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Analysis of Factors Affecting Farming Productivity of Rawa Lebak Riceland Based on Land Typology in Gandus District, Palembang City

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Abstract

Most of the paddy fields in the city of Palembang are rawa lebak land that scattered on the banks of the Musi River. One of the centers of rawa lebak rice in Palembang City is in Gandus District, which has an area of 1,017,255 hectares of rawa lebak rice fields. The productivity of rawa lebak rice in Gandus District (4.4 tons/ha) is still lower than the average productivity of South Sumatra Province (4.975 tons/ha) and national (5.13 tons/ha). The purpose of this study was (1) to analyze the factors that influence rice production in rawa lebak rice farming in three typologies, namely shallow, middle, and deep rawa lebak land, and (2) to analyze the efficiency of the use of rice production factors in rawa lebak rice farming in three typologies of rawa lebak land. The research was conducted in Gandus District, Palembang City. Sampling used purposive sampling method and taken as many as 93 farmers, consisting of 31 farmers in each rawa lebak typology. The analysis used is a Cobb-Douglass model regression and t-test to determine the effect of production factors, and efficiency analysis to determine the efficiency of the use of production factors. The results showed that (1) The production factor of urea and NPK fertilizers had a significant affect on farming productivity in all typologies of rawa lebak land. Land area, seed, and pesticide factors had no significant effect on farming productivity in all typologies of rawa lebak land. Meanwhile the labor factor had a significant effect in middle and deep rawa lebak land, but had no significant effect in shallow rawa lebak land.(2) The production factors of land area and seeds are inefficient in all land typologies. The production factor of urea and NPK fertilizer has not been used efficiently in all land typologies. The use of pesticide factor is inefficient in the middle and deep rawa lebak land, while the use of labor is inefficient in the shallow and deep rawa lebak land.

Keywords : efficiency, production factors, productivity, rawa lebak rice fields.

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1. Introduction

South Sumatra Province is one of the food-producing provinces in Indonesia. Statistical data in 2020 shows that South Sumatra Province has a rice harvest area of 551,320.76 hectares with a production of 2,743,059.68 tons and a productivity of 4,975 tons/hectare [1]. Meanwhile, Palembang City has a rice area of 4,070.11 hectares, with a production of 12,682.17 tons and a productivity of 4.4 tons/hectare [2].

Most of the paddy fields in Palembang City are rawa lebak rice fields scattered on the banks of the Musi River, namely in the Districts of Gandus, Kertapati, and Kalidoni. Gandus District is one of the centers of rice production in Palembang City. The condition of the rice fields in the Gandus District, which is located on the outskirts of the city, makes it very vulnerable to changing functions, especially into residential and industrial land.

In order to maintain the sustainability of the rawa lebak rice farming business in Gandus District, efforts are needed to increase the productivity of the land so as to increase rice production and farmers' income. The increase in production will encourage the motivation of farmers to continue cultivating rice as their main livelihood, which of course can contribute to increasing food security in Gandus District in particular.

Based on the height and duration of inundation, rawa lebak lands are grouped into shallow, middle, and deep rawa lebak. Shallow rawa lebak is a rawa lebak area where the water level is less than 50 cm for less than 3 months. The middle rawa lebak area is the rawa lebak area where the water level is 50-100 cm for 3-6 months. The deep rawa lebak is a rawa lebak area where the water inundation is more than 100 cm for more than 6 months [3].

To achieve high productivity, farmers should carry out intensive plant cultivation in accordance with recommendations and good cultivation techniques. Therefore, the technical skills of farmers really need to be improved. The need for agricultural production facilities, such as seeds, fertilizers and pesticides must be available at affordable prices. In addition, the area of land cultivated and the use of labor are also important production factors.

Rawa lebak rice farming is a source of income and job opportunities for rural communities, therefore proper management is needed by using production factors efficiently. The use of inefficient production factors in rawa lebak rice farming will result in low production and high costs, which in turn reduces farmers' income. For farmers, farming activities that are carried out are not only increasing production but also how to increase income through the use of production factors, because it is often the case that adding production factors does not provide the income expected by farmers [4].

The purpose of this study is (1) to analyze the factors that influence rice productivity in Rawa Lebak rice farming in three typologies, namely shallow, middle, and deep rawa lebak in Gandus District, Palembang City, and (2) to analyze the efficiency of use factors of rice production in rawa lebak rice farming in three typologies of rawa lebak land in Gandus District, Palembang City.

2. Materials and Methods

2.1 Place and time of research

This research was conducted in Gandus District, Palembang City, South Sumatra Province. The location determination was carried out purposely with the consideration that Gandus District is the center of the rawa lebak rice plant.

2.2 Research methods

The method used in this research is a survey method, which begins with looking for elements and phenomena that occur at the research location within a certain period of time, starting with collecting data, analyzing and interpreting it.

2.3 Sample Withdrawal Method

This research was conducted in Pulokerto Village because it has the largest area of rice fields. The total population of rice farmers in Gandus District is 1,004 people, so random sampling is done.

The determination of the number of samples using the Slovin formula [5]:

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

Where:

n = number of samples
N = total population
e = error (10%)

The sample of farmers taken is divided into three based on the typology of rawa lebak land, namely shallow rawa lebak (31 sample farmers), middle rawa lebak (31 sample farmers), and deep rawa lebak (31 sample farmers), so that a total of 93 sample farmers were obtained.

2.4 Method of collecting data

Data collection techniques used in this study are:

a. Field Research

This method is done by asking questions directly to the parties who can provide information related to the problems to be discussed in this study. In this study, the authors conducted direct interviews with rawa lebak rice farmers in Gandus District, Palembang City, by giving questionnaires.

b. Library Research

Scientific and theoretical data collection activities, namely by reading and quoting directly from several books related to the problems that will be discussed in this research. This is done so that the data obtained is more relevant.

2.5 Data Processing and Data Analysis Methods

The first problem identification was analyzed using the Cobb Douglas model linear function analysis method to analyze the effect of land area, use of seeds, amount of urea fertilizer, amount of NPK fertilizer, amount of pesticides, and number of workers on the productivity of rawa lebak rice in Gandus District. The similarities are [6]:

$$Y = a\, X_1^{\beta 1} . X_2^{\beta 2} . X_3^{\beta 3} . X_4^{\beta 4} . X_5^{\beta 5} . X_6^{\beta 6} . e^{\mu}$$

The equation is then converted into a linear equation as follows:

$$LnY_{shallow} = Ln.a + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \beta_6 X_6 + \mu$$

$$LnY_{middle} = Ln.a + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \beta_6 X_6 + \mu$$

$$LnY_{deep} = Ln.a + \beta_1 LnX_1 + \beta_2 LnX_2 + \beta_3 LnX_3 + \beta_4 LnX_4 + \beta_5 LnX_5 + \beta_6 X_6 + \mu$$

Where:

Y = Rawa Lebak rice productivity (Kg/Ha)
a = Constant
β1, β2,βn = coefficient regression X1 .. Xn
X1 = land area (Ha)
X2 = seed use (Kg/Ha)
X3 = amount of urea fertilizer (Kg/Ha)
X4 = amount of NPK fertilizer (Kg/Ha)
X5 = amount pesticide (Liter/Ha)
X_6 = number of workers (HOK/Ha)
e = natural logarithm (e=2.178)
µ = error

To see the significance of the influence of the independent variable (factor of production) individually on the dependent variable (productivity) by assuming the other independent variables to be constant, the t-test was used. Where if $t_{count} < t_{table}$, then Ho is accepted or the independent variable individually has no effect on the dependent variable (not significant) [7].

To answer the second problem, the analysis of economic efficiency is an analysis used to determine the level of economic efficiency in the use of production factors in a farm. Economic efficiency (EE) is achieved if the Marginal Product Value (MPV) is equal to the price of the factors of production (Pxi), it can be formulated as follows [8]:

$$EE = \frac{MPVxi}{Pxi} = \frac{\beta i.(Y/xi).Py}{Pxi} = 1$$

Where:

EE = economic efficiency
MPVxi = marginal product value from input X
Pxi = factor price i (Rp)
βi = production elasticity of production i
Y = rice production (kg)
Py = rice price (Rp/kg)
xi = production factors i

The criteria for economic efficiency are as follows [9]:

a. The use of factors of production is not efficient if $\frac{MPVxi}{Pxi} < 1$

b. The use of factors of production is efficient if $\frac{MPVxi}{Pxi} = 1$

c. The use of production factors is not efficient if $\frac{MPVxi}{Pxi} < 1$

3. Results and Discussion

3.1 Characteristics of Respondents

Age has an influence on the ability of farmers in carrying out their farming.

Table 1. Rawa Lebak Farmers Respondents Based on Age

No	Age (Years)	Shallow Rawa Lebak		Middle Rawa Lebak		Deep Rawa Lebak	
		Total (Person)	Percent (%)	Total (Person)	Percent (%)	Total (Person)	Percent (%)
1	25 - 35	5	16.13	4	12.90	3	9.68
2	36 - 45	8	25.81	9	29.03	10	32.26
3	46 - 55	9	29.03	9	29.03	8	25.81
4	56 - 65	4	12.90	8	25.81	7	22.58
5	> 65	5	16.13	1	3.23	3	9.68
	Total	**31**	**100.00**	**31**	**100.00**	**31**	**100.00**

Source: Results Primary Data Processing, 2022.

We can see that the number of farmers aged between 36 to 45 years and between 46 to 55 years is the most dominant age group in the three typologies of rawa lebak land (Table 1). In the Shallow rawa lebak, the highest respondent's age was in the 46 to 55 year age group (29.03%). In the middle rawa lebak, the highest respondent age was in the age group of 36 to 45 years and 46 to 55 years (29.03%). While in the deep rawa lebak, the highest respondent's age is in the age group of 36 to 45 years (32.26%).

Table 2. Respondents of Rawa Lebak Farmers Based on the Level of Education

Level of Education	Shallow Rawa Lebak		Middle Rawa Lebak		Deep Rawa Lebak	
	Total (Person)	Percent (%)	Total (Person)	Percent (%)	Total (Person)	Percent (%)
No School	-	-	-	-	1	3.23
Elementary School	20	64.52	12	38.71	19	61.29
Junior High School	11	35.48	5	16.13	4	12.90
Senior High School	-	-	14	45.16	7	22.58
S1	-	-	-	-	-	-
Total	**31**	**100.00**	**31**	**100.00**	**31**	**100.00**

Source: Results Primary Data Processing, 2022.

Formal education shows the length of time farmers have attended school. Education is important for farmers in their daily lives and in relation to the ability of farmers to receive information about agriculture and new technologies as well as apply them.

From the table above, we can see the number of farmers based on the level of education in each typology of rawa lebak land. From these data, it can be seen that the largest number of respondent farmers in shallow and deep Rawa Lebak are at the elementary school level, which are 20 people (64.52%) and 19 people (61.29%). While in the middle rawa lebak the largest at the level of high school education, which are 14 people (45,15%).

Table 3. Rawa Lebak Farmers Respondents Based on Years of Being Farmers

Years of Being Farmers	Shallow Rawa Lebak		Middle Rawa Lebak		Deep Rawa Lebak	
	Total (Person)	Percent (%)	Total (Person)	Percent (%)	Total (Person)	Percent (%)
< 5	-	-	-	-	7	22.5
5 - 10	7	22.6	3	9.7	4	12.9
> 10	24	77.4	28	90.3	20	64.5
Total	31	100.0	31	100.0	31	100.0

Source: Results Primary Data Processing, 2022.

From the table above, we can see that the number of farmers who have farming experience of more than 10 years is the largest in the three typologies of swampland, namely 24 people (77.42%) for shallow rawa lebak, 28 people (90.32%) for middle rawa lebak, and 20 people (64.52%) for deep rawa lebak.

3.2 Cobb-Douglass Model Function Regression

This analysis was conducted to determine how much influence each production factor as an independent variable has on rice productivity as the dependent variable. In addition, this analysis is also used to determine the elasticity of each independent variable to the dependent variable. Furthermore, regarding the Cobb-Douglas model function production in this analysis, the data is transformed into Ln form so that it can be linearly regressed. The analysis was carried out using the SPSS 26 program, the results of the linear regression analysis are shown in Table 4.

Table 4. Regression Coefficient of Production Factors in Rawa Lebak Rice Farming in Gandus District, Palembang City

Variable	Regression Coefficient		
	Shallow Rawa Lebak	Middle Rawa Lebak	Deep Rawa Lebak
Constant	6.240	5.201	6.529
Ln_X_1 Land	0.021	0.008	0.026
Ln_X_2 Seed	0.015	-0.051	-0.010
Ln_X_3 Urea	0.242	0.244	0.196
Ln_X_4 NPK	0.108	0.157	0.082
Ln_X_5 Pesticides	0.041	-0.007	0.007
Ln_X_6 Labor	0.088	0.432	0.161
Adjusted R^2	0.744	0.819	0.800

Source: SPSS Output Results

From the results of the linear regression analysis above, the regression equation for each land typology can be written as follows:

$$LnY_{Pematang} = 6.240 + 0.021 LnX_1 + 0.015 LnX_2 + 0.242 LnX_3 + 0.10 LnX_4 + 0.041 LnX_5 + 0.088 LnX_6$$

$$LnY_{Middle} = 5.201 + 0.008 LnX_1 - 0.051 LnX_2 + 0.244 LnX_3 + 0.157 LnX_4 - 0.007 LnX_5 + 0.432 LnX_6$$

$$LnY_{Deep} = 6.529 + 0{,}026 LnX_1 - 0{,}010 LnX_2 + 0{,}196 LnX_3 + 0{,}082 LnX_4 + 0{,}007 LnX_5 + 0{,}161 LnX_6$$

One of the advantages of the Cob-Dauglass Production Function is that the elasticity value can be read from the regression coefficient value. So that the linear regression equation can be returned to the production function of the Cob-Dauglass model as follows [6]:

$$Y_{Shallow} = 512.86.X_1^{0.021}.X_2^{0.015}.X_3^{0.242}.X_4^{0.108}.X_5^{0.041}.X_6^{0.088}$$

$$Y_{Middle} = 181.45.X_1^{0.008}.X_2^{-0.051}.X_3^{0.244}.X_4^{0.157}.X_5^{-0.007}.X_6^{0.432}$$

$$Y_{Deep} = 684.71.X_1^{0.026}.X_2^{-0.010}.X_3^{0.196}.X_4^{0.082}.X_5^{0{,}007}.X_6^{0{,}161}$$

The equation above shows the relationship between production factors of land area (X_1), seeds (X_2), urea fertilizer (X_3), NPK fertilizer (X_4), pesticides (X_5), and labor (X_6) on productivity of rawa lebak rice. Of the six independent variables in shallow rawa lebak, all the variables show a positive relationship. In the middle rawa lebak, the variables of seeds and pesticides showed a negative relationship, while the other variables showed a positive relationship. While the deep rawa lebak the seed variable shows a negative relationship, while the other variables show a positive relationship.

From these results, the data normality test, classical assumption test and statistical test were carried out.

1. Data Normality

Test The data normality test aims to test whether in the regression model, the data obtained are normally distributed or not. Test statistical *Kolmogorov-Smirnov*. Data is said to be normally distributed when it has a significance coefficient > 0.05 [10]. The results of the analysis can be seen in Table 5.

Table 5. Result of Statistical Test Kolmogorov-Smirnov

		Unstandardized Residual		
Rawa Lebak Typology		Shallow	Middle	Deep
N		31	31	31
Normal Parameters[a,b]	Mean	0.000	0.000	0.000
	Std. Deviation	0.091	0.103	0.088
Most Extreme Differences	Absolute	0.149	0.092	0.070
	Positive	0.108	0.092	0.061
	Negative	-0.149	-0.073	-0.070
Test Statistic		0.149	0.092	.070
Asymp. Sig. (2-tailed)		0.076[c]	0.200[c,d]	0.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

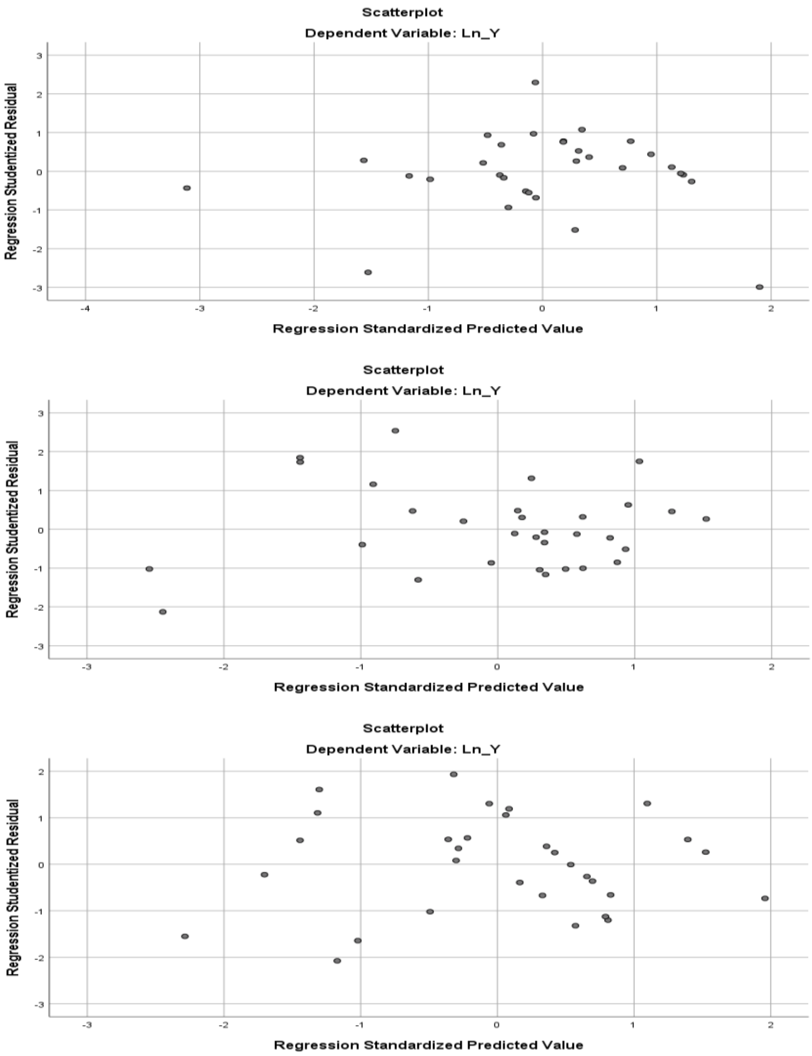
Based on the SPSS output table, it is known that the significance value of Asymp. Sig. (2-tailed) in the three land typologies are the same, namely 0.20 and greater than 0.05. So according to the basis of decision making in the Kolmogorov-Smirnov Test above, it can be concluded that the data is normally distributed.

2. Classical Assumption Test

a. Test Heteroscedasticity

Used to find out whether the regression model has variance inequality from one observation residual to another observation. The results of this heteroscedasticity test can be seen on the Scatterplot graph, if on a scatterplot graph that forms a neat pattern such as straight, wide, wavy, and other neat shapes, it means that heteroscedasticity has occurred [11].

Based on the three scatterplot outputs above, it can be seen that the data points spread without forming a certain pattern. So it can be concluded that there is no heteroscedasticity problem in the model.



Shallow Rawa Lebak

Middle Rawa Lebak

Deep Rawa Lebak

Figure 1. Scatterplot Graph of Heteroscedasticity Test Results

b. Multicollinearity Multicollinearity

A test was conducted to test whether there is a high correlation between the independent variables in the regression model. The multicollinearity test is carried out by looking at the *tolerance* value or VIF value, where if the *tolerance value* > 0.10 and the VIF value is < 10.00, then multicollinearity does not occur, whereas if *tolerance value* < 0.10 and the VIF value is > 10.00, then multicollinearity occurs. and there is a correlation between the independent variables [12].

- Middle rawa lebak (Adjusted R^2 = 0,819), this shows that 81.9 % of rice productivity in middle rawa lebak is explained by factors of land area (X_1), seeds (X_2), urea fertilizer (X_3), NPK fertilizer (X_4), pesticides (X_5), and labor (X_6). While the remaining 18.1 % is explained by other variables outside of this study.
- Deep rawa lebak (Adjusted R^2 = 0,800), this shows that 80.0 % of rice productivity in deep rawa lebak is explained by factors of land area (X_1), seeds (X_2), urea fertilizer (X_3), NPK fertilizer (X_4), pesticides (X_5), and labor (X_6). While the remaining 20.0 % is explained by other variables outside of this study.

Table 6. Multicollinearity Test Results

Model	Collinearity Statistics					
	Shallow Rawa Lebak		Middle Rawa Lebak		Deep Rawa Lebak	
	Tolerance	VIF	Tolerance	VIF	Tolerance	VIF
(Constant)						
Ln_X_1 Land	0.654	1.530	0.850	1.176	0.681	1.469
Ln_X_2 Seed	0.743	1.347	0.783	1.277	0.811	1.233
Ln_X_3 Urea	0.539	1.855	0.592	1.689	0.305	3.279
Ln_X_4 NPK	0.682	1.466	0.605	1.654	0.291	3.440
Ln_X_5 Pesticides	0.818	1.222	0.953	1.050	0.753	1.328
Ln_X_6 Labor	0.711	1.407	0.441	2.270	0.697	1.435

Source: SPSS Output Results Multicollinearity

From the table above, it can be seen that the tolerance value for all swamp typologies is greater than 0.10 (> 0.10) and the VIF value is less than 10 (< 10), so it can be concluded that there is no multicollinearity between the independent variables.

C. Hypothesis Test

1. Coefficient of Determination Test (R^2)

This test is used to find out what percentage of variation in the dependent variable can be explained by the independent variable. The coefficient of determination is to find out how big the percentage of the independent variable's contribution to the dependent variable which can be expressed as a percentage [13]. From the regression results in Table 4, it is known that the adjusted R^2 values for each land typology are:

- Shallow rawa lebak (Adjusted R^2 = 0,744), this shows that 74.4 % of shallow rawa lebak rice productivity is explained by land area factors (X_1), seeds (X_2), urea fertilizer (X_3), NPK fertilizer (X_4), pesticides (X_5), and labor (X_6). While the remaining 25.6 % is explained by other variables outside of this study.

2. T-Test

The t test aims to determine the effect of the independent variables, namely land area (X_1), seeds (X_2), urea fertilizer (X_3), NPK fertilizer (X_4), pesticides (X_5), and labor (X_6) on the productivity of rawa lebak rice partially [7]. This t test is used to prove the hypothesis that has been made. To see the t-test of t-statistics, if t-statistics is greater than t-table, then H0 is rejected and H1 is accepted, meaning that there is an influence between the independent variable and the dependent variable. In addition, to find out the truth of the hypothesis, it can also be seen through the t-statistical probability value. If the t-statistical probability value is greater than α = 5%, then H0 is accepted and H1 is rejected, meaning that there is no influence between the independent variable and the dependent variable and vice versa if the statistical probability value is less than α = 5% then H0 is rejected and H1 accepted, which means that there is an influence between the independent variable and the dependent variable. The results of the t test can be seen in Tables 7.

The results of the regression analysis of the influence of production factors on the productivity of swamp rice in the shallow, middle, and deep rawa lebak can be seen in Table 7.

Table 7. Result of Regression Analysis of Production Factors in the Rawa Lebak

Rawa Lebak Typology	Variable	Regression Coefficient	T-count	Significant	Test Result
Shallow Rawa Lebak	Constant	6.240	14.090	0.000	
	Ln_X_1 Land	0.021	0.591	0.560	Not Significant
	Ln_X_2 Seed	0.015	0.176	0.862	Not Significant
	Ln_X_3 Urea	0.242	6.005	0.000	Significant
	Ln_X_4 NPK	0.108	2.128	0.044	Significant
	Ln_X_5 Pesticides	0.041	1.224	0.233	Not Significant
	Ln_X_6 Labor	0.088	0.852	0.403	Not Significant
Middle Rawa Lebak	Constant	5.201	11.193	0.000	
	Ln_X_1 Land	0.008	0.182	0.857	Not Significant
	Ln_X_2 Seed	-0.051	-0.723	0.477	Not Significant
	Ln_X_3 Urea	0.244	5.372	0.000	Significant
	Ln_X_4 NPK	0.157	3.300	0.003	Significant
	Ln_X_5 Pesticides	-0.007	-0.208	0.837	Not Significant
	Ln_X_6 Labor	0.432	2.516	0.019	Significant
Deep Rawa Lebak	Constant	6.529	17.131	0.000	
	Ln_X_1 Land	0.026	0.512	0.613	Not Significant
	Ln_X_2 Seed	-0.010	-0.184	0.855	Not Significant
	Ln_X_3 Urea	0.196	4.308	0.000	Significant
	Ln_X_4 NPK	0.082	2.180	0.039	Significant
	Ln_X_5 Pesticides	0.007	0.241	0.812	Not Significant
	Ln_X_6 Labor	0.161	2.200	0.038	Significant

Note: real on α: 0.05 (t-table = 2.0639)

From Tables 7 can be seen that the variables of urea fertilizer (X_3) have a significant effect on rice productivity in all rawa lebak land typologies, because the t value is greater than t table 2.0639. This result is in accordance with [14] which states that the amount of urea fertilizer has a positive effect on rice production. In addition, NPK fertilizer also has a significant effect on rice productivity on shallow and deep rawa lebak, this is in the line with [15] which states that NPK fertilizer has a positive effect on increasing rice production.

Meanwhile, the variables of land area (X_1) had no significant effect on rice productivity at all rawa lebak land typologies, because the t-count value was smaller than t-table 2.0639. This result is in accordance with research conducted by [16] which states that which states that land area has no significant effect on rice production. The same as land area, seeds (X_2) and pesticides (X_5)had no significant effect on rice productivity at all rawa lebak land typologies.

D. Efficiency Analysis of Rice Farming rice in Rawa Lebak swamp

To calculate the value of input efficiency for rice production, it is done through the marginal product value (MPV) approach which is compared with the unit price of the input. Efficiency is achieved when the value obtained is equal to one. If the value is more than one, it is said that the use of input is not efficient, whereas if the value obtained is less than one, it is said that the use of input is inefficient.

The value of the marginal product of a production input cannot be separated from the elasticity of the input. The elasticity of production inputs is the regression coefficient value obtained from the Cobb-Douglas equation. After the elasticity value is obtained, then the value is multiplied by the product price and the ratio between the average production and the average input usage.

The value of the efficiency of the allocation of production factors for shallow, middle, and deep rawa lebak land are shown in the following tables.

Table 8. Value of Production Factor Allocation Efficiency in Rawa Lebak

Land Typology	Variable	Elas-ti-city	Xi	MPPXi	MPVXi	Input Price	MPVXi / PXi	Production Factor Allocation
Shallow Rawa Lebak	Land	0.021	0.701	97.00	436,507.46	1,000,000	0.44	Inefficient
	Seed	0.015	55.141	0.88	3,963.52	10,000	0.40	Inefficient
	Urea	0.242	66.860	11.72	52.737,18	2,250	23.44	Not Efficient
	NPK	0.108	41.137	8.50	38,252.70	2,300	16.63	Not Efficient
	Pesticides	0.041	5.345	24.84	111,771.33	100,000	1.12	Not Efficient
	Labor	0.088	31.215	9.13	41,075.83	100,000	0.41	Inefficient
Middle Rawa Lebak	Land	5.201	0.867	30.79	138,562.21	1.000.000	0.14	Inefficient
	Seed	0.008	58.580	-2.91	-13,078.94	10.000	-1.31	Inefficient
	Urea	-0.051	79.854	10.20	45,903.71	2.250	20.40	Not Efficient
	NPK	0.244	49.082	10.68	48,053.92	2.300	20.89	Not Efficient
	Pesticides	0.157	4.135	-5.65	-25,434.03	100.000	-0.34	Inefficient
	Labor	-0.007	28,746	50.17	225,766.98	100.000	2.26	Not Efficient
Deep Rawa Lebak	Land	6.529	0.756	123.47	555,618.30	1,000,000	0.56	Inefficient
	Seed	0.026	57.547	-0.62	-2,808.55	10,000	-0.28	Inefficient
	Urea	-0.010	61.812	11.39	51,249.18	2,250	22.78	Not Efficient
	NPK	0.196	42.538	6.92	31,155.92	2,300	13.55	Not Efficient
	Pesticides	0.082	3.824	6.58	29,588.78	100,000	0.39	Inefficient
	Labor	0.007	36.668	15.77	70,965.18	100,000	0.71	Inefficient

Source: Results of Primary Data Processing, 2022.

Based on the table above, the allocation efficiency for each factor of production can be described as follows:

a. Land

The use of land area in rawa lebak rice farming based on the results of the analysis is inefficient in the three land typologies, where the MPVXi/PXi value is less than 1, which are 0.44, 0.14, and 0.56 for shallow, middle, and deep rawa lebak respectively. This indicates that the land use is already too extensive, so it must be reduced. This is in accordance with research conducted by [17] who conducted an analysis of the efficiency of the use of production factors for rice farming in South Pekalongan District. By analyzing the actual conditions in the field, the limited resources of farmers are also the cause of the inefficient use of land. The wider the cultivated area, the higher the production factors, such as inputs (fertilizer, seeds, and machinery), meanwhile farmers in Gandus District have limited capital. As a result, farmers reduce the use of inputs such as fertilizers, so that it can reduce productivity.

b. Seed

The number of seeds used in rawa lebak rice farming based on the results of the analysis is inefficient in the three land typologies, where the MPVXi/PXi value is less than 1, which are 0.4, -1.31, and -0.28 for shallow, middle, and deep rawa lebak respectively. This shows that the use of seeds is too much, so it must be reduced. This is in accordance with the research conducted by [18], but not in accordance with the results of [14] which states that the use of seeds is not efficient. By analyzing the actual conditions in the field, the average use of seeds in the shallow, middle, and deep rawa lebak were 55,141 kg/ha, 58.580 kg/ha, and 57.547 kg/ha, respectively. The use of these seeds is higher than the recommended use of seeds for swamp land, which is 30-40 kg/ha. The high use of seeds is caused by poor seed quality.

c. Urea Fertilizer

The amount of urea fertilizer used in lebak swamp rice farming based on the results of the analysis is not efficient in the three land typologies, where the MPVXi/PXi value is greater than 1, which are 23.44, 20.40, and 22,78, respectively, for the shallow, middle and deep swamp. This shows that the use of urea fertilizer is still lacking and needs to be added. This is in accordance with research conducted by [14] which states that the use of N fertilizer has not been efficient. From the results of field interviews, the average use of urea fertilizer in the shallow, middle, and deep rawa lebak were 66.860 kg/ha, 79.854 kg/ha, and 61.812 kg/ha, respectively. The use of urea fertilizer is still lower when compared to the recommended use of urea fertilizer for swamp land in Gandus District, which is 300 kg/ha [19]. The use of urea fertilizer is still low due to the low purchasing power of farmers (capital) and the high price of fertilizer because most of the respondent farmers use non-subsidized fertilizers at higher prices.

d. NPK Fertilizer

The amount of NPK fertilizer used in rawa lebak rice farming based on the results of the analysis is not efficient in the three land typologies, which are 16.63, 20.89, and 13.55 respectively, for the shallow, middle and deep swamp. This shows that the use of urea fertilizer is still lacking and needs to be added. This is in accordance with research conducted by [14] and [16] which states that the use of NPK fertilizers has not been efficient. From the results of field interviews, the average use of NPK fertilizer in the shallow, middle, and deep rawa lebak were 41.137 kg/ha, 49.082 kg/ha, and 42.538 kg/ha, respectively. The use of these NPK fertilizer is still lower when compared to the recommended use of NPK fertilizer for swamp land in Gandus District, which is 250 kg/ha [19]. The low use of NPK fertilizer was caused by the low purchasing power of farmers (capital) and the high price of fertilizer because most of the respondent farmers used non-subsidized fertilizers.

e. Pesticides

The use of pesticides in rawa lebak rice farming varies widely, based on the results of the analysis, pesticide has not been efficient in the shallow rawa lebak. Meanwhile, in the middle and deep rawa lebak, pesticides are inefficient. From the respondent's data, it shows that the average pesticide use in shallow, middle, and deep rawa lebak are 5.345 liters/Ha, 4.135 liters/Ha, and 3.824 liters/Ha, respectively.

f. Labor

The number of workers used in rawa lebak rice farming based on the results of the analysis is not efficient in the middle rawa lebak, where the NPMXi/PXi value is 2.26, This shows that the use of labor is still not enough so that it needs to be added. Meanwhile, in the shallow and deep rawa lebak, labor are inefficient, this shows that the use of labor is too much and needs to be reduced. This is in accordance with research conducted by [15] and [16] which states that the use of labor is inefficient.

4. Conclusion

The production factor of urea and NPK fertilizers had a significant affect on farming productivity in all typologies of rawa lebak land. Land area, seed, and pesticide factors had no significant effect on farming productivity in all typologies of rawa lebak land. Meanwhile the labor factor had a significant effect in middle and deep rawa lebak land, but had no significant effect in shallow rawa lebak land.

The production factors of land area and seeds are inefficient in all land typologies. The production factor of urea and NPK fertilizer has not been used efficiently in all land typologies. The use of pesticide factor is inefficient in the middle and deep rawa lebak land, while the use of labor is inefficient in the shallow and deep rawa lebak land.

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