ANALYSIS OF THE INFLUENCE OF PRODUCTION FACTORS ON THE PRODUCTION OF CASSAVA FARMING BUSINESS IN SALATIGA CITY

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ABSTRACT

Cassava farming in Salatiga City is a food-crop commodity farming business that has good opportunities because the demand for cassava in the market is increasing. However, some obstacles hinder cassava farming, namely cassava productivity which has not reached the target and limited production factors. This indicates that the use of production factors is still not efficient. Production factors that directly affect the productivity of cassava are land area, seeds, fertilizers, and labor. The aims of this study were: (1) to analyze the influence of production factors on cassava production, (2) to analyze the level of elasticity of cassava production factors, and (3) to analyze the level of technical efficiency and economic efficiency in cassava farming activities in Salatiga City. The analytical method used is the Cobb-Douglas production function with the help of the SPSS program to examine the influence of factors on cassava production and production elasticity. Technical efficiency is analyzed using the stochastic frontier production function. The results showed that the factors of seeds, manure, and labor were thought to affect cassava farming. The results of the elasticity analysis of all factors of production are in the rational area (Region II) with a positive value. The results of the technical efficiency analysis show that only the seed variable has a positive and significant value. Based on the results of the calculation of economic efficiency analysis, it shows that the input use of the land area, seeds, manure, and labor is not efficient.

Keywords: factors of production, cassava, Cobb-Douglas production function, elasticity
INTRODUCTION

Production of cassava farming is a brilliant opportunity because the demand for cassava in the market continues to increase. Increasing the productivity of cassava is faced with a problem, namely production factors. The production process leads a farmer to be able to analyze certain technologies and combine various production factors to produce a certain number of products as efficiently as possible. If the combination of factors of production is optimal, it will get efficient and maximum results.

The low production of cassava in Salatiga City is influenced by the technical efficiency of the use of production inputs by farmers. According to Saleh et.al (2016) the production of superior cassava varieties suitable for food is 22 – 100 tons/ha. Whereas for industry it ranges from 22 – 42 tons/ha. The use of production inputs is technically influenced by the use of the land area, seeds, fertilizers, and labor in the right amount or dose. According to (Anggraini et al., 2013) the average cassava farmer has not optimally allocated factors of production and their use is still not as recommended. The use of production inputs with the right amount or dosage will have an impact on the high or low value of technical efficiency (Lutfi & Baladina, 2018).

Productivity increase needs to be done through farming efficiency. Efficiency can be achieved by minimizing the resources needed to produce a certain output, or maximizing the output produced. Therefore it must be accompanied by efficient use of resources so as to increase productivity. Besides being influenced by the combination of the use of production inputs, the efficiency level of cassava farming is also influenced by the socio-economic characteristics of farmers who come from the farmers themselves. Some of the socioeconomic characteristics of farmers that become sources of inefficiency are age, farming experience, level of education, membership in farmer groups, and others. This will affect the managerial ability of farmers in cassava production so it will affect the efficiency level of cassava farming.

Based on the problems above, the objectives of this study are as follows:

1. Analyze the influence of production factors (land area, number of seeds, use of manure, and labor) on cassava production in Salatiga City.
2. Analyzing the level of elasticity of cassava production factors in Salatiga City.
3. Analyze the level of technical efficiency and economic efficiency in the use of production factors in cassava farming in Salatiga City.

RESEARCH METHOD

The research was conducted in 4 sub-districts in Salatiga City, namely: Argomulyo, Tingkir, Sidorejo, and Sidomukti. The selection of research sites was done purposively. The population used in this study were cassava farmers in Salatiga City who were members of farmer groups. The population of cassava farmers in Salatiga City is 180 people spread across 18 sub-districts in Salatiga City. To get a sample that describes the population, in
determining the sample in this study, the Slovin formula was used.

According to (Matakena, 2012) the Slovin formula is used to determine how many minimum samples will be needed if the population size is. If the degree of error used is 5%, it can be seen that the number of samples used is as follows:

\[ n = \frac{180}{1 + 180 \times 0.05^2} = 124.14 \]

The results of calculating the number of samples using the Slovin formula obtained a sample of 124.14 which was rounded up to 125 cassava farmers.

The data in this study included primary data obtained from interviews with cassava farmer respondents in the city of Salatiga. Secondary data was obtained from documents, records, journals, and internet sites owned by related agencies. Data collection techniques using observation methods, direct interviews, and surveys (questionnaires). The interview method was carried out from November to December 2022.

Data analysis was carried out by analyzing the effect of the independent variables as follows: \( X_1 \) (land area), \( X_2 \) (number of seeds), \( X_3 \) (manure), and \( X_4 \) (labor) on \( Y \) (cassava production). Statistical testing with multiple regression tests was chosen because this study aims to examine the effect of more than one independent variable on one related variable. The variation of the X factors that can affect the variation in Y (cassava production) can be calculated using the coefficient of determination \( (R^2) \). In addition, model feasibility testing was carried out to find out if the variables used were able to explain the phenomena being analyzed.

Analysis of factors that influence the production of cassava farming using the Cobb Douglas production function. Cobb-Douglas function analysis is used to answer the first research objective. This analysis is used to find out how the influence of the production level variable is related to the variables: land area, number of seeds, manure, and labor by using the formula:

\[ Y = b0 X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} e^u \]

Information:

- \( Y \): Amount of cassava production in 1 planting season (kg)
- \( X_1 \): Land area (ha)
- \( X_2 \): Seedlings planted in 1 planting period (stems)
- \( X_3 \): Manure used in 1 planting season (kg)
- \( X_4 \): Labor used (HOK)
- \( b0 \): Constant
- \( b1, \ldots, b5 \): Production elasticity of \( X_1, \ldots, X_4 \)
- \( e \): Natural logarithm
- \( u \): Error (error)

To facilitate the estimation of the above equation, the equation is converted into a multiple linear form by the logarithm of the equation, so that it becomes:

\[ \ln Y = \ln a + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + u_t \]

The equations that have been obtained are continued with the classical assumption test and multiple linear regression analysis tests. The production function is estimated using the Cobb-Douglas production function method obtained with the assistance of the
MS program. Excel and Statistical Product and Service Solution (IBM SPSS Statistics version 23).

Model analysis on the equation of the data that has been logarithmic above is transformed into the Ln equation becomes:

\[ \log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + e \]

The above equation needs to be used so that it can be solved with the SPSS application and so that the elasticity can be known. From the transformation form of the Cobb–Douglas production function above, it is then converted into the original form of the production function, namely:

\[ Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} \]

From the production function above, the output elasticity of input can be known from the exponential coefficient value of each input factor. Meanwhile, return to scale can be determined by adding up the rank coefficients that exist in each production factor input.

The elasticity of production is the degree of production sensitivity which is reflected by the percentage of additional products due to an additional one percent input (Istikomah et al., 2018). The elasticity of a function \( Y = f(x) \), is defined as the quotient of the marginal function \( y' \) with the average function \( w \).

Production elasticity formula (Ep):

\[ Ep = \frac{y'}{y'} = \frac{dy/dx}{y/x} = \frac{dy/y}{dy/x} \]

An Ep value greater than 1 indicates the production process is in Region I, an Ep value between one and zero is a production process in Region II, and an Ep value less than zero/negative indicates the production process is in Region III. Ep calculation using simple or multiple linear functions by multiplying the coefficient “b”. In the form of the Cobb-Douglas function, the coefficient “b” already reflects Ep.

The sum of the magnitudes of elasticity in each independent variable is the level of returns to scale. Return to scale is used to find out whether a business under study follows the rules of increasing, constant, or decreasing returns to scale, thus there may be 3 alternatives, namely (Soekartawi, 2003):

1. Decreasing returns to scale, that is, if \( \beta < 1 \) means that additional results are decreasing on a production scale, the case where output increases with a smaller proportion than input.
2. Constant returns to scale, if \( \beta = 1 \) means constant additional returns on a production scale if all inputs increase in the same proportion.
3. Increasing returns to scale if \( \beta > 1 \) means that additional returns increase on a production scale. Output increases with a greater proportion than input. (Soekartawi, 2003).

The efficiency test is used to see whether the inputs or factors of production used in cassava farming in Salatiga City are efficient or not. Inputs that are thought to affect production are land area, seeds, manure, and labor tested using the Cobb-Douglas Production Function. The production function equation model used is as follows:
\[ \ln Y = Lna + b\ln X_1 + c\ln X_2 \]

The efficiency test in the analysis includes technical efficiency and economic efficiency:

**Technical Efficiency**

Technical efficiency can be analyzed using measurements from the results of data processing with the help of Frontier Version 4.1c software.

The justification for the value of technical efficiency is:

- If the value of technical efficiency is equal to one, then the use of inputs or factors of production is efficient.
- If the value of technical efficiency is less than one (not equal to one), then the use of inputs or factors of production is not efficient.

Technical Efficiency Measurement with the following formula (Coelli et al., 1998):

\[ \text{TE}_i = \exp(-E[\mu_i | \varepsilon_i]) \quad i = 1,2,3,4,n \]

\( \text{TE}_i \) is the level of technical efficiency achievement of the \( -i \) cassava farmer, is the \( \exp(-E[\mu_i | \varepsilon_i]) \) expected value (mean) of \( \mu_i \) under the conditions \( \varepsilon_i \). The Technical Efficiency value is \( 0 \leq \text{TE}_i \leq 1 \). If the TE value is closer to 1 then farming can be said to be more technically efficient and if the TE value is getting closer to 0 then farming can be said to be more technically inefficient. This technical efficiency model refers to the technical inefficiency effects model developed by Coelli., et al (1998). To determine the level of technical efficiency, the assessment is categorized as an efficiency index value of 0.70. If the efficiency value is greater than 0.70, the farming is efficient and if it is less than 0.70, the farming is not efficient (Coelli et al., 1996).

**Economical Efficiency**

Economic Efficiency Measurement uses the principle of minimizing production costs. This function is obtained by deriving the dual cost function in the form of the Cobb-Douglas production function model and must be homogeneous. The Stochastic Frontier cost function can be written mathematically as follows:

\[ C = f(H_1 + H_2 + H_3 + H_4) \]

Keterangan:

\( C \) = Cost of farming (Rp)
\( H_1 \) = Land rent (Rp/ha)
\( H_2 \) = Price of cassava seeds (Rp/kg)
\( H_3 \) = Price of manure (Rp/kg)
\( H_4 \) = Labor wages (Rp/HOK)

This function will produce Cost Efficiency (CE) and Economic Efficiency (EE) which is the inverse of Cost Efficiency (CE):

\[ EE = \frac{1}{CE} \]

Then the value of economic efficiency (EE) is \( 0 \leq EE \leq 1 \)

According to Soekartawi (2002) if the value of EE > 1 then it is said to be inefficient and vice versa if EE < 1 it can be said that economic efficiency is not efficient.

**RESULTS AND DISCUSSION**

Cassava farming in Salatiga City is not the main farming, but a side farming. The main farming carried out is farming in paddy fields, while cassava farming is carried out on dry land. In line with research (Radjit et al., 2014)
which states that cassava has the potential to be cultivated under various agroecological conditions from areas with dry climates, marginal lands, and optimal lands. The ability of cassava to grow on dry land is due to its deep root system and its ability to explore to a depth of 1 meter to absorb nutrients in various soil conditions so that it can grow and develop on marginal soils (Abdullahi et al., 2014).

Based on data from the Food and Agriculture Service of the City of Salatiga in 2021 the area (Najib, 2020) of dry agricultural land in the City of Salatiga is 1,729 ha. The average area of land used by farmer respondents to cultivate cassava in Salatiga City is 0.15 ha. A total of 76 respondents (63%) have the status of their land. Some of the farmer respondents in Salatiga City planted cassava of local varieties such as genjah, coral gondang, petruk, trengganis varieties, and others. As many as 45 farmer respondents (37.50%) cultivate cassava with a harvest age of 6-8 months. In early maturing cassava varieties can be harvested at the age of less than 8 months. According to (Najib, 2020) harvesting cassava at a relatively young age, which is around 7-8 months after planting (BST) and some are even 6 BST, affecting the quantity and quality of cassava produced. The production objective of all farmer respondents doing cassava farming is to sell. Cassava farming in Salatiga City which is planted in monoculture is generally developed for the purpose of selling and personal consumption. In intercropping cropping patterns are generally developed for the purpose of selling fodder.

1. Effect of Production Factors on Cassava Production

Analysis of cassava production activities in the City of Salatiga is carried out by taking into account the level of input used against the level of production obtained. This production model shows the physical relationship between the input factors used and the output produced.

Based on the results of the analysis shown in Table 1, it is known that the variable land area has a significance of more than 0.05. This shows that the variable land area partially has no significant effect on cassava production in Salatiga City. The significance value of the seed, manure, and labor variables shows a value of less than 0.05. This shows that the variables of seeds, manure, and labor partially have a significant effect on cassava production in Salatiga City.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Unstandardized Coefficient B</th>
<th>Std. Error</th>
<th>Standardized Coefficient Beta</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>1.598</td>
<td>.308</td>
<td></td>
<td>5.187</td>
<td>.000</td>
</tr>
<tr>
<td>Land</td>
<td>.034</td>
<td>.037</td>
<td>.030</td>
<td>.895</td>
<td>.373</td>
</tr>
<tr>
<td>Seeds</td>
<td>.793</td>
<td>.033</td>
<td>.781</td>
<td>23.828</td>
<td>.000</td>
</tr>
<tr>
<td>Manure</td>
<td>.150</td>
<td>.023</td>
<td>.186</td>
<td>6.395</td>
<td>.000</td>
</tr>
<tr>
<td>Labor</td>
<td>.073</td>
<td>.037</td>
<td>.055</td>
<td>1.999</td>
<td>.048</td>
</tr>
</tbody>
</table>

Table 1 Results of Cobb-Douglas Production Function Estimation on Cassava Farming in Salatiga City

Dependent Variable: Production
Source: Primary Data (Processed), 2023
In reading the results and interpreting the regression analysis in Table 1, the form of an equation containing constants and regression coefficients is used, with the regression equation the factors that influence the amount of production of cassava farming are as follows:

\[ Y = 1.593 + 0.034X_1 + 0.793X_2 + 0.150X_3 + 0.073X_4 \]

The factors of production of land area, labor, seeds, and fertilizers will have a positive influence if each of these factors mutually supports one another (Thamrin et al., 2015). These factors do not always have a positive effect on farmers’ production, there are several factors that also give a negative value for increasing cassava production. One factor that has no effect is land area. In cassava farming, a large area of land is expected to produce large production. However, on a large land area, management and supervision are less effective so productivity is not optimal (Bakhri, 2016).

Based on the findings at the research location, the seeds used in cassava farming were the Pandesi variety which is one of the superior varieties of cassava in Salatiga City. The older the seeds are used, the better for cassava production, and cassava plants are not susceptible to pests and diseases (Anggraini et al., 2017). In line with research (Zartika et al., 2023) using inappropriate seeds will reduce the production value of cassava farming.

### 2. Elasticity of Factors of Production

The value of the regression coefficient in the Cobb-Douglas production function model is the value of the production elasticity of these production variables. The sum of the elasticity values can be used to estimate the state of the business scale. The presumed production model shows that the sum of the values of the explanatory parameters (the sum of the exponential coefficient values of each input factor) is 1.05. This figure is the result of the sum of the regression coefficients of production factors which in this case are considered as the elasticity of these factors. The sum of the production elasticity values is greater than one, so it can be concluded that cassava farming is on an increasing return to scale. This value means that the addition of one percent of each production will increase production by 1.05%.

The production function of cassava farming mathematically can be written as follows:

\[ \text{Ln}Y = \text{Ln} 1.598 + 0.034\text{Ln}X_1 + 0.793\text{Ln}X_2 + 0.150\text{Ln}X_3 + 0.073\text{Ln}X_4 + Ut \]

The multiple linear equation above is transformed into the Cobb-Douglas production function as follows:

\[ Y = 4.94X_1^{0.034}X_2^{0.793}X_3^{0.150}X_4^{0.073} \]

The value of the parameter estimation in the Cobb-Douglas production function above can show the elasticity value of the inputs used. Input variables that significantly influence cassava production are seeds \( X_2 \), manure \( X_3 \), and labor \( X_4 \).

- If the seeds \( X_2 \) are increased by 1% from the average number of seedlings of 1,659 stems (ceteris paribus) to 1,676 stems, then the production of cassava farming will increase by 0.793% from an average product of 7,278 kg to 13,049 kg. A positive
production elasticity indicates that land use is in a rational area (Region II).

- If the manure (X₃) is increased by 1% from the average amount of manure of 4,307 kg (ceteris paribus) to 4,350 kg, then the production of cassava farming will increase by 0.15% from the average product of 7,278 kg to 8,370 kg. A positive production elasticity indicates that land use is in a rational area (Region II).

- If the labor (X₄) is increased by 1% of the average total workforce of 39.62 HOK (ceteris paribus) to 40.02 HOK, then the production of cassava farming will increase by 0.073% from an average product of 7,278 kg to 7,809 kg. A positive production elasticity indicates that land use is in a rational area (Region II).

3. Technical Efficiency Analysis
The results of technical efficiency analysis using the Stochastic Frontier Production Function in detail can be seen in Table 2.

From Table 2 can be seen that most of the parameters in the production function of cassava farming in Salatiga City show negative values and are not significant. There is one variable that gives a positive and significant value, namely the seed variable. According to Thamrin et al (2015), the seed is one of the factors of production that affect the output of farming. The cassava farming seedlings at the research site used old seeds and the middle part was taken. Research (Prasmatiwie et al., 2022) on cassava farming in Central Lampung Regency stated that technical efficiency can be increased by expanding land or extensification, intensification by adding manure, and labor.

The regression coefficient for seed input is 0.842 and is significant. This means that if the use of seed input is increased, it will result in an increase in production output. With the addition of 1% seed from the average number of seedlings of 1,659 stems (ceteris paribus) to 1,676 stems, the production of cassava farming will increase by 0.842% from an average product of 7,278 kg to 13,406 kg. Production factors of land area, manure, and labor statistically have no significant effect on the production of cassava farming.

The distribution of technical efficiency of cassava farming is presented in Table 3.

<p>| Table 2 Estimation of the Stochastic Frontier Production Function for Cassava Farming in Salatiga City |</p>
<table>
<thead>
<tr>
<th>Variable</th>
<th>Parameter</th>
<th>Koefisien</th>
<th>t hitung</th>
</tr>
</thead>
<tbody>
<tr>
<td>Konstanta</td>
<td>x</td>
<td>10.511</td>
<td>63.66***</td>
</tr>
<tr>
<td>Land</td>
<td>β₁</td>
<td>-0.00044</td>
<td>-2.198</td>
</tr>
<tr>
<td>Seeds</td>
<td>β₂</td>
<td>0.842</td>
<td>16.476***</td>
</tr>
<tr>
<td>Manure</td>
<td>β₃</td>
<td>-0.00045</td>
<td>-2.484</td>
</tr>
<tr>
<td>Labor</td>
<td>β₄</td>
<td>-0.00034</td>
<td>-0.003</td>
</tr>
<tr>
<td>Sigma-squared</td>
<td></td>
<td>1.1136</td>
<td>6.276***</td>
</tr>
<tr>
<td>Gamma</td>
<td></td>
<td>0.927</td>
<td>30.783***</td>
</tr>
</tbody>
</table>

Information:
***: signifikan at α=1%
ns : non signifikan
Source: Primary Data (Processed), 2023
In essence, the technical efficiency index value is close to one, it means that farmers are very efficient in the use of their inputs, whereas if the index value leads to a value of 0, it means that farmers are not technically efficient. If the efficiency value is greater than 0.70, the farming is efficient and if it is less than 0.70, the farming is not efficient (Coelli, 1996). Table 3 indicates that the average value of the technical efficiency level of cassava farmers is 0.53, which means that cassava farmers are not technically efficient. In line with research (Fadlli & Bowo, 2018) regarding the efficiency of cassava farming in Pati Regency which is also not efficient. In this study, it was explained that inefficient technical efficiency conditions occurred because cassava farmers had not been able to combine the use of production factors of land area, labor, fertilizers, and seeds to obtain optimal cassava production. According to Anggraini et al., (2013), the average cassava farmer has not optimally allocated factors of production and their use is still not as recommended. The use of production inputs with the right amount or dose will have an impact on the high or low value of technical efficiency. (Lutfi & Baladina, 2018).

The minimum value shown in Table 3 regarding the level of technical efficiency of farmers is at a value of 0.10, which means that there are farmers who are not yet technically efficient. The maximum value of technical efficiency in this study is 0.91 which is very close to one, meaning that these farmers are close to a perfect score for the level of technical efficiency, which is a value of 1. Table 3 also concludes that there are 25.83% of farmers who are already technically efficient, in words On the other hand, cassava farmers in Salatiga City already understand the proportion of using good inputs to get optimal results. According to Asmarantaka & Zainuddin (2017), differences in the level of technical efficiency achieved by farmers indicate different levels of mastery, technology application, and farming management.

### 4. Economic Efficiency Analysis

Economic efficiency occurs when the marginal product value of each additional unit of input equals the price of each of these input units (Soekartawi, 2003) can write by the formula:

#### Table 3 Distribution of Technical Efficiency of Cassava Farming in Salatiga City

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Farmers (people)</th>
<th>Presentase (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 &lt; ET &lt; 0.7</td>
<td>89</td>
<td>74.17</td>
</tr>
<tr>
<td>0.71 &lt; ET &lt; 0.85</td>
<td>28</td>
<td>23.33</td>
</tr>
<tr>
<td>ET &gt; 0.86</td>
<td>3</td>
<td>2.50</td>
</tr>
<tr>
<td>Amount</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>Min Value</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Maximum Value</td>
<td>0.91</td>
<td></td>
</tr>
</tbody>
</table>

Source: Primary Data (Processed), 2023
\[ NPM = P_x \]

Where:

\[ NPM_x = \] The value of the marginal product of input X
\[ P_x = \] Input price

With the provision that if \( NPM_x / P_x > 1 \) means that the use of input \( (x) \) is not yet the highest economic efficiency, in this condition input \( (x) \) can still be added if \( NPM_x / P_x < 1 \), it means that the use of input is not efficient, input \( (x) \) needs to reduced (Soekartawi, 2003). The use of production factors is said to be economically efficient if the value of economic efficiency is equal to one.

Measuring the level of economic efficiency can be used as a basis for determining the action decisions that must be taken by farmers in increasing cassava production in Salatiga City. The decision in question is determine the amount of input that must be applied so that farmers are economically efficient. This measurement can do after getting the results of the analysis of the Cobb-Douglas production function model. Analysis of economic efficiency, was only carried out on variables that significantly influence the production of cassava farming. Calculation of economic efficiency analysis can see in Table 4.

Based on the calculation results, the input use of the land area, seeds, manure, and labor is not efficient. This condition is by research (Fadlli & Bowo, 2018) that the use of production factors in cassava farming is not efficient based on the price aspect. The input of land area and seeds has a value of \( NPM_x / P_x > 1 \), meaning that the input use of land area and seeds is not economically efficient, in this condition the input of land area and seeds still needs to be added to the amount used. The input of manure and manure has an \( NPM_x/P_x < 1 \), meaning that the use of inputs is not efficient, the input of manure and labor needs to reduce. The results of this study are in line with research (Luthfiah et al., 2017) on cassava farming. In his research results the use of seeds and fertilizers has not reached economic efficiency. According to Pramudita et al., (2014), in cassava farming as a sideline farming, inputs given by farmers tend to be sober, especially cassava plants require 7-12 months from planting, so the plants need sufficient nutrients to grow and develop. According to Kuswono & Suratiningsih (2012), states that farmers use more labor than needed because farmers think they need a lot of labor at harvest time, because more production so that with the addition of a lot of labor will result in the production of cassava farmers decrease.

<table>
<thead>
<tr>
<th>Production Factor</th>
<th>Y/Xi</th>
<th>Xi</th>
<th>NPMXi</th>
<th>PXi</th>
<th>NPMXi/ PXi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>48.520</td>
<td>0.15</td>
<td>4.054,775,97</td>
<td>1.300,000</td>
<td>3,12</td>
</tr>
<tr>
<td>Seeds</td>
<td>4.39</td>
<td>1659</td>
<td>8.550,79</td>
<td>200</td>
<td>42.75</td>
</tr>
<tr>
<td>Manure</td>
<td>1.69</td>
<td>4307</td>
<td>623,01</td>
<td>1.400</td>
<td>0.45</td>
</tr>
<tr>
<td>Labor</td>
<td>183.70</td>
<td>39,62</td>
<td>32,960.03</td>
<td>60.000</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Source: Primary Data (Processed), 2023
CONCLUSION

Based on the results of research that has been done, it can be concluded that production factors: seeds, manure, and labor affect cassava farming. In the elasticity analysis, all factors of production are in the rational area (Region II) with a positive value. Technical efficiency analysis shows that the seed variable is the only factor that gives a positive and significant value. Based on economic efficiency analysis, the use of production factors including land area, seeds, manure, and labor is not efficient.

REFERENCES


***