

Determinants Of Lowland Rice Farming Profitability In A Semi-Arid Agroecosystem: A Regression-Based Smartpls Analysis Of The Sejahtera Farmer Group In Noelbaki, Indonesia

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Abstract

Lowland rice farming in East Nusa Tenggara, Indonesia, operates within a semi-arid agroecosystem where rainfall variability, production costs, labor requirements, and access to farm inputs influence economic performance. This study analyzes the determinants of lowland rice farming profitability among all 60 members of the Sejahtera Farmer Group in Noelbaki Village, Kupang Regency. A quantitative census design was employed. Primary data were collected through questionnaires, interviews, and field observations, while secondary data were obtained from statistical and village-level sources. Farm profitability was represented by the revenue-cost ratio (R/C ratio), and the effects of land area, labor, seed, and fertilizer were evaluated using multiple linear regression implemented through the SmartPLS regression workflow. The respondents cultivated 125.42 ha and produced 1,051,700 kg of paddy during one production season. Total revenue reached IDR 11.175 billion, total production cost was IDR 802.067 million, and net farm income was IDR 10.373 billion. The average R/C ratio was 14.04 and the average B/C ratio was 13.04. The regression model produced $R^2 = 0.613$ and adjusted $R^2 = 0.586$ and was statistically significant ($F = 22.596$; $p = 0.001$). Land area had a positive and significant effect on profitability (coefficient = 5.822063; $p = 0.001911$), whereas labor had a negative and significant effect (coefficient = -0.000878; $p = 0.003242$). Seed use ($p = 0.498795$) and fertilizer use ($p = 0.754051$) were not statistically significant. The findings indicate that profitability in this semi-arid rice-farming system is more closely associated with farm scale and labor efficiency than with simply increasing seed and fertilizer quantities. Management-oriented extension, more efficient labor

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allocation, improved farm budgeting, and input use aligned with agronomic and economic requirements are therefore important for strengthening farm profitability.

Keywords: farm profitability; lowland rice; R/C ratio; land area; labor efficiency; seed; fertilizer; SmartPLS; semi-arid agriculture

INTRODUCTION

Rice is a strategic agricultural commodity in Indonesia because it supports household food security, rural livelihoods, employment, and regional economic activity. The agricultural sector remains important to regional development, and rice occupies a central position because it is the staple food for a large share of the population. Bangkole et al. (2024) emphasize the continuing role of agriculture in regional economic growth, while Damayanti et al. (2025) underline the importance of maintaining rice production for national food security. Consequently, the economic sustainability of rice farming is not only a farm-level concern but also a broader development issue.

Despite strong demand for rice, farmers do not automatically obtain high profits. The profitability of rice farming depends on the relationship between production, output prices, and the costs incurred to mobilize land, labor, seed, fertilizer, machinery, and other production inputs. Khasanah et al. (2025) show that farmers can face simultaneous pressure from rising input prices and fluctuations in grain prices. Under <https://e-journal.citakonsultindo.or.id/index.php/IJEBIR/index> these conditions, increasing physical output may fail to improve farm income when additional production requires disproportionately higher costs.

At the national level, rice farming also faces structural pressures related to land conversion, climatic variability, and the rising cost of farm inputs. Ramadhan et al. (2024) discuss the dynamics of paddy-field conversion and the importance of protecting agricultural land, while Siagian and Soetjipto (2020) show that production performance must also be considered from an efficiency perspective. These issues reinforce the need to evaluate farming outcomes using profitability measures rather than relying only on yield or gross revenue.

The challenge is particularly pronounced in East Nusa Tenggara (NTT), which is characterized by a predominantly semi-arid agroecosystem and a high dependence on seasonal rainfall. The thesis reports that rice production in NTT reached 707.79 thousand tons of harvested dry grain in 2024, representing a decline of 7.70% from the previous year. A more substantial decrease occurred in Kupang Regency, where production fell from 83,408.13 tons in 2023 to 63,041.96 tons in 2024. This production context is affected by limited irrigation infrastructure, rainfall uncertainty, uneven access to capital, and

production-input constraints. Naumar et al. (2021) also point to the importance of irrigation management in supporting agricultural performance.

Noelbaki Village is one of the rice-producing areas in Kupang Regency and provides a useful setting for examining profitability under semi-arid conditions. The respondent farmers in the Sejahtera Farmer Group generally operate holdings of around two hectares, use both family and hired labor, purchase seed and fertilizer, and rely on rented agricultural machinery for major operations. Their economic results are therefore shaped by the interaction between farm size, labor use, input allocation, and the cost structure of cultivation.

Previous studies have examined related dimensions of farm production and profitability. Sadat et al. (2025) assessed socioeconomic factors and profitability in rainfed rice farming in Maros Regency. Bete and T. (2018) reported that labor could have a negative and significant relationship with agricultural production under certain conditions. Novianty (2020) found that some production factors significantly influenced agroindustry profitability while others did not. Sudirman et al. (2023) analyzed factors affecting rice farming production, while Tenriwaru et al. (2024) examined land area, labor cost, fertilizer price, and rice-farmer income. These studies demonstrate that individual production factors do not necessarily affect all economic outcomes in the same way.

A gap therefore remains between studies that explain physical production and studies that explain profitability. Profitability incorporates the cost side of farming and is especially relevant when farmers face high input prices and limited financial resources. A factor that contributes to higher yield may have little or no effect on profit if the additional cost of that factor is equal to or greater than the additional revenue generated. This distinction is important for farm decision-making and for the design of extension programs.

This study addresses that gap by combining farm-budget analysis with regression analysis. It focuses specifically on land area, labor, seed, and fertilizer and evaluates how these variables relate to the R/C ratio of lowland rice farms in Noelbaki. The study contributes empirical evidence from a semi-arid farming system that is less frequently represented in the rice-farming profitability literature and provides practical information for farmers, extension workers, and local government.

Research objectives. The study aims to: (1) identify the production factors associated with the profitability of lowland rice farming in Noelbaki Village, Kupang Regency; and (2) estimate the magnitude and direction of the effects of land area, labor, seed, and fertilizer use on farm profitability.

THEORETICAL BACKGROUND AND EMPIRICAL REVIEW

2.1 Farm Profitability and Economic Feasibility

Farm profitability reflects the ability of a farming enterprise to generate economic returns from the resources used during one production cycle. In the thesis, total revenue (TR) is defined as the product of output quantity and selling price, while total cost (TC) comprises fixed and variable production costs. Net farm income is calculated as $\pi = TR - TC$. These measures provide the monetary basis for assessing whether farming activities generate a positive economic surplus.

The study also uses the revenue-cost ratio (R/C ratio) and benefit-cost ratio (B/C ratio). R/C is calculated as total revenue divided by total cost, while B/C is calculated as net benefit divided by total cost. An R/C ratio greater than one indicates that each unit of cost generates more than one unit of revenue, whereas a B/C ratio greater than zero indicates a positive net benefit. Awaliyah et al. (2022) and Afni et al. (2024) similarly use farm-income and feasibility indicators to evaluate agricultural enterprises.

Profitability is conceptually different from production. Production is a technical outcome, while profitability is an economic outcome that depends on both revenue and cost. Consequently, an input that raises output can still have a weak or negative relationship with profitability if its additional cost is relatively high. This distinction provides the theoretical basis for examining land, labor, seed, and fertilizer as potential determinants of farm profitability.

2.2 Land Area and Scale of Farming

Land area represents the physical scale of the farming operation. Larger cultivated areas can increase total production and gross revenue and may create opportunities to spread certain fixed and mechanization costs over a larger output base. Sadat et al. (2025) and Tenriwaru et al. (2024) both identify land-related factors as important to farm economic performance. However, scale advantages are not automatic; farmers must still coordinate labor, machinery, seed, fertilizer, and working capital efficiently. On this basis, the first hypothesis is H1: land area has a significant effect on lowland rice farming profitability.

2.3 Labor Use and Cost Efficiency

Labor is required throughout rice cultivation, including land preparation, planting, maintenance, harvesting, post-harvest handling, and marketing. Labor therefore contributes to production but simultaneously represents a potentially large cost. Where additional labor use is not matched by proportional gains in production or revenue, labor can reduce profitability. The thesis specifically distinguishes family and non-family labor and male and female labor use. Bete and T. (2018) also reported a negative and

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significant labor effect in an agricultural production study. The second hypothesis is therefore H2: labor use has a significant effect on lowland rice farming profitability.

2.4 Seed and Fertilizer as Biological Inputs

Seed and fertilizer are core biological inputs. Seed quantity and quality influence plant establishment and crop population, while fertilizer provides nutrients needed for growth and yield formation. Nevertheless, the profitability effect of these inputs depends on both agronomic response and cost. Increasing seed or fertilizer use does not necessarily increase profit if application exceeds requirements or if the value of additional output is lower than the additional cost. Sudirman et al. (2023) report important production effects for rice-farming inputs, but the effect on profitability may differ because production costs are explicitly included. The third and fourth hypotheses are H3: seed use has a significant effect on profitability, and H4: fertilizer use has a significant effect on profitability.

2.5 Previous Empirical Studies

Table 1. Selected previous studies used in the thesis

Study	Context	Method	Main relevance to the present study
Sadat et al. (2025)	Rainfed rice; Maros Regency	Multiple regression	Socioeconomic factors, including land-related characteristics, were associated with profitability.
Tanik (2018)	Purple eggplant farming	Cobb-Douglas	Farm inputs jointly influenced production, although partial effects were not uniformly significant.

Study	Context	Method	Main relevance to the present study
Bete & T. (2018)	Red chili farming	Cobb-Douglas and BEP	Experience, education, and manure were positive and significant; labor was negative and significant.
Novianty (2020)	Coconut-sugar agroindustry	Multiple regression	Capital and production were significant; labor and raw material were not significant for profitability.
Sudirman et al. (2023)	Rice farming	Production-function analysis	Land, seed, fertilizer, and other inputs were assessed as determinants of rice production.
Tenriwaru et al. (2024)	Rice farming; Wajo Regency	Income analysis	Land area, labor cost, and fertilizer price were examined in relation to farmer income.
Wulandari (2025)	Multi-commodity farming	Profitability analysis	Profitability and its determinants were examined using 60 farmer respondents.

Source: Literature review in the thesis. The table summarizes only information explicitly reported in the source document.

The reviewed studies collectively show that the direction and significance of production factors depend on the outcome being analyzed and the production context. This provides a strong rationale for testing the four factors in Noelbaki using profitability rather than production as the dependent outcome.

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MATERIALS AND METHODS**3.1 Study Area and Research Period**

The research was conducted from January to July 2026 in Noelbaki Village, Kupang Tengah District, Kupang Regency, East Nusa Tenggara, Indonesia. The study focused on members of the Sejahtera Farmer Group. Noelbaki represents a relevant site because lowland rice farming is conducted under the semi-arid conditions typical of the region and because farmers face production, labor, irrigation, and cost-management constraints described in the thesis.

3.2 Research Design, Population, and Census

A quantitative research design was employed. The population consisted of all 60 members of the Sejahtera Farmer Group. Because the population was relatively small and fully accessible, the study used a census approach and included all 60 farmers as respondents. The use of a census eliminated sampling selection within the group and enabled the analysis to represent the full set of group members during the study period.

3.3 Data Sources and Data-Collection Methods

Primary data were collected using structured questionnaires, interviews, and direct observation. The questionnaire captured respondent characteristics, landholding size, labor use, input use, production, output price, farm costs, and other information needed to calculate revenue and profitability. Interviews were used to clarify questionnaire responses and improve the consistency of the information recorded.

Observation was used to support the interpretation of cultivation practices and farm conditions. Secondary data were drawn from statistical sources and village-level information. Using these methods together enabled the study to combine quantitative farm-budget information with contextual information on respondent and production characteristics.

3.4 Operational Variables**Table 2. Operational definition of research variables**

Variable	Operational definition	Measurement	Role
Land area (X_1)	Cultivated lowland rice area used during one production season	Hectares (ha)	Independent

Variable	Operational definition	Measurement	Role
Labor (X_2)	Family and hired labor used from land preparation to marketing	HOK/person-days and labor cost	Independent
Seed (X_3)	Quantity of rice seed used during one production season	Kilograms (kg) and cost	Independent
Fertilizer (X_4)	Use of Urea, NPK, and organic fertilizer during production	Sacks and cost	Independent
Profitability (Y)	Revenue generated relative to total production cost	R/C ratio = TR/TC	Dependent

Source: Variable-definition table in the thesis. The regression uses the R/C ratio as the profitability measure.

3.5 Farm-Budget Analysis

Total revenue was calculated as $TR = Y \times P_y$, where Y represents paddy production and P_y represents the selling price received by the farmer. Total cost consisted of fixed costs and variable costs. Fixed costs included depreciation of farm tools and land tax, while variable costs included seed, fertilizer, labor, and machinery rental.

Net farm income was calculated as $\pi = TR - TC$. A positive value indicates that revenue exceeds total production cost. Financial feasibility was then evaluated using the R/C ratio, calculated as TR/TC , and the B/C ratio, calculated as $(TR - TC)/TC$. According to the criteria used in the thesis, $R/C > 1$ and $B/C > 0$ indicate economically feasible farming.

3.6 Regression Model and Statistical Tests

The relationship between production factors and profitability was estimated using multiple linear regression implemented in the SmartPLS regression workflow. The model was specified as $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$, where Y is the R/C ratio; X_1 is land area; X_2 is labor; X_3 is seed; X_4 is fertilizer; β_0 is the intercept; β_1 - β_4 are regression coefficients; and ε is the error term.

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Model evaluation included R^2 and adjusted R^2 , an overall F-test, partial t-tests at a 5% significance level, variance inflation factors (VIF) for multicollinearity, the Durbin-Watson statistic, and the Breusch-Pagan test for heteroskedasticity. The thesis used $VIF < 5$ as the multicollinearity criterion and $p > 0.05$ in the Breusch-Pagan test as evidence that heteroskedasticity was not detected (Gun, 2020; Subhaktiyasa, 2024). Because the predictors were observed ratio-scale variables entered directly into a regression model, the thesis did not apply latent-construct validity and reliability procedures.

3.7 Data Consistency and Manuscript Preparation

The thesis contains several numerical transcription inconsistencies between narrative paragraphs and the underlying tables. For this journal version, numerical values were taken from the original statistical-output tables and respondent-level appendices where available. For example, the SmartPLS output table reports $R^2 = 0.613$ and adjusted $R^2 = 0.586$, while the 60-farmer appendix reports total revenue of IDR 11.175 billion, total production cost of IDR 802.067 million, and net farm income of IDR 10.373 billion. This manuscript therefore preserves the source data while prioritizing the original tables and appendices over clearly inconsistent narrative transcription.

RESULTS

4.1 Respondent Characteristics

The respondent profile shows that most farmers were within the economically productive age range. Eighty percent were 15-64 years old, while 20% were older than 64. The group was predominantly male: 57 respondents (95%) were men and 3 respondents (5%) were women. This distribution indicates that rice-farming activities within the group were largely managed by male household members.

Farming experience was relatively strong. Sixty-three percent of respondents had more than 11 years of farming experience. In contrast, formal education levels were generally low: 33% had completed primary school and 32% had no formal schooling. The thesis also reports that 67% had never participated in agricultural extension activities. These characteristics suggest that practical farming experience was an important source of knowledge, while formal and extension-based learning opportunities remained limited.

Table 3. Selected respondent characteristics

Characteristic	Number	Percent
Productive age (15-64 years)	48	80.0
Older than 64 years	12	20.0
Male	57	95.0

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Characteristic	Number	Percent
Female	3	5.0
Primary-school education	20	33.0
No formal schooling	19	32.0
Farming experience >11 years	38	63.0
Never attended extension activities	40	67.0
Own land	60	100.0

Source: Primary data, 2026, as summarized in the thesis.

4.2 Landholding Structure

All respondents cultivated their own land, with a combined area of 125.42 ha. The largest landholding class was 1.90-2.39 ha, accounting for 22 respondents (37%). Fourteen farmers (23%) cultivated 1.40-1.89 ha, 11 farmers (18%) cultivated 2.40-2.89 ha, 8 farmers (13%) cultivated 0.90-1.39 ha, and 5 farmers (8%) cultivated 2.90-3.39 ha. The distribution shows that most members of the group operated farms close to two hectares.

Table 4. Distribution of respondents by cultivated land area

Land-area class	Farmers	Percent
0.90-1.39 ha	8	13
1.40-1.89 ha	14	23
1.90-2.39 ha	22	37
2.40-2.89 ha	11	18
2.90-3.39 ha	5	8

Source: Primary data, 2026. Percentages total 99% because of rounding in the thesis.

4.3 Fixed and Variable Production Costs

Fixed costs included depreciation of farm tools and land tax. The total depreciation cost reported for hoes, sickles, and machetes was IDR 2,326,388. Total land tax for the 125.42 ha cultivated by respondents was IDR 4,850,000, or approximately IDR 80,833 per farmer.

Variable costs included seed, fertilizer, labor, and machinery rental. Total seed use reached 4,988 kg, equivalent to 83.13 kg per farmer and 39.77 kg/ha. Total fertilizer use was 451 sacks, or 7.52 sacks per farmer. Total fertilizer expenditure was IDR 27.81

million. Machinery rental represented an important cash-cost component: tractor rental totaled IDR 81.15 million and combine-harvester rental totaled IDR 100.45 million.

The labor data in the thesis distinguish family and non-family labor and male and female workers. Reported labor expenditure was substantial across these categories, emphasizing the economic importance of labor management in the production system. This cost structure is relevant to the negative labor coefficient obtained in the regression model.

Table 5. Selected input-use and cost indicators

Item	Total	Per farmer	Per hectare
Cultivated land	125.42 ha	2.09 ha/farmer	-
Seed	4,988 kg	83.13 kg/farmer	39.77 kg/ha
Fertilizer	451 sacks	7.52 sacks/farmer	3.60 sacks/ha*
Tool depreciation	IDR 2,326,388	IDR 38,773/farmer	IDR 18,548/ha*
Land tax	IDR 4,850,000	IDR 80,833/farmer	IDR 38,670/ha
Tractor rental	IDR 81,150,000	IDR 1,352,500/farmer	IDR 647,026/ha
Combine rental	IDR 100,450,000	IDR 1,674,167/farmer	IDR 800,829/ha*

Source: Thesis tables and appendices, 2026. *Values marked with an asterisk were recalculated from the source totals and total cultivated area.

4.4 Production, Revenue, Income, and Feasibility

The 60 respondents produced a combined 1,051,700 kg of paddy during the observed production season. Average production was 17,528.33 kg per farmer and 8,385.42 kg per hectare. Selling prices in the appendix ranged mainly between IDR 10,000 and IDR 11,000 per kilogram.

Total farm revenue reached IDR 11,175,000,000. Total production cost from the respondent-level appendix was IDR 802,067,153, resulting in total net farm income of IDR 10,372,932,847. On average, each farmer received IDR 186.25 million in revenue and IDR 172.88 million in net farm income.

The mean R/C ratio was 14.04 and the mean B/C ratio was 13.04. Both indicators were well above their respective feasibility thresholds. The high ratios indicate that, within the cost accounting used in the thesis, the rice farms generated revenue substantially above reported production cost.



Table 6. Farm financial performance during one production season

Indicator	Total	Per farmer	Per hectare
Production	1,051,700 kg	17,528.33 kg	8,385.42 kg
Revenue	IDR 11,175,000,000	IDR 186,250,000	IDR 89,100,622
Production cost	IDR 802,067,153	IDR 13,367,786	IDR 6,395,050
Net farm income	IDR 10,372,932,847	IDR 172,882,214	IDR 82,705,572
R/C ratio	-	14.04	6.72
B/C ratio	-	13.04	6.24

Source: Respondent-level farm-budget appendix, 2026.

4.5 Regression Model Performance

The estimated regression equation was $Y = 8.107 + 5.822X_1 - 0.000878X_2 + 0.000149X_3 + 0.000115X_4 + \varepsilon$. The original SmartPLS model-output table reports $R^2 = 0.613$ and adjusted $R^2 = 0.586$. Thus, the model explained 61.3% of the observed variation in profitability before adjustment and 58.6% after adjustment. The Durbin-Watson statistic was 1.549.

The overall F-test produced $F = 22.596$ with $p = 0.001$, indicating that land area, labor, seed, and fertilizer jointly had a statistically significant relationship with profitability. In the ANOVA table, the regression sum of squares was 748.01 and the error sum of squares was 471.727.

Table 7. Model performance and diagnostic statistics

Statistic	Value	Interpretation
R^2	0.613	Model explanatory power
Adjusted R^2	0.586	Adjusted explanatory power
Durbin-Watson	1.549	Reported regression-output statistic
F statistic	22.596	Overall model significance
Model p-value	0.001	Significant at 5%
Breusch-Pagan statistic	8.348	df = 4
Breusch-Pagan p-value	0.080	No heteroskedasticity detected at 5%

Source: Original regression-output tables reported in the thesis, 2026.



4.6 Partial Effects and Multicollinearity**Table 8. Regression coefficients and partial significance tests**

Variable	Coefficient	SE	t value	p value	Decision
Intercept	8.107133	3.248464	2.495682	0.015490	Significant
Land area (X1)	5.822063	1.330081	4.377224	0.001911	Positive, significant
Labor (X2)	-0.000878	0.000285	-3.073600	0.003242	Negative, significant
Seed (X3)	0.000149	0.000220	0.680735	0.498795	Not significant
Fertilizer (X4)	0.000115	0.000367	0.314816	0.754051	Not significant

Source: SmartPLS regression-output table in the thesis, 2026.

Table 9. Variance inflation factors

Variable	VIF	Assessment
Land area	3.148	No serious multicollinearity
Labor	1.014	No serious multicollinearity
Seed	2.644	No serious multicollinearity
Fertilizer	2.280	No serious multicollinearity

Source: SmartPLS output in the thesis. All VIF values are below the study threshold of 5.

The Breusch-Pagan test produced a statistic of 8.348 with four degrees of freedom and $p = 0.08$. Because the p-value was greater than 0.05, the thesis concluded that heteroskedasticity was not detected at the 5% significance level.

DISCUSSION**5.1 Effect of Land Area on Profitability**

Land area had a positive and statistically significant coefficient. This result indicates that, within the observed range of holdings, larger cultivated areas were associated with higher R/C ratios after controlling for labor, seed, and fertilizer. The finding is consistent with the economic logic of scale. Larger farms can produce greater total output and may spread some fixed and mechanization costs across a larger production base.

The result is also consistent with the broader literature cited in the thesis. Sadat et al. (2025) identify land-related socioeconomic characteristics as important to rice-farm profitability, while Tenriwaru et al. (2024) examine land area as one of the factors associated with rice-farmer income. The present study extends this perspective by



showing a positive land-area effect specifically on a profitability ratio in the Noelbaki context.

Nevertheless, the result should not be interpreted as evidence that simply expanding land will always raise profit. Larger area creates a potential scale advantage, but realizing that advantage depends on farmers' ability to coordinate labor, machinery, seed, fertilizer, and cash flow. Where larger farms are poorly managed, cost escalation can offset the revenue gains from increased scale.

5.2 Effect of Labor on Profitability

Labor had a negative and statistically significant coefficient. The result implies that additional labor use or expenditure, holding other factors constant, was associated with lower profitability. In economic terms, this can occur when the marginal cost of additional labor is greater than the marginal revenue generated by the additional work.

This finding is important because labor is essential to nearly all stages of lowland rice production. The result therefore does not imply that labor is unnecessary. Rather, it points to an efficiency problem: work may be allocated inefficiently across stages, person-days may exceed technical requirements, or wage and opportunity costs may be high relative to the additional production generated.

The thesis reports substantial use of both family and hired labor and substantial labor expenditure. This helps explain why labor management is economically important. The result also resembles the negative labor effect reported by Bete and T. (2018). A practical response is therefore to improve labor productivity through better work scheduling, clearer task allocation, timely mechanization, and careful comparison between hired-labor costs and machinery-service costs.

5.3 Effect of Seed on Profitability

Seed use was not statistically significant in the profitability model. This result does not mean that seed is agronomically unimportant. Seed remains a fundamental production input, and inadequate seed quantity or poor-quality seed can limit production. The statistical result instead indicates that differences in the amount or value of seed used by the 60 respondents were not systematically associated with differences in the R/C ratio after the other variables were controlled.

The distinction between production and profitability is critical. Studies such as Sudirman et al. (2023) focus on production-related outcomes and may therefore detect an input effect that is not observed when the dependent variable is a profitability measure. Increasing seed quantity can raise cost as well as output. If the additional output value does not exceed the additional seed cost, the R/C ratio may not improve.



The average seed use in the sample was 83.13 kg per farmer or 39.77 kg/ha. The policy implication is not to reduce seed indiscriminately, but to align seed rates with technical recommendations and expected economic returns.

5.4 Effect of Fertilizer on Profitability

Fertilizer use was also not statistically significant. Similar to seed, this result should be interpreted economically rather than agronomically. Fertilizer contributes nutrients needed for crop growth, but fertilizer expenditure reduces profit unless the yield response is sufficiently large to compensate for the additional cost.

The sample used a total of 451 sacks of fertilizer, or 7.52 sacks per farmer. The absence of a significant coefficient suggests that variation in fertilizer use did not explain variation in the R/C ratio after land area, labor, and seed were considered. This may reflect relatively similar fertilizer practices across farms, inefficient timing or dosage, or a cost-response relationship in which higher expenditure did not consistently generate higher revenue.

The implication is that fertilizer management should prioritize the right type, dose, timing, and placement rather than simply increasing quantity. This interpretation is consistent with the overall finding that profitability depends on the efficiency of input use rather than on input intensification alone.

5.5 Integrating the Farm-Budget and Regression Results

The farm-budget analysis and regression results reinforce each other. The farms were financially feasible according to the reported R/C and B/C ratios, yet variation in profitability was still strongly associated with how land and labor were managed. This shows that even within an overall profitable farming system, differences in efficiency can generate substantial variation among individual farms.

Machinery rental and labor were important cost components, while seed and fertilizer were smaller or less variable components of the farm budget. This cost structure provides a plausible economic explanation for the significant labor effect and the non-significant seed and fertilizer effects. The main lesson is that farmers should not evaluate inputs only in physical terms; they should compare the cost of each input with the additional revenue that it generates.

The adjusted R^2 of 0.586 also shows that more than two-fifths of profitability variation remained outside the model. The thesis identifies several variables that could be examined in future research, including paddy selling price, access to capital, irrigation conditions, cultivation technology, farmer experience, education, and climate variability.



5.6 Extension, Management, and Policy Implications

The respondent profile shows a clear need for management-oriented extension. Two-thirds of the farmers had never participated in agricultural extension activities, and formal education levels were generally low. Extension programs should therefore use practical and easily applicable methods, emphasizing farm budgeting, cost recording, labor planning, and input allocation.

Because labor had a significant negative relationship with profitability, extension activities should help farmers calculate labor requirements for each production stage and compare the cost of hired labor with machinery services. Where mechanization is technically and financially feasible, better scheduling of tractor and combine services could reduce delays and unnecessary person-days.

Local government support can also focus on the broader constraints identified in the thesis, especially irrigation, access to affordable production inputs, and management training. In a semi-arid production environment, efficient water use and timely cultivation are particularly important. Interventions should therefore combine technical recommendations with farm-business management rather than treating production and profitability as separate issues.

CONCLUSIONS

The lowland rice farms operated by the 60 members of the Sejahtera Farmer Group were financially feasible during the observed production season. The respondents cultivated 125.42 ha and produced 1,051,700 kg of paddy. Total revenue was IDR 11.175 billion, total production cost was IDR 802.067 million, and net farm income was IDR 10.373 billion. The mean R/C ratio was 14.04 and the mean B/C ratio was 13.04.

The regression model explained a substantial share of profitability variation, with $R^2 = 0.613$ and adjusted $R^2 = 0.586$, and the overall F-test was significant. Land area had a positive and significant effect on profitability, while labor had a negative and significant effect. Seed and fertilizer were not statistically significant.

The central conclusion is that profitability in this semi-arid rice-farming setting depends more on the scale and efficiency with which resources are managed than on simply increasing input quantities. Expanding or optimizing cultivated area can contribute positively, but labor must be managed carefully so that additional labor costs do not exceed the additional value generated. Seed and fertilizer should be used according to technical and economic requirements.

RECOMMENDATIONS

Farmers should maintain simple farm records that separate revenue, fixed costs, variable costs, labor expenditure, and machinery expenditure. These records can be

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used to compare the economic contribution of each input from season to season. Labor use should be scheduled according to the needs of each production stage, while seed and fertilizer application should follow recommended rates and be evaluated in relation to both yield response and input cost.

Agricultural extension workers should strengthen training in farm budgeting, labor productivity, cost control, machinery-use decisions, and efficient input allocation. Local government can support profitability improvement through irrigation management, timely access to production inputs, farmer training, and services that improve the efficiency of mechanization.

Future studies should expand the geographical coverage beyond a single farmer group and incorporate additional variables identified in the thesis, including selling price, access to capital, irrigation reliability, technology, education, farming experience, and climate conditions. Broader datasets would improve generalizability and help explain the remaining variation in profitability.

STUDY LIMITATIONS

The findings are specific to the 60 members of the Sejahtera Farmer Group and should therefore be interpreted within this study context. The research uses one production period and a localized cross-sectional design. The model includes four production factors and does not explicitly incorporate market access, output-price risk, irrigation reliability, capital access, technology adoption, or climatic shocks. The high R/C values also depend on the cost-accounting structure used in the thesis. These limitations should be considered when applying the results to other locations or periods.

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