



**THE DETERMINANTS OF OIL PALM FARMERS' INCOME IN SUKA
MAKMUR VILLAGE, GUNUNG MERIAH DISTRICT, ACEH SINGKIL
REGENCY**

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Abstract

This study aims to analyze the determinants of oil palm farmers' income in Suka Makmur Village, Gunung Meriah District, Aceh Singkil Regency. The independent variables are land area, production, Fresh Fruit Bunch (FFB) selling price, agricultural technology, and capital, while the dependent variable is farmers' income. A quantitative approach was used, with data collected through observation, interviews, and questionnaires distributed to 107 farmers using a saturated sampling technique. Data were analyzed using multiple linear regression with SPSS. The results show that production, FFB selling price, and agricultural technology partially have a positive and significant effect on income, capital has a negative and significant effect, while land area has no significant effect. Simultaneously, all variables significantly affect income, with an Adjusted R^2 of 0.990. It is recommended that farmers improve farm productivity and that local government provide extension services and better access to price information.

Keywords: Land Area, Production, FFB Selling Price, Agricultural Technology, Capital, Oil Palm Farmers' Income



INTRODUCTION

Agriculture remains a strategic sector in the economy of developing countries such as Indonesia, functioning both as a primary source of food and as the main livelihood for a large share of the rural population. Within the national economy, the plantation subsector contributes significantly to gross domestic product and export earnings, with oil palm standing out as one of the most economically valuable commodities. According to Indonesia's national statistics agency, the country remains the world's largest oil palm producer, with an annual output of roughly 46–47 million tons and a planted area exceeding 15 million hectares, far surpassing other major producers such as Malaysia, Thailand, Colombia, and Nigeria (Badan Pusat Statistik, 2025).

Table 1.
Comparison of World Oil Palm Production and Plantation Area (2024)

No	Country	Production (Million Tons/Year)	Plantation Area (Million Hectares)
1	Indonesia	46–47	±15.0
2	Malaysia	18–19	±5.5
3	Thailand	3–4	±1.2
4	Colombia	1.8–2.0	±0.6
5	Nigeria	1.0–1.5	±3.0

Source: Badan Pusat Statistik (2025).

Despite this dominant global position, farmers' income at the household level tells a more volatile story. National estimates indicate that oil palm farmers' income fluctuated considerably between 2020 and 2024, peaking in 2022 amid rising global crude palm oil (CPO) prices before declining in 2023 due to falling commodity prices and export restrictions (Badan Pusat Statistik, 2025). A similar pattern is visible at the regional level in Aceh Singkil, where net income per hectare dropped from an estimated Rp35–50 million in 2021 to roughly Rp22–32 million in 2024, driven largely by falling FFB prices and a "trek" season that reduced yields.

At the village level, Suka Makmur in Gunung Meriah District exemplifies this broader trend. Village office records show that average farmer income fell from Rp64,410,280 in 2021 to a low of Rp46,236,449 in 2024, before recovering slightly to Rp50,170,093 in 2025. Interestingly, this decline occurred even as farmers expanded their use of improved seedlings (from 42% to 65% of farmers)



and increased their working capital (from Rp18.5 million to Rp24.3 million), while average land holdings remained relatively stable at around 2 hectares. This apparent contradiction — rising technology adoption and capital use alongside falling income — suggests that FFB selling price, which dropped sharply from Rp3,250/kg in 2022 to Rp1,980/kg in 2024, may be a dominant factor offsetting the gains from other inputs.

Previous studies present mixed findings regarding the determinants of farmers' income. Some studies find that land area significantly affects income (Mappigau & Halim, 2022; Safutri et al., 2026), while others find no significant relationship (Tomina et al., 2023). Similarly, findings on capital vary across commodities and contexts (Mengko et al., 2025; Yasmita, 2023). Moreover, prior research on oil palm farmers has rarely examined land area, production, selling price, technology, and capital together in a single model; studies that do combine technology and capital variables have often been conducted on other commodities such as rice (Supriantini & Suwendra, 2026), leaving a gap regarding whether these five factors jointly and consistently explain oil palm farmers' income at the village level.

Given this gap, the present study aims to: (1) identify the factors influencing oil palm farmers' income in Suka Makmur Village; (2) examine how these factors affect income, both partially and simultaneously; and (3) formulate policy implications for local government. The study is expected to contribute theoretically to agricultural economics literature and practically to farmers, local government, and future researchers seeking to understand smallholder oil palm income determinants in a specific local context.

LITERATURE REVIEW

Farm Income Theory

Farm income is generally defined as the net result obtained by a farmer from agricultural business activities after deducting production costs from total revenue (Soekartawi, 2021). It serves as a key indicator of farmer welfare because it reflects the outcome of the production process. According to Soekartawi (2021), farm income is influenced by multiple factors including land area, production, selling price, capital, labor, technology, and managerial ability — a framework consistent with the variables examined in this study.

Land Area

Land area represents the primary production factor determining the scale of a farming enterprise; theoretically, larger landholdings enable higher potential output. However, empirical findings are inconsistent. Mappigau and Halim



(2022) find land area significantly influences oil palm production and income because land constitutes the basic factor of output. In contrast, Tomina et al. (2023) find land area has no significant effect on oil palm farmers' income, arguing that productivity and management efficiency matter more than sheer land size. Dani and Satrianto (2024) similarly note that agricultural land expansion effects depend heavily on regional and management conditions.

Production

Production reflects the physical output of farming activity within a given period and is theoretically the most direct determinant of revenue. Pradnyawati and Cipta (2021) and Aswan (2020) find that production positively and significantly affects farmers' income because higher output directly increases the volume of sales revenue. Tomina et al. (2023) reach a similar conclusion specifically for oil palm farmers.

Selling Price

The selling price of FFB represents the exchange value farmers receive from processors or collectors. Sartika et al. (2025) and Bandrang (2022) find that FFB selling prices significantly and positively affect farmers' income, while Lifianthi et al. (2024) show that price fluctuations directly affect the revenue and income of independent oil palm smallholders. Shima et al. (2025) further explain that declining prices force farmers to increase maintenance spending, compounding the negative income effect.

Agricultural Technology

Agricultural technology encompasses the use of modern tools, improved seed varieties, fertilizers, and cultivation techniques intended to raise productivity. Oktaviandi and Persaulian (2025) find that technology adoption helps farmers plan activities more effectively and reduces the risk of crop failure, while Rusydi and Rusli (2022) show that technology use improves both productivity and production efficiency, which in turn raises income.

Capital

Capital covers the funds farmers allocate for fertilizer, seedlings, pesticides, labor, and plantation maintenance. While adequate capital is theoretically expected to enable better farm management and higher output, empirical evidence is mixed. Mengko et al. (2025) find capital significantly affects farm income as a key productive input, whereas other studies suggest inefficient capital allocation can offset its expected benefits, particularly when spending is absorbed by rising input costs rather than productivity-enhancing investment (Yasmita, 2023).



Research Gap

Building on this literature, the present study integrates all five variables — land area, production, selling price, technology, and capital — within a single multiple regression model specific to oil palm smallholders, addressing the fragmented scope of prior studies and providing a more comprehensive, locally grounded analysis for Suka Makmur Village.

RESEARCH METHOD

This study employed a quantitative approach using a cross-sectional survey design to examine the causal relationship between independent variables (land area, production, FFB selling price, agricultural technology, and capital) and the dependent variable (farmers' income) (Sugiyono, 2020). The research was conducted in Suka Makmur Village, Gunung Meriah District, Aceh Singkil Regency, selected purposively because it is an established smallholder oil palm center with a heterogeneous farmer population (landholdings ranging from 0.5 to 10 hectares) and accessible, reliable supporting data.

The population comprised all 107 oil palm farmers registered at the Suka Makmur Village Office. Given the relatively manageable population size, the study used a saturated sampling technique (*sampel jenuh*), in which the entire population was used as the sample (Sugiyono, 2020), resulting in 107 respondents. Inclusion criteria required respondents to be active farmers who owned or managed producing (mature) oil palm plantations, had at least 3–5 years of farming experience, resided in the village, and could provide reliable production and income data.

Primary data were collected through structured questionnaires (both closed and open-ended) and interviews covering land area, production volume, FFB selling price, technology use, capital, and income. Data were analyzed using multiple linear regression with IBM SPSS, following the model:

$$Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \varepsilon_i$$

where Y = farmers' income; X_1 = land area; X_2 = production; X_3 = FFB selling price; X_4 = agricultural technology; X_5 = capital; and ε = error term.

Before hypothesis testing, classical assumption tests were performed, including normality (Kolmogorov–Smirnov test), multicollinearity (tolerance and VIF), heteroscedasticity (Glejser test), and autocorrelation (Durbin-Watson test). Hypothesis testing consisted of the partial t-test ($\alpha = 5\%$), the simultaneous F-test, and the coefficient of determination (Adjusted R^2) to assess the model's explanatory power (Sugiyono, 2020).

Table 2.



Operational Definition of Variables

Variable	Operational Definition	Measurement Indicator	Unit	Scale
Farmers' Income (Y)	Net income from oil palm farming after deducting production costs	Total revenue – total costs	Rp/year	Ratio
Land Area (X1)	Total area of oil palm plantation owned/managed	Total plantation area	Hectares	Ratio
Production (X2)	Total yield of FFB harvested	Total FFB output per year	Tons/year	Ratio
Selling Price (X3)	Value received per unit of FFB sold	Average FFB price	Rp/kg	Ratio
Agricultural Technology (X4)	Use of modern tools and cultivation techniques	Technology use index	Index score	Interval
Capital (X5)	Total funds used for production activities	Total business capital cost	Rp/year	Ratio

RESULTS AND DISCUSSION

Respondent Characteristics

Of the 107 respondents, the majority were male (92 people, 85.98%), reflecting the physically demanding nature of oil palm cultivation, while most respondents (43 people, 40.19%) were aged 41–50 years, indicating that the majority of farmers are within their productive working age.

Table 3.

Respondent Characteristics by Gender and Age

Characteristic	Category	Number of Respondents	Percentage (%)
Gender	Male	92	85.98
	Female	15	14.02
	Total	107	100
Age	20–30 years	8	7.48
	31–40 years	28	26.17
	41–50 years	43	40.19



Characteristic	Category	Number of Respondents	Percentage (%)
	>50 years	28	26.17
	Total	107	100

Classical Assumption Tests

Prior to regression estimation, classical assumption tests confirmed the data met the requirements for ordinary least squares estimation. The Kolmogorov–Smirnov test indicated the residuals were normally distributed (Asymp. Sig. > 0.05). Tolerance values for all independent variables exceeded 0.1 with VIF values below 10, indicating no multicollinearity. The Glejser test showed significance values above 0.05 for all variables, indicating no heteroscedasticity, and the Durbin-Watson statistic fell within the acceptable range ($DU < DW < 4 - DU$), indicating no autocorrelation.

Multiple Linear Regression Results

The multiple regression estimation yielded the following equation:

$$Y = -35,294,409.190 - 57,207.418X_1 + 195,296.311X_2 + 18,584.950X_3 + 554,852.253X_4 - 1.138X_5 + \varepsilon$$

Table 4.
Multiple Linear Regression Estimation Results

Variable	Unstandardized B	Std. Error	Standardized Beta	t-value	Sig.
(Constant)	-35,294,409.190	1,826,466.976	–	-19.324	0.000
Land Area (X1)	-57,207.418	400,786.063	-0.015	-1.427	0.157
Production (X2)	195,296.311	4,893.046	1.189	39.913	0.000
Selling Price (X3)	18,584.950	857.226	0.218	21.680	0.000
Agricultural Technology (X4)	554,852.253	231,327.143	0.027	2.399	0.018
Capital (X5)	-1.138	0.137	-0.243	-8.311	0.000

Dependent Variable: Farmers' Income. Source: Primary data processed (2026).

The coefficients indicate that a one-unit increase in production raises income by Rp195,296.311, holding other variables constant, while a one-unit increase in FFB selling price raises income by Rp18,584.950. A one-unit increase in the technology index raises income by Rp554,852.253. Conversely, one-unit increases in land area and capital are associated with decreases in income of Rp57,207.418 and Rp1.138, respectively, holding other variables constant.

Hypothesis Testing



With a t-table value of 1.984 ($\alpha = 5\%$, $df = 101$), land area was found not to significantly affect income ($t = -1.427$, $\text{sig.} = 0.157 > 0.05$), so H_0 is accepted for this variable. Production ($t = 39.913$, $\text{sig.} = 0.000$), selling price ($t = 21.680$, $\text{sig.} = 0.000$), and technology ($t = 2.399$, $\text{sig.} = 0.018$) each showed t-values exceeding the table value with significance below 0.05, indicating positive and significant effects on income. Capital showed a significant negative effect ($t = -8.311$, $\text{sig.} = 0.000$). Based on the standardized Beta and t-values, production emerged as the most dominant determinant of income.

The F-test produced an F-value of 2,022.379 against an F-table value of 2.30 ($df1 = 5$, $df2 = 101$, $\alpha = 5\%$), with a significance level of 0.000. Since F-calculated far exceeds F-table and significance is below 0.05, land area, production, selling price, technology, and capital jointly and significantly affect farmers' income.

Table 5.

Simultaneous Test (F) and Coefficient of Determination

Test	Statistic	Value	Sig.
F-test	F-calculated	2,022.379	0.000
	F-table ($df1=5$, $df2=101$, $\alpha=5\%$)	2.30	–
Correlation (R)	Multiple R	0.995	–
Determination	Adjusted R^2	0.990 (99.0%)	–

The multiple correlation coefficient ($R = 0.995$) indicates a very strong relationship between the independent variables and income. The Adjusted R^2 of 0.990 shows that 99.0% of the variation in farmers' income is explained jointly by land area, production, selling price, technology, and capital, with the remaining 1.0% attributable to factors outside the model, such as farming experience, education level, weather conditions, and land quality.

Discussion

Land area was not found to significantly affect income, consistent with Tomina et al. (2023), suggesting that landholding size alone does not guarantee higher income unless accompanied by productive and efficient land management. This finding contrasts with Safutri et al. (2026) and Mappigau and Halim (2022), who found land area to be a significant determinant elsewhere — a divergence that may reflect the relatively narrow and stable land-area range (around 2 hectares) among Suka Makmur farmers, which limits the variable's explanatory power within this specific sample.

Production was the most dominant positive determinant of income, aligning with Pradnyawati and Cipta (2021), Tomina et al. (2023), and Aswan



(2020), all of whom identify production volume as directly translating into higher farm revenue. This underscores the importance of yield-enhancing practices such as proper maintenance, fertilization, pest control, and timely replanting of unproductive trees.

FFB selling price showed a strong positive and significant effect, consistent with Sartika et al. (2025), Bandrang (2022), Shima et al. (2025), and Lifianthi et al. (2024), all of which confirm that price fluctuations directly transmit into farmers' income regardless of production levels. This reinforces the importance of price stability, market access, and farmers' bargaining position.

Agricultural technology positively and significantly affected income, in line with Oktaviandi and Persaulian (2025) and Rusydi and Rusli (2022), both of which associate technology adoption with improved productivity and efficiency. Although this study's coefficient for technology (Beta = 0.027) was smaller than that for production or price, its statistical significance confirms that better seedlings, tools, and cultivation techniques contribute meaningfully to income gains.

Capital showed a significant negative relationship with income, a counterintuitive but explicable result: increased capital expenditure was not matched by proportional productivity gains, likely due to inefficient allocation or capital being absorbed by rising input costs (such as fertilizer and labor) rather than being channeled into productivity-enhancing investments. This finding is broadly consistent with the efficiency concerns raised by Yasmita (2023), even though that study covered rice rather than oil palm farmers.

Jointly, all five variables significantly explain 99.0% of the variation in farmers' income, reinforcing that income determination in Suka Makmur is a multidimensional process requiring simultaneous attention to production capacity, price conditions, technology adoption, and capital efficiency rather than any single factor in isolation.

CONCLUSION

This study concludes that, partially, production, FFB selling price, and agricultural technology have positive and significant effects on oil palm farmers' income in Suka Makmur Village, while capital has a significant negative effect, and land area has no significant effect. Simultaneously, all five variables significantly determine farmers' income, with an Adjusted R² of 0.990, indicating a very strong model fit.



These findings imply that improving farmers' welfare requires a combination of strategies: enhancing production through better cultivation practices, securing more favorable and stable FFB prices through improved market access and bargaining power, expanding the adoption of appropriate agricultural technology, and — importantly — improving the efficiency of capital use rather than merely increasing capital volume. Local governments are encouraged to support farmers through extension services, technology assistance, price information access, and capital management training, particularly through microcredit facilitation such as Kredit Usaha Rakyat (KUR). Future research should consider additional variables such as farming experience, land quality, pest incidence, and market access, and could extend the geographic scope to strengthen the generalizability of these findings.

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