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ANALYSIS OF FACTORS DETERMINING PRODUCTION AND INCOME OF DRYLAND MAIZE FARMERS IN THE BORDER AREA OF KOBALIMA TIMUR DISTRICT MALAKA REGENCY

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ABSTRACT

A This research was conducted in Kobalima Timur sub-district, namely in Alas Utara village and Kota Biru village. The objectives of this study were: 1) To identify factors that influence the level of production and income of corn farming businesses of dry land farmers in border areas; 2) To find out the amount of production and income obtained by corn farmers in dry land border areas.

The selection of research locations was carried out by simple random sampling, namely selecting 2 villages out of 5 villages that directly border with Timor Leste, namely Alas Utara village and Kota Biru village. The selection of sample farmers was carried out using the simple random sampling method of 20% of the corn farmer population in the 2 selected villages, namely 32 corn farmers in Alas Utara village and 34 corn farmers in Kota Biru village. so that 66 farmers were obtained as respondents.

The results of the study showed that: 1) Factors that significantly influenced the level of corn farming production in the border area of Kobalima Timur Sub-district, Malaka Regency were land area, selling price, and labor. Meanwhile, farming experience, number of seeds and education level do not significantly affect corn production; 2) The income of corn farmers in the border area of East Kobalima sub-district is IDR 15,823,252 per hectare

INTRODUCTION

Indonesia still imports corn every year from Argentina, Brazil, the United States, and several other countries, with imports amounting to 737,228 tons in

2018 and increasing to 1.07 million tons in 2020. Data from the Ministry of Agriculture for the first quarter of March 2021 shows that the corn production by farmers in our country has not been able to meet the annual demand for corn in Indonesia(Direktorat Pakan Direktorat Jenderal Peternakan Dan Kesehatan Hewan Kemeterian Pertanian, 2021). Several corn-producing provinces such as South Sulawesi, Gorontalo, East Java, Southeast Sulawesi, North Maluku, West Nusa Tenggara, and East Nusa Tenggara have not been able to provide corn stocks to meet the increasing domestic demand each year. Besides the high production costs, the suboptimal quality of farmers in cultivating and producing corn, as well as various obstacles faced in the use of production inputs that are not yet optimal,(Baptista et al., 2024) (Pires et al., 2024) the low perception and understanding of dryland farmers regarding land conservation aspects lead to low levels of corn production and farmer income.

Corn is a strategic commodity in the development of agriculture and the Indonesian economy(El-Katcha et al., 2024),(Mohamed Shaffril et al., 2024) considering that this commodity has multifunctional roles, both for food and animal feed. The role of corn in the national economy, especially in rural areas, is also very important. The development of corn production in 2023 was 14,774,432.52 tons, and in 2024, corn production increased to 15,207,141.46 tons of dry shelled corn. The productivity of corn in 2023 was 59.67 quintals/ha, and in 2024, it decreased to 58.86 quintals/ha. The harvested area of corn in 2023 was 2,476,090.93 ha, and in 2024, it increased to 2,583,673.99 ha (Machdi, 2024)

The opportunity to increase domestic corn production is still wide open, both through productivity improvements and area expansion, especially outside the island of Java, such as in East Nusa Tenggara. The productivity of corn in the province of East Nusa Tenggara in 2023 was 25.80 quintals/ha and in 2024 it was 26.68 quintals/ha. This data shows that the level of corn productivity in the province of East Nusa Tenggara is still very low compared to the national productivity.

The dryland farming communities in the province of East Nusa Tenggara have made corn a staple food to support family food security. Corn has been cultivated for generations, especially by the dryland communities in the province of East Nusa Tenggara, including the border communities in Malaka Regency. The cultivation of corn by the dryland farming community in the border area of Kobalima Timur District is the farmers' activity that has the greatest impact in supporting the food consumption needs of farming families. The use of corn as a staple food for the community has been passed down through generations. The short rainfall condition, which lasts only 3 to 4 months per year, is the main consideration for dryland farmers to plant corn using the slash-and-burn and shifting cultivation systems(Abebe, 2021; Ali, 2021). The slash-and-burn and shifting cultivation agricultural practices result in increased erosion rates, environmental damage due to land burning, and

decreased soil fertility, leading to very low productivity of 25.80 quintals/ha compared to the national productivity of 59.60 quintals/ha.

The limited knowledge and skills regarding the good and efficient allocation of production factors(Bai et al., 2024; Van Der Zwan et al., 2024), as well as the low perception and understanding of farmers about the conservation of dryland resources in maintaining soil fertility and reducing erosion, result in low productivity levels of corn farming and low income for corn farmers in the border area of Malaka Regency. Therefore, analyzing the factors determining corn farming production and income becomes very important to study.

RESEARCH METHODS

This research has been conducted in the Kobalima Timur District, Malaka Regency, for 6 months, from April to September 2024. The method used is descriptive quantitative. Two villages, namely Alas Utara Village and Kota Biru Village, were randomly selected from the five villages in the Kobalima Timur District as the research locations.

Method of Collecting Data

The data collected consists of primary and secondary data. Primary data was obtained from interviews with corn farmer households using a prepared questionnaire(Sugiyono, 2019). Secondary data was obtained from various institutions, both government and private, related to this research. The technique for sampling farmers was conducted using simple random sampling. The selection of sample farmers was carried out using the simple random sampling method, amounting to 20% of the population of corn farmer households in the villages of Alas Utara and Kota Biru, resulting in 66 farmer households as respondents.

Data Analysis Method

Empirical Model

The data collected in this study will be analyzed both descriptively/quantitatively to describe the demographic, socio-economic, and cultural conditions. Next, to predict the value of the dependent variable, namely production, based on independent variables such as land area, number of seeds, farming experience, selling price, labor, and farmers' education level, quantitative analysis is used with the Cobb-Douglas production function. The Cobb-Douglas production function is a function or equation that involves two or more variables, where one of these variables is called the dependent variable, which is the bound variable (Y), and the independent variable or free

variable. (X)(Soekartawi, 2003). The consideration for using this production function is because this model is easy to analyze. Another advantage of using this model is that the production elasticity of each factor can be simultaneously determined from the coefficients of each production factor. The formula for the Cobb-Douglas production function is as follows:

$$Y = a\, X_1^{b1}\, X_2^{b2}\, X_3^{b3}\, X_4^{b4}\, X_5^{b5}\, X_6^{b6}\, e^{u}$$

Legend :

Y	: Corn Production	X_1	: Land area	X_4	: Selling Price
		X_2	: Number of seeds	X_5	: Labor
a	: Intercept			X_6	: Education Level
b1–b6	: Regression coefficients	X_3	: Farming experience	E	: Error

Next, to determine the influence of production determinant factors on the level of corn production, an analysis was conducted using multiple linear regression with a function model transformed into natural logarithm form, resulting in the following equation or model:

$$\text{Ln } Y = \text{Ln } a + b_1 \text{ Ln } X_1 + b_2 \text{ Ln } X_2 + b_3 \text{ Ln } X_3 + b_4 \text{ Ln } X_4 + b_5 \text{ Ln } X_5 + b_6 \text{ Ln } X_6 + e$$

To see the simultaneous influence of the independent variables (X1-X6) on corn production (Y), an F-test is conducted(Hamidi et al., 2024). Meanwhile, to test the significance of each independent variable on corn production, a partial test is used. (t-test)(Balakrishnan et al., 2013). An analysis of corn farming revenue and the income will be performed with the formula established (Herliani et al., 2018) (Oskarsson, 2024)as follows:

$$I = TR - TC \quad \text{and} \quad TR = P \times Q$$

Information:

I : Farming revenue (IDR)	TC : Total Cost (IDR)	P: Price (IDR)
TR : Agricultural revenue (IDR)	TR: Total income (IDR)	Q: Amount of product (kg)

RESULTS AND DISCUSSION

Land Area (X1)

Based on the analysis of the effect of land area (X1) on corn production (Y), a t-value of 2.388 > t-table 2.01 was obtained, meaning that if the land area is increased by 1%, corn production will increase by 0.651%.

A crucial topic of agricultural research is the connection between land area and corn productivity, especially in areas where maize is a main crop. Several studies have shown that the total productivity and yield of corn are highly influenced by the amount of land area used for maize farming. The idea that greater farming areas might increase agricultural productivity is supported

by data from Central Java, Indonesia, which shows that an increase in accessible land area positively correlates with corn yield(Romadyah & Purnomo, 2024). This finding is consistent with broader agricultural principles that suggest the quantity of land utilized for farming directly impacts the volume of production achieved.

Corn production is impacted by a number of agronomic parameters, including as soil quality, water availability, and pest control, in addition to land area. Studies have indicated that soil nutrition, planting practices, and climate have an impact on land productivity, which is the amount of land that can produce crops per hectare(Suryani et al., 2020).

Corn production is significantly influenced by socioeconomic factors in addition to environmental ones. Research has shown that maize farmers' income levels are strongly impacted by the size of their land holdings, with greater land areas generally translating into higher incomes and better wellbeing for farming households(Widarma & Setiawina, 2019). Additional land affects corn production significantly because agricultural land is in the border areas of Indonesia and Timor Leste, although dry land still has great potential when planted with corn. These results can certainly become a strategy for developing agribusiness in border areas. This research can also strengthen research (Mulyono Joko, 2020) and support policies from the Indonesian government (Andi Amran Sulaiman et al., 2018).

Amount of Seeds (X2)

Based on the analysis results, the t-value is -0.143 and the t-table value is 2.01. The t-value < t-table means that corn seeds (X2) do not have a significant effect on corn production. If the corn seeds are increased, then the corn production will decrease. Numerous studies that emphasize the complexity of plant density, competition, and environmental factors impacting yield results support the claim that the quantity of seeds has no discernible impact on maize productivity. The relationship between seed density and maize production is complex and can be altered by a variety of agronomic conditions, according to research(Silva et al., 2010).

Corn production is also greatly influenced by the physiological condition of the seeds. Oliveira et al. discovered that although seed vigor can affect germination and subsequent plant growth, weed roots had no discernible effect on corn seed vigor or germination(Oliveira et al., 2017). This indicates that factors such as seed quality and environmental conditions may have a more pronounced effect on yield than the sheer quantity of seeds planted.

Based on interviews with farmers, the corn seeds prepared are usually 3 to 4 times more than the actual need. For example, if the land owned is 1 hectare, then the corn seeds prepared are 100 kg. This happens because of the habit of farmers who are afraid of using small amounts of seeds. Agricultural

empowerment and the role of extension in the future can help educate farmers regarding optimal use of seeds.

Farming Experience (X3)

Based on the analysis results, the calculated t-value is 1.588 and the t-table value is 2.01. The calculated t-value < t-table value, meaning that the independent variable of farming experience (X3) does not have a significant effect on corn production. (Y).

The claim that corn yield is not significantly impacted by farming expertise is a complex subject that has been examined in a number of research. Experience may not have as big of an influence as is frequently thought, according to some research, even though it can boost production through better management techniques. For example, Wang and Hu's study examined the efficiency of maize production in twelve different corn-producing nations and discovered that intensive farming methods and seed mulching had a greater impact on technical efficiency than farming expertise alone. This implies that expertise is not the only factor that determines production efficiency, even though it may help develop better techniques(Wang & Hu, 2021).

Furthermore, the age and physical capabilities of farmers may have an impact on the association between maize productivity and farming experience. According to research by Sahara et al., farmers' physical capabilities may deteriorate with age, which could have a detrimental effect on how efficiently they grow maize. This research suggests that although though experience is usually advantageous, it might not be enough to make up for the physical restrictions that come with growing older. As a result, experience may not be as helpful at increasing corn production over time, indicating that younger or more physically fit farmers may be able to attain higher productivity levels despite years of experience(Efisiensi et al., 2019).

The experience of corn in Kobalima farming is passed down through generations, so there is no difference in corn farming activities. Farmers' experience also does not have a significant effect due to limited sources of knowledge for border farmers. These results are also in line with research(Evylinda Hoar & Fallo Yosefina Marice, 2017).

Selling Price (X4)

Based on the analysis results, it is known that the t-count value is 2.921 and the t-table value is 2.01. Because the t-count value > t-table value, it means that the selling price variable (X4) has a significant partial effect on corn production (Y). It can be concluded that if the selling price (X4) increases by 1%, corn production will increase by 0.104%. The substantial impact of selling prices on maize production suggests that the financial incentives farmers receive from the market have a big impact on their decisions to boost output. In order to generate bigger harvests, farmers typically invest more money in

labor, fertilizers, and high-quality seeds when the selling price of corn rises. According to (Mansur et al., 2023)'s research, rising commodity prices have a direct positive impact on agricultural output in developing nations. Furthermore, a study by (handoko & Narundana, 2023) found that steady and lucrative prices can motivate farmers to use improved farming methods, which will raise crop yields overall. The selling price has a significant influence because the higher the price, the more farmers will tend to increase the number of plants.

Indirectly supporting higher crop yields, competitive corn selling prices can promote effective utilization of production expenses.The adoption of more sophisticated agricultural technologies, like better seed types or agricultural mechanization, can be stimulated by stable market pricing and lucrative selling prices. Therefore, the findings of this study make a significant contribution to the development of policies that assist farmers in raising agricultural production and sustainability.

Labor (X5)

Based on the analysis results, it is known that the calculated t-value is 3.953 and the t-table value is 2.01. The calculated t-value > t-table value, meaning that the labor variable (X5) has a significant partial effect on corn production. (Y). If the labor force is increased by 1%, then corn production will increase by 0.265%.

One of the primary pillars in determining harvest outcomes is the human resource component, as evidenced by the discovery that labor has a substantial partial influence on corn yield. From planting to harvesting, every stage of output in the agricultural industry is greatly impacted by the quantity and caliber of personnel available. Increases in workforce size or quality can help the production process run more smoothly and on schedule, which will raise corn yields. These results are consistent with study by (Zhang et al., 2024), which discovered that laborers who are skilled and of a suitable size can increase maize production efficiency.

Particularly in regions that depend on manual labor, the rise in production capacity is directly correlated with the rise in the number of workers in the corn industry. Planting, fertilizing, and controlling pests are examples of physically demanding jobs that technology cannot completely replace. As a result, labor continues to be a crucial element in reaching ideal production levels(Xin & Ran, 2024).

The number of workers has a significant influence because most of the farmers at the research location are only assisted by family members, so if there is an increase in workers it will have a significant impact on production results. The results of this study are also in line with research(Musafiri, 2016; Tampubolon & Saputra, 2024).

Education Level (X6)

Based on the analysis results, the calculated t-value is -0.110 and the table t-value is 2.01. The negative calculated t-value means that if the education level of farmers increases, production will decrease. The prevailing belief that more education will improve skills and productivity may appear to be contradicted by the research findings that reveal that a rise in farmers' educational attainment is actually linked to a decline in corn yield. Examining the larger socioeconomic elements that affect farmers' output choices, however, helps to explain these findings.

One explanation could be that farmers with more education are more inclined to leave traditional farming for more specialized occupations or other, more secure and lucrative industries like trade or industry. As a result, there may be less manpower available for agricultural tasks, which could lead to less land or less time available for corn planting(Alene et al., 2008).

Higher educated farmers are more likely to base their farming decisions on market and economic research, which occasionally results in the decision to cut back on production in areas that are thought to be unproductive. Farmers with higher levels of education, for instance, could be more likely to evaluate the economic risks associated with maize production and choose to cut back on output or redirect their resources to other, more lucrative industries(Abate et al., 2022; Ma et al., 2024). This could involve switching to more economically viable crops or utilizing technologies that lessens reliance on conventional agriculture.

In certain situations, higher education does not always translate into better technical proficiency in agricultural operations; instead, it emphasizes non-agricultural roles that impact production choices. This could help to explain why increased maize production is not always correlated with higher levels of education.

But it's crucial to keep in mind that raising educational standards can benefit the agriculture industry in the long run, particularly if farmers receive training that is pertinent to contemporary farming ideas and practices. For instance, while there may be a short-term drop in production as a result of a change in resources or mindset, education that promotes the adoption of more effective agricultural methods can raise productivity over the long run. This is because people with higher education prefer other jobs over being farmers. This is of course a concern for all of us that the younger generation's interest in agriculture is greatly decreasing.

Coefficient of Determination (R^2)

The analysis results show that the Coefficient of Determination value is 90.3%, indicating that 90.3% of the variation in the dependent variable (Y) can be explained by the independent variables: land area (X1), seeds (X2), farming experience (X3), selling price (X4), labor (X5), and education level. (X6). Meanwhile, the remaining 9.7% is influenced by other factors not included in this study.

In other words, the aforementioned factors—such as the amount of land used, the quality of the seeds planted, farming experience, the selling price of corn, the labor involved, and the farmers' educational attainment—can be used to anticipate and understand 90.3% of variations in corn production. This finding suggests that these variables have a major impact on the results of corn production.

However, the variables included in this study are unable to account for a 9.7% difference in corn production. Other variables not covered by the model, such as market accessibility, government regulations, climate change, the availability of natural resources, or farmer-used agricultural technology, may be to blame for this unexplained volatility. These elements may not be quantifiable or part of the study's variables, but they frequently affect agricultural production.

To improve our knowledge of the dynamics of maize production, more studies incorporating these other factors are necessary in the future. Furthermore, a multidisciplinary strategy that integrates environmental, social, and technological aspects can offer more thorough insights to improve farmers' welfare and production.

Income

Income is obtained from the difference between revenue and total costs. Details of the corn farming income calculation can be seen in the table below. The results of the data analysis show that the income per hectare obtained from corn farming activities, which is the product of corn production and its selling price, amounts to IDR. 17,960,371. Meanwhile, the average total cost incurred in corn farming activities is IDR. 2,137,119, resulting in an average income of IDR. The calculation of corn farming income in the border area of Kobalima Timur District amounts to IDR. 15,823,252 per hectare.

Table of Corn Farming Income in Alas Utara Village and Kota Biru Village

Description	Average Income
Total Costs	IDR. 2.137.119
Total Revenue	IDR. 17.960.371
Income	IDR. 15.823.252

Source: primary data processed in 2024

Corn growing in this area is very profitable, based on the net revenue these farmers make. To get a more complete picture of the economic viability of corn farming, more research is necessary to examine the variables influencing output and expenses, such as labor, fertilizer, and seed prices, as well as resource utilization efficiency. The selling price of maize is crucial in this situation since price fluctuations may have an impact on farmer's earnings(Bacon et al., 2014).

Notwithstanding the substantial income received, it is crucial to take into account the difficulties farmers have, such as their reliance on seasonal and meteorological fluctuations that may impact crop output. To improve the welfare of farmers in this area, policies that promote price stability, subsidies for agricultural inputs, and easier access to technology for increased production efficiency are also crucial(Mahendra & Priambodo, 2022). The productivity and profitability of the corn farming industry can also be raised by training programs that improve farmers' technical and administrative abilities(Le et al., 2024).

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

The use of production determinants in corn farming is not yet efficient overall. The production factors that significantly affect the production level are land area, selling price, and labor. Meanwhile, farming experience, seed quantity, and education level do not significantly affect corn production. The income of corn farmers in the border area of Kobalima Timur sub-district is obtained at an average of IDR. 15,823,252.00 per hectare.

Suggestion

Based on the research results and conclusions obtained, the recommendations that can be provided by the author in this study are as follows:

1. Corn farmers in the border area of Kobalima Timur District are expected to pay attention to the processes and stages of corn plant care. Especially the care in providing fertilizer to help stimulate corn growth so that corn production improves. It is hoped that farmers will always cooperate with agricultural extension workers in obtaining fertilizers from the government to improve corn production.
2. To the Malaka Regency government, especially the Agriculture Office, more attention should be given to the development of corn farming in the border area of Kobalima Timur District, Malaka Regency, particularly regarding fertilizer subsidy assistance.

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