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Efficiency Analysis of Maize Farming Around the Buffer Areas of The Mandalika Special Economic Zone (SEZ), Central Lombok: A Stochastic Frontier Analysis Approach

Analisis Efisiensi Budidaya Jagung di Sekitar Kawasan Penyangga Zona Ekonomi Khusus (KEK) Mandalika, Lombok Tengah: Pendekatan Analisis Batas Stokastik

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ABSTRACT

Central Lombok Regency has great potential for corn development, although its production decreased from 84,650 tons in 2020 to 53,000 tons in 2023. The presence of the Mandalika Special Economic Zone (SEZ) and the World Bank's I-Core program creates opportunities for agricultural development, marketing, and improvement of infrastructure and regional economic support. This study aims to analyze the factors influencing corn production, measure technical, allocative, and economic efficiency, and identify the factors contributing to technical, allocative, and economic inefficiency. The research employed a quantitative descriptive-analytical method with a Stochastic Frontier Analysis (SFA) approach using the Maximum Likelihood Estimation (MLE) method. The research locations were purposively selected in three villages surrounding the Mandalika SEZ, namely Rambitan, Mujur, and Penujak, with 90 farmer respondents selected through simple random sampling. The results show that land area, labor, and herbicides significantly affect corn production, while seeds, urea fertilizer, and Phonska fertilizer have positive but insignificant effects. In general, corn farmers in Central Lombok are technically efficient but not yet allocatively and economically efficient. Socioeconomic factors that increase technical inefficiency include age, farming experience, farmer group participation, and credit access, while education level and household size reduce it. Allocative inefficiency is influenced by farm distance, whereas economic inefficiency increases with credit access and decreases with farmer group participation and household size.

Keywords: corn, economic efficiency, Stochastic Frontier Analysis, Mandalika SEZ

ABSTRAK

Kabupaten Lombok Tengah memiliki potensi besar dalam pengembangan jagung, meskipun produksinya menurun dari 84.650 ton pada tahun 2020 menjadi 53.000 ton pada tahun 2023. Kehadiran Kawasan Ekonomi Khusus (KEK) Mandalika dan program I-Core Bank Dunia membuka peluang pengembangan, pemasaran, serta peningkatan dukungan infrastruktur dan ekonomi wilayah. Penelitian ini bertujuan untuk menganalisis faktor-faktor yang memengaruhi produksi jagung, mengukur efisiensi teknis, alokatif, dan ekonomis, serta mengidentifikasi faktor-faktor yang memengaruhi inefisiensi teknis, alokatif, dan ekonomis. Metode yang digunakan adalah deskriptif analitis kuantitatif dengan pendekatan Stochastic Frontier Analysis (SFA) dan metode Maximum Likelihood Estimation (MLE). Lokasi penelitian ditentukan secara purposive pada tiga desa di sekitar KEK Mandalika, yaitu Rambitan, Mujur, dan Penujak, dengan jumlah responden sebanyak 90 orang petani yang diambil secara acak sederhana. Hasil penelitian menunjukkan bahwa variabel luas lahan, tenaga kerja, dan herbisida berpengaruh nyata terhadap produksi jagung, sedangkan benih, pupuk urea, dan phonska berpengaruh positif namun tidak signifikan. Secara umum, petani jagung di Lombok Tengah telah efisien secara teknis, tetapi belum efisien secara alokatif dan ekonomis. Faktor sosial ekonomi yang meningkatkan inefisiensi teknis adalah umur, pengalaman usahatani, keikutsertaan kelompok tani, dan akses kredit, sedangkan pendidikan dan jumlah anggota keluarga menurunkannya. Inefisiensi alokatif dipengaruhi oleh jarak lahan, sementara inefisiensi ekonomi meningkat dengan akses kredit dan menurun dengan keanggotaan kelompok tani serta jumlah anggota keluarga.

Kata kunci: jagung, efisiensi ekonomi, Stochastic Frontier Analysis, KEK Mandalika

INTRODUCTION

Central Lombok Regency, West Nusa Tenggara, has great potential for developing corn production (Septiadi et al., 2023). However, corn production in this region has experienced a significant decline from 84,650 tons in 2020 to 53,000 tons in 2023 (NTB, 2024). Nevertheless, the presence of the Mandalika Special Economic Zone (SEZ) provides new opportunities for the development and marketing of corn and its derivative products. In addition, the Mandalika SEZ is expected to stimulate economic growth and promote the improvement of infrastructure and public facilities that support economic activities (Septiadi et al., 2016). Furthermore, support from the I-Core program initiated by the World Bank, as a pilot project in Central Lombok, represents a strategic step to strengthen corn commodity development and meet food demand in the Mandalika area (Antara News NTB, 2021).

As a leading commodity, corn has great potential to support food security, with a broad market share and continuously increasing demand. Based on NTB in Figures (2024), corn productivity in Central Lombok Regency in 2023 reached 56.92 quintals per hectare, compared to the NTB provincial average of 68.07 quintals per hectare. In 2020, Central Lombok recorded only 36.71 quintals per hectare—the lowest productivity level compared to other districts in West Nusa Tenggara, which averaged 60.58 quintals per hectare. Although corn production in West Nusa Tenggara Province has shown high fluctuations over the past two decades (Septiadi et al., 2022), this condition has encouraged farmers to improve their production efficiency to achieve maximum output (Simanjuntak, 2020)

The low productivity of corn farmers is believed to result from suboptimal allocation of production inputs and low managerial ability, both of which stem from socioeconomic differences among farmers around the Mandalika SEZ. Research on corn farming efficiency using the Stochastic Frontier Analysis (SFA) approach is still limited and rarely conducted in Central Lombok. Previous studies have mostly focused on the effects of production factors and technical efficiency. For instance, (Septiadi & Hidayati, 2023) concluded that corn farming in the Mandalika SEZ area is efficient and feasible. Other studies by (Mango et al., 2015) and (Muzeza et al., 2023), found that production factors such as fertilizer, seeds, labor, and land area significantly affect production, while the availability of inputs and technology influence productivity. Research on inefficiency by (A. N. Abdulai & Abdulai, 2016), (Etienne et al., 2019) and (Silitonga et al., 2016) revealed that technical inefficiency in corn farming is affected by education level, farmer group membership, access to credit, farming experience, distance to markets, and agricultural extension services. In contrast, (S. Abdulai et al., 2018), argued that education level and agricultural mechanization do not significantly affect technical efficiency, while agricultural extension services do. Another study by (Ahmed et al., 2018), using the stochastic frontier approach, concluded that seed quantity, land area, and fertilizer usage affect corn production, and that improving economic efficiency in corn production depends more on allocative efficiency than technical efficiency. Socioeconomic and institutional factors also influence technical efficiency.

Based on the above background, the research problems can be formulated as follows: (1). What factors influence corn production? (2) Are there differences in technical, allocative, and economic efficiency and ,(3). What factors affect technical, allocative, and economic inefficiencies in corn farming around the Mandalika SEZ buffer areas?

The urgency of this study lies in identifying and formulating optimal production inputs and designing more appropriate and effective agricultural policies to support the sustainability of corn farming and food security in the Mandalika SEZ area, Central Lombok.

RESEARCH METHOD

The basic method used in this study is descriptive quantitative analysis. Sampling locations were determined purposively based on the highest corn production areas surrounding the Mandalika SEZ buffer zone, namely Rambitan Village (representing Pujut Sub-district), Penujak Village (representing West Praya Sub-district), and Mujur Village (representing East Praya Sub-district). Each selected village included 30 randomly chosen farmer respondents, resulting in a total sample size of 90 respondents. Data collected consisted of primary data obtained directly through documentation and in-depth interviews with corn farmers, and secondary data obtained from agencies or institutions such as the Central Statistics Agency (BPS), the Department of Agriculture

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and Plantations, Agricultural Technical Implementation Units (UPT), scientific reports, and relevant literature.

Data Analysis Method

To answer the first research objective, the stochastic frontier production function model was used. The factors directly influencing production include land area, seeds, labor, Phonska fertilizer, urea fertilizer, SP-36 fertilizer, herbicide, and pesticide. To address the second objective, the stochastic frontier model was used to analyze the level of technical efficiency, while the dual frontier cost function was applied to assess allocative and economic efficiency.

For the third objective, the stochastic frontier model was employed to analyze technical inefficiency, following the technical inefficiency effects model developed by (Coelli, Timothy J., D.S. Prasada Rao., Christopher J. O'Donnel, 2005). Meanwhile, the Tobit model was used to analyze the factors influencing allocative and economic inefficiencies (Birhanu et al., 2022). The variables considered to explain inefficiency effects in this study include farmer's age, education level, family size, farming experience, access to credit, distance to markets, and participation in farmer groups.

RESULT AND DISCUSSION

Characteristics of Respondent Farmers

The characteristics of respondent farmers in this study illustrate the demographic, social, and economic conditions that influence corn farming patterns in the research area. These characteristics can be described as follows:

1. Age of Respondents

The study revealed that the majority of respondents (94.24%) were between 20 and 75 years old. This indicates that most respondents are within the productive age range, meaning they still possess sufficient energy and physical capacity to manage farming activities effectively. Productive age is also closely related to farmers' ability to adopt new technologies and their openness to agricultural innovations.

2. Education Level

In terms of formal education, most respondents had relatively low levels of education. Approximately 55.76% of the farmers had completed only elementary school (SD). This condition limits their ability to access and comprehend information or modern agricultural technologies. However, despite this limitation, farmers rely heavily on practical experience gained from fieldwork, which becomes their main asset in managing farming operations.

3. Farming Experience

Farming experience plays a crucial role in shaping farmers' skills and land management strategies. The results show that 63.46% of respondents had less than 10 years of farming experience, while 36.53% had been engaged in farming for more than 10 years. Farmers with longer experience tend to be more adaptive to changes in climate and market dynamics, while newer farmers are generally still in the learning and adaptation phase.

4. Number of Family Dependents

Family structure is another important aspect of farmer identity. About 71.15% of respondents supported between 1 and 3 family members, indicating that most farmers had a relatively light to moderate family burden. This allows them to allocate more time and focus toward productive farming activities.

Factors Affecting Corn Production in the Mandalika Special Economic Zone (SEZ)

This chapter also presents the analysis of the production function and efficiency of corn farming using the Stochastic Frontier Cobb-Douglas model estimated through the Maximum Likelihood Estimation (MLE) method. The estimation process was carried out in two stages: first, an Ordinary Least Squares (OLS) regression was performed to obtain the initial parameter estimates; then, the MLE method was applied simultaneously to estimate the production function parameters and inefficiency effects.

Out of the seven input variables initially analyzed, pesticides were excluded from the model because their regression coefficient was negative, which is economically irrational. Therefore, the stochastic frontier production function model for corn farming in the Mandalika SEZ area, Central Lombok, included six main input variables: Land area, Seeds, Labor, Urea fertilizer, Phonska fertilizer, Herbicide. The MLE estimation results for the stochastic frontier production function of corn farming in the Mandalika SEZ buffer area, Central Lombok, in 2024 are presented in Table 1 below.

Tabel 1. Estimation Results of the Stochastic Frontier Production Function for Corn Farming in the Mandalika SEZ Buffer Area, Central Lombok, 2024

Variable	Coefficient	Stadar error	t-ratio
Constant	4.3437	0.723	1.278
Land (X1)	0.572	0.158	2.143*
Seed(X2)	0.237	0.229	0.516
Labor (X3)	0.012	0.159	2.379*
Urea fertilizer (X4)	0.037	0.636	0.739
Phonsca Fertilizer (X5)	0.017	0.442	0.109
Herbicide (X6)	0.074	0.037	2.257*
Sigma square	0.0603		
Gamma	91.39		
LR-test	49.62		
log likelihood ols	2.7965		
log likelihood MLE	27,609		

Source : processed primary data
Desciption : real at a 5 percent level of significance

The estimation results show that the log-likelihood value of the MLE model (27.609) is higher than that of the OLS model (2.7965), indicating that the MLE model is more suitable for the research conditions. The LR test value (49.6267) is also higher than the Kodde-Palm critical value (19.384) at the 1% significance level, confirming the presence of both efficiency and inefficiency effects in corn farming in Mandalika. The gamma value of 91.39% indicates that most of the variation in corn production is due to technical efficiency, while the remaining 8.61% is attributed to random factors such as pests, soil fertility, temperature, and climate. This gamma value is lower than those reported by (Cordanis et al., 2020) and (Suprapti et al., 2014).

The analysis results show that land area (X1), labor (X3), and herbicides (X6) have a significant effect on corn production, while seed, urea fertilizer, and Phonsca fertilizer have positive but insignificant effects. The coefficients of the Cobb-Douglas production function also reflect elasticity, with the highest value for land area (0.572). This means that a 1% increase in land area would increase production by approximately 0.479%. This finding confirms that land is the dominant factor in increasing corn production, consistent with previous studies. The average cultivated land area per farmer is 1.49 ha (ranging from 0.37 ha to 4.10 ha). Therefore, land expansion remains the main strategy for increasing production, especially considering the vast dryland potential in Central Lombok.

Labor was found to have a significant effect on corn production at the 5% significance level (α = 0.05), with an elasticity value of 0.203. This means that a 1% increase in labor use will increase production by 0.203%. The average use of labor in the study area is relatively low, influenced by simultaneous farming patterns from land preparation to harvest leading to high labor demand amid limited availability. Labor includes family labor (men, women, and children), hired labor (daily male and female workers), and contract labor. Labor input is calculated in Workdays (HOK), based on total wages paid, with 100% for male labor and 60–70% for female labor. These results align with previous studies (Hastuti et al., 2018) and (Silitonga et al., 2016), which found that labor significantly affects corn production. In addition to land area and labor, herbicide use also significantly affects corn production, with an elasticity value of 0.213 at the 5% significance level (α = 0.05). This implies that a 1% increase in herbicide use can increase production by 0.213%. This result is consistent with findings by (Mandei, 2015) and (Nainggolan & Proklamita, 2024). The average herbicide use in the study area is … liters/ha, mainly for weed control in dryland areas before planting.

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For seed (X2), although it has a positive effect on production, the effect is not significant. The average seed use is 19.8 kg/ha, which aligns with the extension agents' recommendation (15–20 kg/ha). Therefore, additional seed use does not significantly increase yield. Similarly, urea fertilizer (X4) and Phonsca fertilizer (X5) show positive but insignificant effects. The average application rates are 281 kg/ha for urea and 296 kg/ha for Phonsca, both consistent with Balitsereal's recommendations. This indicates that fertilizer doses are already optimal, so additional application does not result in a significant increase in production.

Overall, the sum of the elasticity coefficients is 1.264, meaning that corn farming in the study area operates under increasing returns to scale (IRS) conditions, where a proportional 1% increase in input results in a 1.264% increase in output.

Technical, Allocative, and Economic Efficiency of Corn Farming in the Mandalika SEZ, Central Lombok

The level of technical efficiency was analyzed using the Cobb-Douglas stochastic frontier production function estimated through the MLE method with the Frontier 4.1 program. Meanwhile, allocative and economic efficiencies were calculated using the dual frontier cost function, based on technical efficiency data, individual input prices, and the average prevailing input prices. The results of these efficiency analyses are presented in table 2.

Table 2. Distribution of Technical, Allocative, and Economic Efficiency Levels of Corn Farming in the Buffer Areas of the Mandalika Special Economic Zone, Central Lombok, 2024.

Kisaran Luas Lahan	Efisiensi Teknis		Efisiensi Alokatif		Efisiensi Ekonomis	
	jumlah	persentase	Jumlah	persentase	Jumlah	Persentase
0.20 – 0.40	0	0	0	0	12	13.33
0.40 – 0.60	2	2.00	6	6.66	15	16.66
0.60 – 0.80	12	13.33	17	18.88	42	46.66
0.80 – 1.00	76	84.44	67	66.66	21	23.33
Jumlah	90	100	90	100	90	100
Maksimum	0.95		0.94		0.79	
Minimum	0.54		0.47		0.26	
Rata-rata	0.81		0.76		0.64	

Source : processed primary data

The distribution of technical efficiency in Table 2 shows values ranging from 0.54 to 0.95, with an average of 0.82. This indicates that corn farming in Mandalika is relatively efficient; however, there remains potential to increase production by approximately 18% if inputs are optimized according to recommended technologies. The variation in efficiency among farmers reflects differences in technological mastery, which are influenced by both internal factors (age, education, and farming experience) and external factors (membership in farmer groups, agricultural extension participation, and access to farm inputs). If the average farmer aims to reach maximum efficiency, there is a potential production increase of 13.68%, while for the least efficient farmers, the potential increase reaches 43.15%.

Allocative and economic efficiencies were estimated using the dual cost frontier approach of the stochastic frontier model, with allocative efficiency (AE) calculated as the ratio of economic efficiency (EE) to technical efficiency (TE). The analysis was conducted from the input-cost perspective, based on actual farm-level prices, including corn at IDR 4,250/kg, land rent at IDR 2,760,000/ha, seed at IDR 118,525/kg, labor at IDR 91,250 per workday, urea fertilizer at IDR 3,127/kg, Phonsca fertilizer at IDR 3,258/kg, and herbicide at IDR 123,500/liter. The minimum cost estimation using the dual frontier approach formed the basis for analyzing technical, allocative, and economic efficiencies.

$$Ln\ C = 0.9911 + 1.1685\ ln\ Yo + 0.4395\ ln\ P1 + 0.0474\ ln\ P2 + 0.2124\ ln\ P3 + 0.0311\ ln\ P4 + 0.0173\ ln\ P5 + 0.1979\ ln\ P6$$

Based on Table 3, the average allocative efficiency of corn farming in the Mandalika SEZ is 0.74, ranging from 0.47 to 0.94. This means that farmers could potentially reduce production costs by 20–52% if they reached the highest efficiency level. This value is lower than the findings of (Dwi Lestari & Emi Maimunah, 2023), suggesting that allocative efficiency remains suboptimal. The average economic efficiency is 0.64, with most farmers ranging between 0.60 and 0.80, and only 23.33% of them approaching full efficiency. If maximum efficiency were achieved, costs could be

reduced by up to 16.88%. The relatively low economic efficiency is mainly due to high labor, harvesting, and post-harvest costs. This result is also lower than that reported by (Fadwiwati et al., 2014).

Based on the analysis, the technical efficiency (TE), allocative efficiency (AE), and economic efficiency (EE) values were 0.81, 0.76, and 0.79, respectively. These findings indicate that corn farming in the Mandalika Special Economic Zone, Central Lombok Regency, has achieved efficiency from a technical perspective but remains inefficient in allocative and economic terms. The TE value greater than 0.80 shows that farmers are relatively capable of managing production factors (land, labor, and herbicide). Conversely, allocative and economic efficiency values below 0.80 (<0.80) suggest that input use is not yet cost-efficient (Fadwiwati et al., 2014) and (Fermadi., 2015). The higher TE value compared to AE indicates that farmers can optimize inputs but have not fully considered input prices in their production decisions, resulting in less-than-maximum profits. Efficiency improvement can be achieved through enhanced technical skills and greater cost-awareness, particularly regarding input prices. This finding aligns with (Fermadi., 2015) but contrasts with (Ahmed et al., 2018), who emphasize the importance of price information access. Therefore, technical training and improved market access are key strategies to enhance the efficiency of corn farming around Mandalika.

Analysis of Technical Inefficiency in Corn Farming

The analysis of technical inefficiency factors in corn farming uses the inefficiency effects model within the stochastic frontier production function. The variables examined include age (Z1), education (Z2), experience (Z3), number of family members (Z4), as well as dummy variables for farmer group membership (D1) and credit access (D2). The estimation results are presented in the following table.

Table 3. Estimation Results of the Technical Inefficiency Effects Model in the Stochastic Frontier Production Function of Corn Farmers in the Mandalika Special Economic Zone, Central Lombok

Variabel	Koefisien	Standar error	t-ratio
Konstanta	2.1392	0.4923	3.7986
Farmer age (Z1)	0.0721**	0.0047	1.7432
Level of education (Z2)	-0.032	0.0243	0.1243
Farming experience (Z3)	0.021	0.4352	0.0931
Nurmber of family members (Z4)	-0.0875**	0.0298	1.9873
Dummy farmer group (D1)	0.0184	0.0879	1.2871
Dummy credit access (D2)	0.2091**	0.0779	2.1097

Desciption : real at a 5 percent level of significance

The estimation results (Table 3) show that the age of farmers has a positive and significant effect on technical inefficiency (α = 0.05; coefficient 0.0721). This means that as farmers get older, inefficiency tends to increase due to the decline in physical ability. Although the average age of corn farmers (39 years) is still within the productive range, age remains an influential factor in efficiency. This finding is consistent with (Rohi et al., 2018) and (Osawe et al., 2012)nbut differs from (Anggraini et al., 2017), who found the opposite effect in cassava farming.

The education variable has a negative coefficient (-0.032) but is not significant, indicating that education level does not have a significant effect on technical inefficiency. In other words, farmers' formal education does not directly determine the efficiency of corn farming. In the study area, most farmers have completed elementary school (39%), with an average education level equivalent to junior high school, allowing them to read, write, and access basic information. Although formal education is not a significant factor, increasing farmers' knowledge through training and extension remains important to support technology adoption and better farm management. Unlike (Rohi et al., 2018), who found that formal education can reduce technical inefficiency in corn farming in Kupang, NTT, and (Adar & Bano, 2020), who found similar results for corn in East Nusa Tenggara.

The farming experience variable (Z3) has a negative coefficient (-0.021) and is not significant, indicating that the longer a farmer manages corn farming, the lower the level of technical inefficiency tends to be. Although not statistically significant, farming experience remains important as it reflects accumulated knowledge, skills, and adaptability that can enhance production efficiency.

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The number of family members (Z4) has a negative coefficient (-0.0875) and is significant at α = 0.05, meaning that a larger household size tends to reduce technical inefficiency. This is because family labor availability can reduce production costs, increase productivity, and minimize dependence on hired labor. These results are consistent with (Adar & Bano, 2020) and (Wahyuningsih et al., 2018).

The farmer group membership variable has a negative but insignificant coefficient, suggesting that farmer groups have not yet played an optimal role in improving production efficiency. Although in theory, such groups serve as platforms for knowledge exchange, technology access, and input distribution, in practice, their benefits remain limited due to weak institutional capacity and low farmer participation.

The credit access variable (Z6) also has a negative but insignificant coefficient, indicating that while not statistically significant, access to credit still has the potential to reduce technical inefficiency and strengthen farmers' production capacity. Access to credit helps farmers overcome capital constraints, enabling timely purchase of inputs and more efficient cost management, thereby supporting higher productivity and technical efficiency. About 68% of corn farmers have access to credit, with varying loan amounts depending on farm size, reflecting reliance on external financing, especially for large-scale farmers. These findings align with (Fadwiwati et al., 2014) and (Nursan et al., 2020), who reported that credit improves technical efficiency in corn farming, but differ from (Anggraini et al., 2017), who found a negative impact in cassava farming likely due to differences in commodities, input use patterns, and institutional structures.

Allocative and Economic Inefficiency

The analysis of allocative and economic inefficiency uses the Tobit model, as the dependent variable is limited (≥0), making it more appropriate than linear regression. The explanatory variables include age, farm distance, number of family members, farmer group membership, and credit access, with the estimation results presented in Table 4

Table 4. Estimation Results of Allocative and Economic Inefficiency Parameters in Corn Farming around the Mandalika Special Economic Zone, Central Lombok, 2024

Variabel	Efisiensi Alokatif (AE)		Efisiensi (EE)	
	Koefisien	Prob.	Koefisien	Prob.
Konstanta	0.632	0.617	0.781	0.002
Umur Petani (Z1)	0.001	0.352	-0.003	0.265
Jarak lahan UT (Z2)	0.014**	0.043	0.002	0.177
Jumlah Anggota Keluarga (Z3)	0.023	0.089	-0.027**	0.036
Keaggotaan Kel Tani (Z4)	0.023	0.072	-0,131**	0.042
Akses Kredit (Z5)	0.004	0.891	0.061**	0.014

Desciption : real at a 5 percent level of significance

The Tobit estimation results show that land distance has a positive and significant effect (coef. 0.014; α = 0.05) on allocative inefficiency. This means that the farther the farmland is from the farmer's residence, the lower the allocative efficiency due to increased transportation costs and a higher risk of delays in farming activities. Greater distances lead to higher risks of delays in fertilization, pest control, or harvesting, which ultimately reduce productivity and farmers' income. Survey results show that the average transportation cost for corn is IDR 20,000–30,000 per quintal, indicating a stronger cost effect for larger-scale farms. Therefore, greater land distance increases transport costs and allocative inefficiency, highlighting the need for efficiency improvements through better road access, collective transportation, or farmer group support.

The number of family members variable has a significant effect on economic inefficiency (α = 0.05) with a coefficient of -0.027, meaning that the larger the household size, the higher the economic efficiency of corn farming. Conceptually, household size reflects the availability of family labor that can substitute for hired labor. Their participation reduces production costs, thus increasing the economic efficiency of corn farming. This finding is consistent with (Anggraeni, 2016), who showed that family labor improves economic efficiency, particularly among small-scale farmers, as it reduces production costs and optimizes resource use. Empirically, these results reaffirm the crucial role of family labor in corn farming, as it helps reduce costs, allows for management flexibility, and makes a tangible contribution to improving economic efficiency.

The farmer group membership variable has a negative and significant effect (-0.131) on economic inefficiency, indicating that participation in farmer groups helps lower production costs and improve economic efficiency. Farmer groups function as partners in government programs and as distributors, allowing for collective input purchases that reduce costs and enhance efficiency. In contrast, (Anggraini et al., 2017) found that farmer group membership did not significantly affect economic efficiency, as productivity is more influenced by skills, technology, and management; thus, farmer groups tend to play a greater role in economic efficiency than in technical efficiency. The findings show that 92.9% of respondent farmers are members of farmer groups, reflecting their awareness of the importance of collective organizations for access to capital, production inputs, and bargaining power enhancement.

Access to credit has a significant and positive effect (coef. 0.061; $\alpha = 0.05$) on economic inefficiency, meaning that farmers who receive credit tend to be less economically efficient. Interestingly, the study reveals contrasting roles of credit: while it positively affects technical efficiency by enabling timely input purchases, it increases economic inefficiency when funds are not fully used for production purposes. Some farmers use credit for consumption rather than production, leading to inefficient cost management despite increased output. This finding aligns with Anggraini et al. (2017) and Bifarin (2010), who reported that credit can reduce economic efficiency when not productively utilized or when disbursement is delayed. However, it differs from Lubis (2014), who found that credit improves efficiency when properly targeted—emphasizing that the impact of credit depends heavily on farmers' financial behavior and the effectiveness of lending institutions. Overall, credit can enhance economic efficiency only if managed responsibly and allocated for productive activities; otherwise, it increases costs and reduces efficiency.

CONCLUSION

Based on the objectives and findings of this study, it can be concluded that:

1. Variables that significantly affect frontier production in corn farming in the Mandalika Special Economic Zone, Central Lombok, are land area, labor, and herbicide use. Meanwhile, seed, urea fertilizer, and Phonska fertilizer have positive but insignificant effects.
2. On average, corn farmers in Central Lombok are technically efficient, but allocative and economic efficiency have not yet been achieved.
3. Socioeconomic factors that positively influence technical inefficiency include farmer age, farming experience, group membership, and credit access, while education level and number of family members negatively affect technical inefficiency. Furthermore, the distance of farmland influences allocative inefficiency, while credit access positively affects economic inefficiency. In contrast, farmer group membership and number of family members negatively affect economic inefficiency in corn farming in the Mandalika Special Economic Zone, Central Lombok.

Recommendations

Based on the research findings, it is recommended that corn farmers in the Mandalika Special Economic Zone improve technical efficiency by optimizing input use—particularly by expanding cultivated land area, increasing labor utilization, and using herbicides more effectively. The use of agricultural credit should be better targeted to ensure that funds are allocated for input purchases and prioritized for small-scale farmers to maximize efficiency gains.

Furthermore, future research is encouraged to apply alternative production function models, such as the Translog model, and include additional socioeconomic variables (e.g., extension frequency, seed variety type) to provide a more comprehensive understanding of the factors influencing corn farming efficiency.

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REFERENCES

Abdulai, A. N., & Abdulai, A. (2016). Allocative and scale efficiency among maize farmers in Zambia: a zero efficiency stochastic frontier approach. *Applied Economics*, *48*(55), 5364–5378. https://doi.org/10.1080/00036846.2016.1176120

Abdulai, S., Nkegbe, P. K., & Donkoh, S. A. (2018). Assessing the technical efficiency of maize production in northern Ghana: The data envelopment analysis approach. *Cogent Food and Agriculture*, *4*(1), 1–14. https://doi.org/10.1080/23311932.2018.1512390

Adar, D., & Bano, M. (2020). Faktor-Faktor Penentu Efisiensi Teknis Usahatani Jagung Lahan Kering: Studi Kasus di Kabupaten Kupang Provinsi Nusa Tenggara Timur, Indonesia. *Jurnal Excellentia*, *9*(2), 93–104. https://ejurnal.undana.ac.id/index.php/JEXCEL/article/view/3281

Ahmed, M. H., Tazeze, A., Mezgebo, A., & Andualem, E. (2018). Measuring maize production efficiency in the eastern Ethiopia: Stochastic frontier approach. *African Journal of Science, Technology, Innovation and Development*, *10*(7), 779–786. https://doi.org/10.1080/20421338.2018.1514757

Anggraeni, M. R. R. S. (2016). Kesejahteraan Masyarakat Pedesaan. *Modus*, *28*(2), 155–167.

Anggraini, N., Harianto, H., & Anggraeni, L. (2017). Efisiensi Teknis, Alokatif dan Ekonomi pada Usahatani Ubikayu di Kabupaten Lampung Tengah Provinsi Lampung. *Jurnal Agribisnis Indonesia*, *4*(1), 43. https://doi.org/10.29244/jai.2016.4.1.43-56

Birhanu, F. Z., Tsehay, A. S., & Alemu Bimrew, D. (2022). Cereal production practices and technical efficiency among farm households in major "teff" growing mixed farming areas of Ethiopia: A stochastic meta-frontier approach. *Cogent Economics and Finance*, *10*(1). https://doi.org/10.1080/23322039.2021.2012986

Coelli, Timothy J., D.S. Prasada Rao., Christopher J. O'Donnel, G. E. B. (2005). *An introduction to efficiency and productivity analysis. In An Introduction to Efficiency and Productivity Analysis*. 349. https://doi.org/https://doi.org/10.1007/b136381

Cordanis, A. P., Sudirman, P. E., & Piran, R. D. (2020). Efisiensi Usaha Tani Jagung di Kecamatan Amabi Oefeto Timur Kabupaten Kupang. *CIWAL (Jurnal Ilmu Pertanian Dan Lingkungan)*, *1*(1), 23–26.

Dwi Lestari, & Emi Maimunah. (2023). Faktor-Faktor Yang Mempengaruhi Produksi Usaha Ternak Ayam Petelur Di Kecamatan Way Kenanga Kabupaten Tulang Bawang Barat. *Journal on Education*, *06*(01), 6343–6350.

Etienne, X. L., Ferrara, G., & Mugabe, D. (2019). How efficient is maize production among smallholder farmers in Zimbabwe? A comparison of semiparametric and parametric frontier efficiency analyses. *Applied Economics*, *51*(26), 2855–2871. https://doi.org/10.1080/00036846.2018.1558363

Fadwiwati, A. Y., Hartoyo, S., Kuncoro, S. U., & Rusastra, W. (2014). Analyses of Technical, Allocative, and Economic Efficiencies of Maize Farm Management by Variety in Gorontalo Province. *Jurnal Agro Ekonomi*, *32*(1), 1–12.

Fermadi., P. F. E. . & K. E. (2015). Analysis of Production's Efficiency and Profit of Corn's Farming in East Ogan Komering Ulu Regency of South Sumatera. *Jiia*, *3*(1), 107–113.

Hastuti, D., Prabowo, R., & Syihabudin, A. A. (2018). Tingkat Hen Day Production (HDP) dan Break Event Point (BEP) Usaha Ayam Ras Petelur (Gallus sp). *Agrifo : Jurnal Agribisnis Universitas Malikussaleh*, *3*(2), 64. https://doi.org/10.29103/ag.v3i2.1111

Mandei, J. R. (2015). Efisiensi Teknis Usahatani Jagung Di Kecamatan Remboken Kabupaten Minahasa. *Agri-Sosioekonomi*, *11*(1), 28. https://doi.org/10.35791/agrsosek.11.1.2015.7168

Mango, N., Makate, C., Hanyani-Mlambo, B., Siziba, S., & Lundy, M. (2015). A stochastic frontier analysis of technical efficiency in smallholder maize production in Zimbabwe: The post-fast-track land reform outlook. *Cogent Economics and Finance*, *3*(1). https://doi.org/10.1080/23322039.2015.1117189

Muzeza, N. T., Taruvinga, A., & Mukarumbwa, P. (2023). Analysis of factors affecting technical efficiency of A1 smallholder maize farmers under command agriculture scheme in Zimbabwe: The case of Chegutu and Zvimba Districts. *Cogent Economics and Finance*,

11(1). https://doi.org/10.1080/23322039.2022.2163543

Nainggolan, V. F., & Proklamita, T. L. (2024). Efisiensi Teknis dan Sumber Inefisiensi Teknis Pada Usahatani Bawang Merah di Kabupaten Kupang (Pendekatan Maximum Likelihood Estimation). *Agrimor*, *9*(2), 69–77. https://doi.org/10.32938/ag.v9i2.2431

NTB, B. (2024). *Rencana Aksi Daerah Adaptasi Perubahan Iklim Provinsi Nusa Tenggara Barat*. 360.

Nursan, M., Ayu, C., & Suparyana, P. K. (2020). Analisis Keuntungan dan Kelayakan Ekonomi Usahatani Tembakau Virginia di Kabupaten Lombok Tengah. *Jurnal Ilmiah Membangun Desa Dan Pertanian*, *5*(3), 104. https://doi.org/10.37149/jimdp.v5i3.11825

Osawe, O. W., Adeqeye, A. J., & Omonona, B. T. (2012). Technical Efficiency of Small Scale Farmers: An Application of the Stochastic Frontier Production Function on Fish Farmers in Ibadan Metropolis. *SSRN Electronic Journal*, *February*. https://doi.org/10.2139/ssrn.1819042

Rohi, J. G., Winandi, R., & Fariyanti, A. (2018). Analisis Faktor Yang Mempengaruhi Produksi Usahatani Jagung Serta Efisiensi Teknis Di Kabupaten Kupang. *Forum Agribisnis*, *8*(2), 181–198. https://doi.org/10.29244/fagb.8.2.181-198

Septiadi, D., & Hidayati, A. (2023). Analisis Efisiensi Dan Faktor-Faktor Yang Mempengaruhi Produksi Jagung Di Daerah Penyangga Kawasan Ekonomi Khusus Mandalika. *AGRITA (AGri)*, *5*(2), 113. https://doi.org/10.35194/agri.v5i2.3806

Septiadi, D., Hidayati, A., Tanaya, I. G. L. P., & Hidayanti, A. A. (2023). Potensi Budidaya Jagung dan Faktor Sosial Ekonomi Dalam Mendukung Pendapatan Petani di Kawasan Ekonomi Khusus Mandalika. *Jurnal Agristan*, *5*(1), 135–148. https://doi.org/10.37058/agristan.v5i1.7041

Septiadi, D., Sukardi, L., & Suparyana, P. K. (2022). The influence of socio-economic factors on tobacco farmers' income (case study in Suralaga District, East Lombok Regency). *Jurnal Agrotek Ummat*, *9*(2), 117. https://doi.org/10.31764/jau.v9i2.8300

Silitonga, P. Y., Hartoyo, S., Sinaga, B. M., & Rusastra, I. W. (2016). ANALISIS EFISIENSI USAHATANI JAGUNG PADA LAHAN KERING MELALUI PENERAPAN PENGELOLAAN TANAMAN TERPADU (PTT) DI PROVINSI JAWA BARAT Efficiency Analyses of Maize Farming on Dry Land trough Implementation of Integrated Crop Management in West Java Province. *Informatika Pertanian*, *25*(2), 199–214.

Simanjuntak, R. (2020). ANALISIS FAKTOR-FAKTOR YANG MEMPENGARUHI PENDAPATAN USAHATANI JAGUNG (Nagori Bayu Bagasan Kecamatan Tanah Jawa Kabupaten Simalungun). *Agriprimatech*, *4*(1), 32–37. https://doi.org/10.34012/agriprimatech.v4i1.1316

Suprapti, I., Darwanto, D. H., Mulyo, J. H., Lestari, D., & Waluyati, R. (2014). Efisiensi Produksi Petani Jagung Madura Dalam Mempertahankan Keberadaan Jagung Lokal the Production Efficiency of Corn Farmers Madura in Maintaining the Existence of Local Corn. *Agriekonomika*, *3*(1), 11–20.

Wahyuningsih, A., Setiyawan, B. M., & Kristanto, B. A. (2018). Efisiensi Ekonomi Penggunaan Faktor-Faktor Produksi, Pendapatan Usahatani Jagung Hibrida Dan Jagung Lokal Di Kecamatan Kemusuk, Kabupaten Boyolali. *Agrisocionomics: Jurnal Sosial Ekonomi Pertanian*, *2*(1), 1. https://doi.org/10.14710/agrisocionomics.v2i1.2672