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Analysis of Appropriate Technology Implementation in Efforts to Increase Rice Paddy Production in Cialam Jaya Village, Konda Sub-district

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Abstract

This study aims to analyze the efficiency level of the application of appropriate technology in increasing the production of paddy rice in Cialam Jaya Village, Konda District. Population is a generalization area consisting or objects/subjects that have certain quantities and characteristics set by researchers to study and then draw conclusions (Sugiyono, 2016). The population in this study was a group of rice farmers in Cialam Jaya Village, South Konawe Regency, totaling 20 farmers. Data analysis used is regression analysis with the Cobb-Douglas production function model to determine the effect of X on Y, using the Program for Social Science (SPSS). While to determine the level of efficiency in this study we use the Frontier program. technically this study has been fairly efficient where the smallest estimated efficiency value is 0.736 or 73% and for the largest value is 0.958 or 96%. This can be considered efficient if the value is > 0.7 in the form of a percentage of 70%.

Keywords: Technology, Production, Efficiency

INTRODUCTION

Indonesia is an agricultural country where the agricultural sector plays an important role in the overall national economy. This can be shown by the large number of people who work in the agricultural sector (Aninsi, 2021). One of the agricultural sectors that provides a source of livelihood for the people of Indonesia is rice paddy farming (Handayani *et al.*, 2018).

Rice is a very basic food crop that is consumed by the Indonesian people every day. The

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need for rice is so high that the price of rice at the farm level is very low but in the market the price of rice is very high. The prices of fertilizers, pesticides and seeds are uncertain so that the production costs incurred are very large. Sometimes the net income earned is lower than the costs incurred so that many farmers have a low economic level (Listiani, 2019).

The use of technology at this time supports farmers' activities in harvesting. Currently, getting labor is decreasing, because at a productive age farmers do not want to work as farmers but prefer to work in the building sector and work in the city. The location of the research conducted the distance to the city is not too far and the road access is smooth, so that farmers of productive age choose other work than as farmers (Amirullah, 2016).

Cialam Jaya Village is one of the villages in South Konawe Regency and is located in Konda District, Southeast Sulawesi Province, which has a land area of 19.32 km^2which is occupied by residential areas, plantations, and rice fields. The livelihoods of Cialam Jaya villagers are mostly farming and gardening. In other words, the natural resources owned are the results of rice fields and gardening (Hasdiansyah *et al*., 2022). For all the rice fields in Cialam Jaya Village, which is approximately 200 ha, where in 2010 before the technology the average yield of paddy rice was 2-3 tons/ha. And in 2020 to 2023 the increase in yields was able to grow up to 5-7 tons/ha. The technology used in the effort to increase the yield of paddy rice is as follows:

Table1 Technology Used in Rice Paddy Production in Cialam Jaya Village, South Konawe Regency

No.	Name of Tool	Number of Units	Percentage (%)
1.	Tractor (Tr2)	1	4
2.	Jonder (Tr4)	1	4
3.	*Combine Harvester*	4	15
4.	*Blower*	20	77
	Total	26	100

Source: Chairman of Gapoktan Cendana Jaya Cialam Jaya Village

With the implementation of the technology in Table 1, it was able to produce an average productivity of 5-7 tons/ha of paddy rice. In this case the researcher wants to know how efficient the application of technology is in the production of paddy rice, by compiling a study entitled "Analysis of the Implementation of Appropriate Technology in Efforts to Increase Paddy Rice Production in Cialam Jaya Village, Konda District". The purpose of this study is to determine the application or implementation of appropriate technology in an effort to increase the production

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of paddy rice in Cialam Jaya Village, South Konawe District.

METHOD

This research was conducted in Cialam Jaya Village, Konda Subdistrict from January 2024 to March 2024. The location of this study was determined *purposively* with the consideration that this area is one of the production of paddy rice. South Konawe Regency is one of the regions in Southeast Sulawesi Province which is the center of paddy rice production.

The population in this study was a group of rice paddy farmers in Cialam Jaya Village, South Konawe Regency, totaling 20 farmers who were taken by saturated sampling method. Data collection techniques were carried out by observation at the research site, interviews using a list of questions in the form of questionnaires, and literature. The analysis techniques used in this study are:

- To find out how the application of production technology in rice paddy farming in Cialam Jaya Village, South Konawe Regency, the descriptive data analysis technique will be used to determine the description or distribution of sample or population data in the research area. The data obtained will be tabulated and described descriptively.
- To determine the level of efficiency of the application of appropriate technology in increasing the production of paddy rice in Cialam Jaya Village, stochastic frontier production function analysis with Maximum Likelihood Estimation (MLE) method based on Cobb-Douglas assumption is used. Analysis of technical efficiency and inefficiency factors was conducted simultaneously using Frontier and SPSS programs to measure input efficiency as well as internal and external factors that affect it. In this rice farming, the *Cobb-Douglass* production function model was used which was transformed into a natural logarithm linear form, as follows:

  $Ln\ Y = ln\ \beta 0 + \beta 1\ ln\ X_1 + \beta 2\ ln\ X_2 + \beta 3\ ln\ X_3 + \beta 4\ ln\ X_4 + \beta 5\ ln\ X_5 + (vi - ui)$

  Description:

  Y = rice paddy production (kg)
  $\beta 0$ = intercept
  βi = regression coefficient (i=1 to 5)
  $X_{(1)}$ = land area (ha)
  X_2 = amount of rice seed (kg)
  $X_{(3)}$ = amount of fertilizer (kg)
  X_4 = amount of pesticide (lt)
  $X_{(5)}$ = amount of labor (HOK)

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Vi = error caused by things that are not mastered by the farmer
Ui = the effect of technical inefficiency (error controlled by the farmer).

In this study, the measurement of technical efficiency from the input side is used, which is the ratio of the input or cost of the *frontier* to the input or cost of the observation. To get the value of technical efficiency achieved by the i-th observation at the t-th time in production efficiency research, it is known by the following formula (Battese & Coelli, 1995):

$ET = YY^*=E(Yi|Ui, Xi)/E(Yt|\ Ui=0, Xi) = E[exp(-Ui) / \varepsilon_i]$

Where:
Eti = technical efficiency of the i-th farmer
Y = actual production
Y* = potential production
Value $0 \leq ET \leq 1$

The value of ET is between zero and one, the closer to the value of one, the more technically efficient the farm and vice versa. The efficiency index value of the analysis results can be categorized as: a) inefficient if the value is < 0.7 and b) efficient if the value is ≥ 0.7 (Sumaryanto, 2001).

RESULTS AND DISCUSSION

Application of Production Technology in Cialam Jaya Village

The application of production technology in Cialam Jaya Village from 20 respondents, most farmers rent from the surrounding community and only a few farmers use their own technology. For the application of production technology during land management such as tractors from 20 respondents, most respondents rented from people around the area. While the production technology during harvesting used in Cialam Jaya Village is generally *Combine Harvester*.

Table 2 Variable Costs

Variable	Type	Number of Respondents	Percentage (%)
Seed	Impari 42	7	35
	Impari 32	5	25
	MR 219	3	15

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	CL 220	4	20
	PADI ACL	1	5
Fertilizer	Urea	20	100
	Npk Phonska	20	100
Pesticides	Spontaneous	20	100
	Dangke	20	100
	Amistartop	20	100
	Manohara	10	50

Source: Primary data processed, 2024

Based on table 2 above, the variable costs in this study can be explained as follows;

1. That the use of seeds of respondent farmers in Cialam Jaya Village varies, some of which use impari 42, impari 32, mr 219, cl 220 and acl rice. However, of the 5 types of seeds, the seeds that are more widely used by respondent farmers are impari 42 seeds as many as 7 people with a percentage of 35%.
2. That the use of fertilizer respondent farmers in Cialam Jaya Village there are various 2 types, with the same percentage. Based on field research that respondent farmers use two types of fertilizer, namely urea fertilizer and NPK fertilizer. Urea fertilizer is a single type of fertilizer that has a nitrogen element that can accelerate plants while NPK fertilizer is used to increase plant resistance, both types of fertilizer are easily found in the market.
3. That the use of pesticides most widely used by respondent farmers are pesticides Spontan, Dangke, and Amistartop with a percentage of 100%, for Pesticide Manohara has a percentage of 50%.

The use of labor of respondent farmers is divided into 2, namely: the use of labor within the family and the use of labor outside the family. In Cialam Jaya Village, some farmers have now used a fairly small amount of labor due to the application of technology which has now saved time, reduced the amount of labor and reduced the high level of risk.

Efficiency Level of Appropriate Technology Application in Increasing Production

Model testing in regression analysis is carried out to see several values, namely the correlation coefficient (*R*), the coefficient of determination (R2), and the *F* value. *The R* value shows the closeness of the relationship of the independent or independent variable (*X*) to the independent variable (*Y*), the R2 value shows the level of fit of the model and the *F* value to see and know the effect of the independent variable (*X*) simultaneously or together on the dependent

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variable (*Y*). *R* and R2 values can be known through variant analysis and the *F* value is known based on the *F* test in the SPSS program at the 95% confidence level or α = 0.05%. *R* value, R2 and *F* value.

Table 3 Adjusted R Square Results on the Regression Model

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	. 902[a]	0. 813	0.746	2.581

Source: Primary data processed, 2024

In Table 3, the *Adjusted R Square* value is 0.746 or 75% of the production of paddy rice in the study area can be explained by variables of land area *(X_1)* , seeds (X_2), fertilizer area (X_4), pesticides (X_6), labor ($X_{5)}$, and production (*Y*).

Table 4 F Test Results on Regression Model

Model		*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
	Regression	404.932	5	80.986	12.157	.000[b]
	Residual	93.266	14	6.662		
	Total	498.198	19			

Source: Primary data processed, 2024

Based on Table 4 seen from the probability level shows that the probability value of 0.000 is smaller than the significant level of 0.05, it can be concluded that the variable land area (X_1), seeds (X_2), fertilizers (X_3), pesticides (X_4) and labor (X_5) together have an effect on the amount of production (*Y*). Independent variables have a positive effect on increasing the amount of grain production.

Table 5 T Test Results on Regression Model

No	Variable	*Regression Coefficient*	T count	*Prob. Sig.*
1	Constant	-1.400	-.836	0.471
2	Land Area	-.033	-.434	0.671
3	Seeds	-.172	-.421	0.680
4	Fertilizer	.105	.765	0.457
5	Pesticides	-3.869	-2.282	0.039
6	Labor	2.721	2.596	0.021

Source: Primary data processed, 2024

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Table 5 through multiple linear regression testing using the SPSS program the regression equation is as follows:

$$Y = -1.400 + -0.033\ X_1 + -0.172\ X_2 + 0.105\ X_3 + -3.869\ X_4 + 2.721\ X_5$$

The coefficient (constant) value of -1,400 means that if the Land Area ($X_{1)}$, Seed ($X_{2)}$, Fertilizer ($X_{3)}$, Pesticide ($X_{4)}$ and Labor (X_5) value is 0 or constant then the production of Milled Dry Grain (Y) value is -1,400.

1. Land Area ($X_{1)}$, in normalization Land area can be said to be normal with a significant value of 0.671. But it cannot be said to have an effect on grain production because the significant value is greater than the real level (0.05), this means that the land area has no significant effect on grain production. Land area has a coefficient value of -0.033, meaning that every increase of 1 hectare are (Ha) of land area, the production decreases by -0.033/kg. The decrease in productivity with an increase in land area is caused by various factors such as soil fertility and texture. Thus, even with a small land area, if the soil is fertile and suitable for agriculture, productivity can remain high (Fatmawati, et. al., 2023).
2. Seeds ($X_{2)}$ showed a negative influence on grain production. The regression coefficient of seed is -0.172 with a significant level of 0.680. Where the significant value is greater than the real level (0.05), this means that the seed has no significant effect on grain production. The direction of the coefficient is negative, this means that every additional 1 kg of seeds, the production decreases by -0.172 / kg. The use of fertilizers that are not in accordance with the dosage can reduce land productivity so that production decreases. To reduce the decline and increase the productivity of sustainable results, it is necessary to use adequate organic fertilizer in terms of quantity, quality, and continuity (Hartatik *et al.,* 2015).
3. Fertilizer (X_3) has a coefficient value of 0.105 every increase of 1 kg of fertilizer, the production increases by 0.105 / kg. Where the significant level is 0.457, the significant value is greater than the real level (0.05), this means that seeds do not have a significant effect on grain production. This research is relevant to research conducted by Fatimah *et al.* (2017) showed that the use of fertilizer showed a significant effect on productivity conducted in Tanahmea Village, Banawa District, Donggala Regency. The results of this study are in accordance with the results of interviews with one of the wet-rice farmers in Cialam Jaya Village, Konda Subdistrict, South Konawe Regency who stated that in carrying out wet-rice farming activities, the use of balanced fertilizers according to the recommendations greatly affects the production of each hectare, further stating that the

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use of fertilizers will be different from the results of other farmers who do not use fertilizers.

4. Pesticide (X_4) has a coefficient value of -3.869 with a significant level of 0.039. Where the significant value is smaller than the real level (0.05), this means that pesticides have a significant effect on grain production. The negative coefficient value means that every addition of 1 liter of pesticide, resulting in a decrease in production by -3.869 / kg. Pesticides are chemicals that can be used to kill or control various pests. When farmers want to increase production, they use pesticides to reduce pest and insect attacks on their farms (Mahyuni, 2015). Pesticides are used in various fields and activities, ranging from households, medicine, agriculture, and many more. Besides their benefits, pesticides can also poison and destroy other living things such as plants, insects, animals, and humans. This is because most of the active ingredients of pesticides do not have a specific toxic effect so that they have an impact on target and non-target organisms, humans, and the environment and ecosystem as a whole (Pamungkas, 2017).
5. Labor (X_5) showed a positive influence on grain production. The regression coefficient of labor is 2.721 with a significant level of 0.021. Where the significant value is smaller than the real level (0.05) this means that labor has a significant influence on grain production. The positive coefficient direction means that every additional 1 labor (HOK), the production increases by 2.721/kg. Labor consists of labor force and non-labor force. The labor force is the entire population aged ten years and over who have the most activities working and looking for work (Cahyo 2020).

Table 6 Technical Efficiency

Farm	Year	*eff.-est.*
1	1	0.958
2	1	0.907
3	1	0.736
4	1	0.941
5	1	0.817
6	1	0.866
7	1	0.752
8	1	0.752
9	1	0.906
10	1	0.866

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11	1	0.780
12	1	0.752
13	1	0.907
14	1	0.866
15	1	0.752
16	1	0.866
17	1	0.866
18	1	0.817
19	1	0.866
20	1	0.941

Source: Primary data processed 2024

Based on Table 6 Technical efficiency is measured for each production unit in this case the *farm* amounted to 20, where the smallest estimated efficiency value is 0.736 or 73% and for the largest value is 0.958 or 96%. This can be considered efficient if the value is > 0.7 in the form of a percentage of 70%.

According to Sumaryanto (2001) that a farm is said to be efficient if the technical efficiency index value is > 0.7 and not efficient if the value is < 0.7. Based on Table 4.13 for *farms* 1-20 the value of technical efficiency can be said to be efficient.

CONCLUSION

From the description above we can conclude that the application of technology in increasing the production of paddy rice in Cialam Jaya Village, Konda District, Konawe Selatan Regency . There are 2 variables that have a significant effect on the production of paddy rice, namely pesticides (X_4) and labor (X_5) . While technically this research has been fairly efficient where the smallest estimated efficiency value is 0.736 or 73% and for the largest value is 0.958 or 96%. This can be said to be efficient if the value is > 0.7 in the form of a percentage of 70%.

Based on the results of research and conclusions, the advice that will be related to the application of technology in increasing the production of paddy rice is that farmers who already understand about technology need to increase their knowledge and help other farmers in the effort to apply technology.

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