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Research Article

Analysis of Rice Production Scale in Kerambitan Sub-District, Tabanan Regency

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Abstract: Agriculture is a sector that plays a vital role in the economies of many developing countries, including Indonesia. This study aims to analyze the production scale and examine the factors influencing rice production, such as capital, labor, and land area. The research was conducted in Kerambitan Sub-district, Tabanan Regency. The agricultural sector, particularly rice production, plays an essential role in the regional economy and food security. However, it continues to face fluctuations due to various influencing factors. This study employs a quantitative method using multiple linear regression based on the Cobb-Douglas production function to measure the scale of production. Data were collected through questionnaires and interviews with rice farmers in Kerambitan Sub-district, using proportionate stratified random sampling. The results indicate that capital, labor, and land area have a positive and significant effect on rice production in Kerambitan Sub-district, Tabanan Regency. Furthermore, the production scale in this study shows decreasing returns to scale, meaning that each additional unit of input produces a proportionally smaller additional increase in output. These findings imply the need for strategies to enhance production efficiency and optimize resource utilization to improve rice productivity.

Keywords: Capital, Labor, Land Area, Production

1. INTRODUCTION

The agricultural sector plays a crucial role in the economy, especially in developing countries such as Indonesia (Robintara and Dewi, 2021). The lack of educational advancement has led to an increase in the informal labor force, including agriculture, which in turn provides employment opportunities for the population. Even during times of economic crisis, this sector continues to show positive growth and serves as a cornerstone of the national economy. Therefore, agricultural development must be promoted to improve farmers' welfare and ensure national food security. The population's reliance on food availability, particularly rice, also makes agriculture a key factor in maintaining economic and social stability.

In Indonesia, agriculture serves as a primary economic driver in many regions, including Bali Province. Tabanan Regency is known as the rice granary of Bali, as it is the largest rice-producing area on the island, with approximately 26.88 percent of its land consisting of rice fields. This makes agriculture the main occupation and source of income for the majority of its population. The development of agricultural sub-sectors such as food crops, horticulture, and livestock plays a pivotal role in determining the success of regional economic development. Therefore, focusing on agricultural development is essential to ensure sufficient and affordable food availability and to promote regional economic growth.

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Table 1. Rice Production per District in Tabanan Regency 2019-2023 (Tons)

Subdistrict	Production (Tons)				
	2019	2020	2021	2022	2023
Selemadeg Barat	6.223	9.907	6,566	8.242	4,672
Selemadeg	15,544	19.903	18,792	16,454	16,192
Selemadeg Timur	17,835	15,473	11,531	15,757	13,068
Kerambitan	28,784	20,313	25,266	21,179	24,398
Tabanan	25.173	23,636	19,780	24,503	12.203
Kediri	23,439	30,864	28,845	33,280	31,366
Marga	11,715	25,242	19,270	17,833	15,428
Baturiti	19,962	15,537	17,402	15,383	16,279
Penebel	52.136	41,318	42,553	47,387	41,700
Pupuan	11.120	10,762	8.018	10,085	9,579
Total	211,931	212,954	198,023	210.103	184,883

Source: Tabanan Regency Agriculture Service, 2024

Based on Table 1, it can be observed that there were fluctuations in rice production in Tabanan Regency from 2019 to 2023. Rice production in Tabanan Regency increased from 211,931 tons in 2019 to 212,954 tons in 2020, but then declined to 198,023 tons in 2021. In 2022, production rose again to 210,103 tons, before decreasing once more in 2023 to 184,883 tons.

In an agrarian country like Indonesia, land is considered the most important factor of production compared to others, as it receives a higher return than other production factors. The size of agricultural land influences the scale of farming, which ultimately affects the efficiency level of a farming operation (Nguyen, 2015).

As widely acknowledged, land is a fundamental aspect of farming. According to existing theory, the larger the land area, the greater the resulting production (Ambarita and Kartika, 2015). Mubyarto (1989:42) also stated that land is a production factor where agricultural products are generated, and it contributes significantly to farming activities.

Table 2. Rice Field Area per District in Tabanan Regency 2019-2023 (Ha)

Subdistrict	Land area(Ha)				
	2019	2020	2021	2022	2023
Selemadeg Barat	784	784	748	748	748
Selemadeg	1,788	1,788	1,788	1,788	1,788
Selemadeg Timur	2.286	2.286	2.286	2.123	2,078
Kerambitan	2.187	2.187	2.187	2.187	2.187
Tabanan	1,804	1,804	1,804	1,806	1,806
Kediri	2,837	2,794	2,794	2,794	2,794
Marga	2,062	2,062	2,062	2,062	2,062
Baturiti	1,728	1,728	1,728	1,728	1,728
Penebel	3,864	3,864	3,864	3,864	3,864
Pupuan	936	936	936	936	936
Total	20,256	20,233	20,197	20,036	19,991

Source: Tabanan Regency Agriculture Service, 2024

Based on Table 2, it shows that there are several sub-districts that have experienced a decrease in the area of rice fields and there are also several sub-districts whose rice field area has not changed. It can be seen that Penebel Sub-district has the largest rice field area in

Tabanan Regency, which is 3,864 Ha in 2023. Then followed by Kediri Sub-district which has a land area of 2,794 Ha in 2023. Then followed by Kerambitan Sub-district which has a land area of 2,187 Ha in 2023. Meanwhile, Selemadeg Barat Sub-district has the smallest rice field area, which is 748 Ha in 2023.

Productivity in business is actually a combination of the concept of business efficiency (physical) with land capacity. Efficiency is used to measure the amount of production results (output) obtained from one unit of input. While the capacity of a certain piece of land describes the ability of the land to absorb labor and capital so as to provide large gross production results at a certain level. From the farmer's side, productivity is an important factor in realizing the success of increasing the farmer's income itself.

Table 3. Rice Productivity per District in Tabanan Regency 2019-2023 (Kw/Ha)

Subdistrict	Productivity(Kw/Ha)				
	2019	2020	2021	2022	2023
Selemadeg Barat	41.24	63.59	53.69	57.92	57.89
Selemadeg	45.63	64.47	53.04	56.12	55.99
Selemadeg Timur	62.40	59.25	44.64	61.38	51.33
Kerambitan	70.70	57.09	56.41	59.81	63.04
Tabanan	71.21	75.05	54.70	69.75	53.13
Kediri	41.34	67.71	56.46	60.13	57.99
Marga	24.87	66.66	46.10	46.97	52.00
Baturiti	66.00	56.96	61.49	50.39	59.07
Penebel	77.00	66.94	56.28	58.08	58.88
Pupuan	65.00	57.99	46.70	56.15	54.30
Average	56.54	63.57	52.95	57.67	56.36

Source: Tabanan Regency Agriculture Service, 2024

Based on Table 3, rice productivity in Tabanan Regency experienced fluctuations during the period from 2019 to 2023, with relatively low average productivity, recorded at approximately 56.54 quintals per hectare in 2019 and slightly declining to 56.36 quintals per hectare in 2023. However, in 2023, Kerambitan District recorded the highest productivity, reaching 63.04 quintals per hectare. This district holds significant potential in the agricultural sector, primarily because the majority of its land around 2,187 hectares is utilized as rice fields. As one of the supporting areas for the capital of Tabanan Regency, Kerambitan plays a vital role in food security and the local economy.

To improve agricultural productivity, it is necessary to optimize various production factors such as capital, labor, and land area. The Cobb-Douglas production function is used in this analysis because it effectively describes the quantitative relationship between input and output, as well as evaluates elasticity and scale of production. Agricultural technology also plays an important role; however, it is assumed to remain constant in this study to focus on other influencing factors. The Tabanan Regency Government has supported farmers by providing modern tools such as tractors and grain dryers, although optimal outcomes still heavily depend on land area and production management efficiency.

This study aims to analyze the scale of production and the efficiency of capital, labor, and land use in rice production in Kerambitan District. It builds upon previous studies that have shown inconsistent findings, particularly regarding the effects of land area and labor on rice production. By focusing on a region with high agricultural potential and utilizing the latest

data, this research is expected to provide a clearer picture and strategic recommendations to enhance productivity in the agricultural sector of the region.

2. RESEARCH METHODS

This study employs a quantitative associative approach to examine the influence of independent variables namely capital, labor, and land area on the dependent variable, which is rice commodity production in Kerambitan District, Tabanan Regency. The research location was selected purposively due to its status as the region with the highest rice productivity. The study population consists of all rice farmers in Kerambitan District, totaling 4,638 individuals. A sample of 100 respondents was determined using the Slovin formula and selected through proportionate stratified random sampling.

The data used in this study include both quantitative and qualitative data, derived from primary sources (questionnaires, observations, and interviews) and secondary sources from the Tabanan Regency Agricultural Office. Data analysis was conducted through classical assumption tests (normality, multicollinearity, and heteroscedasticity), as well as multiple linear regression using the Cobb-Douglas production function. The regression equation was expressed in natural logarithmic form to measure the elasticity of each variable in relation to rice production.

The purpose of the analysis is to determine the magnitude of the influence of each independent variable and to identify whether the production relationship reflects increasing, constant, or decreasing returns to scale. This study is expected to provide insight into the key factors influencing rice production in Kerambitan District, Tabanan Regency.

3. RESULTS AND DISCUSSION

Discussion of Research Results

Multiple Linear Regression Analysis

Table 4. Results of Multiple Linear Regression Analysis

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4,649	0.459		-10,121	0,000
	Capital (LnX1)	0.170	0.034	0.194	5,007	0,000
	Labor (LnX2)	0.468	0.024	0.720	19,316	0,000
	Land Area (LnX3)	0.181	0.038	0.210	4,756	0,000
a. Dependent Variable: Production Quantity (LnY)						

Source: Processed Primary Data, 2025

Based on the results of multiple linear regression analysis as presented inTable 4, then the following regression equation can be made:

$$\widehat{LnY} = -4.649 + 0.170\ LnX1 + 0.468\ LnX2 + 0.181\ LnX3$$

MarkThe regression coefficient of each independent variable has a t-test significance value of less than 0.05. This shows that all independent variables have a significant influence on the dependent variable.

Results of the Determination Coefficient Test (R^2)

Table 5. Results of the Determination Coefficient Test (R^2)

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	**0.953a**	**.908**	**.905**	**.10732**

Predictors: (Constant), Land Area (LnX3), Labor (LnX2), Capital (LnX1)
Dependent Variable: Production Quantity (LnY)

Source: Processed Primary Data, 2025

The test results in Table 5 provide results where the adjusted R^2 (adjusted determination coefficient) is 0.905. This means that the variation in rice commodity production can be significantly influenced by capital, labor and land area variables by 90.5 percent, while the remaining 9.5 percent is explained by other factors not explained in the research model.

Classical Assumption Test Results

1) Normality Test

Table 6. Normality Test Results

		Unstandardized Residual
N		
Normal Parameters[a,b]	**Mean**	**.0000000**
	Std. Deviation	**.11286315**
Most Extreme Differences	**Absolute**	**.071**
	Positive	**.041**
	Negative	**-.071**
Test Statistics		**.053**
Asymp. Sig. (2-tailed)		**.200[c,d]**

Source: Processed Primary Data, 2025

Based on the analysis results in Table 6, a significance value of 0.200 is obtained, which is greater than 0.05. Therefore, the significance value of the Kolmogorov-Smirnov test is more than 0.05, it can be concluded that the regression equation model is normally distributed.

2) Multicollinearity Test

Table 7. Multicollinearity Test Results

Variables	Tolerance	VIF	Information
Capital (LnX1)	**0.637**	**1,571**	**Free from multicollinearity**
Labor (LnX2)	**0.692**	**1,446**	**Free from multicollinearity**
Land Area (LnX3)	**0.492**	**2,032**	**Free from multicollinearity**

Source: Processed Primary Data, 2025

Based on Table 7, it can be seen that the tolerance and VIF values of all variables show that the tolerance value for each variable is greater than 10% or more than 0.10 and the VIF value is less than 10, which means that the regression equation model is free from multicollinearity.

3) Heteroscedasticity Test

Table 8. Heteroscedasticity Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0.525	0.284		-1,844	0.068
Capital (LnX1)	0.037	0.021	0.220	1,773	0.079
Labor (LnX2)	0.022	0.015	0.176	1,486	0.141
Land Area (LnX3)	-0.021	0.024	-0.125	-0.885	0.378
a. Dependent Variable: ABS_RES					

Source: Processed Primary Data, 2025

Based on Table 8, it can be seen that the significance value of the capital variable is 0.079, labor is 0.141 and land area is 0.378. This value is greater than 0.05, which means that there is no influence between the independent variables on the absolute residual. Thus, the model created does not contain symptoms of heteroscedasticity.

Simultaneous Test Results (F Test)

Table 9. F Test Results

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	10,885	3	3.628	315,027	0.000[b]
	Residual	1.106	96	.012		
	Total	11,991	99			

a. Dependent Variable: Production Quantity (LnY)
b. Predictors: (Constant), Land Area (LnX3), Labor (LnX2), Capital (LnX1)

Source: Processed Primary Data, 2025

Based on Table 9 shows that the F value is 315.027 with a significance of 0.000 which is less than $\alpha = 0.05$, this means that the model used in this study is feasible. This result gives the meaning that all independent variables are able to predict or explain the phenomenon of rice commodity production. in other words there is a simultaneous influence of capital, labor, and land area variables on rice commodity production.

Partial Test Results (T-Test)

Table 10. T-Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4,649	0.459		-10,121	0,000
	Capital (LnX1)	0.170	0.034	0.194	5,007	0,000
	Labor (LnX2)	0.468	0.024	0.720	19,316	0,000
	Land Area (LnX3)	0.181	0.038	0.210	4,756	0,000
a. Dependent Variable: Production Quantity (LnY)						

Source: Processed Primary Data, 2025

The results of the test of the influence between variables can be explained as follows:

1) The Influence of Capital on Rice Production

Capital can be interpreted as the expenditure of a company or agency to produce goods or services (Prastyo and Kartika, 2017). The capital component in this study is the capital spent by farmers in one harvest period, namely all agricultural needs such as purchasing seeds, purchasing fertilizers, purchasing pesticides, tractor costs, transportation costs, harvest costs, and various costs incurred by farmers to support agricultural activities.

Based on the results of the influence analysiscapital for rice commodity production is shown in Table 10obtained the calculated $t_{value} = 5.007 > t_{table}$ (0.05:96) = 1.660 with a

significance of 0.000 < 0.05 which indicates that H_0 is rejected and H_1 is accepted. This result means thatcapitalhas a positive and significant impacton rice commodity production.

2) The Influence of Labor on Rice Production

The workforce is the population that has entered working age (BPS, 2023). The working age population is the population aged 15 to 64 years. The workforce includes people who are able to work to provide and produce services to meet the needs of the community. The workforce in this study is the workforce projected in the form of the number of working hours devoted by farmers during the farming process, both labor from the family and labor from outside the family.

Based on the analysis resultsthe influence of labor on rice commodity production shown in Table 10 obtained a calculated t_{value} = 19.316 > t_{table} (0.05:96) = 1.660 with a significance of 0.000 < 0.05 which indicates that H_0 is rejected and H_1 is accepted. This result means that labor has a positive and significant effect on rice commodity production.

3) The Influence of Land Area on Rice Production

According to the Indonesian dictionary, land is defined as open land and cultivated land. Land is the most important production factor in agriculture because land is a place where farming can be done and where production results are produced because the land is where plants grow. In this study, the area of land cultivated by rice farmers in Kerambitan District, Tabanan Regency was calculated in are units. The area of rice fields cultivated by farmers when viewed from the ownership status is their own.

Based on the analysis resultsthe influence of land area on rice commodity production shown in Table 10 obtained a calculated t_{value} = 4.756 > t_{table} (0.05:96) = 1.660 with a significance of 0.000 < 0.05 which indicates that H_0 is rejected and H_1 is accepted. This result means that land area has a positive and significant effect on rice commodity production.

Production Scale

According to Hal R. Varian in his book entitled Microeconomic Analysis (1992) in the regression model using the Cobb-Douglas production function or other log-linear forms, βi represents the regression coefficient of each input variable. ∑βi is the sum of the coefficients used to determine the scale of production results. Based on the processed data, it shows that the sum of the three coefficients is:

$$\sum \beta i = \beta_1 + \beta_2 + \beta_3$$

$$\sum \beta i = 0.170 + 0.468 + 0.181 = 0.819 < 1$$

MarkThis shows that Σβi < 1. This means that the long-term production system is in a condition of decreasing returns to scale. It can be concluded that each additional input of production factors will produce an additional production output that is smaller than the change in input.

4. CONCLUSION AND SUGGESTIONS

Based on the results of the previous discussion and description, the following results were obtained. Capital, labor, and land area simultaneously have a significant effect on rice production in Kerambitan District, Tabanan Regency. Partially, the variables of capital, labor, and land area have a positive and significant effect on rice production in

Kerambitan District, Tabanan Regency. And the results of the calculation of the production scale show the results of Decreasing Returns to Scale. This means that each additional input of production factors will produce an additional production output that is smaller than the change in input.

Based on the research results, it is suggested that the Government, the Department of Agriculture or Related Agencies can consider policies or methods to increase or stabilize rice production. From the farmer's side, it is also suggested to think about and consider capital, labor, and land area properly and efficiently. Farmers can also invest capital in equipment and technology that can increase production efficiency, such as modern planting tools, drip irrigation systems, or integrated pest control technology. This study has several shortcomings, one of which is ignoring the technology variable. Therefore, seeing the rapid development of technology, it is suggested that further research can consider the use of technology variables as further research.

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