Research Article

Analysis of Factors Affecting Clove Production in Bengkel Village, Busungbiu District, Buleleng Regency

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Abstract: Clove is one of the plantation commodities that plays a significant role in the national economy, particularly as a raw material for the kretek cigarette industry, as well as the food and pharmaceutical industries. This study aims to analyze the factors influencing clove production in Bengkel Village, Busungbiu District, Buleleng Regency. The independent variables used in this study include labor, capital, harvested area, and fertilizer, while clove production serves as the dependent variable. A quantitative approach was employed using a multiple linear regression analysis in the form of a power function. Data were collected through questionnaires distributed to 140 clove farmers as respondents. The results of the study indicate that labor, capital, harvested area, and fertilizer simultaneously have a significant effect on clove production in Bengkel Village. Partially, each of these variables also has a positive and significant effect on production. These findings highlight the importance of optimizing the use of these production factors to improve clove yields in Bengkel Village, Busungbiu District, Buleleng Regency.

Keywords: Capital, Fertilizer, Land Area, Production, Working Hours

1. INTRODUCTION

Development is a continuous and planned process of change aimed at achieving better conditions. In this context, the agricultural sector plays a vital role in supporting national development through the provision of employment opportunities and the enhancement of community income. As an agrarian country, Indonesia relies on agriculture—including food crops, horticulture, plantations, fisheries, and livestock—as a key pillar of its economy. If managed properly, this sector can make a substantial contribution to economic growth through an agribusiness approach.

One of the leading commodities in the plantation sector is clove (*Syzygium aromaticum*), which plays a crucial role in the national economy, particularly as a raw material for the kretek cigarette industry, essential oil production, and the food and pharmaceutical industries. Approximately 95% of clove production is absorbed by the kretek cigarette industry, making it a strategic commodity that not only generates income for farmers but also contributes to the country's foreign exchange earnings.

Indonesia's clove production has shown fluctuations over the past five years. According to data from the Central Statistics Agency (BPS), the highest production was recorded in 2020 at 139.1 thousand tons, while the lowest occurred in 2023 at 134.1 thousand tons. Bali Province contributes to national clove production, especially through Buleleng Regency, which serves as the main production center. However, a decline in production has been

observed in several other regencies, such as Jembrana and Klungkung, which is influenced by various factors including climate change and crop pests.

Table 1. Clove Production in Bali Province by Regency/City (2019–2023)

Regency/City	2019	2020	2021	2022	2023
Jembrana	660	658	616	618	392
Tabanan	423	453	445	158	171
Badung	31	29	35	34	37
Gianyar	16	18	19	4	3
Klungkung	70	66	33	18	6
Bangli	21	21	20	14	13
Karangasem	137	155	5	48	35
Buleleng	1,750	2,174	2,288	2,298	2,073
Denpasar	0	0	0	0	0
Total Bali	**3,048**	**3,574**	**3,462**	**3,844**	**2,730**

Buleleng Regency dominates clove production in Bali, recording over 2,000 tons for three consecutive years, although there was a slight decline in 2023. The significant decrease in other regencies indicates the need for specific strategies in managing this commodity. The concentration of production in certain areas highlights the importance of climatic and soil suitability in clove cultivation. To support production stability, improvements in cultivation management, adaptation to climate change, and the implementation of sustainable agricultural innovations are required.

2. RESEARCH METHODS

This study adopts a quantitative associative approach to analyze the influence of labor, capital, harvested area, and fertilizer on clove production in Bengkel Village, Busungbiu District, Buleleng Regency. The data used consist of primary data collected through questionnaires distributed to 140 clove farmers (using a saturated sampling technique), as well as secondary data obtained from the Central Statistics Agency (BPS), the Agriculture Office of Buleleng Regency, and the Bengkel Village Office. This location was selected due to its high potential for clove production. In addition, the study also employed observation, interviews, and in-depth interviews to gather supplementary information from relevant parties.

To analyze the data, a multiple linear regression model was employed using a power function production approach, accompanied by classical assumption tests, including the normality test (using the Jarque-Bera method), multicollinearity test (using Variance Inflation Factor or VIF values), and heteroscedasticity test (using the ARCH test). The independent variables in this study include working hours, capital, harvested area, and fertilizer, while the dependent variable is clove production. Each variable was defined operationally in measurable terms: working hours were measured in labor-hours, capital in Indonesian Rupiah (IDR), harvested area in hectares, fertilizer based on expenditure, and production in tons. This study aims to provide a quantitative understanding of the factors that influence clove production.

3. RESULTS AND DISCUSSION

Multiple Linear Regression Analysis

Table 2. Multiple Linear Regression Test Results

Dependent Variable: LNY
Method: Least Squares
Date: 05/18/25   Time: 21:45
Sample: 1 140
Included observations: 140

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNX1	0.368946	0.040865	9.028468	0.0000
LNX2	0.213701	0.048532	4.403292	0.0000
LNX3	0.904264	0.086088	10.50401	0.0000
LNX4	0.228062	0.033688	6.769861	0.0000
C	-7.893474	0.702877	-11.23024	0.0000

R-squared	0.936434	Mean dependent var	1.272512
Adjusted R-squared	0.934550	S.D. dependent var	0.536804
S.E. of regression	0.137331	Akaike info criterion	-1.097781
Sum squared resid	2.546083	Schwarz criterion	-0.992722
Log likelihood	81.84465	Hannan-Quinn criter.	-1.055088
F-statistic	497.1922	Durbin-Watson stat	1.405960
Prob(F-statistic)	0.000000		

Data source processed with eviews, 2025

Based on the results of the regression test in Table 2, the regression equation model that can be created is as follows:

$$\text{Ln}\hat{Y} = -7.893 + 0.368\ln X_1 + 0.213\ln X_2 + 0.904\ln X_3 + 0.228\ln X_4$$

The multiple linear regression model used in this study is the result of the transformation of the Power Function production function into a natural logarithm form. This transformation is carried out to change the non-linear relationship between variables into a linear form so that it can be analyzed by linear regression. In this form, each regression coefficient can be directly interpreted as production elasticity, namely the percentage change in output (production) caused by a 1% change in each input, assuming other inputs remain constant (ceteris paribus). In addition to looking at the influence of each input individually, the total input elasticity can also be used to determine the scale of production results (return to scale). The total value of the regression coefficients of the four independent variables in the model is:

$$0.368 + 0.213 + 0.904 + 0.228 = 1.713$$

$\beta_1 + \beta_2 + \beta_3 + \beta_4 > 1$ then the production function formed shows the nature of increasing returns to scale. This means that if all production factors are increased proportionally by 1%, then clove production will increase by more than 1%, namely by 1.713%. This condition indicates that there is scale efficiency in clove farming in Bengkel Village. In other words, increasing the use of all production inputs simultaneously will result in a greater increase in output

Classical Assumption Test Results

1) **Normality Test Results**

   Table 3. Normality Test Results
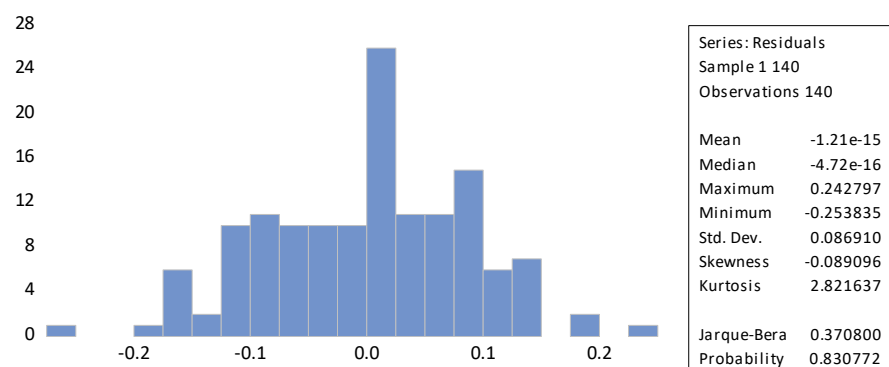
Source: Eviews Primary Processed Data, 2025

The probability value of 0.830 is greater than the level of significance, which is 5 percent (0.05). So it can be concluded that the regression model tested is normally distributed.

2) Multicollinearity Test

Table 4. Multicollinearity Test Results

Variance Inflation Factors
Date: 05/18/25   Time: 21:54
Sample: 1 140
Included observations: 140

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNX1	0.001670	360.9826	2.188082
LNX2	0.002355	4169.555	3.530674
LNX3	0.007411	19.16792	3.860402
LNX4	0.001135	1880.080	1.810528
C	0.494036	3667.310	NA

Source: Eviews Primary Processed Data, 2025

The results of the multicollinearity test show that all independent variables have a VIF value <10, so it can be concluded that the regression model in this study does not have multicollinearity and the regression model is suitable for use.

3) Heteroscedasticity Test

Table 5. Heteroscedasticity Test Results

Heteroscedasticity Test: Arch

F-statistic	1.473649	Prob. F(2,135)	0.2327
Obs*R-squared	2.948424	Chi-Square Prob.(2)	0.2290

Source: Data processed with Eviews, 2025

Table 5 shows thatThe probability value of 0.2327 is greater than 0.05, so it can be concluded that there is no heteroscedasticity in the data being tested.

R² Determination Coefficient Test Results

Table 6. Results of the Determination Coefficient Test

R Square	Adjusted R Square
0.936434	0.934550

Source: Data processed with Eviews, 2025

The test results in Table 6 provide results where the value of $R2$ is 0.936434. This means that 93.64 percent of the variation in clove production in Bengkel Village, Busungbiu District can be influenced by the variables of working hours (X1), capital (X2), harvest area (X3) and fertilizer (X4) while the remaining 6.804 percent is explained by other factors.

Model Feasibility Test Results (F Test)

Table 7. Simultaneous Test Results (F)

No	Information	Value
1	F Statistics	497,1922
2	F Statistic Probability	0.000000

Source: Data processed with Eviews, 2025

The results of the F test are carried out by following the procedures or steps as follows.

1) **Hypothesis Formulation**

H0 :β_1=β_2=β_3= β_4= 0, which means that working hours, capital, harvest area and fertilizer, simultaneously do not have a simultaneous effect on clove production in Bengkel Village.

H1: at least one of $\beta i \neq 0$, which means that working hours, capital, harvest area and fertilizer have a simultaneous effect on clove production in Bengkel Village.

2) **Real Level**

With a real level of = 0.05 or a confidence level of 95 percenta

3) **Testing Criteria**

H0 is accepted if the prob value. (0.000) >a = 0.05

H0 is rejected if the prob value. (0.000)≤ a = 0.05

4) **Calculating the value of the F test statistic**

The calculated F value = 497.1922 and the prob. value = 0.000

5) **Conclusion**

The prob. value obtained is 0.000 = 0.05, then≤ a H0 is rejected, which means that simultaneously labor, capital, harvest area, and fertilizer have a significant effect on clove production.

Partial Test Results (t-Test)

Table 8. t-Test Results (Hypothesis Test)

Variables	Regression Coefficient	T-count value	Probability	Conclusion
Working hours (X1) → Production (Y)	0.368946	9.028468	0.0000	Positive influence
Capital (X2) → Production (Y)	0.213701	4.403292	0.0000	Positive influence
Harvested area (X3) → Production (Y)	0.904264	10.50401	0.0000	Positive influence
Fertilizer (X4 → Production (Y)	0.228062	6,769861	0.0000	Positive influence

Source: Data processed with Eviews, 2025

The Effect of Labor on Clove Production

Hypothesis Formulation:

- H$_0$: $\beta_1 \leq 0$, meaning that working hours (X$_1$) have no effect on clove production.

- H$_1$: $\beta_1 > 0$, meaning that working hours (X$_1$) have a positive and significant effect on clove production.

Significance Level:

A significance level of $\alpha = 0.05$, or a 95% confidence level.

Decision Rule:

- H$_0$ is accepted if the probability value (0.000) > $\alpha = 0.05$

- H₀ is rejected if the probability value (0.000) ≤ α = 0.05

t-test Results:

t-statistic = 9.028, probability value = 0.000

Conclusion:

Since the probability value of 0.000 ≤ 0.05, H₀ is rejected and H₁ is accepted. This indicates that, partially, the labor variable has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

The Effect of Capital on Clove Production

Hypothesis Formulation:

- H₀: $\beta_2 \leq 0$, meaning that capital (X_2) has no effect on clove production.
- H₁: $\beta_2 > 0$, meaning that capital (X_2) has a positive and significant effect on clove production.

Significance Level:

A significance level of α = 0.05, or a 95% confidence level.

Decision Rule:

- H₀ is accepted if the probability value (0.000) > α = 0.05
- H₀ is rejected if the probability value (0.000) ≤ α = 0.05

t-test Results:

t-statistic = 4.403, probability value = 0.000

Conclusion:

Since the probability value of 0.000 ≤ 0.05, H₀ is rejected and H₁ is accepted. This indicates that, partially, the capital variable has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

The Effect of Harvested Area on Clove Production

Hypothesis Formulation:

- H₀: $\beta_3 \leq 0$, meaning that harvested area (X_3) has no effect on clove production.
- H₁: $\beta_3 > 0$, meaning that harvested area (X_3) has a positive and significant effect on clove production.

Significance Level:

A significance level of α = 0.05, or a 95% confidence level.

Decision Rule:

- H₀ is accepted if the probability value (0.000) > α = 0.05
- H₀ is rejected if the probability value (0.000) ≤ α = 0.05

t-test Results:

t-statistic = 10.504, probability value = 0.000

Conclusion:

Since the probability value of 0.000 ≤ 0.05, H₀ is rejected and H₁ is accepted. This means that, partially, the harvested area variable has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

The Effect of Fertilizer on Clove Production

Hypothesis Formulation:

- Ho: $\beta_4 \leq 0$, meaning that fertilizer (X_4) has no effect on clove production.

- H1: $\beta_4 > 0$, meaning that fertilizer (X_4) has a positive and significant effect on clove production.

Significance Level:

A significance level of $\alpha = 0.05$, or a 95% confidence level.

Decision Rule:

- Ho is accepted if the probability value (0.000) > $\alpha = 0.05$

- Ho is rejected if the probability value (0.000) $\leq \alpha = 0.05$

t-test Results:

t-statistic = 6.769, probability value = 0.000

Conclusion:

Since the probability value of $0.000 \leq 0.05$, Ho is rejected and H1 is accepted. This indicates that, partially, the fertilizer variable has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

Discussion of Research Results

The Effect of Working Hours, Capital, Harvest Area, and Fertilizer Simultaneously on Clove Production in Bengkel Village, Busungbiu District, Buleleng Regency

Based on the results of data processing, it is known that working hours, capital, harvest area, and fertilizer simultaneously have a significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency. The results of this study indicate that the more working hours are devoted, the more capital, the wider the cultivated land, and the more fertilizer is given, the more clove production from farmers in Bengkel Village increases.

Labor can reflect the quality of effort given by a person in a certain time in producing goods and services (Simanjuntak, 2005:69). Labor cannot be separated from the clove cultivation process. The role of labor in clove production can be in the form of plant maintenance, harvesting, and post-harvest land management. Therefore, the more optimal the utilization of labor (both in terms of quantity and quality of skills), the higher the potential for clove production produced.

Capital is needed to support clove production facilities in Bengkel Village, Busungbiu District, Buleleng Regency. Capital in the form of money is used to purchase various production inputs. Directly, capital can increase land productivity to the maximum. With adequate capital, farmers can care for plants intensively, access better training or technology, and avoid delays in planting or harvesting due to limited tools or labor (Limonu,et. al,2024).

The large area of planting provides an opportunity for farmers in Bengkel Village to produce more cloves. The wider the harvest area, the greater the volume of production produced. This is due to the increase in the number of trees harvested, so that the total production results increase (Ekaputri, 2008). However, increasing the harvest area also needs to be supported by other factors such as capital and labor. In addition, climate conditions, pests, and cultivation practices also affect the results of clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

Fertilization has a significant influence on clove production in Bengkel Village. Providing adequate fertilizers that are adjusted to the specific needs of plants and soil conditions can increase greater clove production. According to Hayati (2010), Fertilizer application can prevent nutrient deficiency during the clove plant growth process. The majority of clove farmers in Bengkel Village use fertilizer in balanced doses, so this is the main driver of Bengkel Village as a clove production center in Busungbiu District.

The partial effect of working hours on clove production in Bengkel Village, Busungbiu District, Buleleng Regency

Based on the results of the analysis of the influence of working hours on clove production in Bengkel Village in table 8, the value of t count = 9.028> t table = 1.656 with a probability value of 0.0000 <0.05 indicates that working hours partially have a positive and

significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency. So this study is in accordance with the hypothesis and theory of the Power Function production function which assumes that proportional changes in input (working hours) will cause proportional changes in output (clove production). This proves that working hours are an important factor in the clove production process, especially at the maintenance and harvest stages.

The partial influence of capital on clove production in Bengkel Village, Busungbiu District, Buleleng Regency

Based on the results of the analysis of the influence of capital on clove production in Bengkel Village in table 8, the value of t count = 4.403> t table = 1.656 with a probability value of 0.0000 <0.05 indicates that capital partially has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency. So this study is in accordance with the hypothesis and theory of the power function production function which assumes that every increase in capital input will provide additional output according to its elasticity level.

The results of this study are in line with Jelatu (2023) and Adyatma & Budiana (2013) found that capital has a positive effect on clove production. The level of clove production is highly dependent on the amount of capital spent by farmers. Additional capital will increase the value of clove farming production (Virnayanti & Darsana, 2018).

Partial Effect of Harvest Area on Clove Production in Bengkel Village, Busungbiu District, Buleleng Regency

Based on the results of the analysis of the influence of harvested area on clove production in Bengkel Village in table 8, the t-value = 10,504> t-table = 1,656 with a probability value of 0.0000 <0.05 indicates that the harvested area partially has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency. So this study is in accordance with the hypothesis and theory of the power function production function which assumes that land area has an influence on production, the wider the harvested land, the greater the production results obtained by farmers. The results of this study are in line with Sari,et. al.(2017) and Ekaputri (2017) found that land area had a positive effect on clove farming production.

Partial effect of fertilizer on clove production in Bengkel Village, Busungbiu District, Buleleng Regency

Based on the results of the analysis of the effect of fertilizer on clove production in Bengkel Village in table 4.16, the t-value = 6.769> t-table = 1.656 with a probability value of 0.0000 <0.05 indicates that fertilizer partially has a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency. So this study is in accordance with the hypothesis and theory of the power function production function which assumes that each additional fertilizer input will increase output according to its elasticity level. This shows that fertilizer as a source of plant nutrients makes a significant contribution to increasing clove plant productivity.

The results of this study are in line with Rahma,et.al(2020) and Ambarita & Kartika (2015) found that fertilizer application has a positive effect on increasing clove production. Fertilizer application that is in accordance with the development of the age of the clove plant will provide good production value.

4. CONCLUSION

Based on the results of the previous discussion and description, the following conclusions can be drawn.

1. Labor, Capital, Land Area and Fertilizer simultaneously have a significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

2. Labor, Capital, Land Area and Fertilizer partially have a positive and significant effect on clove production in Bengkel Village, Busungbiu District, Buleleng Regency.

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