

Analysis of Factors Influencing Citronella Oil Farming Income in Sekuelen Village, Blangjerango District, Gayo Lues Regency

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Abstract

Citronella is one of the essential oil-producing plants that is widely used as a raw material in numerous downstream industries, such as cosmetics, fragrances and pharmaceuticals and is also a commodity in the agribusiness sector that has a worthy market and is highly competitive in foreign markets. The purpose of this study was to analyze how the effect of the amount of production, labour costs, the price of firewood, the price of citronella leaves, and the selling price of citronella oil on the income of citronella oil farming. The sample was determined using the *slovin* formula with a total of 62 respondents. The method used in this research is using multiple linear regression analysis and the data is processed using *Eviews* software. The results of the analysis show that the variable production volume, labour costs, firewood prices, citronella leaf prices, and citronella oil selling prices have an effect of 97.6% ($R^2 = 0.976$) on citronella oil farming income. While simultaneously the variable amount of production, labour costs, price of firewood, price of citronella leaves, and selling price of citronella oil affect the income of citronella oil farming. Partially the variable amount of production, labour costs, price of firewood, price of citronella leaves, and selling price of citronella oil have a significant effect on the income of citronella oil farming in Sekuelen Village, Blangjerango District, Gayo Lues Regency.

Keywords: Multiple Linear Regression Analysis, amount of production, labour cost, price of firewood, price of citronella leaves, and selling price of citronella oil.

Introduction:

Indonesia is an archipelagic country that has diverse geographical locations, for instance, differences in the height and low of a community's residence. The existence of differences in natural factors can affect different climates and weather which results in different livelihoods for Indonesian people, such as farmers, fishermen, plantations, and so on. Indonesian people who live in mountainous areas make a living in the plantation sector. Meanwhile, lowland areas

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pursue agriculture and those in coastal areas work as fishermen. As a matter of fact, Indonesia is referred to as an agricultural country that relies on nature for the continuity of its business in meeting its needs.

Citronella (*Cymbopogon nardus*) is a type of essential oil plant which is classified as having developed from the distillation of its leaves so that citronella oil is obtained which is known in world trade as Citronella Oil, while Indonesian citronella oil in the world market is known as *Citronella Oil* of Java (Iskandar, 2017). Essential oils are traditional plants that are widely used in the chemical industry as raw materials for perfumery products (perfume), pharmaceuticals, cosmetics, preservation of goods, and other basic industrial needs. Development of citronella oil production (*Cymbopogon nardus*) is currently the most popular business in Gayo Lues Regency, Aceh Province with an area of citronella plants reaching 13,517 Ha in 2018 and 16,850.5 Ha in 2019 and citronella oil production in 2018 reached 2,244 tonnes and in 2019 reached 2,870 tonnes.

In carrying out farming, one of the objectives of farmers is to obtain maximum income. Farming income will be affected by farming costs. In the meantime, the amount of production is always influenced by factors that are external and also influenced by internal factors. To obtain the maximum income, farmers must be able to control internal factors in the form of using production facilities, using appropriate technology and using a more efficient workforce (Sembodo, 2020). Sekuelen Village is one of the villages in the Blangjerango District which is capable of producing citronella oil in quite large quantities each year. The people of Sekuelen Village in the Blangjerango District earn most of their income from citronella farming, so until now the average community in Sekuelen Village, Blangjerango sub-district has a very high interest in doing citronella farming. This is due to the condition that the selling price of citronella oil is quite high and the method of cultivating citronella is quite easy and inexpensive so it assists in increasing people's income, which in the end the community carries out this citronella farming activity as the main activity and business of farmers in increasing income besides farming rice fields and other activities. However, starting in the last two years the price of citronella oil in Gayo Lues Regency has decreased drastically compared to the year of 2019 it was around Rp. 300,000/Kg until 2019. This of course has resulted in the income of citronella farmers in Sekuelen Village in particular having decreased in the past two years. The existence of price fluctuations causes a decrease in income for citronella oil farmers (Badan, 2022).

The purpose of this study was to analyze the effect of production quantities, labour costs, firewood prices, citronella leaf prices, and citronella oil selling prices on citronella oil farming income in Sekuelen Village, Blangjerango District, Gayo Lues Regency.

Research Methodology:

Site Selection Method: The selection of research locations was carried out purposively (purposive sampling) in Sekuelen Village, Blangjerango District, Gayo Lues Regency. This research is planned to take primary data taken directly from respondents in the field as well as secondary data from the Central Statistics Agency (BPS) and the Plantation Office of Gayo Lues Regency. This research was conducted in May - June 2022.

Method of collecting data: The type of data used in this research is primary data and secondary data. Primary data can be obtained from field research on citronella farmers through interviews, documentation, and field observations, while secondary data is obtained from the Plantation Office and the Central Statistics Agency for Gayo Lues Regency to support research

data in testing. The independent variables in this study are the amount of production, labour costs, the price of firewood, the price of citronella leaves, and the selling price of citronella oil while the dependent variable is the income of citronella oil farming.

Population and Sample: In this study, the population was farmers in Sekuelen Village, Blangjerango District, Gayo Lues Regency, totalling 161 heads of citronella farming families, so based on equation 3.1 the number of samples was 62 heads of citronella farming families. While the determination of the sample can use the *slovin* formula:

$$n = \frac{N}{1 + Ne^2}$$

$$= \frac{161}{1 + 161.0,01}$$

$$= 61,68 = \text{the head of the citronella farming family}$$

e is the desired critical value (accuracy limit), which is the percentage of inaccuracy due to sampling error. The critical value used is 10%. Sampling was done randomly.

Data analysis method: In this study, the analysis of the factors that influence income uses multiple linear regression analysis. Factors taken as independent variables are factors that are considered to influence the income of citronella oil farmers. The data taken in this study is cross-sectional data, so the price of the inputs does not vary too much. Based on literature studies and field conditions, several variables are thought to influence the income of citronella oil farmers, including the amount of production, labour costs, price of firewood, price of citronella leaves, and selling price of citronella oil. The regression equation is as follows:

$$\pi = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon$$

Description:

- π = citronella oil farming income (Rp)
- X_1 = Production amount (Kg)
- X_2 = Labor costs (Rp/HOK)
- X_3 = Price of Firewood (Rp/ freight)
- X_4 = Price of citronella leaves (Rp/Kg)
- X_5 = Selling price of citronella oil (Rp/Kg)
- α = Constant
- $\beta_{1,2,3,4,5}$ = Coefficient or parameter
- ε = Error

Furthermore, the model is estimated using the OLS (Ordinary Least Square) approach. The ordinary least squares method (OLS) is the most popular method for estimating structural parameters (Sayuti, et al, 2022).

Classical Assumption Testing: In this study, the classical assumption test was carried out, consisting of the Normality test, Heteroscedasticity Test, and Multicollinearity Test. In testing the normality test that is seen is the value of JB and its probability. If the JB value is less than 2 and the probability value is less than 0.05, the research data is normally distributed. The heteroscedasticity test can be seen from the probability value. If the probability value is > 0.05, the research data does not experience heteroscedasticity problems. Meanwhile, the

multicollinearity test can be seen from the VIF value. If the VIF value ≤ 10 , the research data does not experience multicollinearity.

Statistical Testing: Statistical testing is carried out to test whether the independent variables used have a real impact or not on the dependent variable. Statistical tests used include:

Coefficient of Determination (R²): The measurement of model fit was carried out by taking into account the magnitude of the coefficient of determination (r^2). According to Gujarati, (2021), the coefficient of determination is a descriptive measure of the degree of agreement between the actual data and its forecast. The r^2 interval used is $0 < r^2 < 1$. The equation $r^2 = 0$ indicates that none of the variations in the variables can be explained by the regression function. If the coefficient of determination is close to 1 (one), then the model is considered good.

Simultaneous Test (Test F): The F test is used to find out whether the independent variables have an impact on the dependent variable (Gujarati, 2021). Testing the effect of the independent variables together on changes in the value of the dependent variable is carried out by testing the magnitude of changes in the dependent variable which can be explained by changes in all values of the dependent variable. The results of the F test can be seen from the probability value. If the probability value is < 0.05 , the independent variable simultaneously influences the dependent variable.

Partial Test (t-test): The t-test was carried out to test the estimated coefficients of each independent variable, and whether it partially has a significant impact on the dependent variable or not (Gujarati, 2021). Test criteria:

$$t_{\text{count}} < t_{\text{table}}: \text{accept } H_0$$
$$t_{\text{count}} > t_{\text{table}}: \text{reject } H_0$$

The decision is made based on the location of the t-count value of each regression coefficient on the normal curve used in determining the critical value. If the location of the t-count of a regression coefficient is in the area of acceptance of H_0 , then the decision is to accept H_0 . meaning that the regression coefficient is not different from zero. In other words, these variables have no significant effect on the value of the dependent variable and vice versa.

Results and Discussion:

Farming Costs: In managing citronella oil farming, farmers in Sekulen Village, Blangjerango District, Gayo Lues Regency, incur costs to produce production output. Calculations in the cost analysis are divided into 2 groups, namely fixed costs and variable costs. Based on the results of the study, it shows that the fixed costs used in citronella oil farming consist of depreciation costs for the agricultural machinery used in the farming, such as the citronella refining kettle, and the citronella oil filtering. While the variable cost component used is in the form of labour costs. Below is the distribution of respondents based on the costs of cultivating citronella oil in Sekuelen Village.

Table 1: Distribution of Respondents Based on the Cost of Citronella Oil Farming in Sekuelen Village per One Harvest Season²

No.	Farming Costs (Rp)	Number of Farmers (Individuals)	Percentage (%)
1.	< 3.000.000	26	41.94
2.	3.000.000 – 4.000.000	16	25.81
3.	4.000.000 – 5.000.000	9	14.52
4.	5.000.000 – 6.000.000	4	6.45
5.	> 6.000.000	7	11.28
Total		62	100

Based on the data in the table above, it can be seen that the distribution of respondents based on the costs used by farmers in conducting citronella oil farming in Sekulen Village in one harvest the highest costs incurred by farmers ranged from > Rp.6,000,000 as many as 7 farmers with a percentage of 11.28%. While the lowest costs incurred by farmers ranged from Rp. < 3,000,000 for 26 farmers with a percentage of 41.94%.

Production: Based on the results of the research conducted, it shows that the production volume of citronella oil produced by each farmer is different, even though several farmers have the same area. This is influenced by several things such as different soil fertility levels that can affect plant growth processes, plant density in a field, and weather conditions at the time of harvesting. Weather conditions greatly affect the production of oil produced. Farmers in Sekulen Village avoid harvesting during the rainy season as much as possible because it will reduce the level of oil production they produce. The production volume of citronella oil can be seen in the following table.

Table 2: Production Distribution of Citronella Oil Farming in Sekulen Village per One Harvest Season³

No.	Production Volume (Kg)	Frequency (Individuals)	Percentage (%)
1.	35 – 49	8	12.90
2.	50 – 64	26	41.94
3.	65 – 79	6	9.68
4.	80 – 94	16	25.81
5.	95 – 109	3	4.84
6.	110 – 124	1	1.61
7.	125 – 139	1	1.61
8.	140 – 154	1	1.61
Total		62	100

The table above shows that the most production volume of citronella oil produced by farmers is around 50-64 kg with a percentage of 41.94%, while the least production volume produced by farmers is between 110-124 kg, 125-139 kg, and 140-154 kg with a percentage of 1.61% each.

Farming Income: Farming revenue is the multiplication of the products obtained with the selling price. Total production is the result obtained from the type of farming cultivated, while the selling price is the value or price of farming per unit of production. A farm is said to be

² Source: Primary Data Processed (2022)

³ Source: Primary Data Processed (2022)

successful if the income situation meets the requirements, namely enough to pay for all production facilities, to pay labour wages or other forms during the production process. Farmers' acceptance of citronella oil farming in Sekulen Village based on the research results obtained can be seen in the following table.

Table 3: Revenue Distribution of Citronella Oil Farming in Sekuelen Village per One Harvest⁴

No.	Farming Income (Rp)	Number of Farmers (Individuals)	Percentage (%)
1.	<6.000.000	2	3.23
2.	6.000.000 – 7.000.000	1	1.61
3.	7.000.000 – 8.000.000	9	14.52
4.	8.000.000 – 9.000.000	8	12.91
5.	9.000.000 – 10.000.000	12	19.35
6.	10.000.000 – 11.000.000	2	3.22
7.	>11.000.000	28	45.16
Total		62	100

The table above shows that the highest farming income obtained by citronella oil farmers in Sekulen Village ranges from Rp.> 11,000,000 with a total of 28 farmers with a percentage of 45.16%. While the lowest farming income ranges from Rp.6,000,000 – Rp.7,000,000 with one farmer with a percentage of 1.61%.

Farm Income: The income earned by citronella oil farmers can be calculated from the difference between the total revenue and the total cost. The income of citronella oil farming in Sekuelen Village, Blangjerango District, Gayo Lues Regency can be seen in the following table:

Table 4: Distribution of Respondents Based on Citronella Oil Farming Income in Sekuelen Village per One Harvest Season

No.	Income (Rp)	Number of Farmers (Individuals)	Percentage (%)
1.	<5.000.000	7	11,29
2.	5.000.000 – 7.000.000	25	40,33
3.	7.000.000 – 9.000.000	15	24,19
4.	9.000.000 – 11.000.000	15	24,19
Total		62	100

The table above shows that the distribution of respondent farmers based on citronella oil farming income in Sekulen Village, Blangjerango sub-district, Gayo Lues Regency per one harvest season with the highest total income is Rp. 9,000,000 – Rp.11, 000,000 for 15 people with a percentage of 24.19%. This shows that the welfare level of citronella oil farming is quite high because the income of citronella oil farmers is quite large. Then the income of farmers is the lowest based on research data, which is around <Rp. 5,000,000 for 7 people with a percentage of 11.29%. Production costs will determine the amount of income earned followed by the area of land owned by the farmer.

Classic assumption test:

⁴ Source: Primary Data Processed (2022)

The Normality test: Aims to determine whether the residual values that have been standardized in the regression model are normally distributed or not. The test results using the Eviews application can be seen from the Jarque-Bera value and the probability value (P-value) presented in the form of a histogram. The following is the data from the test results on the research data presented in the form of a histogram graph:

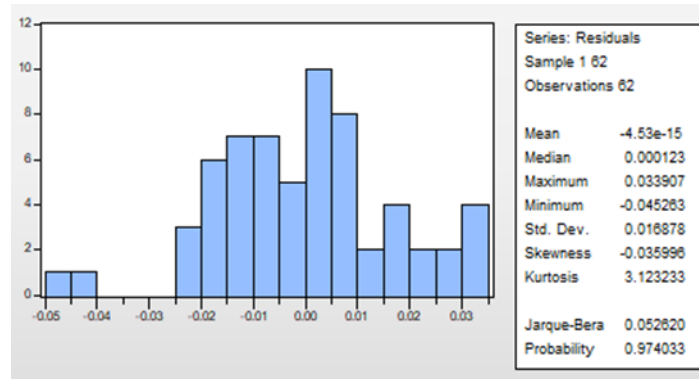


Figure 1: Normality Test Estimation Results⁵

The graph above shows that the Jarque-Bera value is $0.05 < 2$ and the resulting probability value is $0.97 > 5\%$ (0.05) which means that the data in this study does not have a normality problem or can be declared normally distributed.

Heteroskedasticity Test: The heteroscedasticity test was carried out to test whether in the regression model, there is an inequality of variance and residuals from one observation to another. If the residual variance from one observation to another observation remains, then it is called homoscedasticity or heteroscedasticity does not occur which is done using the Glejser test in data processing so that it can be seen from the significance value. If the significance value is > 0.05 , then it is Homoscedasticity, but if the significance value is ≤ 0.05 then there is heteroscedasticity. The following are the results of the Glejser test using the Eviews 10 software.

Table 5: Glejser Test Results⁶

Free Variables	Prob.
Production Amount	0.4108
Labour costs	0.8065
Price of Firewood	0.2629
Price of Citronella Leaves	0.0786
Selling Price of Citronella Oil	0.4284

The probability value of the five independent variables is > 0.05 , so it can be concluded that there is no heteroscedasticity in the regression model.

Multicollinearity Test: The multicollinearity test can be used to test whether in a regression model, there is a correlation between independent variables. The existence of multicollinearity can be seen from the value of VIF (Variance Inflation Factor). If the VIF value

⁵ Source : Output Eviews 10 (2022)

⁶ Source: Output Eviews 10 data processed (2022)

< 10, then multicollinearity does not occur, and if the VIF value > 10, multicollinearity occurs. To find out if the research data have multicollinearity or not can be seen in the following table.

Table 6: Multicollinearity Test Results⁷

Free Variables	VIF
Production Amount	3.5487
Labour costs	3.0176
Price of Firewood	10.777
Price of Citronella Leaves	8.4311
Selling Price of Citronella Oil	3.4922

Based on the table above, it can be seen that each independent variable has a VIF (Variance Inflation Factor) value of <10. It can be concluded that the regression model does not have multicollinearity.

Model Fit Test:

Determination Coefficient Test (R²): The coefficient of determination test is used to find out how much the percentage of influence of the independent variables, namely, the amount of production (X1), labour costs (X2), the price of firewood (X3), the price of Citronella leaves (X4), the selling price of Citronella oil (X5) can explain The dependent variable is citronella oil farming income (Y). The following are the results of the R² test using the Eviews 10 software.

Table 7: Test Results for the Coefficient of Determination (R²)⁸

R-Square model	Adjusted R Square	Std. Error of the Estimate
0.976	0.974	0.017615

Based on the table above, it can be seen that the value of R² (Coefficient of Determination) or R square is 0.976. this shows that the amount of production (X1), labour costs (X2), the price of firewood (X3), the price of citronella leaves (X4), and the selling price of citronella oil (X5) have an effect of 97.6% on the income of citronella oil farming (Y) in Sekuelen Village, Blangjerango District, Gayo Lues Regency. The remaining 2.4% is explained by other factors not included in this study.

Simultaneous Test (Test F): The F test is used to determine whether the independent variable is significant or not simultaneously, namely the amount of production (X1), labour costs (X2), the price of firewood (X3), the price of Citronella leaves (X4), the selling price of Citronella oil (X5) to the dependent variable namely citronella oil farming income (Y). The table below is the result of the F test from data processing using the Eviews 10 software:

Table 8: F test results⁹

Test	Prob.
F Test	0.000

⁷ Source: Output Eviews 10 data processed (2022)

⁸ Source: Output Eviews 10 Processed Data (2022)

⁹ Source: Output Eviews 10 Processed Data (2022)

Based on the table above, it can be seen that the significance value is 0.000, which means that the significance value is smaller than the α value, namely 5% (0.05) or $0.000 < 0.05$ so it can be concluded that H_0 is rejected and H_1 is accepted, which means that the variable amount of production (X1), labour costs (X2), the price of firewood (X3), the price of citronella leaves (X4), the selling price of citronella oil (X5) have a simultaneous and significant effect on the income of citronella oil farming (Y).

Partial Test (t-test): The t-test is used to determine whether the independent variables are partially significant, namely the amount of production (X1), labour costs (X2), the price of firewood (X3), the price of Citronella leaves (X4), the selling price of Citronella oil (X5) to the dependent variable, namely citronella oil farming income (Y). The table below is the result of the t-test from data processing using the Eviews 10 software:

Table 9: Test Results t¹⁰

Variable	Coefficient	t-statistic	Prob.
C	-11.4297	-3.7247	0.0005
Production Amount	1.4118	42.5619	0.0000
Labour costs	-0.1775	-12.9779	0.0000
Price of Firewood	-0.0570	-2.0717	0.0429
Price of Citronella Leaves	-0.1407	-3.2794	0.0018
Selling Price of Citronella Oil	3.4544	6.0502	0.0000

Based on the table above, it can be seen that the amount of production (X1), labour costs (X2), the price of firewood (X3), the price of citronella leaves (X4), the selling price of citronella oil (X5) have a partial effect on the income of citronella oil farming (Y) so that the following equation can be seen along with its description:

$$\pi = -11.429 + 1.411X_1 - 0.177X_2 - 0.057X_3 - 0.140X_4 + 3.454X_5 + \varepsilon$$

The meaning of the regression equation above is:

a constant of 11,429 which means that the total production, labour cost, price of firewood, price of citronella leaves and selling price of citronella oil are equal to zero, so income is 11,429. The coefficient value of total production is 1,411 and is positive, meaning that total production has a positive effect on income. For every 1% increase in production, the value of income increases by 1,411%. The value of the labour cost coefficient is -0.177 and is negative, meaning that labour costs have a negative effect on income. For every 1% increase in labour costs, the value of income decreases by 0.177%. The coefficient value of the price of firewood is -0.057 and is negative, meaning that the price of firewood has a negative effect on income. For every 1% increase in the price of firewood, the value of income decreases by 0.057%. The value of the price coefficient of citronella leaves is -0.140 and is negative, meaning that the price of citronella leaves has a negative effect on income. For every 1% increase in the price of citronella leaves, the value of income decreases by 0.140%. The coefficient value of the selling price of citronella oil is 3,454 and is positive, meaning that the selling price of citronella oil has a positive effect on income. For every 1% increase in the selling price of citronella oil, the value of revenue increases by 3,454%.

¹⁰ Source: Processed Data Eviews Output (2022)

Conclusion:

Based on the results of the study it can be concluded that the amount of production (X1), labour costs (X2), the price of firewood (X3), the price of citronella leaves (X4), the selling price of citronella oil (X5) has an effect of 97.6% ($R^2 = 0.976$) to the income of citronella oil farming in Sekuelen Village, Blangjerango District, Gayo Lues Regency. Simultaneously the amount of production (X1), labour costs (X2), price of firewood (X3), price of citronella leaves (X4), and selling price of citronella oil (X5) show a real and significant effect on the income of citronella oil farming in the village Sekuelen, Blangjerango District, Gayo Lues Regency. This is indicated by the large calculated F value obtained compared to the F table ($F_{\text{calculated}} = 474.2242 > F_{\text{table}} = 2.383$) and a probability value of $0.000 < 0.05$. Factors that have a partial effect on the income of citronella oil farming in Sekuelen Village, Blangjerango District, Gayo Lues Regency are the variable amount of production (X1), labour costs (X2), firewood prices (X3), citronella leaf prices (X4), selling price of citronella oil (X5) with a probability value of all variables < 0.05 .

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