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# Analysis of Production Factors and Allocative Efficiency of Sweet Corn Production in Sukaramah Village, Panyipatan District, Tanah Laut Regency, South Kalimantan Province

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***Abstract:***
***Background**: Corn is a major source of carbohydrates and can be used as a substitute for rice. Indonesia's demand for corn has increased substantially in the last decade with the rise of the population. The position of corn in diversifying food consumption serves to reduce dependence on the staple food rice so that its availability is required in sufficient quantities.*
***Materials and Methods**: This study aims to analyze the factors that influence sweet corn production and measure allocative efficiency (price efficiency) in Sukaramah Village, Panyipatan District, Tanah Laut Regency, South Kalimantan. The village was chosen as the research location because this village had many farmers growing sweet corn instead of hybrid corn. The number of samples taken was 46 people from a population of 308 sweet corn farmers.*
*The Cobb-Douglas model was used to analyze the influence of factors (inputs) affecting sweet corn production. Measurement of allocative efficiency (price efficiency) was carried out with the allocative efficiency index, namely the ratio between the value of the marginal product and the price of the input in question (marginal factor cost).*
***Results**: The results showed that simultaneously the production factors of land, seeds, organic fertilizers, inorganic fertilizers, pesticides, and labor had a significant effect on the production of sweet corn. Meanwhile, when tested partially, only three production factors, namely land, seeds, and inorganic fertilizers, had a significant effect on sweet corn production, while the production factors of organic fertilizers, pesticides, and labor had no significant effect. The use of production factors for organic fertilizers, inorganic fertilizers, and pesticides had been used by farmers efficiently. On the other hand, the use of land and seed production factors was still inefficient, while the use of labor was also inefficient; in other words, the use of labor was too excessive.*
***Conclusion:** The average land used by farmers for sweet corn farming was only 0.43 ha, while the seeds used were only 1.91 kg farm$^{-1}$, while the average labor used was only 10.74 mwd (man workday). If the allocative efficiency of sweet corn farming was to be achieved, it can be done by increasing the business area and adding seeds for each business area. Conversely, the factor of production of labor must be reduced to achieve this.*
***Key Word**: Sweet corn, production factors, allocative efficiency.*

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## I. Introduction

Indonesia is an archipelago that boasts a tropical climate and mineral-rich soils that are perfect for various types of flora. This lends itself to a country that can produce a large variety of crops to support the needs of its population. With this potential, farmers can cultivate plants to feed themselves and sell them to generate income. Agriculture is a big sector of this country's economy and has the potential to be a major driving force in the international market.

Agriculture is the activity of utilizing biological resources by humans to produce food, industrial raw materials, or energy sources and to manage the environment. Based on the business sector, the agricultural sector is divided into several sub-sectors, namely food crops, horticulture, plantations, animal husbandry, fisheries, and forestry. Concerning the food crops sub-sector, one of the commodities that have an important role in the development of the agricultural sector is corn. Corn is known as a source of carbohydrates which has an important role in supporting food security and adequacy of animal feed supply. The position of corn in diversifying food consumption serves to reduce dependence on the staple food rice so that its availability is required in sufficient quantities.

Corn is one of the most versatile crops, being fit for consumption for both humans and livestock. It is a major source of carbohydrates and can be used as a substitute for rice. In addition, damaged corn can be fed to animals so that they can be consumed in turn. Corn as livestock feed can reach up to 51.4% of a country's total produce (1). Indonesia's demand for corn has increased substantially in the last decade with the rise of the population. In 2015 the Association of Livestock Feed Entrepreneurs (GPMT) estimated that demand for corn reached 8.5 million tons/year; however, only 40% was fulfilled by domestic production (2). Indonesia's corn production has continued to increase in the last five years. Indonesia has succeeded in suppressing corn imports by 66% only in the last two years (3); from 2013-2017, production increased by 9.44 million tons (51%).

To boost domestic production, the Indonesian government has created several programs to incentivize farmers to plant more corn and improve the quality of the crop. One of these programs is called *Upsus* (*Upaya Khusus* = Special Effort) in which three million hectares' worth of corn are planted in various areas. One of these areas is the Province of South Kalimantan (4), where Panyipatan is one of the main districts to produce corn along with Pelaihari and Batu Ampar.

Farming activities are not only seen in how much production is produced but also in the use of factors of production in the production process as efficiently as possible. One indicator of efficiency is if a certain amount of output can be produced using several combinations of certain production inputs that can minimize production costs without reducing the output produced (5). Efficiency in farming consists of two components, namely technical efficiency which shows the ability of a farm to obtain maximum output from a certain amount of input, and allocative efficiency which shows the ability of a farm to use optimal input proportions according to the price and production technology it has (6).

Allocative efficiency is defined as a situation where both the demand and supply of a product can meet at an equilibrium, therefore production uses the lowest amount of expenses and produces the greatest amount of revenue. In using allocative efficiency to study the production of corn, corn producers can determine how much input to invest into producing corn to generate the maximum amount of revenue. Therefore, a study on allocative efficiency in the production of corn in Panyipatan would be highly beneficial to corn producers.

The research was carried out in Panyipatan District, Tanah Laut Regency from November 2022 to March 2023. The research was using a survey method. The data collected consisted of primary and secondary data. Primary data was collected through direct interviews with farmers who planted corn using questionnaires. Secondary data were collected from various related agencies such as the Central Statistics Agency, Office of Agriculture for Food Crops and Horticulture, as well as other references.

Respondents were farmers who plant corn in several corn-producing villages in the district of Panyipatan. Based on data from the Agricultural Counseling Center (BPP) of Panyipatan (2023), the villages that cultivated corn were Sukaramah, Batu Tungku, Bumi Asih, and Kandangan Lama Village. Other villages were relatively low in corn cultivation. The selected villages were Batu Tungku and Sukaramah.

The objectives of this research were as follows: (1) to analyze the effect of business scale on the allocative efficiency of corn farming in Panyipatan District; (2) to analyze the effect of production factors (land area, seeds, organic fertilizer, inorganic fertilizer, pesticide, and labor) on corn production; (3) to analyze the elasticity of the factors of production and determine the return to scale. This research was expected to be beneficial for (1) the community, especially farmers, to be input and reference in corn farming, (2) the government, as data in making decisions in agriculture, (3) academics, this research provides information about the analysis of allocative efficiency of corn farming.

## II. Material and Methods

The research was carried out in Panyipatan District, Tanah Laut Regency from April 2021 to January 2022. The research was conducted using a survey method. The data collected consists of primary and secondary data. Primary data was collected through direct interviews with farmers who planted corn using questionnaires. Secondary data were collected from various related agencies such as the Central Statistics Agency, Office of Agriculture for Food Crops and Horticulture, as well as other references.

Based on data from the Agricultural Counseling Center (BPP) of Panyipatan District (2021), the villages that cultivate corn were Sukaramah, Batu Tungku, Bumi Asih, and Kandangan Lama Village. Other villages were relatively low in corn cultivation. The selected village was Sukaramah since many farmers cultivate sweet corn. Respondents were selected with a simple random sampling of 46 people.

The first objective is the influence of the use of production factors in sweet corn production using a multiple linear regression function model, namely the Cobb-Douglas function type model:

$$y = \alpha\, x_1^{b1} x_2^{b2} x_3^{b3} x_4^{b4} x_5^{b5} x_6^{b6} e^{u}$$

The Cobb-Douglas function model when transformed into a linear form into an equation:

$$\ln y = \ln \alpha + \beta_1 \ln x_1 + \beta_2 \ln x_2 + \beta_3 \ln x_3 + \beta_4 \ln x_4 + \beta_5 \ln x_5 + \beta_6 \ln x_6 + \varepsilon_i$$

with:

$\hat{Y}$ = sweet corn production (kg)
$x_1$ = land area (ha)
$x_2$ = amount of seeds (kg)
$x_3$ = amount of organic fertilizer (bag)
$x_4$ = amount of inorganic fertilizer (kg)
$x_5$ = amount of pesticides (L)
$x_6$ = amount of labor (mwd)
α = coefficient of intercept or constant
ε = error
$\beta_1$ ... $\beta_5$ = regression coefficient
$\varepsilon_i$ = error variable

Coefficient of determination = $R^2 = \frac{Kt_{regression}}{Kt_{total}}$

To determine the effect of the whole variables, the F-test formula was applied:

$$F\ \{count\} = \frac{Kt_{\{regression\}}}{Kt_{remainder}} = \frac{\sum \hat{y}i^2/k}{\sum ei^2/k - n - 1}$$

where:

The hypothesis:
$H_0$: $b_i = 0$
$H_1$: $b_i \neq 0$

If $F_{count} > F_{table}$ (α; n-k), then H0 is rejected and H1 is accepted, meaning that all production factors together have a significant effect on production. And if $F_{count} \leq F_{table}$ (α; n-k), then $H_0$ is accepted and $H_1$ is rejected, meaning that all production factors have no significant effect on production.

If $F_{count} > F_{table}$ (α; n-k), then H0 is rejected and H1 is accepted, meaning that all production factors together have a significant effect on production. And if $F_{count} \leq F_{table}$ (α; n-k), then $H_0$ is accepted and $H_1$ is rejected, meaning that all production factors have no significant effect on production.

Test-t: $t_{count} = \frac{b_1}{S_e\,(b_1)}$

where:

bi: regression coefficients h-i
Se($b_1$): standard error
The hypothesis:
$H_0$ : bi = 0
$H_1$ : bi ≠ 0

If $t_{count} > t_{table}$ (α = 0.05), then $H_0$ is accepted and H1 is rejected, meaning that the production factor has no significant effect on production. And if $t_{count} \leq t_{table}$ (α = 0.05), then $H_0$ is rejected and H1 is accepted, meaning that the production factor $x_i$ has a significant effect on production.

The second objective, which was to analyze the allocative efficiency of the use of production factors used by farmers in sweet corn production, can be seen from the Value of Marginal Product Value (VMP$x_i$) for a factor of production with marginal factor cost (MFC$x_i$) equal 1. Since MFC$x_i$ is the additional cost required to obtain additional output, then MFC$x_i$ is equal to the input price (P$x_i$) (7). The formula:

$$\frac{\mathrm{VMPx_i}}{\mathrm{Px_i}} = 1$$

where:

VMP$x_i$: the value of the marginal product for the production of factor $X_i$
P$x_1$ = price of Xi
VMP$x_i$ is calculated using the first derivative of the Cobb-Douglas production function, that is:

$$Y = \mathrm{b_0 X_i^{bi}}$$

$$MP_{xi} = b_i b_0 X_i^{bi-1} = \frac{b_i b_0 X_i^{bi-1}}{X_i}$$
$$MP_{xi} = b_i \frac{Y}{P_{Xi}} \text{ where } VMP_{xi} = b_i \frac{Y}{X_i} \times P_y$$
$$VMPMx_i = P_{xi}$$
$$\frac{VMP_{xi}}{P\,x_i} = \frac{b_i Y P_y}{P\,x_i} = k_i = 1$$

where:

$k_i$ : allocative (price) efficiency index
$b_i$ : elasticity of the i-th factor of production
$Y$ : average production
$X$ : average production usage i
$Py$ : average production price
$Pxi$ : the average price of the i-th factor of production
The hypothesis:
$H_0$ :ki = 0 (efficient use of factors of production)
$H_1$ :ki ≠ 0 where i = 1, 2, ... 6 (the use of factors of production is inefficient)
To prove the hypothesis, the t-test statistic is used:

$$t_{count} = \left|\frac{k_i - 1}{Sk_i}\right|$$
$$Sk_i = Sb_i \frac{Y - P_y}{X_i \times P_{xi}}$$

where:

$Sk_i$ : standard error of efficiency coefficient
$Sb_i$ : standard error of regression coefficient
$Y$ : average production
$X$ : average production usage
$Py$ : average production price
$Px_i$ : average price of the i-th factor of production

$H_0$ is rejected if $G_{count} \geq X^2_{k(p)}$
$H_0$ is accepted if $G_{count} < X^2_{k(p)}$

If $t_{count} \leq t_{table}$ (α/2: n-k-1), then $H_0$ is accepted which means that the use of the factors of production is efficient. On the other hand, if $t_{count} > t_{table}$ (α/2: n-k-1), then $H_1$ is accepted which means that the use of the production factor is inefficient.

## III. Results and Discussion

### Characteristics of Respondents

**Age.** Age is a unit of numbers that states how long the survival of living things, both humans, animals, plants, and inanimate objects. In agriculture, age is often associated with farmers' knowledge of farming. The age of farmers who carry out sweet corn farming ranged from 19-64 years and over with an average age of 39 years for sweet corn and an average age of 42 years for hybrid corn. The age range of the respondent farmers can be said to be in the productive age, so it is expected to have an impact on the success of farming activities. Age was important because it impacts knowledge, attitude, and quality of work in carrying out corn production. The age distribution of the corn farmer respondents in Sukaramah Village can be seen in Figure 1.

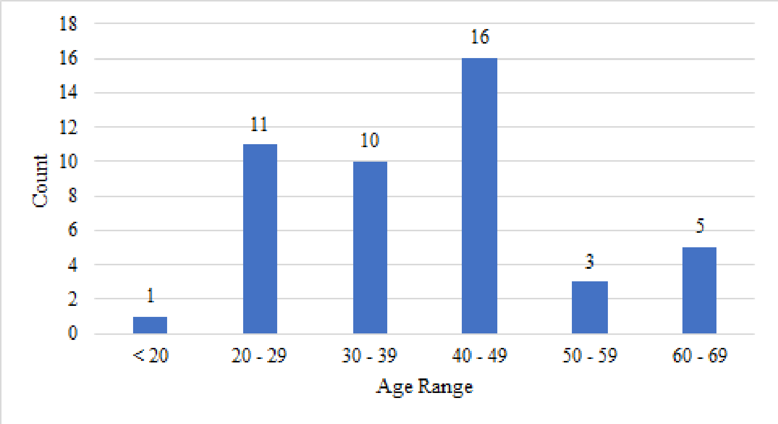


**Figure 1. Distribution of respondents by age group.**

Based on Figure 1, the largest age group was between 40-49 years, with as many as 16 farmers (34.8%), while the smallest was the <20 group, which consists of one farmer (2.2%). The younger the farmer, the possibility of working in farming can be done by the respondent himself is bigger, thereby reducing the cost of outsourced labor. The older the farmer, the lower the level of ability to work, and the way of thinking and acting can influence their decisions in cultivating corn, because of their physical condition.

**Level of Education.** Education as a stage of learning to increase knowledge is expected to provide benefits for those who carry it out and can provide changes in attitudes and views that are better and more mature. In agriculture, the level of education is often used as a factor influencing farmers' decision-making as well as farmer expertise in carrying out farming and absorbing technological information. The education level respondent farmers engaged in corn farming were primary school graduates up to bachelor's degrees. Education is used as a method by which a farmer can pursue to produce better yields. Education can widen a farmer's horizons and give them the knowledge that they may not be able to obtain otherwise to improve their outlook on farming. This can include their reception to advancements in farming technology. Education is considered a major factor in agriculture because it influences how a farmer approaches his crop and therefore the output. The level of education available to farmers was the primary school to undergraduate level.

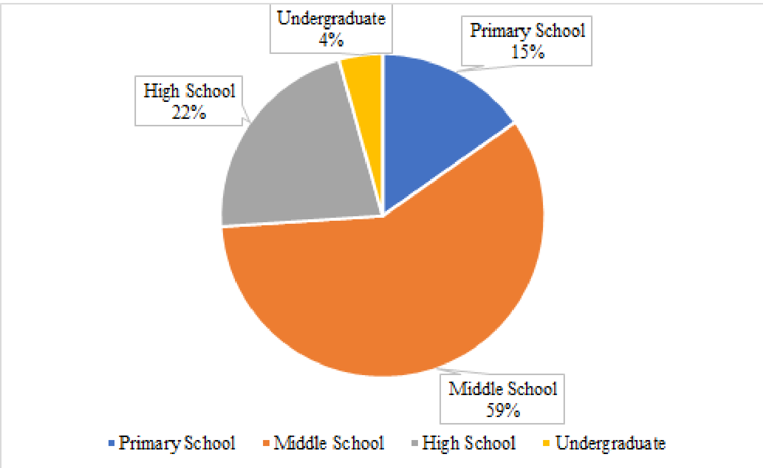


**Figure 2. Number of years in school.**

Figure 2 shows that most corn farmers in Sukaramah village have a middle school level education of 59%. The second highest education level of corn farmers is the education level of primary school level of 22%. This shows that the education level of corn farmers in Sukaramah is still relatively low, mostly at the primary and middle school levels.

**Family Dependents.** The number of family dependents is the number of family members who are still dependents of the family, both siblings and non-siblings who live in the same house. Humans tend to have a family to fulfill their need for social interaction and for continuing their lineage. To do this, each farmer found a spouse, married, and had one or more children. However, this may also increase their cost of living.

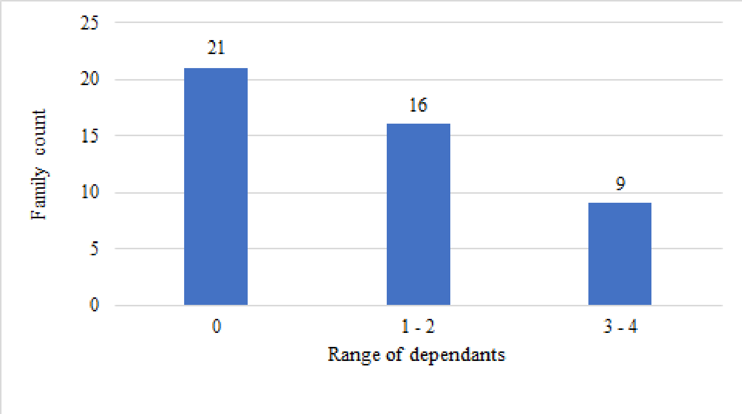


**Figure 3. The number of dependents of the farmers.**

Based on Figure 3, the number of family dependents was between 0-5 corn farmers. Most corn farmer family sizes are between 1-2 people, as many as 34 farmers (56.67%). While the smallest number of family dependents was five people, which was 3%. This was because some of the children of farmers who were already married remained in their parents' homes. Many family members can affect the level of household income.

**Amount of Land**. Arable land is land that has been utilized by an individual or a group of individuals for the needs of agricultural activities within a certain area by each individual. The area of arable land can also affect the level of income, the wider the arable land the higher the income but also the higher the production costs. The area of cultivated land is also one of the determinants in the success of the production process of both sweet and hybrid corn farming. As for the area of cultivated land, the respondents of corn farmers in Sukaramah Village can be seen in Figure 4.

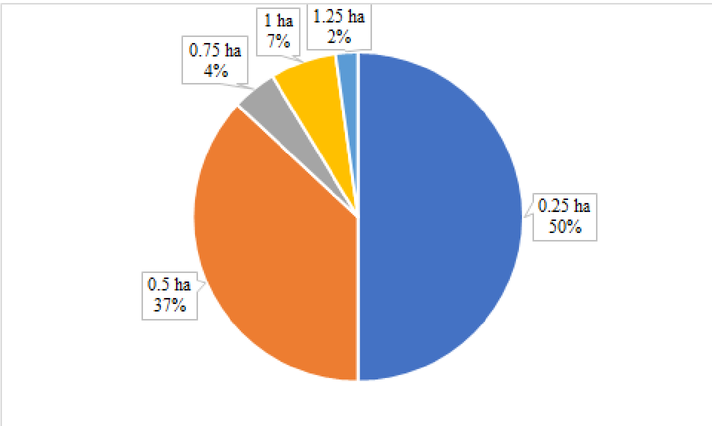


**Figure 4. Land area owned by sweet corn farmers.**

Figure 4 shows that the highest percentage of the land area was 0.25 ha at 50%. The second largest group of land was at 0.5 ha at 37%. The overall trend was that corn farmers preferred to own a minimal amount of land, likely to reduce the expenses of maintaining their crops. However, this would also affect the amount of corn produced, as the data will show.

**Secondary Jobs.** Because Sukaramah is a relatively poor village with a low-income level, many farmers and their families choose to take up secondary jobs to supplement their incomes. Farmers can take up another job in addition to their primary one, and their spouses can also choose to be employed. This will allow them to have more disposable income to pay for maintaining their crop and their living expenses. The number of farmer families who have secondary jobs can be seen in Figure 5.

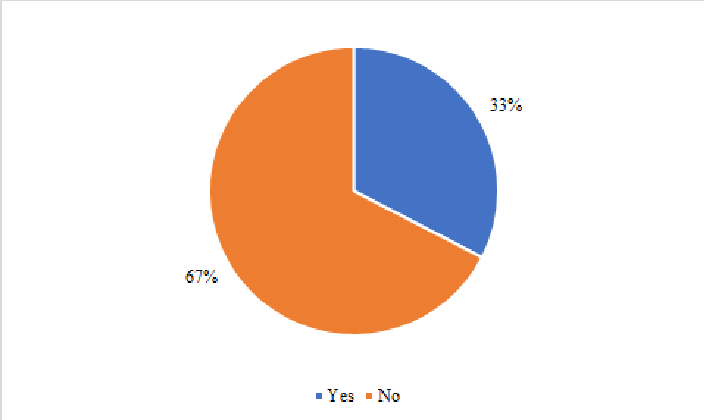


**Figure 5. The number of farmer families who have secondary jobs.**

Most of the farmers surveyed (67%) didn't have secondary jobs, while 33% had secondary jobs (as seen in Figure 5). Of the farmers with secondary jobs, 27% had a land area of 0.5 ha and 27% also had a high number of dependents (3-4 people). The farmers most likely took these jobs to supplement their income to support their families. Moreover, the farmers' side jobs were still in agriculture as farm laborers or raising chickens/cows (on-farm) (53%) and 47% worked unrelated (off-farm).

**Factors Affecting Sweet Corn Production**

To determine the effect of the use of production factors in corn production, an estimate was made using a regression analysis of the Cobb-Douglas function type model, with the results of the analysis:

$$\ln Y = 6.524 + 0.478 \ln X_1 + 0.406 \ln X_2 + 0.052 \ln X_3 + 0.069 \ln X_4 + 0.104 \ln X_5 - 0.03 \ln X_6$$

Based on the results of the regression analysis, the value of the coefficient of determination ($R^2$) of the function was 0.985 (Table 1). This shows that the level of sweet corn production 98.5% was determined by the independent variables (land area, number of seeds, organic fertilizers, inorganic fertilizers, pesticides, and labor) in this function, while the remaining 1.5% was determined by other variables not included in the function model.

**Table 1. The coefficient of determination ($R^2$) of the model**

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .992[a] | .985 | .983 | .06706 |

a. Predictors: (Constant), Labor, Pesticide, Inorganic fertilizer, Seed, Organic fertilizer, Land

Source: Data analysis, 2022.

For the F-test, it is known that the F-hit value (431.115) with a probability value of 0.000 < 0.05 ($\alpha$ = 5%), means that hypothesis $H_0$ was rejected and $H_1$ was accepted. The result showed that land area ($X_1$), number of seeds ($X_2$), amount of organic fertilizer ($X_3$), amount of inorganic fertilizer ($X_4$), number of pesticides ($X_5$), and number of laborers ($X_6$) had a significant effect on sweet corn production, simultaneously. Details can be seen in Table 2.

**Table 2. The result of simultaneously tested production factors**

**ANOVA[a]**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| | Regression | 11.627 | 6 | 1.938 | 425.889 | .000[b] |
| | Residual | .177 | 39 | .005 | | |
| | Total | 11.805 | 45 | | | |

a. Dependent Variable: Production

b. Predictors: (Constant), Labor, Pesticide, Inorganic fertilizer, Seed, Organic fertilizer, Land

Source: Data analysis, 2022.

Furthermore, the production factors that affect the production of sweet corn individually were analyzed, namely land area ($X_1$); seeds ($X_2$); organic fertilizer ($X_3$); inorganic fertilizers ($X_4$); Pesticide ($X_5$), and Labor ($X_6$).

The results of data processing showed that in the production function, it turned out that only the variables of land area and seeds had a significant effect on sweet corn production in Sukaramah Village, Panyipatan District. This situation was indicated by the significance value (Sig) of both the land area variable and the seed variable which was less than 0.05 ($\alpha = 5\%$), namely 0.05 and 0.000, respectively. Meanwhile, other production factors, namely the variables of organic fertilizers, inorganic fertilizers, pesticides, and labor did not have a significant effect on sweet corn production, where each variable's significance value was greater than 0.05 ($\alpha = 5\%$).

Furthermore, when viewed from the regression coefficients, namely β1 and β2 of 0.478 and 0.406. This means that if the land area was increased by 10%, then sweet corn production would increase by 4.78%, whereas if the seed was added by 10%, sweet corn production would also increase by 4.06%. Table 3 shows the results of testing the production factors that affect corn production, partially.

**Table 3. The production factors that affect sweet corn production**

**Coefficients[a]**

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | 6.273 | .286 | | 21.940 | .000 |
| Land | .541 | .179 | .510 | 3.031 | .004 |
| Seed | .426 | .083 | .413 | 5.151 | .000 |
| Organic fertilizer | .073 | .087 | .068 | .836 | .408 |
| Inorganic fertilizer | .083 | .047 | .111 | 1.781 | .083 |
| Pesticide | -.078 | .104 | -.070 | -.525 | .456 |
| Labor | -.029 | .055 | -.026 | -753 | .603 |

a. Dependent Variable: Production

Source: Data Analysis, 2023.

**Allocative Efficiency of Production Factors in Sweet Corn Farming**

In the implementation of subsistence farming, farmers usually carry out farming activities only based on habits and experiences that have been passed down from generation to generation. This condition is due, among other things, to the lack of education and knowledge of farmers, in addition to limited capital and the difficulty of obtaining production facilities that affect farmers in making decisions. One way to analyze the implementation of efficient farming is by measuring allocative efficiency. If the allocative efficiency index is equal to one, it means that the input allocation used is price efficient. In other words, achieving allocative efficiency. The allocative efficiency index is obtained from the ratio between the Value of Marginal Product ($VMPx_i$) equal to the factor of production price ($Px_i$) and afterward statistically tested using the t-test. The ratio between the value of the marginal product (VMP) of an input ($X_i$) and the input value ($Px_i$) is called the allocative efficiency index ($k_i$).

If $k_i = 1$, it means that the use of factors of production is efficient so that the input does not need to be added. If $k_i \neq 1$ then the use of production factors is not yet/inefficient. If $k_i > 1$ then the use of the input is not efficient, which means that the use of the input can be increased, whereas if $k_i < 1$ it means that the use of the input is not efficient so the use of the input must be reduced. The allocative efficiency value of the use of production factors in sweet corn farming can be seen in Table 4.

**Table 4. The allocative efficiency value of the use of production factors in sweet corn farming**

| Variable | $\beta x_i$ | X | Px (IDR) | VMPx (IDR) | ki | std | Ski | t-count | Remark |
|---|---|---|---|---|---|---|---|---|---|
| Land area | 0.541 | 0.43 | 54,348 | 14,817,767 | 272.65 | 0.179 | 90.2104 | 3.0113 | Inefficient |
| Seed | 0.426 | 1.98 | 595,652 | 2,533,952 | 4.25 | 0.083 | 0.8288 | 3.9260 | Inefficient |
| Organic Fertilizer | 0.073 | 20.67 | 24,000 | 41,587 | 1.73 | 0.087 | 2.0651 | 0.3548 | Efficient |
| Inorganic Fertilizer | 0.083 | 368.48 | 2,350 | 2,653 | 1.13 | 0.047 | 0.6393 | 0.2016 | Efficient |
| Pesticide | -0.078 | 1.19 | 70,000 | -771,972 | -11,03 | 0.055 | 7.7763 | -1.5468 | Efficient |
| Labor | -0.029 | 10.74 | 1,231,522 | -31,804 | -0.03 | 0.104 | 0.0926 | -10.9709 | Inefficient |

Source: Data analysis, 2022.

Y = 5,838 kg
Py = IDR 2,017.4
t-tab ($\alpha$/2, df) = 2.023

Based on the analysis, the use of production factors of land area, seeds, and labor used was inefficient. Meanwhile, the use of fertilizer (both organic and inorganic), and pesticides was efficient.

**Allocative Efficiency of Land Area.** $VMPx_1/Px_1$ of the land area was 272.65 which means the use of factor production of land was not efficient. Nicholson (8) stated that allocative efficiency is achieved when the ratio between the value of the marginal productivity of each input ($VMPx_i$) and the price of the input ($Px_i$) equals 1. This showed that the use of 0.43 ha of land in sweet corn farming was still not efficient yet. Therefore, land use can be optimal, it was necessary to increase the area of land so that it was expected to increase the amount of production and income. Based on the t-test, it was also obtained that t-count > $t\alpha/2$ (n-2) then accept $H_1$ and reject $H_0$, which means that the use of land production factors did not achieve an efficient level. Therefore, land use should be added while still paying attention to costs (in this case land rent). Relatively narrow use (less than 0.5 ha) was due to limited capital owned by farmers.

**Allocative Efficiency of Seeds.** The factor of seeds had a value of the marginal product (VMP), which was IDR 2,533,952. This value means that each additional use of one kg of seeds for sweet corn farming would increase revenue by as much as IDR 2,533,952. The price efficiency index of seed, which is the ratio of VMP seed and its price ($Px_2$) was 4.25. In this case, $H_1$ was accepted. Consequently, $H_0$ was rejected since t-count (2,016) > t-table (2.023) at $\alpha$ = 5%. It means that the seeds used were inefficient. For sweet corn farming to be efficient, the use of seed inputs must be increased. In the research area, the price of sweet corn seeds was relatively expensive, IDR 595,692 $kg^{-1}$ containing approximately 43,000 seeds.

**Allocative Efficiency of Organic and Inorganic Fertilizer.** The factor of organic fertilizer had a value of the marginal product (VMP), which was IDR 41,587. This value means that each additional use of one bag (25 kg) of organic fertilizer will increase revenue by as much as IDR 41,587 for sweet corn farming. The price efficiency index of organic fertilizer, which is the ratio of VMP organic fertilizer, and its price ($Px_3$) was 1.73. In this case, $H_0$ was accepted, consequently, $H_1$ was rejected since t-count (0.3548) > t-table (2.023) at $\alpha$ = 5%. It means that the organic fertilizer used was efficient. Meanwhile, the factor of inorganic fertilizer has a value of the marginal product (VMP), which was IDR 2,653. This value means that each additional use of one kg of inorganic fertilizer will increase revenue by as much as IDR 2,653 in sweet corn farming. The price efficiency index of inorganic fertilizer, which is the ratio of VMP inorganic fertilizer, and its price ($Px_4$) was 1.13. In this case, $H_0$ was accepted. Consequently, $H_1$ was rejected since t-count (0.2016) > t-table (2.023) at $\alpha$ = 5%. It means that the organic fertilizer used was efficient.

**Allocative Efficiency of Pesticide.** The use of pesticides in sweet corn farming was considered efficient. The data analysis result showed that the allocative efficiency index of pesticides was -11.03. In terms of hypothesis testing, $H_0$ was accepted. Consequently, $H_1$ was rejected since t-count (1,5468) < t-table (2.023) at $\alpha$ = 5%. It means that the pesticide used was efficient. However, the variable of pesticide had a value of the marginal product (VMP), which was IDR -771,972. This value means that when the pesticide is added by one liter it would decrease the revenue incur as much as IDR 771,972 in sweet corn farming. Therefore, farmers must be extra careful in using pesticide inputs, bearing in mind the dosage and type of use of pesticides are generally very sensitive to sweet corn.

**Allocative Efficiency of Labor.** The use of labor in sweet corn farming was considered inefficient. The data analysis result showed that the allocative efficiency index of the labor variable was -1.13. It means that farmers gave too much labor into sweet corn farming. When conducting a hypothesis test, $H_0$ was rejected while $H_1$ was accepted (t-count > t-tab: 10,9709 < 2.023 at $\alpha$ = 5%). It means that labor use in sweet corn farming was still inefficient. The value of the marginal product (VMP) of labor was -31,804. This value means that when one man workday was added to the farming, it will decrease the revenue of sweet corn production by as much as IDR 31,804.

## IV. Conclusion and Suggestion

**Conclusion**

1. The results of statistical testing of the Cobb-Douglas type of production function showed that simultaneously (production factors: land area, number of seeds, organic fertilizers, inorganic fertilizers, pesticides, and labor) had a significant effect on sweet corn production, while the partial test shows that the variable of land area, seeds, and inorganic fertilizer had a significant effect on sweet corn production individually, while the variables of organic fertilizer, pesticide, and labor had no significant effect.
2. Statistical testing of allocative efficiency (price efficiency) showed that organic fertilizer, inorganic fertilizer, and pesticide had been used efficiently in sweet corn farming. On the other hand, the independent variables of land area, seed, and labor were used inefficiently, since the index of allocative

efficiency on sweet corn was larger than 1. The average land area for sweet corn farming was less than 0.5 ha, while seed used less than 2 kg farm$^{-1}$. In terms of labor, it was also inefficient. In this case, too much labor was devoted to sweet corn farming which causes its production to decrease.

**Suggestion**

1. Additional capital was needed for farmers in developing sweet corn farming, especially in increasing the planting area and purchasing seeds.
2. Technical guidance was also needed so that the development of sweet corn farming would be successful because, with a wider business scale, of course, farming management needed to be improved, especially in terms of the allocation of input use.
3. Further research was needed to determine technical efficiency to achieve economic efficiency in sweet corn farming.

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