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“Entrepreneurship on Global Economics Development in the Era of Society 5.0”

Factors Analysis on Palm Oil (*Elaeis Guineensis* Jacq) Production**Dina Arfianti Saragih¹, Ingrid Ovie Yosephine Sitompul¹, Delyana R Pulungan^{1*},
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Jl. Williem Iskandar, Medan, Indonesia***Email:** delpulungan@itsi.ac.id**ABSTRACT**

Three concepts related to palm oil production are Genetic Production, Site Yield Potential, and Actual Production. First, genetic production is the maximum production potential possessed by plant material in an environment with little or no environmental constraints, as well as cultivation and management techniques. Second, Site Yield Potential is a production that can be achieved by certain plant materials in accordance with the conditions of a place after experiencing obstacles by limiting factors that cannot be controlled by humans such as climate factors. Third, the actual production is the production that has been achieved by certain plant materials at a location after experiencing obstacles by limiting factors that cannot be controlled. To get optimal production, all production factors that influence must be sought in optimal conditions. The results showed that labor did not affect the production of oil palm, this can be seen from the t-value of $-1.346 > t\text{-table } 2.004$, with a significant value of 0.184. Rainfall has no effect on the production of oil palm plants, this can be seen from the t-value of $-.567 > t\text{-table } 2.004$, with a significant value of 0.573. Pesticides have no effect on the production of oil palm plants, this can be seen from the value of t-count $.894 > t\text{-table } 2.004$, with a significant value of 0.375. Rainy days have a significant effect on the production of oil palm plants, this can be seen from the t-value of $2.590 > t\text{-table } 2.004$, with a significant value of 0.012. Fertilizers have a significant effect on the production of oil palm plants, this can be seen from the t-value of $2.316 > t\text{-table } 2.004$, with a significant value of 0.024.

Keywords: Palm Oil, Production, Analysis

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INTRODUCTION

Palm oil is the highest oil-producing plant per hectare, where Indonesia is the largest palm oil producing country in the world. In 2017 it was recorded in statistical data on oil palm commodity plantations. Indonesia has a total area of 12,307,227 Ha and produces 35,359,384 tonnes of palm oil (Dirjenbun, 2017).

Oil palm plantations in Indonesia currently cover an area of more than 7 million hectares, making it a very important plantation commodity. However, it is unfortunate that its productivity is still low and its distribution in the country is uneven. The most extensive plantation areas are on the islands of Sumatra and Kalimantan (Sunarko, 2009).

There is a trend of increasing demand and supply of palm oil in the world. This indicates that CPO is an important agricultural commodity in Indonesia. Therefore, Indonesia has a great opportunity to dominate the world palm oil market compared to other world palm oil exporting countries. The increase in Indonesia's CPO export volume every year is supported by an increase in the amount of domestic CPO production and an increase in the area of oil palm plantations. (Ningsih, et al, 2013).

Three concepts related to palm oil production. First, genetic production is the maximum production potential possessed by plant materials in an environment without or slightly experiencing obstacles, both environmental factors, as well as cultivation techniques and management. Second, Site Yield Potential is the production that can be achieved by certain plant materials in accordance with the conditions of a place after being hampered by limiting factors that cannot be controlled by humans such as climate factors. Third, actual production is production that has been achieved by certain plant materials at a location after experiencing constraints by limiting factors that cannot be controlled. To obtain optimal production, all factors of production that affect it must be cultivated at optimal conditions (Firdaus and Iskandar, 2018).

METHOD

This research was conducted in Afdeling IV of Plantation PT. XVZ, Serdang Bedagai district, North Sumatra Province from March to May 2019. This research was conducted using a descriptive analysis method and also using a multiple linear regression model with the SPSS 16 tool. The equation model used in the analysis of the factors of production of palm oil as follows:

$$Y = a + bx_1 + bx_2 + bx_3 + bx_4 + bx_5 + bx_6$$

Y = Productivity of oil palm (tons ha-1)

a = Y-intercept, is an approximate value for Y when X = 0

b = Regression coefficient or the average change in Y for every one unit change (increase or decrease) in variable X, assuming the other independent variables are constant.

X1 = Labor (HK/ month)

X2 = Rainfall (mm/month)

X3 = Rainy Day (day/month)

X4 = Fertilizer

X5 = Insecticide

Observation

Observations were made on several observation objects, namely:

Garden information consisting of:

1. History of the garden

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2. Location of the garden
3. The area of the afdeling
4. Rainfall in the last 5 years, from 2014 to 2018
5. Production for the last 5 years, from 2014 to 2018
6. RKAP (Company Budget Work Plan)
7. Fertilization data for the last 5 years, from 2014 to 2018
8. Data on use of insecticides for the last 5 years, from 2014 to 2018
9. Labor/Ha

RESULT AND DISCUSSION

Research Block

The Adolina Plantation business unit is divided into 9 Afdeling, with the research location in Afdeling IV with an area of 1053 Ha. The topography of Afdeling IV of Plantation PT. XVZ, Serdang Bedagai district is a plain of 1053 Ha. Analysis of production factors used in this study is to use a descriptive analysis model and also use a multiple linear regression model with SPSS 16 tools.

Classic assumption test

Before testing the hypothesis of this study, classical assumption testing was first carried out to ensure that the multiple linear regression test tool can be used or not. If the assumptions of the classical test have been met, then the multiple linear regression statistical test tool can be used.

Normality Test Graph – Histogram

Normality test aims to find out in the regression model, confounding or residual variables. The normality test is used to test whether the data is normally distributed or not.

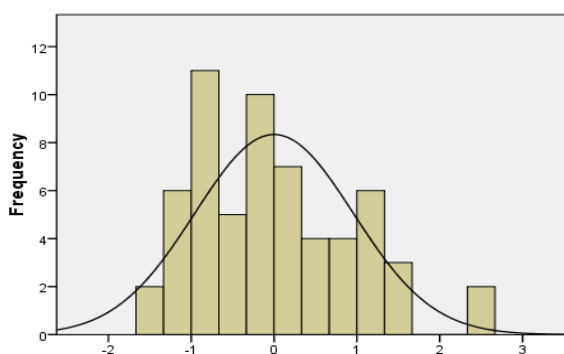


Figure 1. Histogram

It can be seen that the shape of the histogram graph shows that the data is normally distributed because the shape of the curve graph is symmetrical where the curve pattern does not lean to the left or to the right. Because according to Ghozali (2006), the normality test aims to test whether in the regression model, the confounding or residual variables have a normal distribution.

Proceeding Medan International Conference Economics and Business

Volume 1, Year 2023

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Image of Normality Test Results

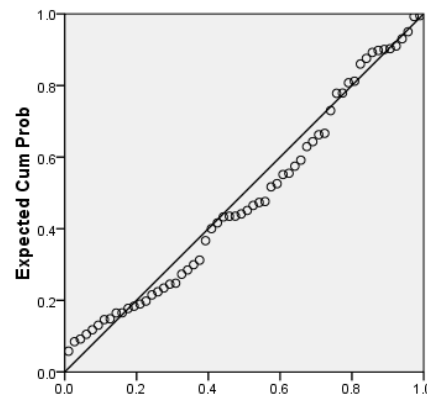


Figure 2. Normal P-P Plot of Regression Standardized residual

It can be seen that the dots are around the diagonal line or spread around the diagonal line and their distribution follows the direction of the diagonal line, this indicates that the data is normally distributed. The normal distribution will form a straight diagonal line, and plotting the rest of the data will be compared with the diagonal line. If the residual data distribution is normal, then the line that describes the actual data will follow the diagonal line (Ghozali, 2011).

Multicollinearity Test

The multicollinearity test aims to determine whether there is a correlation between the independent (free) variables in the regression model. Whether multicollinearity occurs or not, can be seen in the tolerance and VIF values. If the tolerance value is greater than 0.1 and the VIF value is less than 10, it can be said that the regression model does not cause symptoms of multicollinearity.

Table 1. Multicollinearity Test

Collinearity Statistics	
Tolerance	VIF
.458	2.185
.337	2.967
.369	2.711
.543	1.840
.524	1.910

Source : Data Processing, 2022

It can be seen that the five independent variables; labor, rainfall, rainy days, fertilizers and insecticides, have a VIF value of less than 10 and a tolerance value of all above 0.1. Thus, the data is declared free from multicollinearity.

Proceeding Medan International Conference Economics and Business

Volume 1, Year 2023

"Entrepreneurship on Global Economics Development in the Era of Society 5.0"

Heteroscedasticity

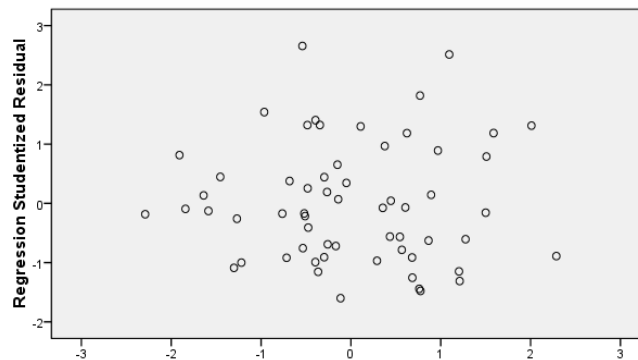


Figure 3. Heteroscedasticity Test Results

Based on the results of the heteroscedasticity test, it can be seen that the production dependent variable is spread throughout the image which is below, on the right, and on the left of the image. This shows that there is no heteroscedasticity in the regression model, so this regression model is feasible to use or use. Ghozali (2009) in Haslinda and Jamaluddin M, 2018) states that the detection of the presence or absence of heteroscedasticity can be seen by the presence or absence of certain patterns on the scatterplot graph. If there is a certain pattern, it indicates that heteroscedasticity has occurred. But if there is no clear pattern and the points spread above and below the number 0 on the Y axis, then there is no heteroscedasticity. Heteroscedasticity aims to test whether in the regression model there is an inequality of variance from one residual observation to another. In this study the heteroscedasticity test with plot graphs (Ghozali, 2016).

R and R Square Values

The coefficient of determination test aims to determine the relationship between two or more independent variables (X1, X2, X3, X4 and X5) on the dependent variable (Y) simultaneously. The value of R ranges from 0 to 1, if the value is closer to 1 it means the relationship is getting stronger, or vice versa if the value is close to zero, then the relationship is getting weaker. R and R square values can be seen in table 2.

Table 2. R and R Square Values

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Sig. F Change	Durbin-Watson
					R Square Change	F Change	df1	df2		
1	.519 ^a	.269	.202	3.74518E5	.269	3.981	5	54	.004	.906

Source : Data Processing, 2022

The coefficient of determination for the output of SPSS 16 obtained an R value of 0.519. This indicates that labor, rainfall, rainy days, fertilizers and insecticides can be explained by 51.9%. While the remaining 48.1% cannot be explained because it is influenced by other factors not included in this study.

Proceeding Medan International Conference Economics and Business

Volume 1, Year 2023

"Entrepreneurship on Global Economics Development in the Era of Society 5.0"

Determination of table F values

The F test is a test of the goodness of the model used to find out how good or not an independent variable is in predicting the value of the dependent variable. The F test is used to show whether all the independent or independent variables included in the model have a joint effect on the dependent/dependent variable (Ghozali, 2011).

Table 3. T Test Results (independent sample test) Total Microbes Depth 20-40 cm

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	2.792E12	5	5.584E11	3.981	.004 ^a
Residual	7.574E12	54	1.403E11		
Total	1.037E13	59			

Source: Data Processing, 2022

It can be seen that the f-count value (3.981) > f table (2.39) with a significance level of 0.004. This means that labor, rainfall, rainy days, fertilizers, insecticides have a significant effect on the production of oil palm plants.

Multiple Linear Test Results

Regression analysis is basically a study of the dependence of the dependent (bound) variable with one or more independent (free) variables with the aim of estimating and/or predicting the population average or the average value of the dependent variable based on the known values of the independent variables (Ghozali, 2006).

Multiple linear regression analysis was used to obtain a comprehensive picture of the effect of labor (X1), rainfall (X2), rainy days (X3), fertilizer (X4), and insecticides (X5) on production (Y). Based on computer calculations of the SPSS 16 statistical program, the regression coefficient values are obtained according to table 4.9 below.

Table 4. T Test Results (independent sample test) Soil Respiration Depth 0-20 cm

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	873975.386	151317.009		5.776	.000
Labor	-1504.062	1117.377	-.231	-1.346	.184
rainfall	-498.936	880.145	-.114	-.567	.573
Rainy days	56703.676	21896.308	.496	2.590	.012
fertilizers	1.891	.816	.366	2.316	.024
insecticides	428.081	478.982	.144	.894	.375

Source: Data Processing, 2022

The multiple regression values are as follows:

$$Y = 873975.386 - 1504.062x_1 - 498.936x_2 + 56703.676x_3 + 1.891x_4 + 428.081x_5$$

Thus the results of the t test can be explained as follows:

- The results of the calculation of the t test obtained the calculated t value for labor of -1.346 with a significant value of 0.184. The t-count value is $-1.346 < t\text{-table } 2.004$, which

Proceeding Medan International Conference Economics and Business

Volume 1, Year 2023

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- means that labor does not have a significant effect on the production of oil palm plants. The value of the labor coefficient is -1,504 which means that by adding 1 worker, it will reduce the amount of production by 1,504 kg. There is no need to increase the number of workers but to optimize or increase the wholesale base of each harvester.
- b. The results of the calculation of the t test obtained t value calculated rainfall of -.567 with a significant value of 0.573. The t-count value is $-.567 < t\text{-table } 2.004$, which means that rainfall does not have a significant effect on the production of oil palm plants. The value of the rainfall coefficient -498 means that the addition of 1 mm will reduce the amount of production by 498 kg. If the rainfall is too high then the pollination process will be disrupted and this will affect (inhibit) the process of pollination of flowers by insects.
 - c. The results of the calculation of the t test obtained the value of t counting rainy days of 2.590 with a significant value of 0.012. The t-count value is $2.590 > t\text{-table } 2.004$ which means that rainy days have a significant effect on the production of oil palm plants. The coefficient value of rainy days is 56.703 which means that with the addition of 1 rainy day it will increase the amount of production by 56.703 kg. If the rainy day is optimal, there will be no water deficit, so that it can speed up the fruit formation and ripening process.
 - d. The results of the t test calculation obtained a fertilizer t value of 2.316 with a significant value of 0.024. The t-count value is $2.316 > t\text{-table } 2.004$ which means that fertilizer has a significant effect on the production of oil palm plants. Fertilizer coefficient value of 1,891 means that the addition of 1 kg of fertilizer will increase the amount of production by 1,891 kg. because the nutrients absorbed by the plants do not return to the soil, it is necessary to apply fertilization to increase the nutrients to support oil palm production..
 - e. The results of the calculation of the t test obtained an insecticide t value of .894 with a significant value of 0.375. The t-count value is $0.894 < t\text{-table } 2.004$, which means that insecticides have no significant effect on the production of oil palm plants. The pesticide coefficient value of .428 means that the addition of 1 liter of insecticide will increase the amount of production by 428 kg. It doesn't have to be just using insecticides, utilizing the natural enemies of the bagworm pests can suppress (reduce) the population of the bagworm pests..

CONCLUSION

Labor does not affect the production of oil palm plants, this can be seen from the t-count value $-1.346 > t\text{-table } 2.004$, or a significant value of $0.184 > 0.05$. Rainfall has no effect on the production of oil palm plants, this can be seen from the t-count $-.567 > t\text{-table } 2.004$, or a significant value of $0.573 > 0.05$. Pesticides have no effect on the production of oil palm plants, this can be seen from the t-count value of $.894 > t\text{-table } 2.004$, or a significant value of $0.375 > 0.05$. Rainy days have a significant effect on the production of oil palm plants, this can be seen from the t-count value of $2.590 > t\text{-table } 2.004$, or a significant value of $0.012 > 0.05$. Fertilizer has a significant effect on the production of oil palm plants, this can be seen from the t-count value of $2.316 > t\text{-table } 2.004$, or a significant value of $0.024 > 0.05$.

Proceeding Medan International Conference Economics and Business

Volume 1, Year 2023

“Entrepreneurship on Global Economics Development in the Era of Society 5.0”

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Proceeding Medan International Conference Economics and Business

Volume 1, Year 2023

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