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Economic Feasibility And Break-Even Analysis Of Smallholder Maize Farming In South Aceh, Indonesia

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Abstract

Maize is a strategic food crop and an important source of farm household income in rural agricultural areas. However, maize farmers in Lhok Raya Village, Trumon Tengah District, South Aceh Regency face unstable output prices, limited farm financial records, and production risks caused by field conditions. This study aimed to analyze maize farming income, business feasibility based on the revenue-cost ratio, and break-even points for price and production. The research was conducted in Lhok Raya Village from July to August 2024. The location was selected purposively because maize farming is one of the main agricultural activities in the village. A quantitative descriptive approach was used. The sample consisted of 37 maize farmers selected through a census technique. Primary data were collected through field observation, structured interviews, questionnaires, and documentation, while secondary data were obtained from relevant institutions and literature. Data were analyzed using total cost, total revenue, farm income, R/C ratio, break-even price, and break-even production formulas. The results showed that average maize production was 4,144 kg/ha with an average selling price of IDR 4,900/kg. Average revenue reached IDR 13,011,496/ha, while total production cost used in the income and break-even analysis was IDR 3,110,065/ha. Therefore, average farm income was IDR 9,901,431/ha. The recalculated R/C ratio was 4.18, indicating that maize farming was economically feasible and profitable. The break-even price was IDR 750.4/kg, and break-even production was 634.7 kg/ha, both substantially below the actual

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selling price and production level. These findings indicate that maize farming in Lhok Raya Village remains financially viable, but farmers need stronger cost recording, production planning, and price-risk management to maintain profitability.

Keywords: break-even point, farm feasibility, farm income, maize, revenue-cost ratio.

INTRODUCTION

Agricultural sector development is primarily carried out by enhancing the food and plantation subsectors. One food crop that plays a crucial role in agricultural sector development is corn. In Indonesia, corn is the second most important food commodity after rice and serves as a source of calories or a substitute for rice. Furthermore, corn is also used as animal feed (Purwono & Hartono, 2007; Musthafa et al., 2018).

Agriculture remains a fundamental sector in Indonesia because it contributes to food availability, rural employment, and household income. In agrarian regions such as South Aceh Regency, agriculture is not only an economic activity but also a major livelihood system for rural communities. Lhok Raya Village in Trumon Tengah District is one of the areas where food crops and plantation crops are cultivated by local farmers. Among food crops, maize (Zea mays L.) has an important position because it can be used for household consumption, animal feed, and agro-industrial raw materials.

Maize has strong economic potential because demand for this commodity is linked to both food and feed industries. In the study area, maize farming is widely practiced by farmers and contributes to household income. Nevertheless, farmers still face several structural and managerial problems. The most visible problem is output price fluctuation. The selling price of maize reportedly reached IDR 5,000/kg in early 2023 but declined to around IDR 4,800/kg by the end of the year. In addition, some farmers do not maintain systematic farm records, making it difficult to distinguish between production cost, revenue, and net income.

The absence of simple bookkeeping is not a minor administrative issue; it directly weakens farmers capacity to evaluate whether their farming activities are truly profitable. Farmers may feel that they earn income after harvest, but without cost calculation they cannot identify the minimum selling price, the minimum production volume, or which input component consumes the largest share of capital. In areas exposed to flooding, crop failure, and price instability, this weakness increases business risk.

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Income analysis, revenue-cost ratio, and break-even point analysis are therefore useful tools for evaluating farm performance. Income analysis measures the difference between total revenue and total cost. The R/C ratio indicates whether the value of output is higher than the cost incurred. Break-even analysis identifies the minimum price and production volume required to avoid losses. Based on this background, this study analyzes the income, feasibility, break-even price, and break-even production of maize farming in Lhok Raya Village, Trumon Tengah District, South Aceh Regency.

This research aims was: (1) To analyze the income of smallholder maize farming; (2) To assess the economic feasibility of maize farming based on the Revenue-Cost Ratio; (3) To determine the break-even price and break-even production level of maize farming; (4) To identify the financial position of maize farming under actual cost, production, and selling price conditions; (5) To provide practical recommendations for improving farm cost recording, input efficiency, and price-risk management.

RESEARCH METHODS

Research Location and Sampling

The study was conducted in Lhok Raya Village, Trumon Tengah District, South Aceh Regency, from July to August 2024. The location was selected purposively (Mukhlis et al., 2019; Mukhlis et al., 2024; Asgaf et al., 2025), because maize farming is one of the agricultural activities carried out by the local community and because the village has relevant production and income issues for analysis.

The population consisted of 37 maize farmers in Lhok Raya Village. Because the population was relatively small, the study used a census or saturated sampling technique, meaning that all members of the population were included as respondents.

Data Types and Collection Methods

This study used primary and secondary data (Sugiyono, 2022; Mukhlis et al., 2022; Mukhlis et al., 2023; Ogari et al., 2026). Primary data were obtained from maize farmers through direct observation, structured interviews, questionnaires, and field documentation. The data covered respondent characteristics, land area, input use, production cost, output quantity, selling price, and farm income. Secondary data were obtained from local institutions, village records, agricultural offices, and relevant literature.

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Data Analysis

The data were analyzed using quantitative descriptive analysis. This method was used because the study focused on describing the actual financial performance of maize farming based on production, cost, revenue, income, feasibility, and break-even indicators. All cost, revenue, income, and feasibility indicators were calculated on a per-hectare basis to allow comparison among farmers with different land sizes.

The first step in the analysis was calculating the total production cost. Total cost represents all expenditures incurred by farmers during one maize production period. In this study, production cost was divided into fixed cost and variable cost. Fixed cost consisted of equipment depreciation, while variable cost included seed, fertilizer, pesticide, and labor costs. Total cost was calculated using the following formula:

$$TC = FC + VC$$

Where:
TC = total cost of maize farming (IDR/ha)
FC = fixed cost of maize farming (IDR/ha)
VC = variable cost of maize farming (IDR/ha)

After calculating production cost, total revenue was estimated. Total revenue refers to the gross income received by farmers from selling maize before deducting production costs. Revenue depends on the amount of maize produced and the selling price received by farmers. Total revenue was calculated using the following formula:

$$TR = Y \times P$$

where:
TR = total revenue of maize farming (IDR/ha)
Y = maize production (kg/ha)
P = selling price of maize (IDR/kg)

Farm income was then calculated to determine the net return received by farmers from maize farming. Income analysis is important because high revenue does not automatically indicate profitability if production costs are also high. Farm income was calculated as the difference between total revenue and total production cost, using the following formula:

$$I = TR - TC$$

where:
I = maize farm income (IDR/ha)
TR = total revenue of maize farming (IDR/ha)
TC = total cost of maize farming (IDR/ha)

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The economic feasibility of maize farming was analyzed using the Revenue-Cost Ratio. This indicator was used to assess whether the revenue generated from maize farming was greater than the production cost incurred by farmers. The Revenue-Cost Ratio was calculated using the following formula:

$$\mathbf{R/C= \frac{TC}{TR}}$$

where:
R/C = revenue-cost ratio
TR = total revenue of maize farming (IDR/ha)
TC = total cost of maize farming (IDR/ha)

The decision criteria were as follows: if R/C>1, maize farming is economically feasible; if R/C=1, maize farming is at the break-even point; and if R/C<1, maize farming is not economically feasible.

Break-even point analysis was used to determine the minimum selling price and minimum production level required for farmers to avoid losses. This analysis is important because maize farmers in the study area face price fluctuations and production risks. The break-even price indicates the lowest selling price that still allows farmers to cover total production costs. Break-even price was calculated using the following formula:

$$\mathbf{BEP}_{price} = \frac{TC}{Y}$$

where:
BEP_{price} = break-even price or minimum selling price required to cover total cost (IDR/kg)
TC = total cost of maize farming (IDR/ha)
Y = maize production (kg/ha)

In addition to break-even price, break-even production was calculated to identify the minimum production volume required to cover total production costs at the prevailing selling price. This indicator shows how much maize must be produced so that farmers do not experience losses. Break-even production was calculated using the following formula:

$$\mathbf{BEP}_{production} = \frac{TC}{P}$$

where:
$BEP_{production}$ = break-even production or minimum production level required to cover total cost (kg/ha)

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TC = total cost of maize farming (IDR/ha)
P = selling price of maize (IDR/kg)

RESULTS AND DISCUSSION

Overview of the Study Area

Lhok Raya Village is located in Trumon Tengah District, South Aceh Regency. The village consists of three hamlets: Fhatuk Qorib, Darusaadah, and Darussalam. Village records show that the total population was 612 people, consisting of 290 males and 322 females. This demographic structure indicates the availability of rural labor that may support agricultural activities, including maize farming.

Table 1. Population of Lhok Raya Village by hamlet

No	Hamlet	Male	Female	Total
1	Fhatuk Qorib	114	127	241
2	Darusaadah	89	86	175
3	Darussalam	87	109	196
Total		290	322	612

Source: Lhok Raya Village Office, 2024

Respondent Characteristics

The age distribution shows that most maize farmers were older than 40 years, accounting for 21 respondents or 56.7% of the sample. Farmers aged 30-40 years accounted for 35.1%, while those aged 25-30 years accounted for only 8.1%. This indicates that maize farming in the village is dominated by mature farmers rather than younger farmers.

Educational attainment was generally modest. Thirteen respondents or 35.1% had completed elementary school, 10 respondents or 27.0% had completed junior high school, 12 respondents or 32.4% had completed senior high school or vocational school, and only 2 respondents or 5.4% held an undergraduate degree. This pattern suggests that extension services and financial-record training should use practical and simple formats.

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Table 2. Selected characteristics of maize farmers in Lhok Raya Village

No	Characteristic	Category	Number of farmers	Percentage (%)
1	Age	25-30 years	3	8.1
		30-40 years	13	35.1
		>40 years	21	56.7
2	Education	Elementary school	13	35.1
		Junior high school	10	27.0
		Senior/vocational high school	12	32.4
		Undergraduate	2	5.4
3	Farming experience	0-5 years	11	29.7
		5-10 years	19	51.3
		10-15 years	7	18.9

Source: Primary data processed, 2024

Farming experience also supports the interpretation that maize farming is an established activity in the village. Most respondents, 19 farmers or 51.3%, had 5-10 years of experience. However, practical farming experience does not automatically ensure sound financial management. The field problem identified in the source study was that many farmers did not keep proper records of income and expenditure. This makes break-even and feasibility analysis especially important.

Land Area

Most respondents managed relatively small to medium land areas. Farmers cultivating 0.5-1.0 ha represented 56.7% of respondents, while those cultivating 2-3 ha represented 37.8%. Only 5.4% of respondents cultivated more than 3 ha. This land distribution indicates that maize farming in the area is largely smallholder-based.

Table 3. Maize farming land area of respondents

No	Land area	Number of farmers	Percentage (%)
1	0.5-1.0 ha	21	56.7
2	2-3 ha	14	37.8
3	>3 ha	2	5.4

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	Total	37	100.0

Source: Primary data processed, 2024

Production Cost

Production cost consisted of fixed cost and variable cost. Fixed cost was represented by equipment depreciation, while variable cost included seed, fertilizer, pesticide, and labor. The detailed cost components amounted to IDR 2,896,000/ha. The final total production cost used for income and break-even analysis was IDR 3,110,065/ha. This final cost figure was used in the calculations because it is consistent with the reported income and break-even results.

Table 4. Average production cost of maize farming

No	Cost component	Cost (IDR/ha)
1	Equipment depreciation	853,000
2	Seed	750,000
3	Fertilizer	293,000
4	Pesticide	270,000
5	Labor	730,000
Total detailed cost		2,896,000
Total cost used for income and BEP analysis		3,110,065

Source: Primary data processed, 2024

The largest single cost component was equipment depreciation, followed by seed and labor. This structure indicates that farmers need to evaluate machinery and equipment use as well as input purchasing decisions. If input prices increase or if labor requirements rise, profitability can decline even when the selling price remains stable.

Revenue and Farm Income

Average maize production was 4,144 kg/ha, with an average selling price of IDR 4,900/kg. Based on the processed data, average revenue reached IDR 13,011,496/ha. After deducting total production cost of IDR 3,110,065/ha, farmers obtained average income of IDR 9,901,431/ha.

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Table 5. Revenue and income of maize farming

No	Description	Production (kg/ha)	Price (IDR/kg)	Value (IDR/ha)
1	Revenue	4,144	4,900	13,011,496
2	Production cost	-	-	3,110,065
3	Farm income	-	-	9,901,431

Source: Primary data processed, 2024

The positive income confirms that maize farming can generate profit for farmers in Lhok Raya Village. However, profitability should not be interpreted as a reason to ignore managerial weaknesses. The source study clearly indicates that farmers face unstable prices and limited bookkeeping. Without written records, farmers may not know whether profit comes from efficient management or simply from a favorable selling price in a particular season.

Feasibility Based on R/C Ratio

The R/C ratio measures the relationship between total revenue and total cost. Using revenue of IDR 13,011,496/ha and total cost of IDR 3,110,065/ha, the recalculated R/C ratio is 4.18. This means that every IDR 1 spent on maize farming generated IDR 4.18 in revenue. Since the R/C ratio is greater than 1, maize farming in Lhok Raya Village is financially feasible.

Break-Even Point Analysis

Break-even analysis was used to determine the minimum price and production level required to avoid losses. The break-even price was IDR 750.4/kg, far below the actual selling price of IDR 4,900/kg. This means that the selling price received by farmers was substantially higher than the minimum price needed to cover production costs.

The break-even production was 634.7 kg/ha, while actual average production reached 4,144 kg/ha. Therefore, actual production was far above the minimum production level required to avoid losses. This result indicates a relatively wide safety margin under the observed production and price conditions.

Table 6. Feasibility and break-even indicators of maize farming

No	Indicator	Value	Interpretation
1	R/C ratio	4.18	Feasible because > 1

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2	Break-even price	IDR 750.4/kg	Below the actual price of IDR 4,900/kg
3	Break-even production	634.7 kg/ha	Below actual production of 4,144 kg/ha

Source: Primary data processed, 2024

Although the break-even results are favorable, farmers should not treat them as permanent. The margin can decline if flood damage reduces output, if input prices rise, or if the maize selling price falls further. The most practical implication is that farmers should improve input efficiency, record production costs, monitor market prices, and adopt better cultivation practices to protect income stability.

Discussion of Research Findings

The findings show that maize farming in Lhok Raya Village is profitable and economically feasible. The average income reached IDR 9,901,431/ha, supported by actual production of 4,144 kg/ha and an average selling price of IDR 4,900/kg. The recalculated R/C ratio of 4.18 indicates that each IDR 1.00 spent on production generated IDR 4.18 in revenue. This result confirms that maize farming in the study area has a strong short-term financial return, although this return remains vulnerable to output price fluctuations and production shocks. This finding reinforces the role of smallholder agriculture as a key source of rural household income. A similar pattern was observed in patchouli farming systems, where farm income significantly contributed to total household earnings. Khairunnisa and Ringo (2024) reported that patchouli farming in Panga and Sampoiniet Districts, Aceh Jaya Regency, provides a substantial contribution to farmers' household income, highlighting the importance of agricultural activities in sustaining rural livelihoods.

These findings are broadly consistent with Aprilia (2022), who reported that maize farming in Pasempe Village, Palakka District, Bone Regency generated an average income of IDR 10,151,511.68/ha/season and an R/C ratio of 2.79. The income level in that study is close to the income found in Lhok Raya, which suggests that maize can provide attractive returns across different smallholder production areas. However, the R/C ratio in Lhok Raya is higher, indicating a more favorable relationship between revenue and production cost in the present study. This difference may be related to a lower cost structure, differences in input use, or differences in local selling prices.

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The result is also in line with Kusuma and Nuswantara (2021), who found that maize farming in Jumo Village, Kedungjati District, Grobogan Regency generated income of IDR 12,474,932/ha, with an R/C ratio of 2.38, a break-even price of IDR 1,364/kg, and a break-even production volume of 2,800 kg/ha. Compared with that study, Lhok Raya produced lower income but had a lower break-even price of IDR 750.4/kg and lower break-even production of 634.7 kg/ha. This means that, despite producing a lower income than the Grobogan case, maize farming in Lhok Raya has a wider safety margin against losses because the actual selling price and actual production were far above the break-even levels.

A similar conclusion was reported by Ashari (2020) in Patilanggio District, Pohuwato Regency, Gorontalo Province. That study found average maize-farming income of IDR 12,317,515/season from total cost of IDR 6,144,985/season, with a B/C ratio of 2.00. The higher income in Patilanggio suggests that regional differences in production scale, market access, and post-harvest handling may influence farm profitability. Nevertheless, both studies support the same general conclusion: maize farming is financially feasible when output prices remain above production cost and farmers can manage input expenses efficiently.

In contrast, Sultan and Antara (2016) reported a lower income from sweet maize farming in Bulupountu Jaya Village, Sigi Biromaru District, namely IDR 1,096,281.2 per 0.45 ha/season or IDR 4,361,804.44/ha/season. This result differs from the present study, where income reached IDR 9,901,431/ha. The difference is not surprising because sweet maize and grain maize have different production cycles, market channels, selling prices, harvesting systems, and cost structures. This comparison shows that profitability cannot be generalized only by commodity name; it must be interpreted by considering the maize type, farm scale, input intensity, and local market conditions.

Overall, the comparison with previous studies strengthens the argument that maize farming in Lhok Raya is feasible, but the strength of the present finding lies mainly in its cost efficiency and low break-even threshold. The weak point is that farmers remain exposed to price instability and weak farm recordkeeping. Therefore, the practical implication is clear: farmers should not only focus on increasing production, but also improve cost recording, input-use planning, post-harvest quality, and collective marketing. Without these improvements, the current profitability can quickly decline when selling prices fall or input costs increase.

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CONCLUSION

Maize farming in Lhok Raya Village, Trumon Tengah District, South Aceh Regency is economically viable based on the observed production, cost, and price conditions. Average production was 4,144 kg/ha, the average selling price was IDR 4,900/kg, and average revenue was IDR 13,011,496/ha. With total production cost of IDR 3,110,065/ha, farmers obtained average income of IDR 9,901,431/ha. The recalculated R/C ratio was 4.18, indicating that maize farming is feasible and profitable. The break-even price was IDR 750.4/kg and the break-even production was 634.7 kg/ha, both lower than the actual selling price and production level. Therefore, maize farming can continue to be developed in the village, but farmers need to improve financial record keeping, cost control, input efficiency, and price-risk management to maintain profitability across planting seasons.

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