

Analysis of Factors Affecting the Technical Efficiency of Rice Farming in East Java Province

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Artikel Info	Abstrak
<p><i>Article history:</i> Received June 06, 2020 Revised September 29, 2020 Accepted October 29, 2020 Available online December 18, 2020</p> <p>Keywords: <i>Technical efficiency; rice farming; stochastic frontier analysis.</i></p> <p>JEL Classification: E23; O13; Q12.</p>	<p><i>Agriculture is a dominant sector in Indonesia, mostly because many people work in this sector, especially in agricultural centers such as East Java Province. However, it is ironic that the farm sector does not have a considerable contribution to Indonesia's national income. This study aimed to measure rice farming's efficiency in East Java and determine whether education, access to credit, farmer group membership, age, and agricultural extension affected rice farming efficiency. The data source comes from the Central Statistics Agency (Agricultural Business Household Income Survey) in 2013 for East Java Province. The number of samples used was 8603 farmer households. The research method uses Stochastic Frontier Analysis. The results showed that the average efficiency for the Cobb-Douglas production function was 0.764, while the average efficiency for the translog production function was 0.759. The Cobb-Douglas production function is not suitable for this study; the translog production function is considered more appropriate. The variables of education, access to credit, membership of farmer groups, age, and agricultural extension significantly influence rice farming's technical efficiency in East Java. The extension variable has the most significant effect.</i></p>

INTRODUCTION

Food is a basic need for humans to survive, and therefore, adequate food for everyone is a fundamental right that deserves to be fulfilled. Based on this fact, meeting the food needs of the entire population at any time in a region has become the main target of food policy for a country's government. As a country with a large population, Indonesia faces complex challenges in meeting its population's food needs. The problem of food security becomes a central issue in development and becomes the focus of agricultural development.

Agriculture is a reasonably dominant sector in Indonesia, especially in prime areas in the agricultural industry such as East Java Province. Many people depend on the farm sector, either as laborers or as farmers who own the land so that the community gets wages or income from the harvest to meet their daily needs.

However, then an irony occurred where the agricultural sector did not have a considerable contribution to Indonesia's national income. This could be due to the inadequate production of the farm sector, especially rice production.

If you look at table 1, the Indonesian agricultural sector's contribution to Indonesia's GDP is only around 10 percent.

Table 1. The Contribution of the Indonesian Agricultural Sector to the GRDP of East Java Province 2015-2019 (Billion Rupiah)

Sector	Year				
	2015	2016	2017	2018	2019
Agriculture	179.648,5 (10,62%)	194.501,6 (10,48%)	197.484,1 (10,21%)	197.095,0 (9,81%)	203.341,0 (8,64%)
Total PRDB	1.691.477,1	1.855.738,4	2.012.918,0	2.189.823,6	2.352.425,2

Source: [BPS East Java \(2020\)](#)

This means that Indonesian people who work in the agricultural sector only enjoy a small national income part. Even though there are so many people who work in this sector, there should be quite a lot of income obtained either in labor wages or income from the harvest. This, of course, must receive special attention from the government. The goal is for people who work in the agricultural sector to be more prosperous.

In the last five years (2014-2018), rice plants' productivity per hectare in East Java has tended to show a downward trend, especially since 2016 ([BPS Jawa Timur, 2019](#)). This is quite worrying because it can disrupt food security, so efforts are needed to increase East Java's rice farming productivity. In the production theory, two main variables significantly influence production: capital (capital) and labor (labor). This is as described in the study of [Thirtle et al. \(2003\)](#) and [Alene and Coulibaly \(2009\)](#), where work is defined as the number of workers in one hectare while capital is divided into two, namely fertilizer (per hectare) and land area. The three variables (fertilizer, land area, and labor) plus the variables of access to credit and climate will be assessed for their rice production effects.

In addition to rice production, another discussion is worthy of being raised, namely rice production efficiency itself. Production efficiency is an essential capital for a country that wants to advance. Although not one country has overcome poverty and food vulnerability through the agricultural sector alone, almost no country can progress without increasing its agrarian sector's productivity and efficiency ([Ogundari, 2014](#)).

Many factors determine the production efficiency of the agricultural sector. [Ogundari \(2014\)](#), in his research, that the efficiency of agricultural crop production can be influenced by many things such as education, experience (years), land status, credit, land area, cooperative membership, age, number of family members, land expansion, health, and gender. Head of the family. [Chandio et al. \(2017\)](#) stated that credit, land area, fertilizer, and labor significantly affect rice productivity in Sindh, Pakistan. The sex of the head of the household is also considered to influence the efficiency of agricultural production ([Nguyen et al., 2018](#)).

[Nguyen et al. \(2018\)](#) also state variables of age, education, number of family members, and workforce from their own families. [Mishra et al. \(2018\)](#)

examined the efficiency of female farmers in managing the agricultural sector. The results showed that women tend to be inefficient in agriculture to be deemed less suitable to work in that sector. In general, [Mishra et al. \(2018\)](#) found that gender had no significant effect in determining how efficient agricultural management was. [Karunarathna and Wilson \(2017\)](#), in their research, stated that inefficiency is influenced by age, education, number of family members, number of land parcels, land expansion, access to credit, land ownership, and membership in farmer organizations.

The results of research by [Badisha et al. \(2018\)](#) show that output inefficiency is higher for older household heads and lower (efficient) for households that make agriculture their primary job. [Saiyut et al. \(2017\)](#) stated that the farmers' age also greatly determines rice production efficiency. Farmers who are more than 60 years old make agricultural productivity inefficient. Meanwhile, farmers aged 15-59 years reduce technical inefficiencies of agricultural output. [Javed et al. \(2010\)](#) and [Piya et al. \(2012\)](#) also stated that age significantly affects technical inefficiency.

The results of [Armagan's \(2008\)](#) study show that age, education, and experience do not have a significant effect on agricultural efficiency. The same thing was conveyed by [Mohapatra \(2013\)](#) and [Kiatpathomchai et al. \(2009\)](#). On the other hand, [Ogunyinka and Ajibefun \(2004\)](#) state that higher education is a significant factor affecting technical efficiency in agricultural production. Likewise, the research results of [Hengzhou and Tong \(2013\)](#), [Nargis and Lee \(2013\)](#), and [Linh \(2012\)](#).

Research on the efficiency of rice farming in East Java has also been conducted several times, namely [Wardana et al. \(2018\)](#), [Mariyono \(2014\)](#), [Antriandarti \(2015\)](#), and others. There are several fundamental differences between this study and previous studies. [Wardana et al. \(2018\)](#) focused their research on small-scale farmers, while this study took a sample of small and large-scale farmers. [Mariyono \(2014\)](#) uses panel data & this study uses cross-section data. [Antriandarti \(2015\)](#) focuses more on cost efficiency, while this study focuses on technical efficiency. East Java Province is a national rice granary and is still ranked as the province that produces the most rice during 2013-2017 ([Indonesian Ministry of Agriculture, 2018](#)). East Java Province can be the primary signal sign that there are things that need to be improved in Indonesia's agricultural sector.

The main problem that becomes the background of this research is that rice/rice is the staple food in East Java Province and even Indonesia. However, the decline in rice productivity in East Java in recent years is undoubtedly very worrying, so there needs to be a solution to overcome this problem.

The explanation above actually wants to convey the importance of production efficiency in the agricultural sector, especially rice, the staple food in Indonesia. This is the basis of interest so that the researcher aims to analyze the factors that affect the technical efficiency of rice farming in East Java.

RESEARCH METHODS

This research was made using a quantitative research approach. It will be measured the extent of the level of efficiency in East Java Province and then look at the factors that affect efficiency in East Java Province.

Population and Sample

The population in this study were rice farmers in East Java Province. Meanwhile, the number of samples used was 8603 farmer households.

Data collection technique

The data to be used in this research is secondary data obtained from the Central Bureau of Statistics in the form of Agricultural Survey data (Agricultural Business Household Income Survey) 2013 for East Java Province. The data used is a series of Agricultural Surveys conducted by BPS every ten years; the last survey was born in 2013. So the data that can be used is only 2013 data.

Operational definition

To avoid differences in perceptions, the operational definitions of research will be described as follows.

1. Efficiency of Farmers in Rice Production

- Agricultural output; Rice yields harvested by farmers (in rupiah).
- Land area; The total land owned by the farmer for growing rice (in m²).
- Fertilizer; The amount of money spent by farmers to buy fertilizers for rice plants to flourish (in rupiah).
- Seed; Total expenditure to buy seeds used by farmers in the rice planting process (in rupiah).
- Labor; Total expenses to pay workers involved in planting to harvest rice during one growing season (in rupiah). The workforce here can be in the form of family or non-family workers.

2. Model for determining farmer efficiency in rice production

- Education; The last level of formal education that has been taken by farmers (D = 1 if farmer education is high school/equivalent and higher, D = 0 if vice versa).
- Family labor; The number of family members involved in the rice production process (in person).
- Access to credit; The amount of credit obtained by farmers to finance the rice planting process (in rupiah).
- Membership of farmer groups; Head of the family is involved in farmer groups or not (D = 1 if joined in farmer group membership, D = 0 if vice versa).
- Age; The age of the farmer in years.
- Agricultural extension; The head of the family participates in extension/training to improve the ability to manage agriculture (D = 1 if he has participated in extension/training, D = 0 if not).

- Rice production efficiency; The rice production efficiency score is based on the estimation results. The score is between 0 and 1.

Data analysis technique

To simplify the understanding of this research, the details of the models to be estimated are as follows. To measure rice production efficiency, the Stochastic Frontier Analysis (SFA) method will be used. This stochastic frontier model will be calculated using the Maximum Likelihood Estimation (MLE) method and using the FRONTIER 4.1 program. The stochastic frontier model to be estimated is as follows. The first model is the Cobb-Douglas production function.

$$\ln y_i = \beta_0 + \sum_{j=1}^4 \beta_j \ln X_{ij} + \sum_{j \leq k}^4 \sum_k \beta_{jk} \ln X_{ij} X_{ki} + V_i - U_i \dots \dots \dots (1)$$

The second model is the translog production function.

$$\ln y_i = \delta_0 + \delta_1 \ln X_1 + \delta_2 \ln X_2 + \delta_3 \ln X_3 + \delta_4 \ln X_4 + 0.5 \delta_5 \ln X_1^2 + 0.5 \delta_6 \ln X_2^2 + 0.5 \delta_7 \ln X_3^2 + 0.5 \delta_8 \ln X_4^2 + \delta_9 \ln X_1 \ln X_2 + \delta_{10} \ln X_1 \ln X_3 + \delta_{11} \ln X_1 \ln X_4 + \delta_{12} \ln X_2 \ln X_3 + \delta_{13} \ln X_2 \ln X_4 + \delta_{14} \ln X_3 \ln X_4 + V_i - U_i \dots \dots \dots (2)$$

$\ln y_i$ represents the natural logarithm of the agricultural output value of rice, $\ln X_1$ represents the natural logarithm of the total land area / harvested area, $\ln X_2$ represents the natural logarithm of fertilizer, $\ln X_3$ represents the natural logarithm of seed, $\ln X_4$ represents the natural logarithm of wages, and β_j is the parameter to be estimated.

V_i is a random error that is assumed to be freely distributed and identical and depends on uncontrollable factors. U_i is the technical inefficiency effect and nonnegative random variable, which is assumed to be normally distributed.

Meanwhile, the following equations are used to measure technical efficiency (TE).

$$TE_i = \frac{f(X_i, \beta) \exp(v_i - u_i)}{f(X_i, \beta) \exp(v_i)} \dots \dots \dots (3)$$

$$TE_i = \exp(-u_i)$$

$$0 < TE_i < 1$$

The equation above shows that technical efficiency has a value between 0 and 1. The closer to number 1 means the more efficient rice production in East Java. The inefficiency effect model in SFA can be specified as follows.

$$U_i = \delta_0 + \sum_{j=1}^m \delta_j Z_{ji} + W_i \dots \dots \dots (4)$$

The factors that will be measured on technical inefficiency are education, access to credit, farmer groups' membership, age, and agricultural extension. This research has an estimation stage to answer several hypotheses. The first stage is to estimate the Cobb-Douglas production function model and the translog production function to obtain technical efficiency. The early-stage will automatically output the results of data processing using the Frontier 4.1 software. This study will choose between the Cobb-Douglas function model and the translog production function to determine the appropriate and better production function form using the likelihood ratio (LR) statistical test. The likelihood ratio (LR) statistical test can be formulated as follows.

$$\lambda = -2\{\ln[L(H_0)] - \ln[L(H_1)]\} \dots \dots \dots (5)$$

where $L(H_0)$ and $L(H_1)$ Show the value of the likelihood function of the Cobb-Douglas production function model and the translog production function. The

likelihood ratio (LR) statistical test is estimated using the chi-square (χ^2) distribution. The degrees of freedom are the different parameters used between the Cobb-Douglas production function model and the translog production function. The hypothesis for this statistical test is:

- H_0 : Cobb-Douglas production function model as a production function form.
- H_1 : translog production function model as a production function form.

The criteria for testing the hypothesis is if $\lambda_{\text{calculated}} > \chi^2_{\text{tabel}}$, then the null hypothesis is rejected, which means the production function form which is more appropriate and better used in this study is the translog production function model. Conversely, if $\lambda_{\text{hitung}} > \chi^2_{\text{tabel}}$, then the null hypothesis is accepted, which means that the production function form, which is more suitable and better used in this study, is the Cobb-Douglas production function model.

The second stage in this research is to test the effects of inefficiency in the production function model. Testing the impact of this inefficiency is carried out using the LR test one-sided error value and the χ^2 distribution. The hypothesis for testing the inefficiency effect is:

$$H_0 : \gamma = \delta_0 = \delta_1 = \dots = \delta_6 = 0$$

(no inefficiency effects in the production function model)

$$H_1 : \gamma = \delta_0 = \delta_1 = \dots = \delta_6 > 0$$

(there is an inefficiency effect in the production function model)

The testing criterion for this hypothesis is if the LR one-sided error $> \chi^2_{\text{tabel}}$, then the null hypothesis is rejected, which means that the assumption that the inefficiency is zero is dismissed to prove an inefficiency effect in the production function model. Conversely, if the one-sided error $LR < \chi^2_{\text{tabel}}$, then the null hypothesis is accepted, which means there is no inefficiency effect in the production function model.

Suppose the results of the second stage prove that there is an inefficiency effect in the production function. In that case, the third stage is to perform a statistical t-test to determine the source of the inefficiency or the factors that can affect the technique's efficiency. The statistical t-test is used to determine whether the coefficient of each independent variable (δ_i) partially has a significant or not significant effect on the dependent variable inefficiency (μ_i) in the inefficiency effect model. The hypothesis for the statistical t-test is:

$$H_0: \delta_1 = 0 \text{ (independent variables have no effect on inefficiency)}$$

$$H_1: \delta_1 > 0 \text{ (independent variables affect inefficiency)}$$

The testing criteria for this hypothesis are if $t_{\text{ratio}} > t_{\text{tabel}} (\alpha / 2, n-k-1)$. The null hypothesis is rejected, which means that each independent variable partially has a significant effect on inefficiency that these variables can be a factor that can affect technical efficiency. Conversely, if $t_{\text{ratio}} < t_{\text{tabel}} (\alpha / 2, n-k-1)$, then the null hypothesis is accepted, which means that each independent variable partially does not significantly affect inefficiency independent variable cannot be a factor affecting technical efficiency.

RESULT AND DISCUSSION

Descriptive Analysis of Data

This data description aims to provide a general description of the data used in the study. Table 2 shows a short description of the data in this study. Market Behavior and Analysis

Table 2 Descriptive Statistics of Research Data

Variable	STD	MIN	MAX	MEAN
Production	18681,2	108	1018002	8374,9
Land	7853	50	250000	4739,1
Fertilizer	1529,5	5	43668	8125
Seed	1186,8	1	100386	271,2
Wage	2360,5	20	66870	1104,3
Education	0,301	0	1	0,100
Credit	0,274	0	1	0,082
Poktan	0,486	0	1	0,383
Age	12,638	16	98	52,144
Counseling	0,422	0	1	0,231

On average, farmers can get around eight million rupiahs in nominal value in one harvest. No less impressive is the education variable, where it turns out that most farmers in East Java have not graduated from high school/equivalent and above. Farmers with high education are expected to be directly proportional to farmers' efficiency in producing rice crops in East Java.

The age variable is also quite impressive, where the average farmer in East Java is around 52 years old. This has a positive or even negative impact. The positives of 52 years old can show that farmers have sufficient experience to work in the agricultural sector. However, it could also be that the relatively old age makes farmers less knowledgeable about technology or new things in the farm sector, which in turn makes rice production inefficient.

Research Result

This study uses the Stochastic Frontier Analysis method. The variables to be studied are the natural logarithm of the agricultural output value of rice, $\ln X_1$ represents the natural logarithm of the total land area / harvested area, $\ln X_2$ represents the natural logarithm of fertilizer, $\ln X_3$ represents the natural logarithm of seed, $\ln X_4$ represents the natural logarithm of wages. Also, the factors that will be measured the effect of technical inefficiency are education (Z_1), access to credit (Z_2), membership of farmer groups (Z_3), age (Z_4), and agricultural extension (Z_5). The research results can be seen in table 3.

Table 3. Estimation Results for Maximum Likelihood Stochastic Frontier Analysis

Variable	Parameter	Cobb-Douglas		Translog	
		Koefisien	t-ratio	Koefisien	t-ratio
α_0	β_0	1,917	54,466***	2,109	12,209***
$\ln x_1$	β_1	0,503	64,724***	0,422	6,839***
$\ln x_2$	β_2	0,229	29,988***	0,077	1,319
$\ln x_3$	β_3	0,157	22,771***	0,256	5,649***
$\ln x_4$	β_4	0,105	18,350***	0,194	3,774***
$(\ln x_1)^2$	β_5			0,037	2,426**
$(\ln x_2)^2$	β_6			0,097	5,385***
$(\ln x_3)^2$	β_7			0,053	4,525***
$(\ln x_4)^2$	β_8			0,058	4,862***
$\ln x_1 \ln x_2$	β_9			0,005	0,391
$\ln x_1 \ln x_3$	β_{10}			-0,023	-2,026**
$\ln x_1 \ln x_4$	β_{11}			-0,019	-1,697*
$\ln x_2 \ln x_3$	β_{12}			-0,032	-2,606***
$\ln x_2 \ln x_4$	β_{13}			-0,050	-4,540***
$\ln x_3 \ln x_4$	β_{14}			0,000	0,047
z_1	δ_1	-1,538	-7,428***	-1,167	-6,225***
z_2	δ_2	-0,269	-3,215***	-0,208	-2,751***
z_3	δ_3	-0,196	-1,612	-0,222	-5,461***
z_4	δ_4	-0,019	-4,179***	-0,013	-3,960***
z_5	δ_5	-1,890	-5,515***	-1,354	-4,042***
σ^2		3,361	7,382***	2,613	9,382***
γ		0,974	240,216***	0,969	316,286***
Log-likelihood		-4492,439		-4443,832	
LR test of the one-sided error		507,912		517,270	
Mean efficiency		0,764		0,759	

Information: significant at the level of 1% (***), 5% (**), 10% (*)

First, the Cobb-Douglas production function model and the translog production function will be estimated. The estimation of the two production functions uses the Maximum Likelihood method, shown in the table below. The results show that the average efficiency for the Cobb-Douglas production function is 0.764, while the average efficiency for the translog production function is 0.759. Both of them have similar average efficiency values. Furthermore, tests will be carried out to determine the production function's appropriate form between the Cobb-Douglas production function and the translog production function. The value of the likelihood function for the Cobb-Douglas production function is -4492,439, and for the translog production

function -4443,832. For that, the statistical value $LR = -2 [(-4492,439) - (-4443,832)] = 97,214$. The results of this LR statistical calculation show a value that is greater than the x^2_{tabel} with $df = 15$ which is valuable ($x^2_{0.10,15} = 22,307$; $x^2_{0.05,15} = 24,996$; $x^2_{0.01,15} = 30,758$). The result of the likelihood ratio test states that H_0 is rejected. Where the Cobb-Douglas production function is not suitable for use in this study. Therefore, the translog production function is considered more appropriate.

In the second stage, a hypothesis test is conducted to determine the effect of inefficiency on the translog production function using the LR test value of the one-sided error, which has a value of 517.270. The result shows that the LR test's worth of the unjust mistake is greater than the x^2_{tabel} so that H_0 is rejected. So it is evident that there is an effect of inefficiency in the translog production function model.

The third stage will be testing the hypothesis to determine whether there is a stochastic effect on inefficiency. The t statistical value obtained is 316.286, which is greater than the critical value. The conclusion is that there is a stochastic inefficiency effect.

The final stage of hypothesis testing is carried out using t statistic to determine the source of technical inefficiency. Based on the comparison between $t_{ratio} > t_{tabel}$, it can be concluded that the variable education (Z_1), access to credit (Z_2), farmer group membership (Z_3), age (Z_4), and agricultural extension (Z_5) have a significant effect on the technical efficiency of rice farming in Java. East (either with $\alpha = 10\%$, $\alpha = 5\%$ or $\alpha = 1\%$). The relationship is negative, which means that if the value of a variable increase, it will reduce rice farming's technical inefficiency in East Java. Based on the coefficient value, it can be said that the extension variable has the most significant influence because the coefficient value is the highest, which is -1,354. The educational variable is equally influential because it has a coefficient value of -1.167. Other variables have a coefficient below the number 1 (one). Sequentially, the membership of the farmer group coefficient value is -0.222, access to credit has the coefficient value -0.208, and the age coefficient value is -0.013.

Discussion

The results of this study are indeed exciting to discuss. The technical efficiency of rice farming in East Java cannot be maximal, namely 0.759. This is not much different from previous research on the technical efficiency of rice farming. Research [Haryanto et al. \(2016\)](#) show that East Java's technical efficiency score is below 0.7. Where the technical efficiency is 0.695, and the metafrontier technical efficiency is 0.673. [Wardana, et al. \(2018\)](#), the technical efficiency score of small-scale farmers in Jember, East Java is 0.635. [Mariyono \(2014\)](#) technical efficiency of rice-based agribusiness in East Java is in the range of 0.7. [Sumaryanto, et al. \(2003\)](#) TE 0.71 and [Wahida \(2005\)](#) 0.76 in the Brantas River Basin, East Java. [Antriyandarti \(2015\)](#) with an average efficiency of 0.6142 in East Java. This means that there is a need for efforts to improve rice farming's technical efficiency in East Java in general.

The first variable that most influences the efficiency of rice farming in East Java is the extension. East Java Province is quite alert in providing extension workers. East Java Province is one of the provinces with the second-highest number of agricultural extension agents in Indonesia (7,967 people). The number is only inferior to Central Java (9,248 people). However, it should also be noted that the rice fields in East Java are much more comprehensive than East Java, which is 1,081,873 hectares. In comparison, rice fields in Central Java are 951,752 hectares ([Indonesian Ministry of Agriculture, 2018](#)). So, there is nothing wrong if the East Java Provincial Government increases the number of extension workers.

The next variable that has a significant effect is education. As previously explained in the data description, most East Java farmers have not graduated from SMA / equivalent and above. This could be the cause of the high inefficiency of rice farming in East Java. This shows that it is unpopular for highly educated people to work in the agricultural sector. The government must convince people that working in the agricultural sector can also get enough profit/income, even more than enough to meet their daily needs. The measure is, of course, the Farmer Exchange Rate (NTP). This Farmer Exchange Rate compares the price index received by farmers and the price index paid by farmers so that the extent to which farmers' welfare can be measured. So far, the Exchange Rate of East Java Farmers is often above 100%, 104.10 in 2017 and 105.39 in 2018. This means that the price index received by farmers is greater than the price index paid by farmers. This is much better than some other areas where even the Farmers Exchange Rate is below 100%. In 2018 East Java only lost to Lampung, NTB, and West Sulawesi ([Ministry of Agriculture, 2018](#)). It is a challenging task for the government of East Java Province to maintain this, even as much as possible, to attract highly educated people to want to work in the agricultural sector.

The remaining variables are farmer group membership, access to credit, and age, whose influence is not too significant in the coefficient. There needs to be an evaluation of whether the farmer groups have effectively helped farmers meet their rice production needs, for example, in the fertilizer distribution process. Of course, so that farmer groups can be more significant in helping farmers. For example, there should be no authority abuse so that subsidized fertilizers do not reach the farmers. Or it could even be that many people do not understand the benefits of joining a farmer group, so they do not feel the benefits they should receive. Likewise, with access to credit, the hope is that farmer literacy regarding financial institutions must be increased to help farmers who need access to funds to not interfere with the farming process until the harvest season.

The last variable with the smallest effect is age. As explained in the data description, the average age of farmers in East Java is around 52 years. This can have a positive or negative impact. If you pay attention, it seems that it leads to a negative effect because it turns out that the age of farmers who are in the range of 52 years does not have a significant enough impact in reducing rice farming's technical inefficiency. This explanation of age is very closely related

to the education variable. The government must be able to lure educated people and are still relatively young to work in the agricultural sector. The hope is that they can bring new things or even be open to accepting new things in the farming sector to increase rice farming efficiency. So that in the end, the farmers in East Java became more prosperous.

CONCLUSION

Based on the research results, it can be concluded that the average efficiency for the Cobb-Douglas production function is 0.764, while the average efficiency for the translog production function is 0.759. The Cobb-Douglas production function is not suitable for use in this study. Therefore, the translog production function is considered more appropriate. Also, education, access to credit, membership of farmer groups, age) and agricultural extension significantly influences the technical inefficiency of rice farming in East Java.

The extension variable has the most significant effect. This means that extension is an essential component in the effort to increase the technical efficiency of rice farming in East Java. So it is hoped that the government will provide an extra portion of the budget to increase public knowledge to improve the technical efficiency of rice farming in East Java Province. One of them can be by adding extension workers who are tasked with providing information about new things that can improve rice farming's technical efficiency so that it is hoped that the level of rice productivity in East Java Province can be maintained or even increased, so that food availability is maintained.

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