticides does not have a significant effect on income, because excessive use of pesticides is not friendly to the environment and also the nutrients in the soil, in the long run, will be eroded, which will reduce income. And, the number of workers does not have a significant effect on the income of cocoa farmers because the more labor is used, the more costs will be incurred to provide wages.

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