



## Factors Affecting Paddy Rice Production in Tanggetada District Kolaka Regency

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### Abstract

The aim of this research is to find out what factors affect lowland rice production in Tanggetada district, Kolaka regency and to find out how the level of technical efficiency, allocative efficiency and economic efficiency of rice lowland in Tanggetada district, Kolaka regency. To examine the effect of the utilization of the factors of production used on the yield of lowland rice production, a multiple linear regression is used and to determine the level of economic efficiency from the use of the factors of production. production by switching between technical efficiency and price / allocative efficiency and any input factors. The results of the study indicated that the factor of production of land area, urea fertilizers and NPK fertilizers had a significant effect. Meanwhile, labor-intensive factors of production, nararel pesticides and seeds have no significant effect. and Based on the results of the allocative efficiency analysis, an average value of 3.18 was obtained. This means that it is not allocatively efficient, so it is necessary to add the use of factors of production and it is necessary to maximize the profits obtained by making efficiency in the cost elements of the factors of production in order to " achieve optimal conditions. At the same time, the results of technical efficiency show that lowland rice cultivation is not technically efficient. so the use of factors of production should be added to increase the efficiency of lowland rice cultivation. And the value of economic efficiency shows that lowland rice cultivation is still not efficient. It is therefore necessary to make changes and increase the capacity to combine existing factors of production through training in order to achieve economic efficiency.

**Keywords:** product factor, rice field, multiple regresi analysis, efficiency analysis

### A. Introduction

Rice is a plant that plays an important role in the country's economy, especially as a material to meet the basic needs of the community and as a source of income for farmers. The main activity and the main source of income of the community, especially those living in rural areas, still depend on the agricultural sector, which means that the livelihoods of most households depend on this sector. Because in addition to being a staple food, rice is also a strategic commodity with high economic value (Nurmanaf, 2003). The increase in the

production and productivity of lowland rice is linked to the factors of production used. Its use must therefore be managed correctly. The efficient use of lowland rice production factors aims to maximize the use of land, urea fertilizers, poska fertilizers and labor. The efficiency of the use of the factors of production is necessary for the resulting production to reach the maximum value. Inappropriate use of the number and combination of factors of production can lead to a decrease in the quantity of production and an increase in production costs (Miftahuddin, 2014).

Soekartawi (2001) suggests that the principle of optimizing the use of factors of production is in principle how to use these factors of production as efficiently as possible. This definition of efficiency can be classified into three types, namely technical efficiency, allocative efficiency (price efficiency) and economic efficiency. Technical efficiency (TE) is a quantity that shows the relationship between actual production and maximum production. Allocation efficiency (price) shows the relationship between cost and output. Allocation efficiency (price) can be achieved if it can maximize profits by equaling the marginal product of each factor of production with its price. Economic efficiency is a quantity that shows the ratio of real benefits. Economic efficiency can be achieved if technical efficiency and price efficiency (allocation) can be achieved. Kolaka Regency is one of the regions with predominantly agricultural areas. The lowland rice production data in Kolaka regency for the last five years are presented in Table 1.1 below.

Table 1.1 2015-2019 Kolaka Regency Paddy Rice Production Data

No	Year	Harvested Area (ha)	Production (Ton)	Percentage (%)
1	2015	16.864	88.694	23
2	2016	18.424,8	97.835,69	25
3	2017	17.091,70	85.877.14	22
4	2018	13.022,43	56.650,63	16
5	2019	12.232,69	54.657,11	14
<b>Total</b>		<b>77.635,62</b>	<b>383.714,57</b>	<b>100</b>

Source: Central Statistics Agency (BPS) Kolaka Regency 2020

Based on Table 1.1 in 2015-2016, there was an increase due to the continuous increase in the number of rice farmers. However, in 2017-2019 the production of lowland rice decreased due to the transfer of the function of rice fields to industry, housing or infrastructure which could not be matched by the printing of new rice fields. . Soekartawi (1995) stated that agricultural products are produced from a combination of factors of production of land, labor, capital (fertilizer, seeds and medicine). In agricultural technology, the use of factors of production plays a very important role, because the use of the number of factors of production is not precise, resulting in low production or high production costs. Because there are still many farmers who do not understand how the factors of production are used efficiently.

Kolaka Regency has 12 sub-districts, researchers will focus on research in Tanggetada district. Tanggetada district is one of the sub-districts which has a sufficiently large area for a rice producer in Kolaka regency. In the Tanggetada sub-district, it is supported by technical irrigation, so the development of rice cultivation needs to be improved. The factors of production used by farmers are area, use of urea fertilizer, NPK fertilizer, seeds, pesticides and labor. Currently, these factors are not used according to existing standards because farmers use them according to the available capital.

## B. Methodology

### *Technique of Data Analysis*

1. To examine the effect of the utilization of the factors of production used on the yield of lowland rice production, multiple linear regression modalities are used with the Coob Douglas function using the equation:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6}e^u$$

To simplify the estimation, the equation is converted to a multiple linear form with a solution using the natural logarithm, so that it becomes a multiple linear equation as follows:

$$\ln Y = a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + e^u$$

The description:

Y = Lowland rice production

a = constant

bi = Regression coefficient

LogX1 = Area (Ha)

LogX2 = Work (HOK)

LogX3 = urea fertilizer (Kg)

LogX4 = NPK fertilizer (Kg)

LogX5 = Pesticide nararel (Lt)

LogX6 = Seed (Kg)

## 2. Efficiency Analysis

Determine the level of economic efficiency from the use of factors of production by switching between technical efficiency with price / allocation efficiency and all input factors.

### a. Allocation efficiency

To determine the level of allocative efficiency, you can use the formula:

$$NPM_x = P_x \text{ or } NPM_x / P_x = 1 \quad (3.5)$$

Or:

$$NPM_x = PM_x \cdot P_y \quad (3.6)$$

$$NPM_x = b_{ix} / x_i \cdot P_y \quad (3.7)$$

The description:

NPM = value of the marginal product of the factors of production at i

NPM<sub>x</sub> = Marginal production of factor i

B<sub>i</sub> = Regression coefficient X<sub>i</sub>

X<sub>i</sub> = Average use of the i-th paddy rice production factor

Y = Average production of lowland rice (Kg)

P<sub>x</sub> = Average price of the ith paddy production factor (Rp)

P<sub>y</sub> = Average unit price of lowland rice production (Rp)

According to Soekartawi (1990), in reality NPM<sub>x</sub> is not always the same as P<sub>x</sub> or BKM<sub>x</sub>, but what often happens is the following:

1.  $NPM_x / P_x > 1$ , which means that the use of the factor x is not yet effective, to achieve the efficiency, the input x must be increased.

2.  $NPM_x / P_x < 1$ , which means that the use of factor x is not efficient, to achieve efficiency, the use of input x should be reduced.

### b. Technical efficiency

To determine the level of technical efficiency (Technical efficiency rate) can be measured using the formula (Soekartawi 1990):

$$ET = Y_i / y_i \quad (3.8)$$

The description:

ET = level of technical efficiency

Y<sub>i</sub> = The quantity of production (output) i

y<sub>i</sub> = The quantity of production expected at the i-th observation

The obtained value can be known if the efficiency level is equal to 1, then the use of inputs or production factors is efficient, and if the technical efficiency value is less than one, the use of inputs or factors of production is not efficient.

### c. Economic efficiency

Economic efficiency can be expressed by the following formula:

$$EE = TER \cdot RAD \quad (3.9)$$

The description:

EE = Economic efficiency

TER = Technical Efficiency Rate

TEA = Allocative efficiency rate

According to Soekartawi (2003), there are three possibilities for this concept, namely:

- The value of economic efficiency is greater than 1 (one). This means that the maximum economic efficiency has not been achieved. It is therefore necessary to increase the use of factors of production to achieve efficient conditions.

- The value of economic efficiency is less than 1 (one). This means that the work done is not efficient. It is therefore necessary to reduce the use of factors of production.
- The value of economic efficiency is equal to 1 (one). This means that the economic efficiency has been achieved and the maximum profit has been made.

### C. Findings and Discussion

#### 1. Factors affecting agricultural production of paddy rice

Factors of production or inputs are things that absolutely must exist to produce a production. The factors of production in lowland rice cultivation activities consist of land area, labor force, urea fertilizers, NPK fertilizers, seeds and nararel pesticides to produce lowland rice. In lowland rice cultivation, it is necessary to know whether the production factors used have an influence or not on the resulting production. This can be seen from the production function which is a function that describes the relationship between physical output and physical inputs.

Variable Y in this study is lowland rice production and variable X in this study consists of area, labor, urea fertilizers, NPK fertilizers, seeds and nararel pesticides. The effect of factors of production on lowland rice cultivation can be observed through multiple linear regression of the Cobb Douglas model and computer aids using the SPSS version 21 program. With this regression analysis, we can see which factors affect lowland rice production in the Tanggetada district, Regency of Kolaka as shown in Table 4.8 below:

Table 4.9 Results of Multiple Linear Regression Factors Affecting Agricultural Production of Rice Fields in Tanggetada District, Kolaka Regency

Variable	regression coefficient	t-count	Sign	
Constant	49,600	0,168	0,867	ns
Area	1885,063	5,878	0,000	s
Work	2,353	0,210	0,834	ns
Urea fertilizer	5,319	2,847	0,006	s
NPK fertilizer	5,480	2,936	0,004	s
Pesticide Nararel	-8,758	-0,072	0,943	ns
Seeds	2,712	1,089	0,280	ns
R-squared	0,974			
F-count	437,810			
F-table	2,231			
t-table	1,997			
Sig	0,000			
N	77			

Source: SPSS 21 treatment results, year 2021

The description:

ns = not significant (0.05)

s = Significant (0.05)

Based on Table 4.8, the following regression equation is obtained:

$$\ln Y = a + 1X_1 + 2X_2 + 3X_3 + 4X_4 + 5X_5 + 6X_6$$

$$Y = 49,600 + 1885.063X_1 + 2.353X_2 + 5.319X_3 + 5.480X_4 - 8.758X_5 + 2.712X_6$$

##### a. Land area (X<sub>1</sub>)

The regression results in Table 4.9 above show that the variable land area has a value of  $t_{count} > t_{table}$  ( $5.878 > 1.997$ ) and is real with an error rate of 5% with the value of the regression coefficient obtained is 1885.063. This means that every additional 1% of land area will increase rice production by 1885.063%. Assuming that the variables of the use of other factors of production are fixed (*Ceteris paribus*). The results of this study are in line with the research results obtained by Nurlala (2018), where land area has a significant influence on lowland rice, land is a factor of production which cannot substitute for no production factor.

##### b. Work (X<sub>2</sub>)

The regression results in Table 4.9 above show that the work variable has a value of  $t_{count} < t_{table}$  ( $0.210 < 1.997$ ) and has no significant effect on the error rate of 5% with the value of the regression coefficient obtained is 2.353. This means that every 1% more labor will reduce rice production by 2.353%. Assuming that the variables of the use of other factors of production are fixed (*Ceteris paribus*).

c. Urea fertilizer (X3)

The regression results in Table 4.9 above show that the urea fertilizer variable has a value of  $t_{count} > t_{table}$  ( $2.847 > 1.997$ ) and is real at an error rate of 5% with the value of the regression coefficient obtained is 5.319. This means that every 1% addition of urea fertilizer will increase rice production by 5.319%. Assuming that the variables of the use of other factors of production are fixed (*Ceteris paribus*). The use of urea fertilizer has a significant effect on the amount of lowland rice production. The use of urea-based fertilizers in the research area is based on the recommendations or instructions of the agricultural extension agents as well as the financial capacity of the farmers.

d. NPK fertilizer (X4)

The regression results in Table 4.9 above show that the NPK fertilizer variable has a value of  $t_{count} > t_{table}$  ( $2.936 > 1.997$ ) and is significant at an error rate of 5% with the value of the regression coefficient obtained is 5.480. This means that every 1% addition of NPK fertilizer will increase rice production by 5.480%. Assuming that the variables of the use of other factors of production are fixed (*Ceteris paribus*).

e. Pesticide Nararel (X5)

The regression results in Table 4.9 above show that the pesticide variable nararel has a value of  $t_{count} < t_{table}$  ( $-0.072 < 1.997$ ) and has no significant effect on the error rate of 5% with the value the regression coefficient obtained is -8.758. This means that every 1% addition of nararel pesticide will reduce rice production by -8.758%. Assuming that the variables of the use of other factors of production are fixed (*Ceteris paribus*).

f. Seeds (X6)

The regression results in Table 4.9 above show that the starting variable has a value of  $t_{count} < t_{table}$  ( $1.089 < 1.997$ ) and has no significant effect on the 5% error rate with the value the regression coefficient obtained is 2.712. This means that each addition of 1% of seeds will reduce paddy rice production by 2.712%. Assuming that the variables of the use of other factors of production are fixed (*Ceteris paribus*).

## 2. Efficiency Analysis

In this study, to determine the level of economic efficiency from the use of production factors for lowland rice cultivation in Tanggetada district, allocative efficiency and technical efficiency approaches were used. Being able to see the level of economic efficiency with the arrangements of a business can be considered to achieve economic efficiency if EE 1 (Soekartawi, 1990).

a. Allocative efficiency of rice cultivation

It can be said that lowland rice cultivation achieves allocative efficiency when it is able to maximize production by equaling the marginal value of the product (NPM) of each factor of production with its price. According to Soekartawi (2002), allocative efficiency is the efficiency achieved when the value of the marginal product (NPM) is equal to the factor of production. Thus, we can say that lowland rice cultivation achieves allocative efficiency if the value of  $NPMX / PX = 1$ . If  $NPMX / PX > 1$ , it means that the use of factor X is not efficient and that input X must be added. During this time, if  $NPMX / PX < 1$ , it means that the use of factor X is not efficient so the use of input X should be reduced.

In the allocation efficiency analysis in this study, not all production factors were analyzed, but only the production factors that had a significant effect on lowland rice production. Based on the results of tests using the multiple linear regression approach of the Cobbs Douglas model, and computer aids via the SPSS version 21 program, several production factors have a significant effect on lowland rice production, at ie land area, urea fertilizers, nararel pesticides and seeds. So that only these 4 factors were analyzed in an allocative way.

b. Technical efficiency of field rice cultivation

Technical efficiency can be interpreted as the relationship between the level of input use and the resulting output. Technical efficiency is expressed with a rating between 0 and 1. Technical efficiency level below 1 indicates that farmers generally use too much of their production factors, which in turn leads to inefficiency. The number of farmers with the highest technical efficiency value is at the technical efficiency level of 0.95 to 1.14 up to 46 farmers or 59.74% of the total respondents of low-income rice farmers. fund. In addition, at the level of technical efficiency between 0.75 and 0.94 up to 18 farmers or 23.38%. At the level of technical efficiency between 1.15 and 1.54 up to 9 farmers or 11.69%. At the level of technical efficiency between 0.55 - 0.74 farmers or 5.19% The difference in efficiency

level between farmers shows that there are differences in the use of production factors for each farmer. Based on the data obtained above, it can also be seen that the level of technical efficiency of lowland rice cultivation in Tanggetada district, Kolaka regency, is still far from being technically efficient in the region. use of factors of production or that actual output is still not close to potential output.

The lowest efficiency level is 0.56, which means that the respondent is able to achieve 0.56% of the lowland rice production potential. This means that there is a 44% chance for farmers to increase their production using more efficient factors of production. Meanwhile, the highest efficiency level is 1.53, which means that respondents have to reduce the use of factors of production to increase agricultural production in order to achieve an efficiency level. The average value of technical efficiency as a whole is close to number 1, which is 0.995. This indicates that lowland rice cultivation in Tanggetada district, Kolaka regency, is not yet technically efficient. The low level of technical efficiency of the respondents is caused by the lack of capacity of the farmers to use the factors of production at their disposal. Therefore, the use of excessive factors of production can lead to a decrease in the quantity of production. So, in this case, the farmers have to reduce the use of the factors of production to increase the efficiency of lowland rice cultivation.

c. Economic efficiency of rice cultivation

Economic efficiency is a combination or product of technical efficiency and allocative efficiency. The level of economic efficiency describes the condition of overall efficiency. If technical efficiency and allocative efficiency are achieved, then the efforts made have achieved economic efficiency (Soekartawi, 2003). The number of farmers with the highest economic efficiency value is at the economic efficiency level (-49.50) - (20.45) up to 39 farmers or 50.65% of total respondents lowland rice farmers. In addition, at the level of economic efficiency between (21.45) - (90.50) up to 19 farmers or 24.68%. At the level of economic efficiency between (-137.707) - (-50.50) up to 12 farmers or 15.58%. At the level of technical efficiency between (91.50) - (175.45) farmers, i.e. 9.09% The difference in efficiency levels between farmers shows that there are differences in the use of production factors for each farmer.

Based on the results of the economic efficiency analysis using the above factors of production, calculating the value of technical and allocative efficiency for each variable, the average value which indicates the level of overall economic efficiency is greater than one, i.e. 5.55. However, if we globally calculate the average between technical and allocative efficiency (3.81, 0.995) then the result is 3.79. We can therefore say that the use of production factors in lowland rice cultivation is not economically efficient. The economic efficiency value for lowland rice cultivation in Tanggetada district, Kolaka regency is 3.79. The value of economic efficiency is greater than 1, which indicates that lowland rice cultivation in Tanggetada district, Kolaka regency, is still not efficient. It is therefore necessary to make changes and increase the capacity to combine existing factors of production through training in order to achieve economic efficiency.

#### D. Conclusion

Based on the results of the analysis and calculations that were described in the previous discussion, the following conclusions can be drawn:

1. Based on the results of the discussion, it can be concluded that the factor of production of land area, urea fertilizers and NPK fertilizers has a significant effect because the sig value is less than and  $t_{count} > t_{table}$ . Meanwhile, labor inputs, nararel pesticides and seeds have no significant effect because sig value is greater than and  $t_{count} < t_{table}$ .
2. Based on the results of the allocative efficiency analysis, the average value is 3.18. This means that it is not allocatively efficient, so it is necessary to add the use of factors of production and it is necessary to maximize the profits obtained by making efficiency in the cost elements of the factors of production in order to " achieve optimal conditions. While the technical efficiency results got an average efficiency value of 0.995, which indicates that lowland rice cultivation in Tanggetada district, Kolaka regency is not technically efficient. so the use of factors of production should be added to increase the efficiency of lowland rice cultivation. And the economic efficiency value for lowland rice cultivation in Tanggetada district, Kolaka regency is 3.79. The value of economic efficiency is greater than 1, which indicates that lowland rice cultivation in Tanggetada district, Kolaka regency, is still not efficient. It is therefore necessary to make changes and increase the capacity to combine existing factors of production through training in order to achieve economic efficiency.

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