Jurnal Mahasiswa Agribisnis

Journal homepage: http://ojs.unimal.ac.id/jma/index

EFFICIENCY OF USE OF PRODUCTION FACTORS IN RICE FARMING IN SERBA JADI DISTRICT, SERDANG BEDAGAI REGENCY, NORTH SUMATERA

Tria Lestari[1], Suryadi[2*], Sakral Hasby Puarada[3]

[1] Agribusiness Student, Faculty of Agriculture, Malikussaleh University, North Aceh

[2.3]Lecturer of Agribusiness Study Program, Faculty of Agriculture, Malikussaleh University, North Aceh

E-mail:suryadi@unimal.ac.id

Abstract

TRIA LESTARI. This research was conducted on Gambar Island and Tagor Island, Serba Jadi District, Serdang Bedagai Regency. Based on the background, this research was conducted to see the efficiency of using production factors in lowland rice farming on Gambar Island and Tagor Island. This research aims to analyze the influence of land area, fertilizer and labor on lowland rice production and to analyze the technical efficiency of using production factors for lowland rice farming in Serba Jadi District. The data analysis method used is multiple linear regression analysis with the Cobb Douglas model. The types of data in this research are primary and secondary data. The results of this research show that the five factors of agricultural production in the Versatile District, consisting of land area, fertilizer, labor, pest attacks and irrigation. Of the five factors land area, pest infestation and irrigation have a significant effect on lowland rice production, while the fertilizer and labor variables have no significant effect on lowland rice production. and the five production factors are not yet technically efficient.

Keywords: Cobb Douglas, Farming, Lowland Rice, Production Factors

1. INTRODUCTION

Indonesia is an agricultural country where most of the population's livelihoods work in the agricultural sector (Siti et al., 2021). The agricultural sector includes food crops, horticulture, plantations, livestock, forestry and fisheries (Central Statistics Agency, 2018). Among all sub-sectors, the food crop sub-sector, especially rice, has a very large role in Indonesia. Rice production in Indonesia in 2023 is estimated at 53.63 million tons of GKG, a decrease of 1.12 million tons of GKG or 2.05 percent compared to rice production in 2022 which was 54.75 million tons of GKG (BPS, 2023). To realize sustainable agriculture, farmers need to utilize production factors effectively and efficiently for their agricultural production. Production efficiency should be important for farmers to consider (Arnanda et al., 2016).

North Sumatra is one of the rice producing areas in Indonesia. The rice production produced in each region varies, with the amount fluctuating every year. Serdang Bedagai Regency is one of the regencies in North Sumatra. Serdang Bedagai Regency produced rice production of 270,270.84 in 2021 with a land area of 49,091.03. Serdang Bedagai Regency consists of 17 sub-districts and 6 villages. One of these sub-districts is Serba Jadi District. Serba Jadi District consists of 10 villages where only 2 villages have rice fields, namely Pulau Gambar Village and Pulau Tagor Village.

Pulau Gambar Village has a very large rice field area of 812.4 Ha, producing a rice production of 5,278,000 kg in 2022. Pulau Tagor Village has a rice field area of 166 Ha with a rice production of 996,000 kg in 2022.

2. LITERATURE AND THEORETICAL REVIEW

According to Sukirno (2020) Efficiency is a combination of production factors used in production activities to obtain optimal production results, in other words efficiency is an action to obtain a certain output using minimum input or using certain input to produce maximum output. According to Yotopoulus in Adhiana (2022), Efficiency can be divided into three, namely technical efficiency, price efficiency and economic efficiency.

According to Agustin et al. (2018), production is an activity in an industrial company that creates added value from input to be used as output effectively and efficiently as possible. Soekartawi (2003) stated that the production function is a physical relationship between the dependent variable (Y) and the independent variable (X).

Rice belongs to the genus Oryza which is spread in tropical countries such as Asia, Africa, America and Australia. According to Chevalier and Neguier, rice comes from two continents, Oryza fatua Koenig and comes from the Asian continent, while other types of rice, namely Oryza stapfii Roschev and Oryza glaberima Steund, come from West Africa (Adi and Nyoman, 2019).

3.IMPLEMENTATION METHOD

This research was conducted in Pulau Gambar and Pulau Tagor villages, Serba Jadi District, Serdang Bedagai Regency, North Sumatra Province. The determination of the research location was taken intentionally (purposive sampling). The object of the research was rice farmers in Pulau Gambar and Pulau Tagor villages. The population of this research was taken from the number of people who work as rice farmers in Pulau Gambar and Pulau Tagor villages. This research uses the Slovin formula (Silalahi, 2015) with an alpha of 10%, as follows:

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

Information:

n = sample size
N = population size
e = 10%

So we get:

$$n = \frac{1.670 + 200}{1 + 1.870\ (0{,}10)^2}$$

$$= 100 \text{ people}$$

So the number of samples in the Pulau Gambar and Pulau Tagor Village communities is 100 people. The determination of the sample in this study was carried out using the simple random sampling method. After obtaining data on the use of production factors for rice farming, the next stage is the analysis stage. The tool used to see the influence of production factors and the efficiency of the use of production factors is SPSS.20 with multiple linear regression analysis of the Cobb Douglas model with the following formula:

$$Y = a\ X1b1\ X2b2\ X3b3\ D1\gamma 1\ D2\gamma 2\ eu$$

The production function is changed into a multiple linear function form by transforming the equation into a natural logarithm (Ln). The form of the production equation becomes:

$$LnY = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 Ln\ X1 + \boldsymbol{\beta}_2 Ln\ X2 + \boldsymbol{\beta}_3 Ln\ X3 + \gamma_1 D1 + \gamma_2 D2 + eu$$

Information :

Y = Production (Kg)

X1	= Land area (Ha)
X2	= Amount of Fertilizer (Kg)
X3	= Number of Workers (HOK)
D1	= Pest attack
D	= 1 (If a heavy attack occurs)
D	= 0 (If no attack occurs)
D2	= Irrigation
D	= 1 (If irrigation is smooth)
D	= 0 (If irrigation is not smooth)
$\beta 0$	= Intercept or constant
$\beta 1$, $\beta 2$, $\beta 3$	= Regression coefficient of variables X1-X3
$\gamma 1$-$\gamma 2$	= Dummy variable
U	= Error
e	= Natural logarithm, (2.718)

Technical efficiency can be known by calculating the value of production elasticity. The production elasticity can be described as follows:

$$ET = EP = \beta i$$

The use of production factors is declared efficient if the production elasticity is between 0 and 1 or 1 > EP > 0 (Mandei, 2011).

4. RESULTS AND DISCUSSION

The research results obtained from spps.20 on rice farming in Serba Jadi District after being analyzed using multiple linear regression using the Cobb Douglas model can be seen from the following test results:

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std Error	Beta	T	Sig
(Constant)	8,370	0.475		17,616	0.000
Land area	1,030	0.098	0.911	10,533	0.000
Fertilizer	0.031	0.057	0.034	0.546	0.586
Labor	0.018	0.083	0.013	0.212	0.833
Pest Attack	- 0.141	0.064	-0.065	-2.198	0.031
Irrigation	0.091	0.047	0.060	1,957	0.053
R = .963α			Fcount =230.236		
Adjusted R2 = 0.923			Fsig = 0.000		

Based on the results of the regression analysis in the table above with the following equation:

$$LnY = 8.370\ Ln + 1.030\ Ln\ X1 + 0.031\ Ln\ X2 + 0.018\ Ln$$

4.1 Test of Determination Coefficient (R2)

The determination coefficient aims to see the independent variables, namely land area (X1), fertilizer (X2), labor (X3), pest attacks (D1), and irrigation (D2) against the dependent variable, namely production (Y) together. The adjusted square value is 0.923, which means that the variables of land area, fertilizer, labor, pest attacks, and irrigation are able to explain 92.3% of lowland rice production while the remaining 7.7% is explained by other variables.

4.2 Simultaneous Test (F Test)

The F test was conducted to determine the effect of all variables, namely: Land area, fertilizer, labor, pest attacks, and irrigation on rice production (Muklis, 2017). Based on the results of data analysis, the significant value of F is 0.000. This shows that the significant value <α (0.10) simultaneously, land area, fertilizer, labor, pest attacks, and irrigation have a significant effect on production.

4.3 Partial Test (t-Test)

Significant testing in this study was tested at the 10% stage. The results of the t-test value from the regression are as follows:

1. Based on the results of the regression analysis, the regression coefficient of the land area production factor (X1) was 1.030. This means that every 1% increase in land area will increase rice production by 1.030%. The value of the land area coefficient (X1) has a positive and significant effect on lowland rice production with a significant value smaller than alpha (0.000 <0.10). This means that partially the land area production factor has a significant effect on lowland rice production. The results of this study are in accordance with the research conducted by Nopita (2023) which states that land area has a significant effect on lowland rice production in Pemayung District.
2. Based on the results of the regression analysis, the regression coefficient of the fertilizer production factor (X2) was 0.031. This means that every 1% addition of fertilizer will increase rice production by 0.031%. The fertilizer coefficient value (X2) has a positive effect, but statistically its effect is not significant on rice production with a significant value greater than alpha (0.586> 0.10). Partially, it means that fertilizer has no significant effect on lowland rice production. This is in line with research conducted by Habibah (2016) which states that fertilizer has no effect on production.
3. Based on the results of the regression analysis, the regression coefficient of the labor production factor (X3) was 0.018. This means that every 1% increase in labor will increase rice production by 0.018%. The labor coefficient value (X3) has a positive and insignificant effect on rice production with a significant value greater than alpha (0.833> 0.10). Partially, labor has no significant effect on lowland rice production. The results of this study are in accordance with those conducted by Habibah (2016) which states that labor has no effect on rice farming production.
4. Based on the results of the regression analysis, the regression coefficient of the pest attack production factor (D1) was obtained at -0.141. This means that the

occurrence of pest attacks results in a decrease in rice field production. The pest attack coefficient value (D4) is negative and has a significant effect on rice field production with a significant value smaller than alpha (0.031 <0.10). The results of this study are in accordance with the research of Oktaviani et al. (2019), which states that pest and plant disease control (PHPT) has a significant effect on rice field farming production.

5. Based on the results of the regression analysis, the regression coefficient of irrigation production factors (D2) was 0.091. This means that smooth irrigation can increase rice production. The irrigation coefficient value (D2) is positive and has a significant effect on rice production with a significant value smaller than alpha (0.053 <0.10). The use of irrigation in Serba Jadi District is still experiencing disruptions, because the water dam in Serba Jadi District is still under repair. This can also be seen from the number of farmers who experience water shortages for rice farming needs.

4.4 Technical Efficiency

Variables (1)	Elasticity of Production (2)
Constant	8,370
Land area	1,030
Fertilizer	0.031
Labor	0.018
Pest Attack	-0.141
Irrigation	0.091

From the table above, it can be seen that the land area is not yet technically efficient. This can be seen from the production elasticity of > 1 (Ep = 1.030) which means that the land area is not yet efficient and is at stage 1 of the production curve. An efficiency value of more than 1 indicates that the use of land area production factors is not yet efficient so that it needs to be added. This condition can be done by farmers in Serba Jadi District because the larger the land area, the higher the production produced.

In the fertilizer variable, the elasticity value is <1 (Ep = 0.031), which means that fertilizer is approaching technical efficiency and is located at stage 2 of the production curve. There are three types of fertilizers in this production factor, namely urea, phonska, and ZA. The average use of fertilizer at the research location is 558.52 kg/Ha. To achieve an efficient value, farmers in Serba Jadi District need to add urea, phonska, and ZA fertilizers.

In the labor variable, the elasticity value is <1 (Ep = 0.018), which means that the labor is approaching technical efficiency and is located at stage 2 of the production curve. In the labor variable, farmers must add the number of workers to be technically efficient. If the addition of too many workers, the resulting rice production will not be comparable to the labor used. This is because the workforce in Serba Jadi District is grouped, where the labor groups have different numbers and cause the workforce to approach the efficient value.

Return to Scale (RTS)

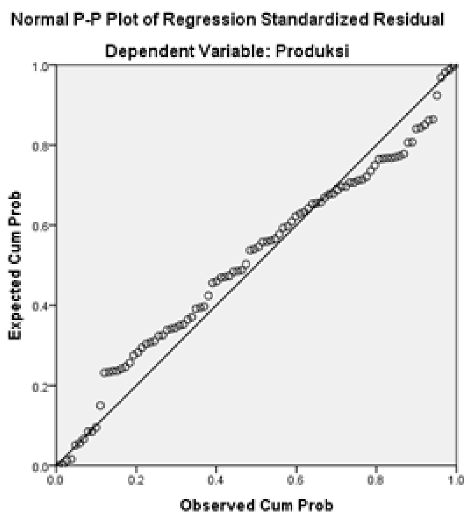
The RTS value can be known by adding the elasticity coefficients of each production factor. The logarithmic form in the cobb douglas function regression analysis can be used as the value of production elasticity (Soekartawi, 2002).

Variables (1)	Elasticity of Production (2)
Land area	1,030
Fertilizer	0.031
Labor	0.018
RTS	1,241

In the RTS analysis, it can be said that the production of lowland rice is in a condition of increasing return scale because the sum of the coefficient values of production factors (land area, fertilizer, and labor) is 1.241 more than 1 (**β** > 1). This means that the addition of production factors will produce additional production output that is proportionally greater, for example, if the production factor is added by 10%, production will increase by 20% (Soekartawi, 2003). If there is an increase in input of land area (X1), fertilizer (X2), and labor (X3) proportionally by 1%, it will cause an increase in lowland rice production (Y) by 1.241%. At the research location, the amount of production can still be increased by adding input in the production process.

4.4 Normality Test

The normality test is used to test whether in the regression model, the data used has a normal distribution or not. In the image below, it can be seen that the data is normally distributed, because the data is spread around the diagonal line and follows the direction of the diagonal line.



4.5 Multicollinearity Test

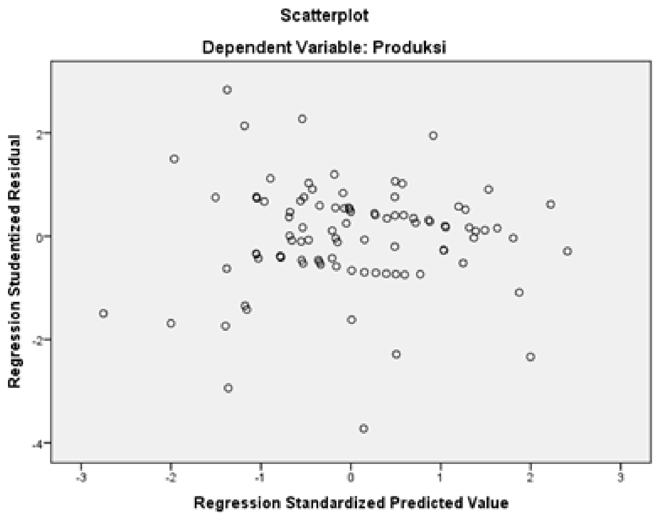
Multicollinearity testing is carried out to determine whether the independent variables are linearly related. To determine the occurrence of multicollinearity, it can be seen from the tolerance and VIF values (Nugraha, 2021). If the tolerance value obtained is > 0.10 and the VIF value < 10.00, it can be concluded that there are no symptoms of multicollinearity in the production function model used.

Model	Tolerance	VIF
Land area	0.108	9,258
Fertilizer	0.204	4,896
Labor	0.224	4,471
Pest Attack	0.908	1,101
Irrigation	0.862	1,160

From the table above, there is no correlation between independent variables from the production function model used. This can be seen in the tolerance table, each independent variable has a value > 0.10 and can be seen from the VIF table has a value < 10.00, meaning that the regression model does not experience multicollinearity.

4.6 Heteroscedasticity Test

The heteroscedasticity test aims to see whether in the regression model the variance of the residuals from one observation to another is different, so this is called heteroscedasticity (Nugraha, 2021).



In the image above, you can see the points spread below and above the number 0 on the Y axis, which means that there is no heteroscedasticity.

5. CONCLUSION

Based on the results and discussion in the research, the following conclusions can be drawn:

1. Of the five production factors of paddy farming in Serba Jadi District consisting of land area (X1), fertilizer (X2), labor (X3), pest attacks (D1), and irrigation (D2). It was found that the variables of land area (X1), pest attacks (D1), and irrigation (D2) had a significant effect on paddy production. While the variables of fertilizer (X2) and labor (X3) had no significant effect on paddy production.
2. The use of production factors for paddy farming in Serba Jadi District, consisting of land area (X1), fertilizer (X2), and labor (X3), is not yet technically efficient and the RTS value of paddy production is in a condition of increasing output scale (increasing return scale), namely 1.241.

REFERENCES

Adi, I & I Nyoman, P. 2019. Peningkatan Produktivitas Tanaman Padi Sawah Melalui Pemupukan Kompos dan NPK. Agrotop. Vol 9 (2): 178-187.

Agustin, H, U., W, H, Rianto., & H, Kusuma. 2018. Analisis Pengaruh Modal Dan Tenaga Kerja Terhadap Efisiensi Produksi Genteng Di Desa Sukorejo Kecamatan Gandusari Kabupaten Trenggalek. Jurnal Ilmu Ekonomi. Vol 2 (2): 194-205.

Arnanda, R., Hadi, S., & Yulida, R. 2016. Efisiensi Produksi Padi di Kecamatan Kuala Kampar Kabupaten Pelalawan. Sorot. Vol 11 (2): 111.

Badan Pusat Statistik 2023. Luas Panen dan Produksi Padi di Indonesia 2023 (Angka Sementara). Jakarta.

Badan Pusat Statistik. 2018. Indikator Pertanian Jawa Timur. Jawa Timur.

Habibah. 2016. Efisiensi Penggunaan Faktor Produksi Dalam Usahatani Padi Sawah Di Kelurahan Memburungan Kecamatan Tarakan Timur Kota Tarakan. Skripsi. Universitas Borneo Tarakan.

Muklis, H.H. 2017. Analisis Efisisensi Ekonomis Penggunaan Faktor-Faktor Produksi Pada Usahatani Tembakau di Kecamatan Getasan Kabupaten Semarang. Fakultas Peternakan dan Pertanian, Universitas Diponegoro

Nopita, S. Analisis Efisiensi Ekonomis Penggunaan Faktor-Faktor Produksi Usahatani Padi sawah Di Kecamatan Pamayung Kabupaten Batang Hari. Skripsi. Universitas Jambi. Jambi.

Nugraha, B. 2021. Pengembangan Uji Statistik: Implementasi Metode Regresi Linear Berganda dengan Uji Asumsi Klasik. Sukoharjo: Pradina Pustaka Grup.

Oktavia, R., Emy, K, & Riri, O.U. Analisis Efisiensi Ekonomi Penggunaan Faktor-faktor Produksi Pada Usahatani Padi Sawah Di Kecamatan Jangkat Kabupaten Merangin Provinsi Jambi. Jurnal Ilmiah, Vol 22 (2).

Siti, N., Isnaini, & Yenita, Y . 2021. Pembagian Kerja Petani Penggarap Sawah di Nagari Padang Ganting Kecamatan Padang Ganting Kabupaten Tanah Datar. Jurnal Pendidikan Tambusui. Vol 5 (3): 6671-6678.

Soekartawi. 2002. Prinsip Dasar Manajemen Pemasaran Hasil-Hasil Pertanian Teori dan Aplikasi. PT Raja Grafindo Persada. Jakarta.

Sukirno. 2020. Mikro Ekonomi Teori Pengantar. Rajawali Pers : Jakarta