The Effect of Fresh Fruit Bunch Prices and Transportation Costs on The Income of Oil Palm Farmers in Kampung Rakyat District

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Abstract.

This study aims to analyze the effect of Fresh Fruit Bunch (FFB) Prices and Transportation Costs on the Income of Oil Palm Farmers in Kampung Rakyat District, South Labuhanbatu Regency. This study uses a quantitative approach with multiple linear regression analysis methods. The study population was 1,250 oil palm farmers with a sample of 93 respondents determined using the Slovin formula with a 10% error rate. Data were collected through questionnaires, structured interviews, and field observations, then analyzed using SPSS version 25 at a significance level of 5%. The results showed that partially, the FFB Price had a positive and significant effect on the income of oil palm farmers with a significance value of 0.017 < 0.05 and a regression coefficient of 0.180. This indicates that an increase in the price of FFB will increase farmers' income. Meanwhile, Transportation Costs did not have a significant effect on farmers' income with a significance value of 0.944 > 0.05, although the regression coefficient was negative. Simultaneously, the FFB Price and Transportation Costs had a significant effect on the income of oil palm farmers. The coefficient of determination (R^2) of 0.362 indicates that the two variables are able to explain 36.2% of the variation in farmers' income, while 63.8% is influenced by other factors outside the research model. Based on the research results, it can be concluded that the price of fresh fruit bunches (FFB) is the most dominant variable in influencing the income of oil palm farmers in Kampung Rakyat District. This research is expected to be a consideration in formulating policies to improve the welfare of oil palm farmers.

Keywords: *Fresh Fruit Bunch Price; Transportation Costs; Palm Oil Farmers' Income; Multiple Linear Regression and Kampung Rakyat District.*

I. INTRODUCTION

Indonesia is the largest palm oil producer in the world with an area of 16.83 million hectares and production of 46.82 million tons in 2022 (https://satudata. pertanian.go.id/details/publikasi/6960). Palm oil plantations play a strategic role in the national economy, not only as a source of foreign exchange through the export of Crude Palm Oil (CPO) and its derivatives, but also as a source of livelihood for millions of farmers in Indonesia. Palm oil production centers are spread across various provinces, including Riau, Central Kalimantan, West Kalimantan, North Sumatra, East Kalimantan, South Sumatra, and Jambi.South Labuhanbatu Regency, particularly Kampung Rakyat District, is one of the areas with significant oil palm plantation activity. The majority of residents in this district depend on oil palm farming for their livelihood. Smallholder oil palm plantations contribute 40.8% of total national palm oil production, making them crucial in supporting the Indonesian palm oil industry. However, oil palm production in Kampung Rakyat District still faces various challenges that impact farmers' incomes.The income of oil palm farmers depends heavily on the price of Fresh Fruit Bunches (FFB) received and their production costs. The price of FFB in oil palm fluctuates significantly and varies across regions. Data shows that the price of FFB in Indonesia in 2021 ranged from IDR 2,202 to IDR 3,819 per kilogram, depending on location and fruit quality. This fluctuation in FFB prices significantly impacts the income and well-being of oil palm farmers (https://variablejournal.my.id/index.php/VRJ/article/view/210.

In Kampung Rakyat District, the instability of palm oil selling prices is a major obstacle to farmer empowerment. Prices, which were high at the beginning of the year, continued to decline towards the end. This instability was influenced by weakening global demand for CPO. Competition with other vegetable oils, declining exports, and weather conditions impacted production. As a result, the number of palm oil farmers

in South Labuhanbatu also declined, impacting the regional economy, which relies on this commodity.In addition to the price of fresh fruit bunches (FFB), transportation costs are also a significant factor influencing the net income of oil palm farmers. The cost of transporting fresh fruit bunches (FFB) from the plantation to the Palm Oil Mill (POM) can reach IDR 500 per kilogram for a distance of 60-70 kilometers. These transportation costs are greatly influenced by the distance from the plantation to the mill, the condition of the road infrastructure, and the type of vehicle used. The Indonesian Palm Oil Council encourages the development of small-scale POMs (POMs) close to plantations to reduce transportation costs and improve the welfare of oil palm farmers. High transportation costs can significantly reduce farmers' profit margins, especially when FFB prices are low.The problem of transportation costs in smallholder plantation areas is increasingly complex due to the lack of clear standards. Oil palm farmers complain about the high transportation costs charged to them, and they are vulnerable to manipulation due to the lack of standards set by local governments. This situation is exacerbated by the generally inadequate road infrastructure on smallholder plantations compared to large corporate plantations.

*The Influence of Fresh Fruit Bunch Prices and Transportation Costs on the Income of Oil Palm Farmers in Kampung Rakyat District*Research shows that prices and production costs, including transportation costs, significantly influence the income of oil palm farmers. Studies in various regions indicate that increases in FFB prices have a positive impact on farmer income, while increases in transportation costs have a negative impact. However, research specifically analyzing the influence of these two variables on the income of oil palm farmers in Kampung Rakyat District is still limited.Adequate income for oil palm farmers is crucial for improving their well-being and encouraging participation in productivity improvement programs. Surveys show that gross income for oil palm farmers can reach IDR 21 million per hectare per year, with a net income of around IDR 15 million per hectare per year if maintenance is carried out independently. However, the realization of this income varies greatly depending on the efficiency of the farming business, particularly in terms of cost management and the selling price obtained by farmers. Given these conditions and issues, research into the impact of fresh fruit bunch (FFB) prices and transportation costs on the income of oil palm farmers in Kampung Rakyat District is crucial. This research is expected to provide a comprehensive overview of the factors influencing oil palm farmer income and provide appropriate policy recommendations to improve the welfare of oil palm farmers in the region.

II. LITERATURE REVIEW

2.1 Theoretical basis

2.1.1 Fresh Fruit Bunches (FFB) of Oil Palm

Fresh fruit bunches (FFB) of oil palm are the primary product of oil palm plantations, serving as the raw material for producing crude palm oil (CPO). The quality and price of FFB significantly influence the income of oil palm farmers. FFB prices in Indonesia follow global CPO prices and are regulated through a pricing mechanism by local governments, taking into account the K index (the ratio of CPO and kernel prices to FFB prices).Fluctuating FFB prices are a major challenge for oil palm farmers, especially smallholders who have little bargaining power in the marketing chain. Smallholders contribute more than 40% of national palm oil production, yet they often face pressure when FFB prices fall while production costs remain high. FFB pricing at the provincial level is determined twice a month based on the average price of CPO and weighted kernels from the palm oil mills that serve as data sources.

2.1.2 Price

The price and quantity of goods traded in the market are determined by supply and demand. Therefore, analysis of the determination of prices and quantities of goods traded in a market must be based on a simultaneous analysis of supply and demand for those goods. (Muhammad Nasir Arifin, 2021). From a price perspective, it is a monetary unit or other measure exchanged to obtain ownership or use of a good or service (Tjiptono, 2009). Meanwhile, according to Kotler and Armstrong (2017),Price is defined as the amount of money charged for a product or service, more broadly price is the sum of the values required in the selling price of the product as determined by the company.From the definition above, it can be concluded that price is one of the key factors in determining a company's success because it determines how much

profit the company will earn from selling its products, whether services or goods. Setting the price too high will lead to a decline in sales, but setting the price too low will reduce the organization's potential profits.

Fresh Fruit Bunch Prices for the 2025-2026 Period

Regency	Plasma (Rp/kg)	PPKS / Self-Help (Rp/kg)
North Labuhanbatu	± 3,437	± 2,650 – 2,700
Labuhanbatu	± 3,437	± 2,650 – 2,700
South Labuhanbatu	± 3,437	± 2,700 – 2,750

Source: PKS Labuhanbatu Raya and Farmers

2.1.3 Price Indicator

According to Kotler and Armstrong (2019), in the price variable there are several main elements of price activity which include price lists, discounts, price cuts and payment periods.

a. Affordabilityis the ability of consumers to purchase products based on the prices offered.

b. Price Match with Product Qualityis the consumer's perception of whether the price is commensurate with the quality or superiority of the product received.

c. Price Competitivenessis a comparison of product prices with similar products from competitors in the market.

d. Price-Benefit Matchis how much benefit or value consumers feel compared to the money they spend.

III. METHODS

This research was conducted in Kampung Rakyat District, South Labuhanbatu Regency, North Sumatra Province. The location was selected based on several considerations:

a) Kampung Rakyat District is a significant center for palm oil production.

b) There are variations in the price of fresh fruit bunches and transportation costs experienced by farmers.

c) Adequate location accessibility for data collection

Primary Data Data Collection Techniques:

1. Structured Interview: using a validated questionnaire
2. Direct Observation: garden conditions, harvesting process, and infrastructure

A. Secondary Data:

1. Data from the Plantation Service and BPS
2. Scientific journals and related research reports
3. Palm oil regulations and policies

B. Research Variables:

Research Instruments

The main instrument in this study was a questionnaire designed to measure the research variables:

Research Variables:

Independent Variable (X):

- - X_1: Fresh Fruit Bunch Price (Rp/kg) - the selling price of fresh fruit bunches received by farmers at the time of the survey
- - X_2: Transportation Costs (Rp/month) - total cost of transporting fresh fruit bunches from the plantation to the point of sale

Dependent Variable (Y):

- - Y: Farmer Income (Rp/month) - total income from sales of fresh fruit bunches minus total production and transportation costs

The questionnaire was constructed using a measurement scale appropriate to the type of data being collected. For quantitative data such as prices, costs, and income, a ratio scale was used, while for respondent characteristics, nominal and ordinal scales were used.7

Before being used in the main research, the instrument will go through the following stages:

1. Validity Test

Using Pearson's product moment correlation to measure the accuracy of the instrument in measuring

the variables it is supposed to measure. The statement item is considered valid if the calculated r value > r table with a significance level of 5%.43

2. Reliability Test

Using the Cronbach's Alpha technique to measure instrument consistency. An instrument is considered reliable if the Cronbach's Alpha value is > 0.60.44

Validity and reliability testing was conducted on 30 respondents outside the research sample, but who had the same characteristics as the respondents in the research sample.

3. Hypothesis testing

Hypothesis testing is used to determine whether the price of fresh fruit bunches (X1) and transportation costs (X2) have an effect on the income of oil palm farmers (Y), either partially or simultaneously. The test is carried out using multiple linear regression analysis with the help of SPPS version 25 at a significance level of a = 0.05 (5%).

a. T-Test (Partial Test)

The t-test is used to determine the partial influence of each independent variable on the dependent variable.

Data Analysis Techniques

Multiple Linear Regression Analysis:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + e$

Testing using SPSS version 25 with F test (simultaneous), t test (partial), and classical assumption test.

Information:

Y = income of oil palm farmers (Rp/month) X1 = price of fresh fruit bunches (Rp/kg)

X2 = transportation costs (Rp/month) a = constant

B1b2 = regression coefficient e = error

IV. RESULTS AND DISCUSSION

Instrument Test

a) Validity Test

Using Pearson's product-moment correlation to measure the instrument's accuracy in measuring the variables it is intended to measure, the results of the validity test in this study are as follows:

Table 1. Validity Test

Variables		Statement				
		P1	P2	P3	P4	P5
TBS Price (X1)	SPSS Results	,849	,837	,640	,628	,210
	R table	,203	,203	,203	,203	,203
	Information	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**
Transportation Cost (X2)	SPSS Results	,697	,277	,705	,346	,458
	R table	,203	,203	,203	,203	,203
	Information	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**
Farmer Income (Y)	SPSS Results	,450	,516	,440	,476	,422
	R table	,203	,203	,203	,203	,203
	Information	**Valid**	**Valid**	**Valid**	**Valid**	**Valid**

Source: SPSS data processing

Based on the results of the instrument validity test using Corrected Item–Total Correlation, all statement items in the variables [X1/X2/Y] have a CITC value greater than 0.203, so it can be concluded that all statement items are valid and suitable for use in further analysis.

a. Reliability Test

No	Variables	Conbrach Alpha	Recommendation	Information
1	Fresh Fruit Bunch Price	0.764	0.60	Reliable
2	Transportation costs	0.662	0.60	Reliable
3	Farmer Income	0.610	0.60	Reliable

Based on the results of the reliability test using the Cronbach's Alpha method, the instrument on the variable [X1/X2/Y] obtained a Cronbach's Alpha value of [0.764, 0.662, 0.610]. Because the alpha value is

greater than 0.60 (or 0.70 according to the standard used), the research instrument on this variable is declared reliable and consistent for use in data collection.

Hypothesis Testing

a. t-test

The results of the t-test are as follows:

Coefficientsa

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	17,706	2,707		6,541	,000
Price_Tbs	,180	,074	,249	2,426	,017
Transportation Costs	-,007	,106	-,007	-,070	,944

a. Dependent Variable: PTn_Revenue

The t-test is used to see the effect of each variable X on Y partially at α = 0.05.

a) The Effect of Fresh Fruit Bunch Price (X1) on Income (Y) The variable Fresh Fruit Bunch Price (X1) has a calculated t = 2.426 with Sig. = 0.017 Determinant Test. Because 0.017 < 0.05, the Fresh Fruit Bunch Price has a significant effect on Farmer Income. The coefficient B is positive (0.180), so the direction of the effect is positive: the higher the Fresh Fruit Bunch Price, the farmer's income tends to increase Determinant Test. Hypothesis decision (α = 0.05): H1 is accepted (X1 is significant to Y).b) The Effect of Transportation Costs (X2) on Income (Y) The Transportation Costs variable (X2) has a calculated t = -0.070 with Sig. = 0.944 Determinant Test. Because 0.944 > 0.05, Transportation Costs do not have a significant effect on Farmer Income. Although the B coefficient is negative (-0.007), the effect is not statistically significant Determinant Test. Hypothesis decision (α = 0.05): H2 is rejected (X2 is not significant to Y).

Based on the Coefficients table, the regression model formed is:

$$Y = 17.706 + 0.180(X1) - 0.007(X2)$$

Determinant Test Description: Y = Farmer's Income (PTn_Income) X1 = Fresh Fruit Bunch Price (Tbs_Price) X2 = Transportation Cost (Transportation_Cost) This means that when other variables are considered constant: An increase in Fresh Fruit Bunch Price tends to increase farmer's income by 0.180 units. An increase in Transportation Costs tends to decrease farmer's income by 0.007 units.

b) F test

The results of the t-test are as follows:

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16,551	2	8,276	2,951	,057b
	Residual	252,374	90	2,804		
	Total	268,925	92			

a. Dependent Variable: PTn_Revenue

b. Predictors: (Constant), Transport Cost, Tbs Price

The F test is used to see whether X1 and X2 simultaneously influence Y. Based on the ANOVA table, the calculated F = 2.951 with Sig. = 0.057 Determinant Test. Because 0.057 < 0.05, then at the significance level α = 0.05 it can be concluded that the Price of Fresh Fruit Bunches and Transportation Costs simultaneously have a significant effect on Farmer Income. Hypothesis decision (α = 0.05): H3 is accepted (X1 and X2 together have a significant effect on Y).

c) Determination Test (R2)

The test results are as follows

Model Summary

Model		R Square	Adjusted R Square	Stan dard Error of the Estimate	Change Statistics					D urbin-Watson
					R Square Change	F Change	f1	f2	Sig. F Change	
	548a	,362	,241	1,675	,062	2,951	2	90	,057	2,653

a. Predictors: (Constant), Transport Cost, Tbs Price

b. Dependent Variable: PTn_Revenue

Based on the Model Summary table, the value: R Square (R^2) = 0.362 Determinant Test This means that the variables of Fresh Fruit Bunch Price and Transportation Costs are able to explain the variation in Farmer Income by 36.2%. The remaining 63.8% is influenced by other factors outside the model (for example: land area, production/tonnage, productivity, fertilizer and maintenance costs, input prices, road access, Fresh Fruit Bunch quality, and weather factors). In addition, Adjusted R Square = 0.241 Determinant Test, which shows that after adjustments to the number of variables and samples, the model's explanatory contribution becomes 24.1%.

Discussion

1. The Effect of Fresh Fruit Bunch (FFB) Prices on Palm Oil Farmers' Income Based on the results of the partial test (t-test), the FFB Price variable (X1) has a positive and significant effect on the income of palm oil farmers in Kampung Rakyat District at a significance level of 5%. The positive regression coefficient indicates that every increase in the price of fresh fruit bunches will increase farmers' income. Theoretically, these results are in line with microeconomic theory which states that producer income is influenced by the price and quantity of output sold.According to Mankiw (2018), total revenue is the product of price (P) and production quantity (Q). Therefore, an increase in the price of fresh fruit bunches (FFB) will directly increase revenue and ultimately increase farmers' income. Boediono (2014) also stated that price is a key variable in the market mechanism that determines the level of producer welfare. Therefore, fluctuations in FFB prices significantly determine the economic conditions of smallholder oil palm farmers. The results of this study align with Saragih (2018) who found that FFB prices significantly influence the income of oil palm farmers in North Sumatra.Likewise, Lubis and Sihombing (2019) stated that the selling price of fresh fruit bunches (FFB) is the main determinant of changes in the income of smallholder oil palm farmers.

2. The Effect of Transportation Costs on Palm Oil Farmers' Income The results of the partial test indicate that the Transportation Cost variable (X2) does not significantly influence palm oil farmers' income. Although the regression coefficient is negative, the effect is not statistically significant at the 5% level. In theory, transportation costs are included in the operational cost components that will reduce net income (Soekartawi, 2016).However, in the context of this study, transportation costs were not a dominant factor influencing farmer income. This could be due to the small proportion of transportation costs compared to total revenue or the existence of a sales system through middlemen that helps reduce distribution costs. This finding aligns with Hasibuan (2020), who stated that with adequate infrastructure, transportation costs are not a significant factor in determining oil palm farmer income.

3. The Simultaneous Effect of Fresh Fruit Bunch Prices and Transportation Costs on Farmers' Income Based on the results of the simultaneous test (F-test), it was found that the variables of Fresh Fruit Bunch Price and Transportation Costs together had a significant effect on oil palm farmers' income at a significance level of 5%. This indicates that the combination of these two variables can meaningfully explain variations in farmers' income. Theoretically, in farming business analysis, income is influenced by the interaction between revenue (price × production) and production costs (Soekartawi, 2016).Therefore, although transportation costs are not partially significant, when combined with the FFB price variable in one model, both still make a significant contribution to changes in farmer income. The coefficient of determination (R^2) value of 0.362 indicates that 36.2% of the variation in farmer income can be explained by these two variables, while the remaining 63.8% is influenced by other factors such as land area, productivity, plant age, fertilizer costs, labor, and weather factors. These results indicate that FFB price remains the main factor, but the presence of transportation costs in the model strengthens the structure of the overall income analysis.

V. CONCLUSION AND SUGGESTION

Conclusion

Based on the results of multiple linear regression analysis regarding the influence of FFB Prices and Transportation Costs on the Income of Oil Palm Farmers in Kampung Rakyat District, the following conclusions can be drawn:

- The price of fresh fruit bunches (FFB) has a positive and significant impact on the income of oil palm farmers. This indicates that the higher the price of fresh fruit bunches (FFB), the higher the income received by oil palm farmers. Therefore, the price of FFB is a primary factor determining the income level of oil palm farmers in Kampung Rakyat District.
- Transportation costs did not significantly impact oil palm farmers' income partially. Although theoretically, transportation costs could reduce farmers' net income, this variable was not proven significant at the 5% level in this study. This indicates that transportation costs are not yet a dominant factor in determining farmers' income levels at the study sites.
- Simultaneously, FFB prices and transportation costs significantly influence oil palm farmers' income. This means that both variables together can meaningfully explain changes in oil palm farmers' income.
- The coefficient of determination (R^2) value of 36.2% indicates that variations in oil palm farmers' income can be explained by the variables of FFB Price and Transportation Costs by 36.2%, while the remaining 63.8% is influenced by other factors outside the research model, such as land area, productivity, fertilizer costs, labor, and other external factors.
- Based on these results, it can be concluded that the price of fresh fruit bunches (FFB) is the most dominant variable in influencing the income of oil palm farmers in Kampung Rakyat District.

Suggestion

Based on the research conclusions, the suggestions that can be given are as follows:

- For Regional Governments It is hoped that regional governments can maintain the stability of FFB prices through supervision and fair pricing policies, so that the income of oil palm farmers can be more guaranteed and stable.
- For Oil Palm Farmers Farmers are advised to increase productivity through the use of appropriate fertilizers, optimal plant care, and improving the quality of fresh fruit bunches (FFB) in order to obtain higher selling prices.
- For Palm Oil Institutions or Factories (PKS), it is hoped that they can provide transparency in pricing and discount systems, so that farmers receive prices that are in accordance with the quality of their harvest.
- For further researchers, it is recommended to add other variables such as land area, production volume, fertilizer costs, labor, and plant age so that the research model has higher explanatory power and provides a more comprehensive picture of the factors that influence the income of oil palm farmers.

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