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THE EFFICIENCY OF INPUT USAGE OF ORGANIC PADDY FARMING IN INDONESIA

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ABSTRACT

Organic farming is an activity in the agricultural sector which emphasizes the importance of environmental issues. Activity in this area has the objective to increase production, productivity, independence of farmers and produce high quality food. The objectives research of this study are: to analyse factors that effects the efficiency of technical input; to analyze the level of technical efficiency of input use, and to analyze the factors that influence the use of input technical inefficiency. Based on the results, the study showed that the factors have influence the efficiency of input use technically were land, seeds, manure, and organic pesticides. The average level of technical efficiency in the area was 93.3%. While the factors that positively affects the level of technical inefficiency were age and number of family.

KEY WORDS

Organic farming, stochastic frontier production function, technical efficiency and inefficiency.

Organic farming became the basis of the development of farming systems that have a bright prospect in the future, especially on issues relating to environmental quality. Positive aspect for the purposes of high-quality food and nutrition can be produced by organic agricultural products. Organic farming makes farmers more professional and mature in managing the usage of inputs, they have more skill when use the inputs, as well as agriculture productivity gain, and finally slowly they can fulfil their daily needs. In Malang, especially at the Sumberpasir village, a huge number of farmers who cultivate organic paddy. Farmers in the area use production factors such as land, labor, seed, manure, compost and organic pesticides. The problem that has affected much of the area farmers is the lack of knowledge and understanding in allocating the input, therefore the organic paddy production and productivity has not been maximized. Human resource factors such as level of education, age and number of farmer's family and others, are the important factors that determine the success or failure to get high productivity level. To increase the production and productivity of organic paddy, needed the efficiency of the usage of inputs on organic paddy farming. By using frontier production function, the efficiency level and inefficiency level of each farmer can be showed.

The objectives research of this study are: 1) To analyse factors that effects the efficiency of technical input, 2) To analyze the level of technical efficiency of input use , and 3) to analyze the factors that influence the use of input technical inefficiency.

RESEARCH METHODOLOGY

This research is done on purpose (*purposive*) at Sumberpasir Village Pakis Subdistrict Malang Regency East Java Province Indonesia. The selection of this location because of there were huge number of farmers that cultivate organic paddy. The total number of farmers that cultivate organic paddy were 37.

This study uses primary data and secondary data. The primary data obtained through direct interviews with farmers by using a list of questions related. The secondary data obtained through government office that related with this research, such as District Office and Agriculture Department offices.

The data were analyzed using stochastic frontier production function. The production function is used to determine the factors that influence the production of organic paddy production and the level of efficiency with the technical inputs. The advantages of this

production functions is it can detect the efficiency of each farmer. Stochastic frontier production function as follows :

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + v_i - u_i,$$

Where:

- Y : Total Production (Kg)
- B₀ : Constanta
- β_i : Elasticity production, the production factor time-
- X₁ : Land area (ha)
- X₂ : Labor (Day work)
- X₃ : Seed (Kg)
- X₄ : Manure (Kg)
- X₅ : Compost (Kg)
- X₆ : Organic Pesticides (ml)
- V_i : *a symmetric, normally distributed random error*
- U_i : *one-side error term (U_i ≥ 0)*

The level of technical efficiency, mathematically formulated using the following equation:

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

The value of TE ranges from zero to one. A value of 1 is the highest level of efficiency in relation to the use of inputs. The hypothesis was tested using Likelihood value Ratio (LR). The equation used is as follows:

$$LR = -2 [\ln (Lr) - \ln (Lu)],$$

Where :

- LR : *Likelihood Ratio*
- Lr : LR values in OLS
- Lu : LR values in MLE

Furthermore, to analyze the level of technical inefficiency will use the following equation:

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + W_{it},$$

Where :

- μ_i : The effect of technical inefficiency
- Z₁ : Age (year)
- Z₂ : Education (year)
- Z₃ : Number of family (person)

RESULTS AND DISCUSSION

Based on the results analysis, can be explained that there are four factors that significantly affect the input of organic paddy production in the Sumberpasir village, Pakis subdistrict Malang regency, such as land, labor, seeds and organic pesticides. In Table 1 below we can see the whole variables or parameters that indicate the real level is as follows.

The value of gamma (γ) of 0.96 at significance level of 5% as shown in Table 1 indicates that the error variation of confounding factors in the model is due to the technical efficiency. Squared sigma value (σ) of 0.007 at the significance level 5% means that the effect has occurred in the technical efficiency frontier production function model.

Table 1 – Data Analysis of Stochastic Frontier Production Function

Variabel	Parameter	Coefisien	Standart Error	t-ratio
Intersep	β_0	1,73	1,05	1,65
Ln X ₁ (Land Area)	β_1	0,05	0,02	2,76*
Ln X ₂ (Labor)	β_2	-0,001	0,09	-0,01
Ln X ₃ (Seed)	β_3	0,36	0,14	2,53*
Ln X ₄ (Manure)	β_4	0,35	0,11	3,03*
Ln X ₅ (Compost)	β_5	-0,21	0,13	-1,54
Ln X ₆ (Organic Pesticides)	β_6	0,41	0,12	3,33*
Sigma Squared	σ	0,007	0,001	5,45
Gamma	γ	0,96	0,04	23,47
Log likelihood function	57,25048			
LR test of the one sided error	3,774587			
* the significance level 5%				
T. Table 5% = 2,028093987				

To see the analysis result of the hypothesis can be seen from the value of LR (Likelihood Ratio) then compared to the magnitude of the critical value χ^2_R (Kodde and Palm, 1986) in the amount of restriction of one. If the value result is greater than the test LR table, then the hypothesis H_a accepted which means on each variable used in the production process has an influence on the level of technical efficiency of input use in the level of farmers. This means that in the area of research, organic paddy farmers have not been 100% use of the technical efficiency.

Several factors in the production of organic paddy farming such as land, seed, fertilizer, and organic pesticides as indicated on the analysis results stochastic frontier production function, have the positive value, while the production factors of labor and compost are both have negative value. The value of the coefficient of the land area is 0.05 means that there will be the addition of organic paddy production of 0.05 units after the addition of the total area of one percent. This is different with factor of labor, which have negative coefficient value -0.001. This value means that it will be decrease 0,001 in organic paddy production, when there is an additional one percent of labor. At organic farming, the intensive tillage is influence the organic paddy production, otherwise the less productive labor is less influence the organic paddy production. The use of manure in the study area are given in good portions and relatively closer to the suggestion, so that farmers are gaining additional production in accordance with the additional use of fertilizers, manure variable positive increases of 0.36. The use of compost should be positive to increase production, it was not obtained by farmers because the applicattion time is not the right time, it makes the lack of fermentation process and make the production decline, the value of compost marked negative coefficient value is -0, 21. The coefficient of the use of organic pesticides marked positive 0.41, meaning farmers in the research area has brought many benefits to the use of organic pesticides to help them obtain the desired production.

The real variation of all the variables can be seen in the difference of the value t ratio with t table. The Input use of land, seeds, manure and organic pesticides significant effect on the level of organic paddy production. Only inputs of labor and compost that has not significant effect on production with a significance level of 5%.

Technically, the average level of efficiency which inputs of organic paddy can be seen in Table 2 below. Table 2 shows that organic paddy farmers in Sumberpasir village, Pakis subdistrict, Malang regency has a chance to increase production by 0.067 or 6.7 percent. This is can be showed from the amount of the average level of efficiency of input use technically at organic paddy farming is 0.933.

Table 2 – The average level of efficiency in the usage of Input In The Organic Paddy Farming in Sumberpasir village, Pakis subdistrict, Malang regency

No.	Rating Achieved	Efficiency Level
1	Average	0,933
2	Minimum	0,837
3	Maximum	0,987

For farmers that has low level of efficiency needs to be improved, while the farmers that already have high efficiency should still be able to defend it.

If viewed as a managerial or due to nontechnical issues, the factors that affect the level of technical inefficiencies that exist in the farmers can be seen in Table 3 below:

Table 3 – Technical Inefficiency Level

Variabel	Parameter	Coefisien	t-ratio
Intersep	δ_0	0,009	0,08
Z ₁ (Age)	δ_1	0,0008	0,80
Z ₂ (Education)	δ_2	-0,005	-0,92
Z ₃ (Number of Family)	δ_3	0,01	1,12

Table 3 above shows that the age of the farmer positive effect on the level of technical inefficiency. Increasingly older age, for farmers will increase the level of their physical inefficiency. Physically there will make lack of ability, therefore it can influence the application of new technology, new innovations will have the negative response from them. On the educational factors that has negative value will reduce technical inefficiency farmers, higher education means that farmers can improve the efficiency with which inputs are increasingly efficient. The farmer's education can improve the long-term knowledge to cultivate the organic farming. The response to the increase in production will be higher for farmers who are well educated than the less educated. The large number of families would increase the technical inefficiency farmers themselves. Farmer needs more daily needs in a large family of farmers, they are more limited in order to obtain additional costs as a result of the increase in household expenditures, thereby affecting their technical efficiency.

CONCLUSION AND SUGGESTIONS

Based on the results of the discussion as described earlier, it can be concluded that the factors that significantly affect the level of technical efficiency are the Land Area, seeds, manure and organic pesticides. Farmers in the area of research still has a chance to improve its technical efficiency, therefore they still have a chance to obtain higher production. Several reasons that may cause farmers to have less chance to improve their organic paddy production can be solved by improving their education, both formal and informal.

The suggestion for farmer are to pay attention in the properly dozing of compost, therefore they will get good response of plants and high production as well as productivity increase. The importance of counseling for farmers is a special concern for the government, especially the department of agriculture crops to provide intensive coaching for them.

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