

## Factors Influencing Technical Efficiency of the Rice (*Oryza sativa*) Farming

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### ABSTRACT

*Increasing production and productivity, primarily done in the rice production centers, is the main focus to reduce the rate of rice imports in Indonesia. Measuring technical efficiency and analyzing factors influencing of rice farming is important in order to achieve maximum production and to obtain maximum profits. This study aims to determine the level of technical efficiency of rice farming analyze factors affecting rice farming. The research location was chosen purposively in Kedungadem, Kalitidu, and Kapas Districts with a sample of 150 rice farmers using simple random sampling. The analytical methods used Data Envelopment Analysis (DEA) with the Variable Return to Scale (VRS) model to measure technical efficiency, while tobit regression analysis to identify factors affecting technical efficiency, and farm income analysis. The research results indicate that the factors significantly affecting technical efficiency are land size, level of formal education, farming experience, and land ownership status. The technical efficiency level of rice farming in the study areas, assessed using the DEA approach under the VRS assumption, was classified to be moderate efficient. However, rice farming in the study sites can be considered as profitable.*

## 1. INTRODUCTION

The agricultural sector is one of the most crucial sectors for Indonesia's economy, contributing the second highest share after the industrial sector, with a 13.19% contribution to the GDP of the business field sector (Juhandi *et al.*, 2021). Additionally, the agricultural sector is a significant source of foreign exchange, with exports reaching 3.613 million USD in 2019 (Badan Pusat Statistik, 2022). Over the past two years, Indonesia's agricultural sector has experienced positive growth, enabling it to serve as an economic cushion amidst the complexities of the pandemic, extreme climate changes, and global geopolitical tensions (Indrawati *et al.*, 2024). The resilience of the agricultural sector has been further tested by the threat of the El Nino crisis, yet it managed to maintain the rice supply throughout this crisis (Simanjuntak & Erwinsyah, 2020). Despite various challenges and obstacles, Indonesia's agricultural sector has shown positive performance with a GDP growth of 2.33% in 2022 (year-on-year) and 14.28% in the second quarter of 2023 (quarter-on-quarter). Moreover, Indonesia also achieved a surplus in agricultural product trade, with a trade surplus of Rp 275.15 trillion in 2022 and agricultural product exports amounting to Rp 258.46 trillion during January-June 2023, resulting in a surplus of Rp 74.35 trillion (BPS, 2022).

Rice (*Oryza sativa*), grown in tropical and subtropical countries, is a strategic agricultural commodity with the highest production quantity worldwide. With a production of 34 million metric tons of white rice, Indonesia ranks fourth in the world after China, India, and Bangladesh. Key provinces driving rice agriculture in Indonesia include Java (East, Central, West), South Sulawesi, and South Sumatra. According to BPS (2024), East Java is among the largest rice producers in Indonesia, with harvested area of 1.69 million ha and rice production of 9.53 million ton, contributing 17.4% of the national rice production. However, rice productivity in East Java has tended to decline during period of 2021-2023, with an average decrease of 0.71% per annum.

Bojonegoro is one of the major rice production centers in East Java and Indonesia. Although East Java has the largest harvested area, its productivity has fluctuated and tend to decline in recent years. Therefore, increasing rice productivity, especially in the production centers like Bojonegoro, is essential to boost national rice production. This research is crucial given Bojonegoro role as a key rice production center in Indonesia, as improving productivity and technical efficiency of rice farmers in this region will significantly contribute to enhancing national rice production.

To meet the growing national rice demand in line with population growth, increasing rice production and productivity is essential, particularly in production centers. This is vital to reduce dependency on rice imports. Efforts to increase rice production and productivity must be accompanied by improvements in agricultural efficiency, particularly technical efficiency. Technical efficiency can be analyzed using the Data Envelopment Analysis (DEA) method, which measures the allocation of inputs by each farmer to maximize output production. DEA demonstrates relative efficiency, meaning the efficiency of farmers compared to others who use inputs more efficiently.

According to BPS data, the harvested rice area in East Java in 2022 was approximately 10.45 million hectares, an increase of 0.39% compared to the previous year. Despite the increase in harvested area, rice productivity in several production centers like Bojonegoro has declined. Therefore, the strategic focus on increasing rice production should be directed towards enhancing productivity.

Efforts to increase production and productivity, particularly among farmers, must be accompanied by agricultural efficiency, one of which is technical efficiency (Asmara & Hanani, 2017). According to Floperda & Wanda (2015), farm management is the study of how to determine, allocate, coordinate, and organize the use of available resources effectively and efficiently so that the income generated by farmers is higher. Tama *et al.* (2014) argue that farming activities are the science of allocating available resources to meet the needs of farmers to maximize profits. Tahir *et al.* (2010) mention that all farming activities are inseparable from the inputs used. Thus, production factors significantly influence farming activities to achieve the highest output. According to Surtiyah (2011), farm management is a field of scientific research that studies how an individual organizes and coordinates production factors such as land and the surrounding environment as capital to achieve the best possible profit. Therefore, the objective of this research is measuring technical efficiency and analyzing factors influencing of rice farming, because it's important in order to achieve maximum production and to obtain maximum profits.

## 2. METHODS

This study was conducted in Bojonegoro Regency, East Java, which was selected purposively because it is the second largest rice production center in East Java in terms of harvest area, production quantity, and productivity. Kedungadem, Kalitidu, and Kapas Sub-districts were chosen because they are among the five regions with the largest harvest areas. The sampling method used was simple random sampling, which provides each member of the population an identical chance of being selected as a sample (Beins & McCarthy, 2012). The sample size determination was done using the slovin formula. The total number ( $N$ ) of rice farmer in Kalitidu Village, Kapas Village, and Kedungadem Village was 654 people. The sample size ( $n$ ) was determined using the Slovin formula with error rate ( $e$ ) of 5%, resulting in 150 farmers from Kedungadem, Kapas, and Kalitidu villages.

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

The type of data used in this study was cross-sectional data, which includes primary and secondary data. Primary data was acquired through direct observations and interviews with rice farmers in the research location, while secondary data was collected from relevant agencies such as the Central Statistics Agency, the Ministry of Agriculture, the Department of Agriculture, and the Food and Agriculture Organization.

Data analysis was carried out using several methods. First, technical efficiency (TE) was evaluated using Data Envelopment Analysis (DEA) to measure the use of inputs including land area, rice seeds, fertilizers (N, P, K, and S), pesticides, and labor, against output (rice production) assuming the Variable Return to Scale (VRS) for non-optimal operation scales (Asmara & Hanani, 2017). Second, factors affecting the technical efficiency were evaluated using the tobit regression model, which considers farmers' age, number of dependents, farming experience, formal education level, land area, and land ownership status. Finally, cost, revenue, and income analysis was conducted to measure the

total farming costs (Surtiyah, 2011), total revenue, which is the product of production obtained and selling price (Agustina, 2001), and net farming income, which is the difference of total revenue and total costs incurred in the rice production process (Sukirno, 2002) of rice farmers in the research location. Based on several previous studies, the technical efficiency values of each Decision Making Unit (DMU) was classified into five categories: very low, low, moderate, high, and full technical efficiency (TE = 1).

### 3. RESULTS AND DISCUSSION

#### 3.1. Technical efficiency Analysis

Technical efficiency analysis was conducted using the DEA approach with input orientation and VRS assumption. This model approach is appropriate for this study because rice farming in the research location almost never reaches an optimal scale. According to Coelli *et al.* (2005), the DEA model assumes that the entities being evaluated use the same set of inputs to produce the same set of outputs. The data are positive, and the weights are restricted to positive values. This model assumes that ratio between input addition and output is not constant (VRS). This means that changes in a DMU input and output occur linearly, allowing for increasing returns to scale (IRS) as well as decreasing returns to scale (DRS) in efficiency values. Farmers in the DRS category show that an increase in inputs (land area, seeds, fertilizers, and labor) is not matched by a proportional increase in output. In other words, if farmers increase their inputs, the resulting increase in output is not proportional to the increase in inputs. Farmers in the CRS category experience a proportional change in output with a proportional variation in inputs. This means that if they increase their inputs, their output also increases in the same proportion. Farmers in the IRS category show that an increase in inputs results in a more than proportional increase in output. This means they benefit from economic scale, where using more inputs leads to a higher increase of output. The output variable used is rice production. The distribution of the production scale of rice farming is presented in Table 1. The input variables used are land area, rice seeds, fertilizer (N, P, K, and S), pesticides, and labors (both family members and hired labors).

Based on Table 1, it is known that the majority of respondent farmers are at the IRS production scale, with 113 farmers or 75% of all respondent farmers. Farmers producing with IRS indicate that the increase in output produced is greater than the increase in input used, while those experiencing constant/CRS production scale are 37 farmers or 25%, indicating that each addition of one unit of input will increase output by the same amount of input constantly (Amalo, *et al.*, 2012). Meanwhile, there are 0 farmers or 0% of all respondent farmers who are at the DRS production scale. This indicates that the increase in rice output is lower than the increase in production inputs. Based on data processing using DEAP version 2.1 software with the VRS model, technical efficiency levels are obtained. The distribution of technical efficiency for rice farming is shown in Table 2. Using the DEA VRS approach, the majority of farmers also achieved full efficiency with a value of 1.00, comprising 64 farmers or 43% of all respondent farmers. At the very low efficiency level, there were 24 individuals (16%), at the low efficiency level, 22 individuals (15%), at the moderate efficiency level, 34 individuals (23%), and at the high efficiency level, 6 individuals (4%). The mean value of the technical efficiency (TE) of rice farming in Bojonegoro Regency was 0.68 or 68%. This indicates that rice farming in Bojonegoro is categorized as inefficient and can still improve its efficiency by 32% to reach the maximum efficiency value in the research area. This is consistent with Tanjung (2003), which states that the efficiency index value from the analysis can be categorized as inefficient if it is  $\leq 0.7$  and efficient if it is  $> 0.7$ . Farmers who have not yet achieved efficiency in rice farming can refer to farmers who have been technically efficient.

Table 1. Distribution of farmers based on production scale

| Production scale                 | Number of farmers |     |
|----------------------------------|-------------------|-----|
|                                  | (people)          | (%) |
| Decreasing Return to Scale (DRS) | 0                 | 0   |
| Constant Return to Scale (CRS)   | 37                | 25  |
| Increasing Return to Scale (IRS) | 113               | 75  |
| Total Sample                     | 150               | 100 |

Source: Primary Data Processed, 2024.

Table 2. Distribution of technical efficiency in rice farming VRS model

| Efficiency Level  | Technical Efficiency Value | Number of Farmer | Percentage (%) |
|-------------------|----------------------------|------------------|----------------|
| Very low          | 0.100 – 0.299              | 24               | 16             |
| Low               | 0.300 – 0.499              | 22               | 15             |
| Moderate          | 0.500 – 0.699              | 34               | 23             |
| High              | 0.700 – 0.999              | 6                | 4              |
| Full efficiency   | 1                          | 64               | 43             |
| Total             |                            | 150              | 100            |
| <b>Mean TE</b>    |                            |                  | <b>0.68</b>    |
| <b>Maximum TE</b> |                            |                  | <b>1</b>       |
| <b>Minimum TE</b> |                            |                  | <b>0.135</b>   |

Source: Primary Data Processed, 2024.

In the context of DEA methodology, there is "slack," referring to how far a unit DMU is from its maximum efficiency. In DEA, units at the maximum efficiency point have zero slack, meaning they use all inputs optimally and produce maximum output efficiently. On the other hand, "inefficient" input slack refers to excess inputs used by a unit that do not significantly contribute to its output. This indicates that the unit is not using its inputs optimally. By analyzing and understanding inefficient input slack, a unit can identify areas for improvement to achieve higher levels of efficiency.

### 3.2. Factors Influencing Technical Efficiency in Rice Farming

In the DEA analysis, some farmers have not yet achieved technical efficiency. This may be due to influences from factors other than farmers' input usage. One of these factors is farmers' internal factors. To understand how internal farmer factors influence technical efficiency, a tobit regression analysis can be conducted. Tobit regression model has several advantages, such as determining the intensity of factors influencing technical efficiency in farming, examining the consistency of DEA results and identifying explanatory variables, and testing the influence of external variables on the production process both in terms of direction (sign) and significance (Cooper *et al.*, 2006).

The analysis of factors influencing rice farming technical efficiency aims to identify what factors make the use of production factors in farming efficient. In this study, the factors included in the tobit regression can be seen in Table 3. In analyzing the factors influencing technical efficiency in rice farming, the technical efficiency values obtained from the DEA calculation are regressed against several socio-economic variables determined using tobit regression. This regression model involves dependent and independent variables. The dependent variable is the value of technical efficiency ranging from 0 to 1, while the independent variables are socio-economic variables listed in Table 3. The results of tobit regression processing show that some variables significantly influence the technical efficiency of rice farming in Bojonegoro, including the land area, formal education level, farming experience, and land ownership status. The results of tobit regression analysis of rice farming in Bojonegoro Regency studied in Kedungadem Village, Kapas Village, and Kalitudu Village can be seen in Table 4.

Table 3. Distribution of factors influencing technical efficiency in rice farming in Bojonegoro

| Variable               | Mean  | Min  | Max | category                                              | Number of Farmer |
|------------------------|-------|------|-----|-------------------------------------------------------|------------------|
| Farmer age             | 43.14 | 20   | 70  | -                                                     | 150              |
| Farmer land area       | 0.646 | 0.06 | 5   | -                                                     | 150              |
| Number of dependents   | 2.94  | 1    | 4   | -                                                     | 150              |
| Formal education level | 7.5   | 0    | 12  | Elementary (6)<br>Junior High (9)<br>Senior High (12) | 150              |
| Farming experience     | 16.2  | 2    | 32  | -                                                     | 150              |
| Land ownership status  | 0.92  | 0    | 1   | Own (1)<br>Lease (2)                                  | 150              |

Source: Primary Data Processed, 2024.

Tabel 4. Summary of tobit regression analysis results about the technical efficiency of rice farming in Bojonegoro

| Variable                   | Coefficient | Probability<br>(Pr >  t ) |
|----------------------------|-------------|---------------------------|
| Farmer age                 | 0.0022      | 0.460                     |
| Farmer land area           | 0.6872      | 0.122**                   |
| Number of dependents       | -0.0028     | 0.508                     |
| Formal education level     | -0.0310     | 0.038*                    |
| Farming experience         | 0.0681      | 0.107**                   |
| Land ownership status      | -0.1537     | 0.039*                    |
| Pseudo R <sup>2</sup>      |             | 0.1102                    |
| *Significant at 5% level   |             |                           |
| **Significant at 15% level |             |                           |

Source: Primary Data Processed, 2024.

Table 4 reveals the results of tobit regression analysis regarding the influence of socio-economic factors on the technical efficiency of rice farming in Bojonegoro Regency. To determine the significance of each independent variables (socio-economic factors) and the dependent variable (technical efficiency), observations on Prob>|t| are required. Prob>|t| values for each variable indicate significance, where a Prob>|t| value smaller than  $\alpha = 5\%$  and  $\alpha = 15\%$  implies that the independent variables significantly affects the dependent variable. Conversely, if Prob>|t| is greater than  $\alpha = 15\%$ , then the independent variables insignificantly affect the dependent variable (Winarso *et al.*, 2021). The explanation of the tobit regression analysis results is as follows:

**Pseudo R<sup>2</sup>.** The coefficient of determination (R<sup>2</sup>) value of 0.1102 indicates that 11.02% of the variation of the technical efficiencies accomplished by farmers is influenced by changes in the independent variables included in the model, while the remaining 89.98% is influenced by other variables not included in the model.

**Partial Test.** Partial tests are conducted to determine if variables such as farmer age, land area, number of dependents, formal education level, farming experience, and land ownership status have a partial or individual effect on technical efficiency in rice farming. Partial tests are conducted by observing the probability values of each variable, whether they are below 0.05 (5% significance level) or 0.15 (15% significance level).

1. **Farmer age.** The regression coefficient value of the farmer age variable is 0.0022 and does not have a significant impact on the technical efficiency. The positive coefficient value indicates that the older farmers will have higher level of technical efficiency. This is related to research Fikadu & Mulatu (2023), that age has a positive effect on technical efficiency where older farmers have the potential to accumulate skills to manage farm resources like animal (cattle), equipment and labor to improve their efficiency. This is consistent with the field conditions because respondent farmers are in their productive age, implying they have a lot of experience in farming.
2. **Farmer land area.** The regression coefficient value of the land area variable is 0.6872 and is significant at  $\alpha = 0.15$  (15%). This is also consistent with research by Hidayah *et al.* (2013), where the land area variable significantly affects the technical efficiency. The positive sign of the land area variable indicates that farmers with larger land holdings are relatively more efficient compared to those with smaller land holdings.
3. **Number of dependents.** The regression coefficient value of the number of dependents variable is -0.0028 and does not have a significant impact on technical efficiency. The negative coefficient value indicates that an increase in the number of family dependents does not significantly affect technical efficiency in rice farming. The negative coefficient suggests that as the number of family dependents increases, technical inefficiency in farming also increases. This is related to Okello *et al.* (2019), that increasing size of household means more labor is available for agricultural production, which becomes relatively inefficient because in terms of labor use, productivity and internal efficiency are seen to increase when associated with the labor market outside of agriculture.
4. **Formal education level.** The regression coefficient value of the formal education level variable is -0.0310 and is significant at  $\alpha = 0.05$  (5%). The negative regression coefficient value indicates that the formal education variable decreases the level of technical efficiency. The higher the education level showed the capability of farmers to

captivate information technology and implement new technologies to develop their farming (Sularso & Sutanto, 2020). However, the education of respondents is low, with an average of only elementary or junior high school. The low level of education affects farmers' attitudes towards innovation and adoption of technology.

5. **Farming experience.** The regression coefficient value of the farming experience variable is 0.0681 and is significant at  $\alpha = 0.15$  (15%). The positive coefficient value indicates that farming experience can increase the level of technical efficiency. This is related to research Ambetsa *et al.* (2020), that high farming experience is associated with increased technical efficiency due to proficiency in agricultural production processes and therefore productivity can be increased. Because of the longer the respondents' farming experience, the more they can minimize risks due to their extensive experience in rice farming. The farming experience of respondents in the research area falls within the productive working ages.
6. **Land ownership status.** The regression coefficient value of land ownership status is -0.1537 and is significant at  $\alpha = 0.05$ . Land ownership status has a significant, negative correlation. This means that increasing land ownership can decrease farm efficiency. Hidayah *et al.* (2013) stated that land area affects technical efficiency significantly.

### 3.3. Analysis of Costs, Revenues, and Incomes

**Cost Analysis** The expenses incurred by farmers in one cropping season consist of fixed costs and variable costs. Fixed costs are expenses that farmers incur regardless of the amount of output produced. Variable costs are expenses that vary based on the output produced. Both fixed and variable costs together yield the total cost. According to Mankiw (2006), cost is something sacrificed to obtain what is desired, while according to Hernanto (1989), production costs are the costs incurred by farmers in the production process and bring it to fruition. Farming costs are influenced by the quantity of inputs used, input prices, labor, labor wages, and farming management intensity. Costs can be divided into fixed costs and variable costs. The total farming cost can be seen in Table 5. The explanation of Table 5 regarding the total cost of rice farming is as follows.

**Fixed Fixed costs**, according to Mulyadi (2009), are costs that remain constant at a certain level of activity. According to Carter (2009), fixed costs include all costs that is constant in total when business volume change (increases or decreases). This means that the amount of fixed costs does not depend on the quantity of production output. The fixed costs included in this study are land rental costs, land taxes, and equipment depreciation. The total fixed costs of rice farming can be seen in Table 6. The breakdown of fixed costs in the research area includes an average land rental cost of IDR3,000,000 per cropping season, land tax of IDR238,456, and equipment depreciation cost calculated at IDR511,276 per production period.

Table 5. Total rice farming costs

| Component           | Amount                |
|---------------------|-----------------------|
| Total Fixed Cost    | Rp, 3,535,651         |
| Total Variable Cost | Rp, 12,102,119        |
| Total Farming Cost  | <b>Rp, 15,637,770</b> |

Source: Primary Data Processed, 2024

Table 6. Total fixed costs of rice farming

| Component              | Amount (IDR) |
|------------------------|--------------|
| Land Rental            | 3,183,333    |
| Land Tax               | 238,456      |
| Equipment Depreciation | 113,862      |
| Total Fixed Costs      | 3,535,651    |

Source: Primary Data Processed, 2024

**Variable Costs:** According to Mulyadi (2009), variable costs are costs that change in proportion to changes in the level of activity. According to Garrison *et al.* (2006), variable costs include costs that proportionally change to fluctuations of production volume. This means that variable costs change according to the level of output produced or



the scale of production. The variable costs included in this study include seed costs (in kilograms), chemical fertilizer costs (including nitrogen, phosphorus, potassium, and sulfur fertilizers), medicine costs (in milliliters), and labor costs (in human days) paid based on production volume. The total variable costs in rice farming in Bojonegoro Regency. Based on Table 7, the total variable costs of rice farming in the research area are IDR12,102,119. This includes the total seed cost of IDR310,640, total chemical fertilizer cost of IDR6,759,840, medicine cost of IDR2,522,639, and labor cost of IDR2,509,000 per production period.

Table 7. Total variable costs of rice farming

| Component                | Usage | Average Price (IDR) | Total (IDR) |
|--------------------------|-------|---------------------|-------------|
| Seed (kg)                | 25.89 | 12,000              | 310,640     |
| Chemical Fertilizer (kg) |       |                     |             |
| - Nitrogen (kg)          | 97.15 | 15,500              | 1,505,773   |
| - Phosphorus (kg)        | 97.15 | 14,000              | 1,360,053   |
| - Potassium (kg)         | 97.15 | 13,500              | 1,311,480   |
| - Sulfur (kg)            | 92.23 | 28,000              | 2,582,533   |
| Medicine (ml)            | 1,939 | 1,301               | 2,522,639   |
| Labor (HOK)              | 50.18 | 50,000              | 2,509,000   |
| Total Variable Costs     |       |                     | 12,102,119  |

Source: Primary Data Processed, 2024

**Revenue Analysis:** Farmers' revenues consist of cash and non-cash receipts (Soekartawi, 2017). According to Shinta (2011), farming revenue is the product of the obtained yield and the selling price. Farming revenue is the product of the yield obtained and the selling price. The total revenue obtained by farmers is IDR31,026,000 per production period calculated by multiplying the average yield of 5,171 kg by the average selling price of IDR6,000 (Table 8).

Table 8. Total Farming Revenue

| Component                      | Amount     |
|--------------------------------|------------|
| Average yield (kg)             | 5,171      |
| Average selling price (IDR/kg) | 6,000      |
| Revenue (IDR)                  | 31,026,000 |

Source: Primary Data Processed, 2024

Table 9. Income analysis of rice farming

| Component   | Total (IDR) |
|-------------|-------------|
| Revenue     | 31,026,000  |
| Total Costs | 15,637,770  |
| Income      | 15,388,230  |

Source: Primary Data Processed, 2024

**Income Analysis:** The difference between revenue and all expenses incurred represents income (Soekartawi, 2017). To calculate farming income, all expenses and revenues during the farming period need to be known. According to Sukirno (2002), total farming income or net income is the difference between total revenue and total costs incurred in the production process. The average income received by rice farmers per cropping season can be seen in Table 9. The total average income obtained by rice farmers in the research area is IDR15,388,230. This is determined by the difference between the total revenue obtained of IDR31,026,000 and the total costs of IDR15,637,770 per cropping season. Therefore, rice farming in the research area, namely in Bojonegoro Regency, specifically in the villages of Kedungadem, Kapas, and Kalitudu, can be considered profitable.

**R/C Ratio:** The R/C (Revenue Cost Ratio) is determined by dividing revenue by total costs. With revenue of IDR31,026,000 and expenses of IDR15,637,770, the R/C ratio is calculated as 1.98. This means that for every one unit increase in costs, revenue will increase by IDR1.98. A value of R/C Ratio > 1 indicates that rice farming in

Bojonegoro Regency, particularly in the villages of Kedungadem, Kapas, and Kalitudu, can be considered efficient and profitable.

#### 4. CONCLUSION

Based on the research results and above discussion, some important point can be concluded:

1. **Technical Efficiency:** Rice farming in Bojonegoro Regency, through the Data Envelopment Analysis (DEA) approach with Variable Returns to Scale (VRS) assumption, has not yet reached optimal efficiency levels. The majority of farmers have not achieved full efficiency, with an average efficiency score of 0.68 or 68%. Improvements are needed in the use of inputs and outputs to enhance efficiency at each DMU.
2. **Factors Influencing Technical Efficiency:** Several significant factors affecting technical efficiency include farm size, level of formal education, farming experience, and land ownership status. However, farmer age and the number of dependents do not have a significant influence on efficiency.
3. **Profitability of Rice Farming:** Rice farming in Kedungadem, Kapas, and Kalitudu Villages in Bojonegoro Regency is considered profitable. This is indicated by the Revenue Cost Ratio (R/C) value of 1.98. The total income per hectare per planting season for farmers reaches IDR15,388,230, with fixed costs of IDR3,535,651 and variable costs of IDR12,102,119 per hectare.

Therefore, improvement measures can be directed towards enhancing technical efficiency while considering significant factors, and rice farming in the area can be regarded as a profitable investment.

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