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Analysis Of Factors Affecting Paddy Production In Ulu Lakara Village, South Konawe Regency

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Abstract

This study aims to analyze the influence of production factors on rice paddy production in Ulu Lakara Village, South Palangga District, South Konawe Regency. This study was conducted from November to December 2025. The population in this study was 160 rice paddy farmers with a sample of 61 people determined using the Slovin formula and sampling using a simple random sampling method. The data used are quantitative data sourced from primary and secondary data. Data analysis used multiple linear regression with the Cobb-Douglas production function in the form of natural logarithms. The results showed that simultaneously (together) the variables of land area, seeds, urea fertilizer, phonska fertilizer, kovinplus 80 P rodenticide, bestnoid 60 WP molluscicide, labor, and farming experience had a significant effect on the amount of rice paddy production. Partially (alone) the variables of land area, seeds, urea fertilizer, rodenticide kovinplus 80 P, molluscicide bestnoid 60 WP, and labor have a significant effect on rice paddy production, while the variables of phonska fertilizer and farming experience do not have a significant effect on rice paddy production in Ulu Lakara Village, South Palangga District, South Konawe Regency

Keyword: production factors, paddy production, Cobb-Douglas

INTRODUCTION

The agricultural sector is one of the strategic sectors in Indonesia's economic development because it serves as a food provider, a major employer, and a contributor to national income. As an agrarian country, the majority of Indonesia's population still relies on the agricultural sector for their livelihoods. In addition to contributing to national income, the

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agricultural sector also plays a vital role in ensuring food security and supporting regional economic development (Moonik et al., 2020). One of the subsectors of strategic importance is food crops, particularly rice, as rice is the staple food for the majority of the Indonesian population. Therefore, the sustainable increase in rice production has become one of the priorities of national agricultural development. Rice production is influenced not only by land availability but also by the efficient utilization of production factors, such as seeds, fertilizers, pesticides, labor, and farmers' ability to manage their farms (Suwandari, 2016; Parawansa, 2024; Onibala et al., 2017).

Rice productivity in Indonesia, including in Southeast Sulawesi Province, continues to fluctuate. Data from 2024–2025 indicate that the harvested rice area ( ) in Southeast Sulawesi increased from 129,999.61 hectares to 153,960 hectares—an increase of approximately 18.4%—followed by a rise in rice production in early 2025. Nevertheless, productivity varies across regions. South Konawe Regency is one of the largest rice-producing centers in Southeast Sulawesi Province and plays a crucial role in regional food security (Prianto, 2023). However, data from the South Konawe Regency Central Statistics Agency for the 2020–2024 period show that the harvested area and rice production have fluctuated. The harvested area decreased from 35,745 ha in 2020 to 21,594 ha in 2024, while production fell from 116,150 metric tons to 80,593 metric tons. On the other hand, rice productivity has generally increased compared to 2020, although it continues to fluctuate. These conditions indicate that the increase in productivity has not yet been fully able to offset the decline in harvested area, resulting in a continued decrease in total production.

This phenomenon is also observed in Ulu Lakara Village, South Palangga Subdistrict, South Konawe Regency. According to data from the South Palangga Subdistrict Agricultural Extension Office for 2020–2025, the area of rice paddies in this village remains at 195 hectares, but rice production and productivity have fluctuated from year to year. Rice production increased from 721.5 metric tons in 2020 to 1,014 metric tons in 2025, while productivity rose from 3.7 metric tons/ha to 5.2 metric tons/ha. Although showing an upward trend, rice production still fluctuates annually. This indicates that increases in production are influenced not only by land area but also by the effective use of production factors in farming practices.

In practice, paddy farmers in Ulu Lakara Village still face various constraints that could potentially affect production levels. These challenges include limited access to high-quality seeds due to relatively high prices, suboptimal fertilizer availability in terms of both price and distribution, infestations by rats and snails, labor shortages resulting from declining interest among the younger generation in the agricultural sector, and farmers' limited ability to adopt

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modern agricultural technologies. Furthermore, since the area of cultivated land remains relatively constant, increasing production can only be achieved through the optimal utilization of production factors. Given these conditions, factors such as land area, seeds, urea fertilizer, Phonska fertilizer, Kovinplus 80 P rodenticide, Bestnoid 60 WP molluscicide, labor, and farming experience are believed to play a significant role in determining the level of paddy rice production in Ulu Lakara Village.

Numerous studies have been conducted on the factors influencing rice production, but the results remain inconsistent. Dhamira (2020) found that climatic factors, such as maximum temperature, minimum temperature, and the El Niño and La Niña phenomena, influence rice production in Indonesia. Puspitasari (2021) reported that land area and seed have a significant effect on irrigated paddy rice production, whereas fertilizer and labor have no significant effect. Delaseh (2020) concluded that land area, seed, urea fertilizer, and herbicides significantly influence rice production in rain-fed paddy fields, whereas KCl fertilizer, insecticides, and labor do not have a significant effect. Meanwhile, Untari (2018) found that only land area had a significant effect on irrigated rice production in South Konawe Regency, whereas seeds, fertilizers, pesticides, and labor did not have a significant effect. These differing research findings indicate that the influence of production factors on rice production is highly dependent on regional characteristics, agroecological conditions, and farm management systems.

Although various studies have examined the factors influencing rice production, research that integrates the use of production inputs, specific pesticides, labor, and farming experience at the farm level in Ulu Lakara Village remains very limited. Furthermore, no study has specifically analyzed the effects of land area, seeds, urea fertilizer, Phonska fertilizer, Kovinplus 80 P rodenticide, Bestnoid 60 WP molluscicide, labor, and farming experience on irrigated rice production in that village using the Cobb–Douglas production function approach. Thus, this study is expected to fill this research gap while providing empirical evidence regarding the production factors that influence irrigated rice yields. The results of this study are expected to serve as input for farmers, agricultural extension workers, and local governments in formulating strategies to sustainably increase rice productivity in South Konawe Regency.

METHOD

This study was conducted in Ulu Lakara Village, South Palangga Subdistrict, South Konawe Regency, Southeast Sulawesi Province, from November to December 2025. The research location was selected through purposive sampling, considering that the village is one of the major rice-farming centers in South Konawe Regency that still experiences production

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fluctuations despite a relatively stable land area, and faces various farming constraints, such as limited access to high-quality seeds, fertilizer availability, pest infestations, and labor shortages. The study population consisted of 160 irrigated rice farmers who owned their own land. The sample was determined using the Slovin formula with a 10% margin of error, resulting in 61 respondents. Subsequently, respondents were selected using simple random sampling, ensuring that every member of the population had an equal chance of being selected as a research sample.

This study employed a quantitative approach utilizing both primary and secondary data. Primary data were collected through field observations, structured interviews using questionnaires, and documentation, while secondary data were obtained from the Central Statistics Agency (BPS), the Agricultural Extension Center (BPP), and various relevant scientific literature. The dependent variable in this study is paddy rice production (Y), while the independent variables include land area (X_1), seeds (X_2), urea fertilizer (X_3), Phonska fertilizer (X_4), Kovinplus 80 P rodenticide (X_5), Bestnoid 60 WP molluscicide (X_6), labor (X_7), and farming experience (X_8). Data analysis was performed using the Cobb–Douglas production function model, transformed into natural logarithmic form and estimated using multiple linear regression analysis to identify the effects of each production factor on paddy rice production.

RESULTS AND DISCUSSION

The results of this study are presented based on data analysis obtained from 61 irrigated rice farmers who served as research respondents. The data were analyzed using the Cobb–Douglas production function model via multiple linear regression in natural logarithmic form to identify the effects of production factors on irrigated rice production. The discussion begins with a presentation of the respondents' characteristics, followed by the model estimation results and an interpretation of the effects of each variable on irrigated rice production.

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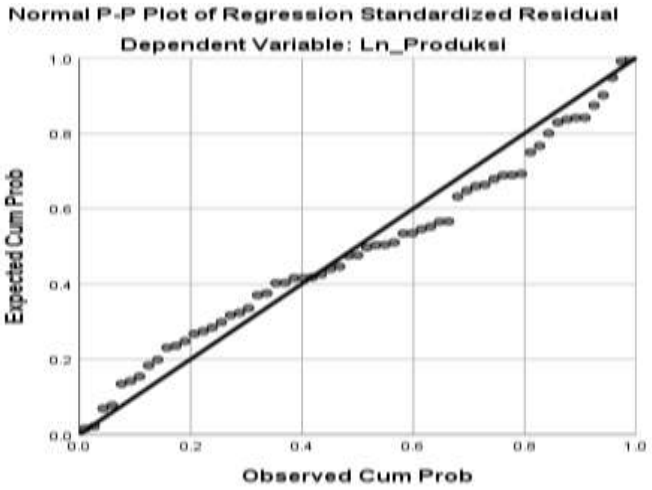


Figure1 . Scatter Plot for the Data Normality Test

Figure 1 shows the results of the normality test, where the graph indicates that the residual points are distributed along the diagonal line and do not show significant deviation. This distribution pattern indicates that the regression model residuals are normally distributed.

Table 1. Results of the Multicollinearity Test

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.218	.070		17,475	.000		
	Ln_LandArea	.559	.008	.904	68,809	.000	.180	5,543
	Ln_Seeds	.013	.005	.022	2,504	.015	.416	2,403
	Ln_UreaFertilizer	.020	.005	.032	3.666	.001	.398	2,512
	Ln_Phonska Fertilizer	-.002	.004	-.004	-.512	.611	.445	2.248
	Ln_Redonticide Kovinplus 80 P	.017	.008	.016	2.088	.042	.535	1,869
	Ln_Molluscicide Bestnoid 60 WP	.055	.008	.056	6.501	.000	.423	2,365
	Ln_Workforce	.015	.008	.012	1,962	.020	.832	1,201
	Ln_Experience Farming Effort	-.004	.003	.008	1.304	.198	.881	1.135

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Table 1 shows the results of the multicollinearity test, where the *Tolerance* values for each *independent* variable are as follows: land area 0.180, seed 0.416, urea fertilizer 0.398, Phonska fertilizer 0.445, Kovinplus 80 P herbicide 0.535, Bestnoid 60 WP molluscicide 0.423, labor 0.832, and farming experience 0.881. The values obtained for all variables were > 0.10. Meanwhile, the calculated *Variance Inflation Factor* (VIF) values for each variable were as follows: land area 5.543, seed 2.403, urea fertilizer 2.512, Phonska fertilizer 2.248, Kovinplus 80 P herbicide 1.869, Bestnoid 60 WP molluscicide 2.365, labor 1.201, and farming experience 1.135. The VIF values obtained for all variables are < 10. Based on the results of the *Tolerance* and *Variance Inflation Factor* (VIF) calculations, it can be concluded that there is no multicollinearity among the *independent* variables.

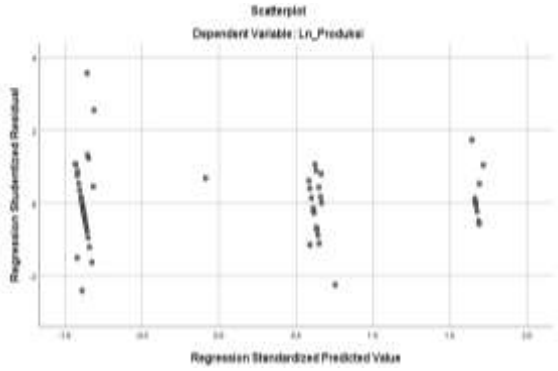


Figure2 . Heteroscedasticity Test Results

Figure 2 shows that the data points in the graph are randomly scattered above and below the zero line and do not form a specific pattern, indicating that there is no heteroscedasticity in the regression model.

Table 2. Results of multiple linear regression analysis

Variable	Regression Coefficient	Significance
Constant	1.218	0.000
Land Area (X1)	0.559	0.000*
Seeds (X2)	0.013	0.015*
Urea Fertilizer (X3)	0.020	0.001*
Phonska Fertilizer (X4)	-0.002	0.611
Kovinplus 80 P Fungicide (X5)	0.017	0.042*
Bestnoid 60 WP Molluscicide (X6)	0.055	0.000*

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Labor (X7)	0.015	0.020*
Agricultural Experience (X8)	-0.004	0.198
R^2	0.998	
Significant F	0.000	

Table 2 shows the results from *the* SPSS *output* and displays the regression coefficients for the variables of land area, seeds, urea fertilizer, Phonska fertilizer, Kovinplus 80 P herbicide, Bestnoid 60 WP molluscicide, labor, and farming experience. Thus, a multiple linear regression equation using the natural logarithm (ln) can be formulated as follows:

$$\ln Y = \ln 1.218 + 0.559 \ln X_1 + 0.013 \ln X_2 + 0.020 \ln X_3 - 0.002 \ln X_4 + 0.017 \ln X_5 + 0.055 \ln X_6 + 0.015 \ln X_7 - 0.004 \ln X_8 + \ln e$$

Then, this equation is substituted back into the Cobb-Douglas equation as follows:

$$Y = 1.218 \times X_1^{\times (0.559)} \times X_2^{\times (0,)} \times (^{0}.^{13})^{\times} \times X_3^{\times (0,)\times (0.20)} \times X_4^{\times (0.002)} \times X_5^{\times (0,)\times (0.17)} \times X_6^{0,055} \cdot X_7^{0.015} \cdot X_8^{0.004} \cdot e$$

Table 3. Coefficient of Determination (R^2)

Model	R	R-Square	Adjusted R-Square	Standard Error of the Estimate	Change Statistics					Durbin-Watson
					R-Square Change	F Change	df1	df2	Sig. F Change	
1	.999[a]	.998	.998	.01173	.998	4,006.935	8	52	,000	1,588

Table 3 shows a coefficient of determination (R^2) of 0.998, meaning that 99.8% of the variation in the *dependent* variable—irrigated rice yield—can be explained by the variation in the eight *independent* variables: land area (X1), seeds (X2), urea fertilizer (X3), Phonska fertilizer (X4), Kovinplus 80 P rodenticide (X5), Bestnoid 60 WP molluscicide (X6), labor (X7), and farming experience (X8). Meanwhile, the remaining 0.2% is explained by other factors outside the model.

The F-statistic value can be seen in Table 2, where the F-statistic is 0.000. This indicates that the F-statistic is less than 0.05 (0.000 < 0.05), which means H0 is rejected and H1 is accepted. Thus, it can be concluded that the *independent* variables—land area (X1), seeds (X2), urea fertilizer (X3), Phonska fertilizer (X4), Kovinplus 80 P rodenticide (X5), Bestnoid 60 WP molluscicide (X6), labor (X7), and farming experience (X8) collectively/simultaneously have a

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significant effect on the *dependent* variable, namely paddy rice production (Y), in Ulu Lakara Village, South Palangga Subdistrict, South Konawe Regency.

A t-test was used to test the partial effects of each independent variable on the dependent variable at a 5% significance level (α = 0.05). The decision regarding the test was based on the significance value: if Sig. < 0.05, then H_o is rejected and H_1 is accepted, indicating that the independent variables have a significant effect on irrigated rice production. Conversely, if Sig. > 0.05, then H_o is accepted and H_1 is rejected, indicating that the independent variable does not have a significant effect on paddy field rice production.

Land Area (X1)

The test results show a regression coefficient for land area of 0.559 with a significance level of 0.000, where this significance value is less than 0.05 (0.000 < 0.05), meaning H_o is rejected and H_1 is accepted. This indicates that land area has a significant effect on paddy rice production. The regression coefficient is positive, meaning that the larger the area of land managed, the higher the paddy rice production; thus, for every 1% increase in land area, paddy rice production increases by 0.559%.

Based on the regression coefficient for land area, it is evident that land area is the most dominant variable influencing irrigated rice farm production. These findings are supported by the theory proposed by Mubyarto (1989), who states that land, as one of the factors of production—the "factory" of agricultural output—makes a significant contribution to farming operations. Land area is a key determinant of the influence of production factors on agricultural commodities. Generally, it can be said that the larger the area of land (that is cultivated or planted), the greater the amount of production generated by that land. The results of this study are also consistent with research conducted by Delaseh (2020), who found that land area has a positive partial effect on irrigated rice production.

Seeds (X2)

The test results show a regression coefficient for the seed variable of 0.013 with a significance value less than 0.05 (0.015 < 0.05), meaning H0 is rejected and H1 is accepted. This indicates that the seed variable influences irrigated rice production in Ulu Lakara Village. The direction of the regression coefficient suggests a positive effect on irrigated rice production. Thus, for every 1% increase in seed quantity, irrigated rice production will increase by 0.013%.

These results show that the seed variable has a significant effect on paddy rice production, even though farmers do not use certified seeds. This finding is supported by the

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theory proposed by Panggabean (2012), who states that seed quality is one of the determining factors for successful crop production. According to Panggabean, seed quality is indicated by high germination rates, optimal vigor or growth strength, freedom from pests and diseases, and varietal purity—which is generally guaranteed through certification. However, the results of this study indicate that the non-certified seeds used by farmers still possess good physiological quality. This suggests that certification status is not the sole determinant of seed quality, as local seeds or selected and well-managed farmer-saved seeds can also exhibit high growth potential and environmental adaptability, thereby continuing to support increased crop yields. These findings are also consistent with research conducted by Delaseh (2020), who noted that seeds have a partial positive effect on irrigated rice production.

Urea Fertilizer (X3)

Test results for the fertilizer variable showed a positive and significant effect at the 0.1 level on irrigated rice farm production. The regression coefficient for the urea fertilizer variable was 0.020 with a significance level of 0.001; since this significance value is less than 0.05 (0.001 < 0.05), H0 is rejected and H1 is accepted. This indicates that urea fertilizer has a significant effect on paddy rice production. The positive direction of the regression coefficient implies that the more fertilizer used, the greater the increase in paddy rice production. Thus, for every 1% increase in urea fertilizer application, paddy rice production increases by 0.020%.

These research findings are supported by the theory proposed by Nurhermawati *et al*. (2021), who state that urea fertilizer is one of the primary sources of nitrogen used in rice cultivation due to its high nitrogen content of 46%, which plays a crucial role in vegetative growth and grain filling.

Phonska Fertilizer (X4)

The results of the Phonska fertilizer variable test showed a regression coefficient for Phonska fertilizer of -0.002 with a significance value of 0.611, where this significance value is greater than 0.05 (0.611 > 0.05), meaning H0 is accepted and H1 is rejected. This indicates that the Phonska fertilizer variable does not have a significant effect on paddy rice production. The direction of the regression coefficient for the Phonska fertilizer variable is negative, meaning that the more Phonska fertilizer used, the lower the of paddy rice production. Specifically, every 1% increase in Phonska fertilizer reduces paddy rice production by 0.002%.

These findings are supported by *the Law of Diminishing Returns*. The lack of a significant effect of Phonska fertilizer on paddy rice production indicates that adding more Phonska

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fertilizer does not necessarily increase production if the crop's nutrient requirements have already been met or if other production factors become limiting. This condition aligns with the *Law of Diminishing Returns*, which states that continuously increasing one production factor while keeping other production factors constant will result in increasingly smaller increases in production; it may even reach a point where additional fertilizer no longer yields a significant increase in yield. These findings are further supported by research conducted by Bakri *et al*. (2021), which concluded that Phonska fertilizer has no effect on irrigated rice farm production.

Kovinplus 80 P Rodenticide (X5)

The results of the analysis of the Kovimplus 80 P rodenticide variable showed a regression coefficient of 0.017 for Kovimplus 80 P, with a p-value of 0.042, which is less than 0.05 (0.042 < 0.05). This means that H0 is rejected and H1 is accepted. This indicates that the Kovimplus 80 P rodenticide variable has a significant effect on paddy rice production. The direction of the regression coefficient for the Kovimplus 80 P rodenticide variable is positive, meaning that the more Kovimplus 80 P rodenticide used, the higher the irrigated rice yield. Specifically, every 1% increase in Kovimplus 80 P rodenticide use increases irrigated rice yield by 0.017%.

These research findings are supported by the theory proposed by Hartono (2018), who states that the use of Kovinplus 80 P rodenticide is effective in increasing paddy rice production through rodent control.

Bestnoid 60 WP Molluscicide (X6)

Test results show that the molluscicide Bestnoid 60 WP has a positive and significant effect at the 0.1 level on irrigated rice farm production. The regression coefficient for Bestnoid 60 WP molluscicide was 0.055 with a significance level of 0.000 , where this significance value is less than 0.05 (0.000 < 0.05), meaning H0 is rejected and H1 is accepted. This indicates that Bestnoid 60 WP molluscicide has a significant effect on paddy rice production. The regression coefficient is positive, meaning that the more Bestnoid 60 WP molluscicide used, the greater the increase in paddy rice production; thus, for every 1% increase in Bestnoid 60 WP molluscicide, paddy rice production increases by 0.055%.

These findings are supported by research conducted by Haryasakiti and Kaharuddin (2018), who stated that Bestnoid 60 WP molluscicide is a commercial molluscicide in *wettable powder* form containing 60% *fentin acetate* as the active ingredient, which acts as a stomach poison against trisipan snails and mulberry snails on irrigated rice crops. The use of the molluscicide Bestnoid 60 WP is effective in suppressing the snail pest population.

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Labor (X7)

Test results show that the labor variable has a positive and significant effect at the 0.05 level on irrigated rice farm production. The regression coefficient for labor is 0.015 with a significance level of 0.020, where this significance value is less than 0.05 (0.020 < 0.05), meaning H0 is rejected and H1 is accepted. This indicates that labor has a significant effect on irrigated rice production. The positive direction of the regression coefficient implies that as the amount of labor used increases, irrigated rice production will also increase. Thus, for every 1% increase in labor, irrigated rice production will increase by 0.015%.

These research findings are supported by the theory proposed by Alamri *et al*. (2022), which states that agricultural labor is crucial for accomplishing various types of agricultural production tasks. Human labor, animal labor, and machine labor are the three types of labor. Human labor is used as a factor of production. Labor within the family (TKDK) and labor outside the family (TKDK) constitute the labor force (TKLK). An optimal increase in the labor force will improve the efficiency of farming activities and lead to increased paddy rice production.

Farming Experience (X8)

Test results show that the farming experience variable has a negative but insignificant effect at the 0.05 level on irrigated rice farm production. The regression coefficient for farming experience is -0.004 with a significance level of 0.198, where this significance value is greater than 0.05 (0.198 > 0.05), meaning H0 is accepted and H1 is rejected. This indicates that farming experience does not have a significant effect on irrigated rice production. The regression coefficient is negative, meaning that for every 1% increase in farming experience, paddy rice production decreases by 0.004%. A farmer's level of farming experience, no matter how high, does not have a significant effect on paddy rice production.

Farming experience does not have a significant effect because farmers still use traditional cultivation methods and have not widely adopted modern agricultural technologies. These conditions mean that the length of farming experience does not directly increase irrigated rice production. Farmers who have been farming for a long time tend to maintain old habits in land preparation, seed selection, fertilization, and pest control. Consequently, their additional experience has not yet been able to bring about significant changes in crop yields.

The results of this study contradict the theory proposed by Thamrin (2012), who states that farming experience is a learning process that enables farmers to more easily adopt and apply evolving technologies. The longer a farmer's experience, the better they are expected to manage their farm, which in turn is expected to increase production

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CONCLUSION

Based on the results of multiple linear regression analysis using the Cobb–Douglas production function, the variables of land area, seeds, urea fertilizer, Phonska fertilizer, Kovinplus 80 P rodenticide, Bestnoid 60 WP molluscicide, labor, and farming experience have a significant effect on irrigated rice production in Ulu Lakara Village, South Palangga Subdistrict, South Konawe Regency. Partially, land area, seeds, urea fertilizer, Kovinplus 80 P rodenticide, Bestnoid 60 WP molluscicide, and labor have a significant effect on paddy rice production, while Phonska fertilizer and farming experience do not show a significant effect.

Efforts to increase irrigated rice production should focus on optimizing the use of production factors proven to have a significant impact, namely the utilization of land area, the use of high-yielding seeds, the application of urea fertilizer according to recommendations, the proper use of the rodenticide Kovinplus 80 P and the molluscicide Bestnoid 60 WP, and more efficient labor management. In addition, the government and relevant agencies are expected to increase support for farmers through extension services, training in sustainable rice cultivation, and the provision of adequate production facilities to support increased productivity in irrigated rice farming.

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