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Analysis of Determinants of Palm Commodity Supply in West Sulawesi

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Abstract

This study aims to analyze trends in palm oil production, analyze factors influencing palm oil supply, and determine the elasticity of palm oil supply in West Sulawesi. The research method used is quantitative descriptive. The study was conducted in West Sulawesi. The data used is time series data from 2004 to 2024, spanning 20 years. Data analysis used includes trend analysis, multiple linear regression analysis, and the supply elasticity formula.

The results show an increasing trend in palm oil production from 2004 to 2024, although annual data shows a fluctuation pattern of 0.4198, or 41.98 percent per year, equivalent to 0.028 units of production per year. Factors simultaneously influencing palm oil supply include the previous year's palm oil price, the previous year's urea fertilizer price, the previous year's cocoa price, harvested area, and rainfall. The variable with a partially significant influence is the harvested area. If the area of oil palm harvest increases by 1 percent, the supply of oil palm also increases by 0.276 percent per year. The elasticity value of the area of oil palm harvested commodities in the short term is 3.50 and the long term is 4.38 elastic while rainfall has an elasticity value with a value of 0.39 in the short term and 0.49 in the long term on the supply of oil palm commodities in West Sulawesi.

Keywords: Supply, Palm Oil, Price, Land Area, Rainfall.

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INTRODUCTION

Observing the development of palm oil production in West Sulawesi, palm oil has become a source of income for the local community. However, land area, production, and prices of palm oil continue to decline, which will affect the quantity of palm oil supply in West Sulawesi. Therefore, a comprehensive and intensive study of the determinants of palm oil supply in West Sulawesi is crucial. Therefore, the author conducted a study entitled "Analysis of the Determinants of Palm Oil Supply in West Sulawesi."

Objectives

The objectives of this study are:

1. To analyze trends in palm oil production in West Sulawesi.
2. To analyze factors influencing the supply of palm oil in West Sulawesi.
3. To determine the elasticity of palm oil supply in West Sulawesi.

The development of the palm oil industry is inseparable from government incentives, such as the plantation rehabilitation program implemented by the Department General of Crop Production of the Ministry of Agriculture. Furthermore, the Plantation Financing and Licensing Facility is outlined in the Government Regulation on Credit for Bioenergy Development and Plantation Restoration (KPENRP). Plans for the socialization and development of the palm oil industry (oil palm plantations) in Indonesia are primarily located in Sumatra, Kalimantan, Papua, and Sulawesi. Indonesia's soil conditions strongly support oil palm cultivation, therefore, oil palm plantations are the most important in various provinces across Indonesia. The potential area of South Sulawesi province is 288,000 hectares.

According to 2019 data from the Central Statistics Agency, West Sulawesi Province is the largest palm oil producer in Eastern Indonesia, with a production of 441,090 tons. The Head of the West Sulawesi Plantation Service, Abdul Waris Bestari, stated that the area of oil palm plantation commodities in West Sulawesi in 2019 was 152,475 hectares, which includes Central Mamuju, Pasangkayu and Mamuju.

DISCUSSION

Production is a crucial factor in determining the quantity supplied of a commodity. The higher the production volume, the greater the quantity of goods available to consumers. Conversely, when production declines, the quantity of goods available also decreases.The trend in oil palm production in West Sulawesi can be calculated using a simple linear regression analysis model (trend analysis). The following is a description of the development of palm oil production in 2004-2024:

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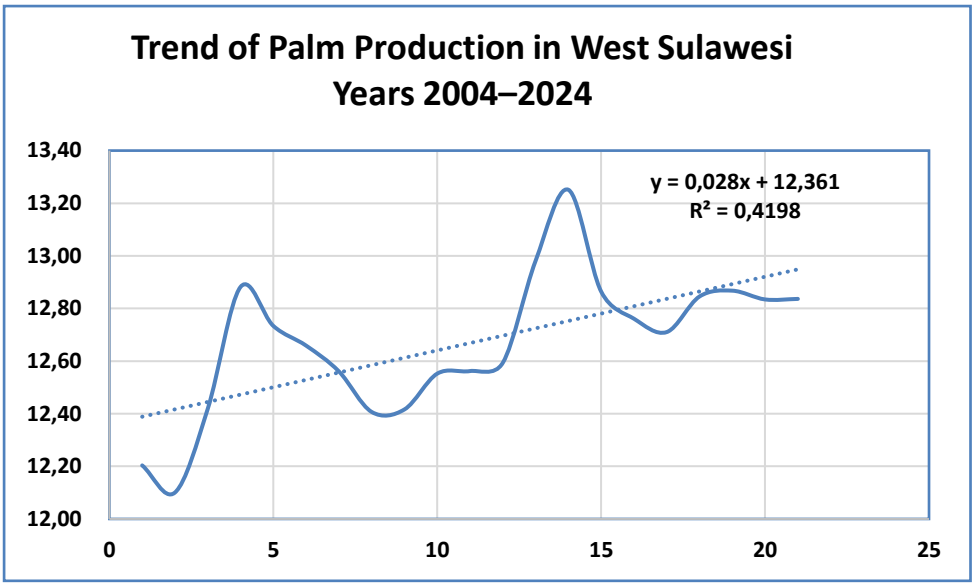


Figure: Palm Oil Production Trends in West Sulawesi 2004-2024.

The graph above shows that palm oil production in West Sulawesi Province fluctuated annually from 2004 to 2024. Although production fluctuated over several periods, the trend line (development) indicates a general trend: a long-term increase in palm oil production. This can be seen from the resulting trend analysis equation:

$Y = 12.361 + 0.028x$

$R^2 = 0.4198$

This equation explains that the regression coefficient (0.028) indicates that palm oil production in West Sulawesi increased by an average of 0.028 units of production per year. In other words, production increases annually, although not significantly, and fluctuations still occur in the actual graph.

The coefficient of determination (R^2) of 0.4198 indicates that 41.98% of the variation in palm oil production can be explained by time (years) using a linear trend model, while the remainder is influenced by factors outside the model.

Thus, it can be concluded that the trend graph of palm oil production in West Sulawesi during the 2004–2024 period shows an increasing direction of development, although annual data shows a fluctuating pattern.

This research, which analyzes the determinants of palm oil supply in West Sulawesi, uses time series data from 2004 to 2024. The variables used in this study to influence palm oil supply in West Sulawesi are the previous year's palm oil price, the previous year's urea fertilizer price, the previous year's cocoa price, harvested area, and rainfall. These are shown in the following table:

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Variabel	Koefisien	t-Statistik	Probability Value (P-value)
Coefficient	7,82978^{ns}	5,93151	0,00002
Palm Oil Price-1	-0,01793^{ns}	-0,09726	0,92380
Urea Fertilizer Price-1	0,21294^{ns}	1,04297	0,31347
Cocoa Price-1	-0,02989^{ns}	-0,20393	0,84114
Harvested Area	0,27682**	2,61064	0,01967
Rainfall	0,06335*	1,84210	0,08531
R^2 = 0,719179 F-statistik = 0,000926	***) : siginifikan (α = 1%) **) : signifikan (α = 5%) *) : signifikan (α = 10%) ns) : non signifikan		

Table. Factors Influencing Palm Supply in West Sulawesi

Based on the analysis above, the multiple linear regression equation for palm oil commodity supply is:

Ln_y = 7.829 – 0.017 ln X1 + 0.212 ln X2 – 0.029 ln X3 + 0.276 ln X4 + 0.063 ln X5

The multiple linear regression analysis shows that the coefficient of determination is at a closeness level of 0.719179. This indicates that 71.91% of the variation in palm oil commodity supply in West Sulawesi can be explained by the independent variables used in this study. The remaining 28.09% is explained by other variables outside the model. The F-test (overall) value has a significant effect at the 90% confidence level (0.000926 < 0.010). This means that all independent variables used as predictors in the study—palm oil price, urea fertilizer price, cocoa price, harvested area, and rainfall—simultaneously (together) have a significant (real) effect on palm oil supply in West Sulawesi.

Based on the results of the predictor variables in the partial t-test analysis, the variable with a significant effect on palm oil supply in West Sulawesi is harvested area. Harvested area shows a positive correlation with palm oil supply in West Sulawesi and demonstrates a significant (real) effect at a 95% confidence level (0.01967 < 0.050), with a regression coefficient of 0.27682 on palm oil supply. Quantitatively, a 1 percent increase in harvested area leads to a 0.276 percent increase in palm oil supply. The results of this study align with those of Aswarman (2018), who described land area as having a positive effect on palm oil production with a probability value of 0.000 <0.05. In his study, "The Effect of Land Area and Labor on Palm Oil Production on Sumatra Island from 2012 to 2017," the study found.

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The rainfall variable showed a regression coefficient of 0.06335, indicating a positive correlation but a significant (real) effect on palm oil supply in West Sulawesi, as it was at the 90% confidence level (0.08531 > 0.010). Quantitatively, a 1 percent increase in rainfall would increase palm oil supply by 0.063 percent. Nanda Tri Machmul A Marida, et al. (2025) explained that rainfall significantly affected palm oil production with a value of 0.022 <0.05 in a journal titled "The Effect of Rainfall on Palm Oil Productivity."

The urea fertilizer price variable shows a regression coefficient of 0.21294. This value indicates a positive correlation but does not have a significant (real) effect, and is at the 90% confidence level (0.31347 > 0.010) on the supply of palm oil commodities in West Sulawesi. Quantitatively, this indicates that a 1 percent increase in the price of urea fertilizer will increase the supply of palm oil by 0.212 percent, but this increase is not statistically significant.

The palm oil price variable shows a regression coefficient of -0.01793. This value indicates a negative correlation and does not have a significant (real) effect, and is at the 90% confidence level (0.92380 > 0.010) on the supply of palm oil commodities in West Sulawesi. Quantitatively, this indicates that a 1 percent increase in the price of palm oil will decrease the supply of palm oil by 0.017 percent.

The cocoa price variable shows a regression coefficient value of -0.02989, indicating a negative correlation and no significant (real) influence, with a 90% confidence level (0.84114 > 0.010) on palm oil supply in West Sulawesi. Quantitatively, a 1 percent increase in cocoa prices can lead to a 0.029 percent decrease in palm oil supply.

Supply elasticity describes the change in the quantity of goods offered over a specific period of time in response to changes in production factors. This study uses two types of elasticity: short-term elasticity and long-term elasticity. The choice of these two measures relates to farmers' ability to utilize production factors to increase palm oil production capacity in West Sulawesi.

In the short term, farmers can only make limited adjustments because their available production factors cannot change significantly. These adjustments are made through more intensive use of existing production factors to increase the quantity of commodities offered. Meanwhile, in the long term, farmers have greater opportunities to make adjustments, including increasing harvested area and restructuring production structures related to their farming activities.

Variables	Short-Run Elasticity	Long-Run Elasticity
Oil Palm Harvest Area	3,50	4,38
Rainfall	0,39	0,49

Table. Elasticity of Palm Supply in West Sulawesi in the Short and Long Term

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Based on the table above, the variable of oil palm harvested area has an elastic elasticity value in both the short and long term. The short-term elasticity value of 3.50 indicates that if the oil palm harvested area increases by 1 percent, the supply of oil palm will increase by 3.50 percent. In the long term, the elasticity value increases to 4.38, which means that a 1 percent increase in the harvested area will increase the supply of oil palm by 4.38 percent. Thus, the oil palm harvested area has a positive and elastic effect on the supply of oil palm commodities in West Sulawesi. The results of this study indicate that the oil palm harvested area has a responsive ability in determining the amount of supply in both the short and long term. This finding is in line with the concept that production factors that can be expanded or increased, such as harvested area, tend to have higher elasticity as the opportunity for adjustment in the long term increases. This aligns with research by Citra Saragih, Ratya Anindita, and Rosihan Asmara (2022), which found that both short-term and long-term variables are significant at the 5% level in the journal "Analysis of the Supply Response of Palm Oil Commodities in Indonesia."

The rainfall variable exhibits elastic properties in both the short and long term. The short-term elasticity value of 0.39 and the long-term elasticity of 0.49 indicate that changes in rainfall affect palm oil supply. In the short-term elasticity, supply increases by 0.39 percent if rainfall increases by 1 percent. Meanwhile, in the long term, a 1 percent increase in rainfall leads to a 0.49 percent increase in palm oil supply. Based on these analysis results, it can be concluded that rainfall is elastic in both the short and long term. Gunawan, Pratama, Rochmiyati, et al (2025) explained that rainfall has been proven to have a significant effect on various indicators of palm oil production with varying time intervals in the proceedings entitled Rainfall Determines Harvest: Quantitative Study of Palm Oil Production in Riau 2017-2021.

CONCLUSION

Based on the analysis and discussion, the following conclusions can be drawn:

1. The trend in palm oil production in West Sulawesi from 2004 to 2024 has shown increasing growth, although annual data shows an average fluctuation of 0.028 units of production per year, with a coefficient of determination of R2 = 0.4198, or 41.98%.
2. The factors simultaneously influencing the supply of palm oil in West Sulawesi are the previous year's palm oil price, the previous year's urea fertilizer price, the previous year's cocoa price, harvested area, and rainfall. The partial (individual) analysis reveals a significant variable, namely the harvested area of palm oil. A 1 percent increase in the harvested area of palm oil will result in a 0.276 percent increase in palm oil supply. It is clear that an increase in the harvested area of palm oil will increase the supply of palm oil.

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3. The elasticity value of the harvested area of palm oil commodities in the short term is 3.50 and in the long term is 4.38, which has elastic properties, while rainfall has an elasticity value of 0.39 in the short term and 0.49 in the long term for the supply of palm oil commodities in West Sulawesi.

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