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Economic Feasibility Assessment of Robusta Coffee Farming

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ABSTRACT

BACKGROUND AND OBJECTIVES
The robusta coffee farming sector in Semarang Regency, Central Java, plays a crucial role in the local economy, providing employment opportunities and contributing to regional agricultural production. Despite favourable agroecological conditions, the productivity and profits of coffee cultivation in the region vary significantly due to differences in cultivation methods. This study aims to evaluate the economic performance of robusta coffee cultivation in Semarang Regency, focusing on farmers' income, profits, and financial feasibility through key indicators such as Cost Income Ratio (R/C) and Cost Benefit Ratio (B/C).

METHODS
This study employed a quantitative descriptive approach, conducting structured interviews with 69 randomly selected coffee farmers from the districts of Getasan, Bandungan, and Banyubiru. Primary data on production costs, crop yields, selling prices, and income components were collected, supplemented by secondary data from local agricultural offices. The financial feasibility of coffee cultivation is evaluated using R/C and B/C ratios to determine profitability and efficiency.

FINDINGS
The study found that the average productivity of robusta coffee was 914.7 kg per hectare, with an average selling price of IDR 24,372 per kg. The average income per hectare after deducting variable costs was IDR 13.33 million, with a net profit of IDR 11.30 million per hectare. An R/C ratio of 2.03 indicates that this farming venture is profitable, and a B/C ratio of 1.03 confirms the economic viability of coffee cultivation in the region.

CONCLUSION
The results of the study indicate that robusta coffee cultivation in Semarang Regency remains economically viable and profitable, with efficient production management practices contributing to positive financial outcomes. However, variations in productivity and input management efficiency among farmers pose challenges in maximising profits. Recommendations include enhancing cultivation practices, expanding market access, and stabilising coffee prices to ensure long-term sustainability. This research contributes to the understanding of the economic potential of coffee cultivation and provides practical insights to improve farmers' income and cultivation efficiency.

Keywords: Plantation agribusiness; Financial performance; Input management; Smallholders; Agricultural productivity

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INTRODUCTION

The plantation sector is one of the main pillars of the rural economy in Indonesia, due to its role in providing jobs, generating sources of income, and contributing to the country's leading commodities (1). Coffee is one of the strategic commodities, covering an area of approximately 1.27 million hectares, of which small-scale farmers cultivate 94.7%. Indonesia's coffee production in 2023 is expected to reach approximately 774,000 tons, with Robusta accounting for more than 70% (2). In the context of agribusiness development, evaluating the economic feasibility of coffee commodities is crucial to ensure that the cultivation activities carried out by farmers are not only productive but also financially viable.

In Central Java Province, coffee commodities, especially Robusta, are experiencing rapid development, with a land area of approximately 46,000 hectares and a production of around 29,000 tons in 2023 (11). Semarang Regency is one of the leading centres of robusta coffee due to its support of agroclimate and suitable topography. Based on data from the Agriculture Office, the harvest area of robusta coffee in Semarang Regency is approximately 2,100 hectares, yielding a production of 1,150 tons per year (11). This condition shows that coffee has a significant role in people's income. However, to ensure the economic sustainability of coffee businesses in the region, financial feasibility analysis cannot rely solely on simple indicators such as the R/C and B/C ratios, especially as farmers begin to invest in increasingly diverse inputs and face rising maintenance costs (3).

Despite having great potential, the productivity and income of robusta coffee farming in Semarang Regency still show quite wide variations. Differences in cultivation techniques, fertilisation quality, maintenance intensity, and post-harvest processing processes cause productivity variations between 0.6 and 1.2 tons per hectare per year (4). This variation also affects farmers' income and profits. In this context, economic analysis is crucial for measuring the extent to which coffee farming provides benefits and whether it is feasible to develop in the long term (5). Thus, a study of income, profits, and business feasibility is essential to determine the efficiency of input management, investment potential, and the prospects for the sustainability of the robusta coffee business in this area.

In the context of economic analysis, measuring farmers' income and profits is a crucial step in understanding the level of farmers' welfare and the effectiveness of business management (6). Coffee farming income is generally influenced by selling prices, seed quality, labour costs, and production facility costs, including expenses for fertilisers and pesticides. Financial indicators, such as the Cost Income Ratio (R/C ratio) and the Cost Benefit Ratio (B/C ratio), are used to assess business efficiency and profitability (7). An R/C value of more than one or a B/C of more than 0 indicates that agriculture provides a viable economic benefit. However, to date, quantitative studies related to the analysis of income, profits, and financial feasibility of robusta coffee farming in Semarang Regency remain limited (8).

Economic analysis in coffee farming is a crucial component for understanding the welfare of farmers, the effectiveness of business management, and long-term financial feasibility. Agricultural income is influenced by selling prices, labour costs, quality of production inputs, and post-harvest processing management. Therefore, economic indicators such as Cost Income Ratio

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(R/C ratio), Cost Benefit Ratio (B/C ratio) are used to measure business efficiency, added value, and return on investment. An R/C value of more than one or a B/C of more than zero indicates that farming provides decent economic benefits. However, studies related to the evaluation of income, profits, and comprehensive financial feasibility of robusta coffee farming in Semarang Regency are still limited.

The novelty of this study lies in its comprehensive evaluation of the economic feasibility of the robusta coffee business in Semarang Regency, achieved by integrating cost-income analysis and simple feasibility calculations (R/C and B/C). This approach provides a comprehensive picture of the business efficiency, return on capital, and financial sustainability prospects of coffee farming at the smallholder scale. The objectives of this study are: (i) to analyse the structure of production costs and income of robusta coffee farming, (ii) to calculate profits and financial efficiency using R/C and B/C ratios. Thus, this research is expected to provide relevant empirical insights for farmers, local governments, and stakeholders on how to increase the income and sustainability of robusta coffee businesses.

RESEARCH METHOD

Research Location

This research was conducted in Semarang Regency, specifically in three sub-districts with robusta coffee production centres: Getasan, Bandungan, and Banyubiru Districts. This location was chosen purposively with the consideration that: (i) the area has the largest area and robusta coffee production in Semarang Regency, (ii) the farmers in the research site have a variety of cultivation techniques and post-harvest processing so that they are relevant for economic feasibility analysis, and (iii) regional accessibility supports the field observation process and farmer interviews. The research was conducted in August and September 2025, encompassing field survey activities, farmer interviews, secondary data collection, and data processing and analysis.

The study population consists of all robusta coffee farmers who are members of farmer groups in the three sub-districts where the study is located, comprising 210 farmers. The sample size was determined using the Slovin formula with an error rate of 10%, resulting in a sample of 69 respondents. The sample was selected using a simple random sampling method to ensure population representativeness. The data used consisted of Primary data, obtained through structured interviews using questionnaires with 69 robusta coffee farmers, related to production costs, number of labourers, cultivation inputs, crop yields, selling prices, and income information. Secondary data was obtained from the Semarang Regency Agriculture Office, BPS, annual reports of farmer groups, and related literature.

The analysis method is prepared based on the research objectives that have been formulated, as follows:

Objective 1 was analysed using farming income analysis, with the following calculations:

$$\text{Total Cost (TC)} = \text{TFC} + \text{TVC}$$

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Revenue

$$TR = P \times Q$$

Information:
TR = total revenue,
P = selling price of coffee (Rp/kg),
Q = total production (kg).

Objective 2 was analysed using the feasibility analysis of the farms based on net profit, then analysed using the R/C ratio and B/C ratio, with the following calculations:

$$Benefit = TR - TC$$

$$R/C = TR / TC$$

Criterion:
R/C > 1 → profitable venture
R/C = 1 → impasses
R/C < 1 → a loss-making effort

B/C Ratio
Assess economic feasibility based on a comparison between net benefits and total costs.

$$B/C = Benefit / TC$$

Criterion:
B/C > 0 → qualified
B/C = 0 → impasse
B/C < 0 → not eligible

RESULTS AND DISCUSSION

Production Cost Structure and Income of Robusta Coffee Farming

The characteristics of the respondents involved in the study included gender, age, education level, land area, and farming experience. This information is crucial for understanding the socio-economic background of robusta coffee farmers in Semarang Regency. Details of respondent characteristics are presented in Table 1, which provides a complete distribution of each demographic variable.

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Table 1. Characteristics of Respondents of Robusta Coffee Farmers in Semarang Regency

No	Variables	Category	Respondent (n)	Percentage (%)
1	Gender	Male	55	79.7
		Female	14	20.3
2		< 40 years old	12	17.4
	Age	40–55 years old	33	47.8
		> 55 years old	24	34.8
3	Education	Elementary school	21	30.4
		Junior high school	19	27.5
		Senior high school	25	36.2
		College	4	5.9
4	Land	< 0.5 ha	28	40.6
		0.5–1 ha	29	42.0
		> 1 ha	12	17.4
5	Farming Experience	< 10 years old	18	26.1
		10–20 years old	31	44.9
		> 20 years old	20	29.0

Source: Research data, 2025

Based on Table 1, the majority of Robusta coffee farmers in Semarang Regency are men and are in the productive age range of 40-55 years. The relatively low level of education and the prevalence of small landholdings (<1 ha) indicate that coffee cultivation remains labour-intensive, experience-based, and lacks support for modern technology. Most farmers have 10–20 years of experience, which reflects the strength of local knowledge, although the use of cultivation innovations has not fully offset it. The main challenges observed are the lack of farmer regeneration, limited capital, and narrow land, which limit productivity growth.

This small land structure and limited access to technology are consistent with similar studies in Indonesia, such as those in Temanggung and Banyubiru (4,9), which show that a limited scale reduces the potential for increased efficiency and revenue. The findings also confirm that labour input is the most significant cost component in coffee farming, so efforts to increase productivity depend on improving cultivation management.

When compared to similar research in other countries, Indonesia's position is still relatively lagging. In Vietnam, which is the world's largest producer of robusta, farmers have a productivity of 2.5-2.8 tons/ha, significantly higher than the figure in this study, due to the use of superior clonal seeds, precision fertilisation, and support for national intensification policies (10,11). Meanwhile, studies in Uganda and Ethiopia show a similar pattern to Indonesia in terms of reliance on manual labour and small land, but higher efficiency levels due to lower labour costs and stronger export market access (11,12). Brazil even reported even higher productivity and efficiency, thanks to mechanisation and drip irrigation technology (13,14). From this comparison, it appears that the characteristics of Robusta farmers in Semarang Regency have similarities with those of other developing countries, namely being labour-intensive and experience-based. However, the most significant gap compared to major robusta producers such as Vietnam and Brazil lies in the use

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of technology, seed quality, input intensification, and more systematic policy support. Thus, even though coffee farmers in Semarang Regency have considerable experience, increasing productivity still requires the support of technological innovation, agribusiness coaching, and institutional strengthening to achieve global competitiveness.

Cost and income structure analysis is a key component in understanding the economic performance of robusta coffee farming. Details of production costs, inputs, and income of robusta coffee farmers in Semarang Regency are presented in Table 2, which contains information on variable costs, fixed costs, total costs, and net income per hectare.

Table 2. Average Production Input and Cost of Farming Robusta Coffee per Hectare

No	Component	Unit	Average	Value (IDR)
A. Production Input				
1	Number of trees	tree	847.3	–
2	Land productivity	kg/ha/year	914.7	–
3	Average selling price	Rp/kg	–	24,372
B. Variable Costs				
4	Organic fertiliser (compost)	kg	1,167.8	1,742,200
5	NPK fertilizer	kg	143.6	431,050
6	Pesticides & fungicides	package	–	372,480
7	Labour (pruning, harvesting, maintenance)	HOK	76.4	6,118,350
8	Transportation costs for crops	–	–	314,720
Total Variable Costs (TVC)				8,978,800
C. Fixed Costs				
1	Depreciation of equipment	year	–	538,620
2	Land lease (calculated)	year	–	1,487,350
Total Fixed Cost (TFC)				2,025,970
D. Total Production Cost (TC)				11,004,770
E. Total Revenue (TR)		914.7 kg × IDR 24,372		22,305,368
F. Revenue (TR – TVC)				13,326,568
G. Benefit (TR – TC)				11,300,598

Source: Research data, 2025

The cost structure of robusta coffee farming in Semarang Regency reveals the dominance of labour costs, confirming that the production system remains labour-intensive, as is generally the case in smallholder plantations in Indonesia. This cost pattern is consistent with similar research in Banyubiru, where labour is also the most significant burden. However, the level of efficiency in Semarang is still lower than in areas such as Temanggung, which generally implement more intensive garden maintenance, resulting in higher productivity.

In a global context, the labour-intensive character encountered in this study aligns with the findings of research in Uganda and Ethiopia, which reported that most of the cost of the robusta

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coffee business is also allocated to labour (15–17). However, the productivity gap between Indonesia and major producing countries remains significant. Vietnam and Brazil, for example, can achieve several times higher yields through the use of superior clonal seeds, precision fertilisation, modern canopy management, and the support of irrigation and mechanisation technologies (18,19).

These findings indicate that, although the cost structure of farming in Semarang Regency is similar to that of other developing countries, the level of technical efficiency remains lagging behind that of large producing countries. Thus, the adoption of technological innovations, improved seed quality, and modern cultivation management are key to narrowing the gap and increasing the competitiveness of local robusta coffee.

To determine the level of efficiency and financial feasibility of robusta coffee farming in Semarang Regency, an analysis was conducted using two leading indicators: the R/C ratio and the B/C ratio. These two indicators provide an overview of the relationship between costs and benefits obtained by farmers in the cultivation process. These values are presented in full in Table 3, which contains the calculation of total production costs, net income, R/C value, and B/C value.

Table 3. Robusta Coffee Farming Feasibility

No	Indicators	Value
1	Total Production Cost (TC)	11,004,770
2	Revenue (TR – TVC)	13,326,568
3	Profit (TR – TC)	11,300,598
4	R/C Ratio	2.03
5	B/C Ratio	1.03

Source: Research Data, 2024

The results of the analysis indicate that robusta coffee farming in Semarang Regency exhibits good financial efficiency, as reflected in a favourable profit ratio that falls within the range commonly observed in coffee farming research in Indonesia. This efficiency value aligns with the findings of a study in Kediri, which also demonstrates that robusta coffee yields stable profits for smallholder farmers (20,21). However, the level of financial feasibility in this study was slightly lower than in areas such as Pesawaran, which tend to have higher productivity and better seed quality.

Compared to research abroad, the efficiency level of farmers in Semarang remains below that of the leading producer countries. Uganda, for example, reports higher financial efficiency due to lower labour costs and broader access to export markets. Brazil also exhibits better feasibility values, thanks to the application of modern cultivation technologies, including irrigation, precision fertilisation, and intensive canopy management.

However, there is an essential similarity between this study and international studies in developing countries: small-scale coffee farming continues to provide financial benefits, despite variations in productivity. The most significant differences lie in the intensity of the technology, the

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quality of the seeds, and the level of institutional support. Thus, the results of this study confirm the need to increase efficiency through the adoption of cultivation technology and strengthen plantation management, thereby enhancing the competitiveness of local farmers at the global level.

CONCLUSION

Research on robusta coffee cultivation in Semarang Regency indicates that this business is feasible and financially efficient, as reflected in the R/C value that exceeds one and a positive B/C, indicating that the income is sufficient to cover costs with adequate profit margins. However, there are still variations in productivity and differences in the efficiency of input use among farmers, so improvements in cultivation techniques, such as pruning, fertilisation, and harvest management, as well as increasing market access and group-based marketing strategies, need to be implemented to strengthen business performance. With these steps, robusta coffee cultivation has the potential to continue to grow as a stable and sustainable source of income for farmers in Semarang Regency.

RECOMMENDATIONS

To improve the performance of robusta coffee farming in Semarang Regency, several applicable measures can be implemented. First, a structured technical assistance program is needed for farmers to address regular pruning, balanced fertilisation, and integrated pest control, thereby suppressing productivity variations between farmers. Second, post-harvest processing training, such as wet fermentation, honey processing, or fullwash, needs to be expanded because it has the potential to increase the selling price by 15-30% at the farmer level. Third, local governments and farmer groups need to strengthen market access by forming joint marketing units or marketing cooperatives, thereby increasing the stability of selling prices and enhancing farmers' bargaining positions. Fourth, support for low-interest microfinance and facilitation of simple processing tools (pulpers, dryers, and seed sorting) can help farmers consistently improve product quality. Fifth, farmer regeneration can be encouraged through coffee entrepreneurship training for village youth and the integration of digital farming, which will attract the interest of the younger generation. Finally, it is necessary to establish a demonstration plot of cultivation innovation in each coffee centre sub-district as a direct learning model for farmers to apply more efficient and environmentally friendly technologies.

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