

# THE EFFECT OF PALM OIL'S PROTECTION COSTS ON COMPANY REVENUE

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## Abstract

This study aims to determine the cost of controlling pests of fire caterpillars (*Setothosea asigna*) and bag caterpillars (*Metisa plana*) of oil palm producing plants and analyze the effect of the cost of controlling pests of fire caterpillars (*Setothosea asigna*) and bag caterpillars (*Metisa plana*) of oil palm producing plants on the income of Kebun Bah Jambi PT. Perkebunan Nusantara IV. This study uses quantitative methods using simple linear regression analysis techniques with the help of the SPSS program. The sample in this study is the last 3 years of pest control data and the last 3 years of palm oil production data. The results of the study can be concluded: the regression equation  $Y = 2.617E11 - 1021.130X$ , meaning that the effect of variable X (pest control) on variable Y (income) is negative. The elasticity value of pest control in this study is 1021.130. This shows that each additional cost of pest control of Rp. 1, the company's revenue decreases by Rp. 1,021.13. The coefficient value obtained ( $R^2$ ) is 0.847, meaning that pest control costs affect revenue by 84.7%, while the remaining 15.3% is influenced by other variables not included in this study.

**Keywords:** *Palm Oil, Pest Control, Income.*

## 1. INTRODUCTION

Palm oil palm (*Elaeis guineensis* Jacq) is Indonesia's leading and main plantation commodity. Palm oil is also a plantation commodity that has a strategic role in Indonesia's economic development. This plant, whose main products consist of CPO (Crude Palm Oil) and PKO (Palm Kernel Oil), is one of the largest contributors to the country's foreign exchange compared to other plantation commodities and has high economic value. Palm oil has a role and prospects both in creating and increasing income. The Central Statistics Agency (BPS) noted that the area of oil palm plantations in Indonesia during 2015-2021 was quite fluctuating. In 2015-2016 the area decreased, but in 2016-2021 the area continued to increase. It was recorded that in 2021 the area would reach 14.66 million ha (Annur, 2020).

Oil palm is considered to still occupy the best portion compared to other crops. If the production, marketing and financial aspects are handled with proper management, it is not impossible that the results obtained can be more than just making a profit (Pahan, 2010 in Panggabean et al., 2011). POil palm maintenance is divided into two, namely maintenance of immature plants which aims to encourage vegetative growth and accelerate the phase of mature plants and maintenance of mature plants which is very important maintenance because it can affect the quality, quantity and continuity of oil palm production (Suwanto, 2010 in Crisdandi, 2015).

Maintenance of mature plants has a big influence on the level of production achieved. In producing oil palm that has high production and high yield, you must pay attention to several aspects in its maintenance. One important aspect in maintaining oil palm plants is pest control. Pest and disease control needs to be carried out considering that pests and diseases affect production. If pests and diseases that attack oil palm plants are not eradicated, oil palm production will decline. One of the pests that attacks oil palm plants is the fire caterpillar pest (*Setothosea asigna*) and the bagworm pest (*Metisa plana*). Pest control costs are very important to pay attention to because they

**THE EFFECT OF MAINTENANCE COSTS (PLANTS PRODUCING PALM PALM) ON COMPANY REVENUE***Anas Josua Sihombing, Ardilla, Tifany Zia Aznur, Rahmad Dian, Febriana Roosmawati*

affect company income. For this reason, companies must reduce pest control costs to a minimum for high company income.

According to Diana, 2017 (in Ratnasari et al, 2021), Income is the gross inflow of economic benefits arising from the entity's normal activities during a period, if the inflow results in an increase in equity that does not come from capital investment contributions. Revenue is the most important element in forming a profit or loss statement in an oil palm plantation company. If the cost of pest control is high, it will greatly affect the production of oil palm plants. With Cultivating oil palm is considered not too difficult, this oil palm is also able to contribute high income if cultivated properly so as to produce palm oil with a high yield. Therefore, this study aims to examine how much influence the costs of controlling fireworm pests (*Setothosea asigna*) and bagworm pests (*Metisa plana*) on oil palm plantations (*Elaeis guineensis* Jacq) have on company revenues.

**2. IMPLEMENTATION METHOD****Place and time**

The research was carried out at the Bah Jambi Plantation PT. Perkebunan Nusantara IV is located in Jawa Maraja Bah Jambi District, Simalungun Regency, North Sumatra. Implementation time starts from 27 June 2022 to 18 July 2022.

**Research design**

The research method used in this research is a quantitative descriptive research method. Descriptive research method is research carried out to determine the value of independent variables, either one or more variables (independent) without making comparisons, or connecting them with other variables (Sugiyono, 2016 in Yasmin, 2017). According to Sugiyono, 2016 (in Yasmin, 2017), quantitative methods are methods that are based on the philosophy of positivism, used to research certain populations or samples, collecting data using research instruments, quantitative or statistical data analysis with the aim of testing predetermined hypotheses. . In this research, a quantitative descriptive method was used to determine the effect of the cost of controlling fireworms (*Setothosea asigna*) and bagworms (*Metisa plana*) of oil palm producing plants (*Elaeis guineensis* Jacq) on income.

**Research Stages**

1. Collecting data from existing research journals and books as reference material for research activities.
2. Collect data on pest control for fireworms and bagworms in the Bah Jambi Plantation of PT. Perkebunan Nusantara IV.
3. 3. Assess the costs of controlling fireworm and bagworm pests in gardens that have been used as research sites.

**Research variable**

Observed data includes:

1. Garden information
  - a. Garden history
  - b. Garden area
2. Data on materials used to control fireworm and bagworm pests.
3. Pesticide dose data (Kg & Ltr).
4. Data on the cost of controlling fireworms and bagworms for the last 3 years.
5. Production yield data (Kg).
6. TBS price data (Rp).

**Data analysis**

1. Data analysis method

Formula for finding pest control costs:

$$TBH = BPB + BTK$$

Information :

TBH = Total Pest Control Cost

BPB = Material Purchase Cost

BTK= Labor Costs

(Pratama, 2020).

2. Formula for finding income:

$$Pd = TR - TC$$

Where :

Pd: Palm Oil Farming Business Income

TR (Total revenue): Total Revenue

TC (Total cost): Total Cost (Pest Control)

Source: (Soekartawi, 2017 in Fadhilah, 2021)

There are also total costs (TC) that are calculated in oil palm farming income are pest control costs.

3. Simple Regression

According to Sugiyono, 2016 (in Muizu et al., 2016), simple regression analysis is an analytical tool used to measure the influence between the independent variable (X) and the dependent variable (Y).

The simple regression equation is formulated as follows:

$$Y = a + bX$$

Information:

Y = Predicted value

a = Constant or if the price of X=0

b = Regression coefficient

X = Value of the independent variable

- a. Kcoefficient of determination

This coefficient of determination functions to determine the magnitude of the influence of the independent variable on the dependent variable. In its use, the coefficient of determination is expressed in percentage (%).

According to Sugiyono, 2010 (in Ressay, 2018) the coefficient of determination formula is as follows:

$$Kd = r^2 \times 100\%$$

Information:

Kd = Coefficient of Determination

r<sup>2</sup> = Correlation coefficient

- b. Hypothesis Test (t Test)

This test is used to find out whether the independent variable (X) has a significant effect on the dependent variable (Y). Significant means that the influence that occurs can apply to the population (can be generalized).

According to Sugiyono, 2014 (in Muizu et al, 2016) using the formula:

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Information:

t = Calculated t value

r = Correlation coefficient

r<sup>2</sup> = Coefficient of determination

n = number of respondents

# THE EFFECT OF MAINTENANCE COSTS (PLANTS PRODUCING PALM PALM) ON COMPANY REVENUE

Anas Josua Sihombing, Ardilla, Tifany Zia Aznur, Rahmad Dian, Febriana Roosmawati

(T-test) The results of this calculation are then compared with the t table using an error rate of 0.05. The criteria used are as follows:

- t count < t table ; H<sub>0</sub> is accepted H<sub>1</sub> is rejected
- t count > t table ; H<sub>0</sub> is rejected. H<sub>1</sub> is accepted

H<sub>0</sub>: The cost of pest control used does not have a significant effect on company income.

H<sub>1</sub>: The cost of pest control used has a significant effect on company income.

## 3. RESULTS AND DISCUSSION

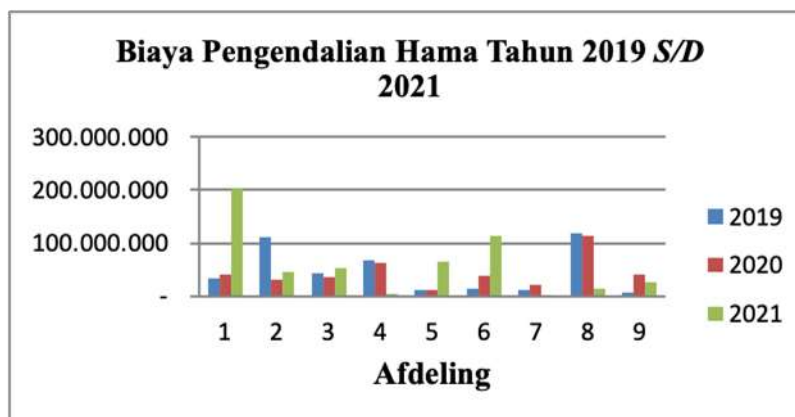
### Pest Control Costs

Pest control in the research area is not a top priority in TM maintenance efforts, which means that this activity will only be carried out if an attack occurs. The method of controlling oil palm leaf-eating caterpillars in the research area is by spraying insecticide using pulsfog and using stem injection.

**Table 1. Palm Oil Pest Control Costs 2019 to 2021**

Afdeling	Tahun			Total Biaya (Rp)
	2019 (Rp)	2020 (Rp)	2021 (Rp)	
1	31.959.580	39.484.691	203.686.116	275.130.387
2	109.991.930	30.129.936	44.872.125	184.993.991
3	42.199.222	34.657.385	53.598.850	130.455.457
4	67.132.914	62.233.362	4.311.301	133.677.577
5	11.982.617	11.016.544	64.018.208	87.017.369
6	14.598.959	38.305.664	113.259.741	166.164.364
7	11.977.077	21.288.794	314.619	33.580.490
8	117.789.138	112.995.085	13.702.151	244.486.374
9	5.974.051	41.333.662	26.970.006	74.277.719
Total	413.605.488	391.445.123	524.733.117	1.329.783.728

The following is a graph of Pest Control Costs at PT. Perkebunan Nusantara IV Kebun Bah Jambi:



**Figure 1. Pest Control Cost Graph for 2019 to 2021.**

Pest control costs experience changing trends in the form of increases and decreases in pest control costs. In 2021, pest control costs reached IDR 524,733,177 and became the highest pest control costs compared to 2019, IDR 413,605,488 and 2020, IDR 391,445,123. Factors that cause the rise and fall of pest control costs are the amount of materials used and the rise and fall of material prices. In 2019 the materials used were 1287.76 Kg and 1882.90 L, in 2020 1006.97 Kg and 3601.40 L, and in 2021 1586.95 Kg and 2489.64 L. In 2020 the materials needed are high, Meanwhile, costs in 2020 decreased compared to the high costs of pest control in 2019 and 2021.

The cause of the decrease in pest control costs in 2020 was the price of Biodiesel fuel which decreased by IDR 7,825/ltr, whereas in 2019 the price of Biodiesel fuel was IDR 8,946/ltr and in 2021 the price of Biodiesel fuel increased by IDR 8,723/ltr. Based on table 1, it can also be

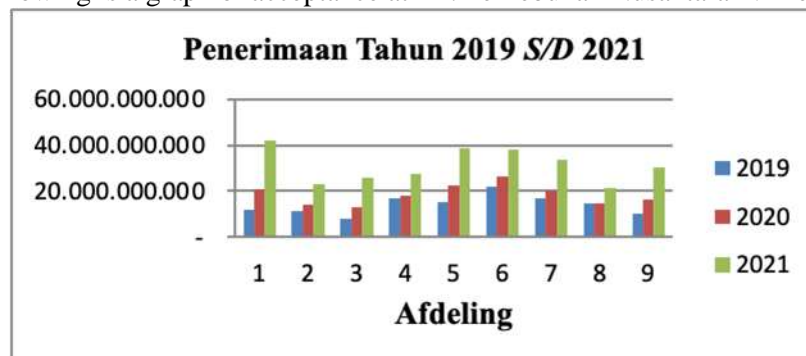
seen that there are differences in pest control costs for each division. In 2019, the lowest pest control costs were in afdeling 9 with pest control costs of IDR 5,974,051 and the highest pest control costs were in afdeling 8 with pest control costs of IDR 117,789,138. In 2020, the lowest pest control costs were in subdivision 5, amounting to IDR 11,106,554 and the highest pest control costs were in subdivision 8, amounting to IDR 112,995,085. In 2021, the lowest pest control costs in subdivision 7 amounted to IDR 314,619 and the highest pest control costs in subdivision 6 amounted to IDR 113,259,741. The factor that causes the low and high costs of pest control in each division is due to the level of pest attacks. The higher the pest attack on one part, the higher the materials and labor required.

### Reception

**Table 2. Revenue in the Last 3 Years**

Afdeling	Tahun			
	2019 (Rp)	2020 (Rp)	2021 (Rp)	Total (Rp)
1	11.694.672.000	20.947.225.950	42.049.304.040	74.691.201.990
2	11.541.360.600	14.266.199.850	23.311.145.160	49.118.705.610
3	7.973.351.100	13.211.875.460	25.822.758.780	47.007.985.340
4	17.126.207.881	17.961.387.105	27.215.641.410	62.303.236.396
5	15.515.591.850	22.271.639.040	38.566.933.860	76.354.164.750
6	21.957.135.750	26.410.221.180	38.096.003.160	86.463.360.090
7	16.982.950.050	20.148.617.020	33.486.117.660	70.617.684.730
8	14.779.759.500	14.790.266.400	21.452.239.980	51.022.265.880
9	10.107.592.514	16.233.326.521	30.196.801.380	56.537.720.415
Total	127.678.621.245	166.240.758.527	280.196.945.430	574.116.325.202

The following is a graph of acceptance at PT. Perkebunan Nusantara IV Kebun Bah Jambi



**Figure 2. 2019 Revenue Graph Until 2021**

Based on table 2, it can be observed that there has been an increase in revenue at the Bah Jambi Gardens. The factors causing the high revenue from Jambi Bah Gardens are the increase in the selling price of FFB/Kg and the increase in production quantities. The biggest increase occurred in 2021 with production of IDR 111,321,790 multiplied by the average FFB price in 2021, namely IDR 2,517, so that the revenue from the Jambi Jambi plantation in 2021 was IDR 280,196,945,430.



# THE EFFECT OF MAINTENANCE COSTS (PLANTS PRODUCING PALM PALM) ON COMPANY REVENUE

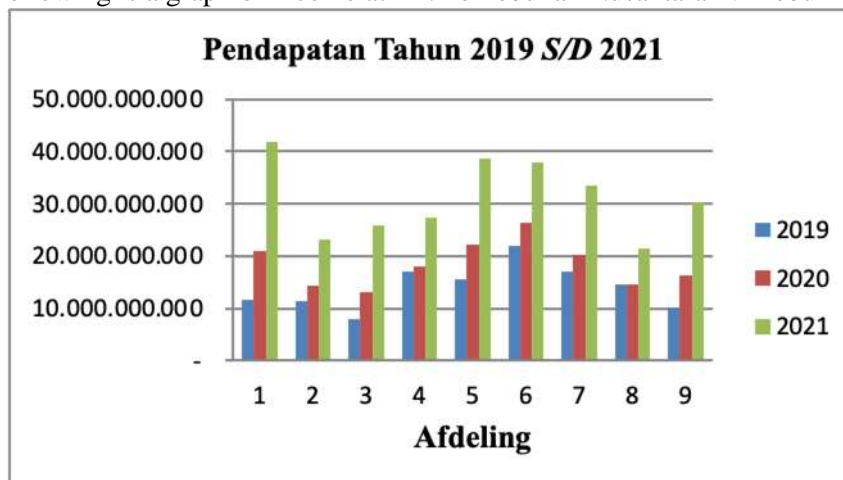
Anas Josua Sihombing, Ardilla, Tifany Zia Aznur, Rahmad Dian, Febriana Roosmawati

## Income

**Table 3. Income in the Last 3 Years**

Afdeling	Tahun			
	2019 (Rp)	2020 (Rp)	2021 (Rp)	Total (Rp)
1	11.662.712.420	20.907.741.259	41.845.617.924	74.416.071.603
2	11.431.368.670	14.236.069.914	23.266.273.035	48.933.711.619
3	7.931.151.878	13.177.218.075	25.769.159.930	46.877.529.883
4	17.059.074.967	17.899.153.743	27.211.330.109	62.169.558.819
5	15.503.609.233	22.260.622.496	38.502.915.652	76.267.147.381
6	21.942.536.791	26.371.915.516	37.982.743.419	86.297.195.726
7	16.970.972.973	20.127.328.226	33.485.803.041	70.584.104.240
8	14.661.970.362	14.677.271.315	21.438.537.829	50.777.779.506
9	10.101.618.463	16.191.992.859	30.169.831.374	56.463.442.696
Total	127.265.015.757	165.849.313.404	279.672.212.313	572.786.541.474

The following is a graph of income at PT. Perkebunan Nusantara IV Kebun Bah Jambi



**Figure 3. 2019 Revenue Graph Until 2021**

In table 3 above, it can be observed that there has been an increase in income at Bah Jambi Gardens. The high income will be in 2021 amounting to IDR 279,672,212,313. The factor that causes the high income of Kebun Bah Jambi is revenue. From the revenue results, high production quantities and high FFB selling prices are obtained. So the production and price of FFB greatly influence the income of Jambi Bahru plantations. greatly affects the income of Jambi Bah Gardens.

## SIMPLE LINEAR REGRESSION ANALYSIS

**Table 5. Analysis Results Simple Linear Regression**

Variable	Regression Coefficients	Standard Error	T-Count	Sig
(Constant)	-2.617E11	1.939E11	-1,349	,406
Pest Control	1021,130	433,785	2,354	,256

R-Square = .847

T-Count = 2,354

T-Table = 12,706

The simple linear regression equation obtained is;

$$Y = 2.617E11 - 1021.130X$$

This means that the influence of variable X (pest control) on variable Y (income) is negative. Elasticity value pest control in this study was 1021.130. This shows that for every increase in pest control costs of IDR 1, the company's income decreases by IDR. 1,021.13. From the results of the regression analysis, the coefficient of determination (R<sup>2</sup>) value is 0.847. The coefficient (index) of determination shows that palm oil income can be explained by the variable pest control costs, meaning that pest control costs influence income by 84.7%, while the remaining 15.3% is influenced by other variables not included in this research. The results of statistical tests carried out using simple linear regression obtained a calculated t value = 2,354. Therefore t count < t table or 2,354 < 12,706 means H<sub>0</sub> is accepted H<sub>1</sub> is rejected. Partially, there is no significant influence between pest control costs and company income.

#### 4. CONCLUSION

1. Costa in pest control at the Bah Jambi Plantation PT. Perkebunan Nusantara IV includes costs for controlling fire caterpillars (*Setothosea asigna*) and bagworms (*Metisa plana*) from 2019 IDR 413,605,488, in 2020 IDR 391,455,123, and in 2021 IDR 524,773,177.
2. From the results of statistical testing carried out using simple linear regression, the R<sup>2</sup> (R Square) value was 0.847. So it can be explained that pest control costs affect company income by 84.7%, while the remaining 15.3% is influenced by other variables not included in this research.

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**THE EFFECT OF MAINTENANCE COSTS (PLANTS PRODUCING PALM PALM) ON COMPANY REVENUE***Anas Josua Sihombing, Ardilla, Tifany Zia Aznur, Rahmad Dian, Febriana Roosmawati*

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