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EFFICIENCY OF PRODUCTION FACTOR OF RED ONION FARMING IN INDONESIA

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ABSTRACT

The agricultural sector is one sector that can support the economy of Indonesia. Horticultural crops such as red onions are agricultural sub-sector hold an important role in economic growth and the needs of Indonesian society. The goal in this research are to analyze the factors that significantly affect the production of red onion, analyze the technical efficiency level of the use of production factors and the factors that have an influence on the technical inefficiency. The results showed that the factors that significantly affect the production of red onion are land, seed, Za fertilizer, SP - 36 fertilizer, Phonska fertilizer and pesticide of furadan. The average level of technical efficiency of the use of production is 0,926, therefore farmers still have a chance to achieve full efficiently by 0,074 or 7.4%. While the factors that have a positive influence on the level of inefficiency are family number and education.

KEY WORDS

Red onion, farming, stochastic frontier, technical efficiency.

The agricultural sector is one sector that can support the economy of Indonesia. It is based on the majority of Indonesia's population are farmers. Horticultural crops such as red onion are agricultural sub-sector hold an important role in economic growth. The productions of these crops have a high economic value and become one of the needs of the community. The rate of population growth and the demand for red onion is increasing, while the red onion production remains relatively fixed. Therefore needed the increasing of red onion production. In increasing red onion production required a technical efficient use of production factors, therefore farmers can achieve optimal production on the use of red onion farming production function.

The objective of the research include: (1) to analyze the factors that significantly affect the production of red onion, (2) to analyze the technical efficiency level of the use of production factors and (3) to analyze the factors that have an influence on the technical inefficiency.

METHODS OF RESEARCH

The research activities is in the village of Banyu Anyar Kidul, District Banyu Anyar, Probolinggo. Research location is done on purpose (purposive). It is based that the village is one of the agriculture central production of red onion. Determination of the respondents in this study was random sampling. Total population red onion farmers in Banyu Anyar village were 250 farmers. The number of respondents were taken in this research is 14% of the total population that are 35 farmers. According Taken in Hidayat (1989) that 10% of the population is considered sufficient units.

The data used in this study are primary data and secondary data. The primary data obtained by interviewing the farmers according to the questionnaire. While the secondary data obtained from government office such as District Office and the Agriculture Department.

The analysis method frontier production function is used to determine the efficiency of the use of production factors on red onion farming. The analytical software used in the study was 4.1 software frontier. The equation formula used in the frontier production function is:

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 \ln X_9 + \beta_{10} \ln X_{10} + \beta_{11} \ln X_{11} + v_i - u_i$$

Where:

- Y: Production (Kg)
- B₀: Constanta
- β₁: Elasticity production time-
- X₁: Land Area (m²)
- X₂: Seed (Quintal)
- X₃: Urea (Kg)
- X₄: ZA (Kg)
- X₅: SP-36 (Kg)
- X₆: KCl (Kg)
- X₇: Phonska (Kg)
- X₈: Furadan (Lt)
- X₉: Ustation (Lt)
- X₁₀: Antracol (Lt)
- X₁₁: Labor (Work day)
- V_i: *a symmetric, normally distributed randim error*
- U_i: *one-side error term (U_i ≥ 0)*

In the measurement of the level of technical efficiency mathematically using the following equation:

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

TE value is between zero to one. A value of 1 indicates full efficiency in the use of production factors. Hypothesis testing is done by the use value Likelihood Ratio (LR). The formula 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

To calculate technical inefficiency in this research then using the following formula equation:

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

Where:

- μ_i: Technical inefficiency Efect
- Z₁: Age
- Z₂: Education
- Z₃: Number of Family

RESULTS AND DISCUSSION

In a research using frontier production function using a software analysis tool frontier 4.1 performed two phases: the first using the OLS and the second stage using the MLE method. Based on this research, the data obtained is presented in Table 1.

According to the table above the value of gamma (γ) of 0.99 or 99% with a 10% significance level . This suggests that the variation in the model error nuisance caused by technical efficiency in the use of the production function red onion farming. In the sigma squared value (σ) is shown at 0.0098, it means that any use of the production function variables there are significant efficiency techniques in the model . LR value test was used to test the hypothesis. Based on the table above the LR test value of 9.8, while the value of 1.642 means the table LR test is greater than the table so that it can be said that any use of

variable inputs in the production process have a level of technical efficiency . Therefore this indicates that each red onion farmers located in the village of Banyu Anyar 100% already full efficiency.

Based on the results of the analysis of stochastic frontier production function, the real impact on red onion production are land area, seed, fertilizer Za, SP - 36, Phonska and Furadan.

Table 1 – Results Analysis of Stochastic Frontier Production Function

Variable	Parameter	Coefficient	Standart Error	t-ratio
Intersep	β_0	0,12	0,74	0,16
Ln X ₁ (Land Area)	β_1	0,1	0,07	1,71*
Ln X ₂ (Seed)	β_2	0,11	0,09	1,83*
Ln X ₃ (Urea)	β_3	-0,11	0,07	-1,59
Ln X ₄ (ZA)	β_4	0,02	0,08	1,81*
Ln X ₅ (SP-36)	β_5	0,15	0,11	1,75*
Ln X ₆ (KCI)	β_6	0,09	0,16	0,58
Ln X ₇ (Phonska)	β_7	0,2	0,08	2,49*
Ln X ₈ (Furadan)	β_8	0,12	0,04	3,15*
Ln X ₉ (Ustation)	β_9	-0,17	0,05	-3,32
Ln X ₁₀ Dursban)	β_{10}	0,08	0,07	1,17
Ln X ₁₁ (Labor)	β_{11}	0,43	0,13	0,33
Sigma Squared	σ	0,0098	0,02	5,82
Gamma	γ	0,99		
Log likelihood function		54,632815		
LR test of the one sided error		9,8085914		

* Significance Level 10%
T. Table 10% = 1,690924198

Here is the interpretation of each variable function red onion production:

Land Area. According to Table 1 above, land area has a coefficient 0.1 or 10%. This indicates that each additional one percent of the land area will increase red onion production by 10 units with other variables held constant. Level of significance in the variable land area can be viewed by using the t value then compared with the value t table. T value in the variable land area is greater than the value t table. It can be seen that t for the variable land area of 1.71 while t table of 1.69 means that the variable can be said to be statistically significant.

Variable land area that has a significant influence and positive, it is based on that the intensiveness of land preparation using natural resources and human resources that are more experienced are factors that can increase the production of red onion.

Seed. Seeds have a positive relationship, it can be seen in the coefficient value is 0.11 or 11%. Therefore the increased use of seed by 1% in the production process will increase production by 11 units with other variables held constant. In statistics can be seen by comparing the value of t arithmetic with t table. If t is greater than the t table means these variables can be said to be significant. Table 1 shows that t the variable seed value greater than t table at a significance level of 10%. Therefore it can be concluded that the variable seed has a significant effect on the level of red onion production .

Red Onion farming activities in the village Banyu this new uses “Bali djo” varieties planted in the dry season and “Beuj” varieties suitable planted in the rainy season. This is an indication that seed in red onion production is influence significantly.

Urea Fertilizer. The coefficient on the variable level of urea fertilizer has a negative value 0.11 or 11%, which means an increase in variable urea at 1% will be decrease red onion production by 11 units, when other variables held constant. The statisitics shows that variable urea fertilizer did not significantly affect the production of red onion. This is indicated by the t value is smaller when compared with a negative value.

Shortage of the use of urea fertilizer which occurs the area could make the decreased production of red onion. Scarcity and high price of urea fertilizer causing farmers reduce the use of dose in red onion production activities. This is the reason why the variable has a negative value and does not significantly affect production.

Za Fertilizer. Based on the table above variables Za fertilizer has a positive relationship with the production of red onion. This variable coefficient value is 0.02 or 2%. Therefore, each additional 1% Za fertilizer will increase production by 2 units of the other variables considered *ceteris paribus*. Statistical variables Za fertilizer has a significant effect on the production, this can be explained by comparing the value of t greater value t table.

The average dose use of fertilizer Za is 220 kg per ha. This is the recommended dose has been given by the agricultural instructor. This is the reasons, that make this variable real influence and have positive relationships.

SP-36 Fertilizer. The value of SP-36 fertilizer coefficient is 0.15 or 15% means that each additional 1% SP-36 fertilizer can increase red onion production by 15 units, while other factors being equal. Statistically SP-36 fertilizer variables significant at 10% significance level, this is because the value of t is greater than the value t table.

The right using of fertilizer at the recommended dosage according to what has been given by the instructor make SP-36 fertilizer has influence in increasing the production of red onion in the village Banyu Anyar.

KCl Fertilizer. The use of KCl in red onion farming activities showed a positive coefficient is 0.09 or 9%, which means that each additional 1% KCl will increase red onion production by 9 units, while other variables held constant. Meanwhile KCl variable t has a value greater than the value t table therefore make the real impact on the production of red onion.

Phonska Fertilizer. The use of Phonska fertilizer positively effect the significance level of 10%. Phonska fertilizer coefficient values is 0.2 or 20%, which indicates that each additional 1 percent Phonska fertilizer will increase production by 20 units. While it can be seen the t value for Phonska Fertilizer is 2.49 greater than the value t table at a significance level of 10%. This is shows that Phonska fertilizer significantly affected the production of red onion.

Red Onion farming activities need to combine the use of fertilizers with the right dose has been recommended. It is quite an important role in increasing production and health of the plant to produce high quality products.

Furadan Pesticides. The coefficient on the variable pesticide Furadan has a positive value 0.12 or 12%, which means that each additional 1% of Furadan pesticides will increase by 12 units organic rice productions, while other variables held constant. The use of Furadan pesticide really impact on organic rice production. It is based on the value of t is greater than the value t table at a significance level of 10%.

Ustasion Pesticides. In Table 1 above shows that ustasion pesticides not significantly affect the production of red onion. The coefficient on this variable has a negative value 0.17 or 17%, which means that each additional 1% ustasion pesticides, will decrease by 12 units organic red onion productions, while other variables held constant.

The average use of ustasion pesticides is 18.5 liters applied to plant onion every 2-3 days. The high implementation of Ustasion pesticides can damage plants and animals or god predator for the plant will die. Therefore, excessive use can reduce the production of red onion.

Dursban Pesticides. Dursban pesticide production function has a positive value 0.08 or 8%. This shows that the addition of dursban pesticides 1% will increase 8 units of red onion production, while other variables held constant. According to statistics dursban pesticides variables did not significantly affect the production of red onion. This is shown by the t value smaller than the value t table at a significance level of 10%.

Red Onion farmers need to increase the dose of pesticide use and the right application therefore pest and diseases can be controlled.

Labor. Participation and the use of labor are needed in the production process red onion farming. The labor force usually comes from within and outside the family. Based on the results of stochastic frontier production function analysis showed that the labor coefficient is 0.43 or 43%, its means that for every 1% increase workforce will increase production by 43 unit, while other variables being equal. Meanwhile statistical t value smaller than the value t table. It is clear that labor did not significantly affect the production of red onion.

Red Onion crop on farming activities are highly vulnerable to pests and plant diseases that required a lot of labor and productive labor. A phenomenon that occurs in the area of research is the lack of manpower in the farming activities and the use of labor is less productive, it is causing these variables did not significantly affect the production of red onion. This resulted in the plant maintenance intensiveness is becoming less and will affect the production of red onion.

Table 2 – Distribution Statistics Technical Efficiency Achieved On Organic Rice Farming in Sumber Pasir

No.	Statistics	Efficiency Level
1.	Average	0,926
2.	Minimum	0,713
3.	Maximum	0,99

The average level of technical efficiency of red onion in the village Banyu Anyar at 0.926. This shows that farmers are still having an opportunity to increase red onion production as much as 0,074 or 7.4%.

Factors that affect the level of technical inefficiency use of production factors used by farmers can be seen as follows:

Table 3 – Results of the analysis Level Technical Inefficiency

Variable	Parameter	Coefficient	t-ratio
Intersep	δ_0	0,11	0,35
Z ₁ (Number of Family)	δ_1	0,19	0,85
Z ₂ (Education)	δ_2	0,22	0,19
Z ₃ (Experience)	δ_3	-0,22	-0,49
Z ₄ (Age)	δ_4	-0,11	0,26

Based on the table above shows that the number of families positively effects the level of technical inefficiency. The growing number of families in the production of red onion make increasingly inefficient in the use of production inputs. This is because farmers will be more careful in the use of technology, that make farmers avoided of the loss that can effect domestic life. Length of education variable has a positive effect on the level of inefficiency red onion organic farming. While the practice variable negatively affect the level of technical inefficiency. The longer the experience will increasingly inefficient farmers in their farming activities. While the variable age has a negative effect means that the increasing age will make the increasingly inefficient farmers in farming activities. This is because farmers are more mature in thinking and acting on red onion farming activities

CONCLUSION AND SUGGESTIONS

The Conclusions from this research are variables that significantly affect red onion production are land, seed, Za fertilizer, SP - 36 fertilizer, Phonska fertilizer and Furadan pesticide. The average level of technical efficiency of use of factors of production is 0.926, therefore farmers still have a chance to achieve full efficiently by 0,074 or 7.4% . While the factors that have a positive influence on the level of inefficiency are family number and length of education.

Suggestions in this research are farmers need to intensify and combine the use of production functions that significantly and appropriately apply in plants, therefore the production of red onion can be increase. To achieve full efficiency and control the level of inefficiency in red onion farming field school needs to be done, therefore farmers obtain agricultural activity systems and the cultivation of innovative technologies by agricultural instructor.

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