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Analysis of The Added Value of Arabica Coffee Beans into Coffee Powder at Solok Radjo Cooperative

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A B S T R A C T

The objectives of this study are 1) To describe the Arabica coffee cultivation process at the Solok Radjo cooperative; 2) To describe the process of processing Arabica coffee beans into ground coffee at the Solok Radjo Cooperative; and 3) The data analysis method used in this study is the Hayami method. The results of this study indicate that: (1) Arabica coffee cultivation carried out at the Solok Radjo Cooperative includes seed selection, soil preparation, fertilization, pest and disease control, and harvesting; (2) The process of processing coffee beans into ground coffee carried out by the Solok Radjo Cooperative begins with sorting coffee beans, roasting, cooling, and the final stage is packaging; and (3) The added value obtained from processing Arabica coffee beans into ground coffee at the Solok Radjo Cooperative is IDR. 734,583.33 per kg with a value-added ratio of 64,95% and a profit of IDR. 714,583.33 per kg with a profit rate of 63.18%

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INTRODUCTION

Coffee is one of the most important agricultural commodities in the world and plays a strategic role in supporting rural economies, employment, and export earnings in many developing countries (Gizaw et al., 2022; Massrie, 2025; Muhie, 2022). Indonesia is recognized as one of the largest coffee-producing countries globally, with Arabica coffee serving as a premium commodity due to its distinctive flavor, aroma, and higher market value compared to Robusta coffee (Lubis & Lubis, 2024; Tampubolon et al., 2023). The increasing demand for specialty coffee in domestic and international markets has encouraged coffee-producing regions to improve product quality and develop value-added processing activities (Ayele et al., 2026; Ma'ruf et al., 2025). Consequently, coffee is no longer viewed merely as a primary agricultural commodity but as a product with substantial opportunities for agroindustrial development and economic transformation.

The development of coffee agroindustry is closely associated with efforts to increase farmers' income through downstream processing activities. Value addition through processing enables producers to transform raw agricultural commodities into products with higher economic value and greater market competitiveness (Białowąs & Budzyńska, 2022; Hu et al., 2025; Istudor et al., 2026). In the coffee sector, processing activities such as roasting, grinding, packaging, and branding contribute significantly to increasing product prices and expanding market opportunities. Previous studies have demonstrated that agroindustrial processing can improve profitability, strengthen market positioning, and create employment opportunities in rural areas (Pansantia et al., 2022; Singh, 2021). Therefore, understanding the economic benefits generated through coffee processing is essential for designing sustainable agribusiness strategies.

Cooperatives play an important role in supporting coffee farmers by facilitating production, quality control, processing, and marketing activities. Through collective action, cooperatives help farmers overcome limitations related to capital, technology, and market access. In Indonesia, coffee cooperatives have become key institutions in promoting sustainable coffee production and improving the bargaining position of smallholder farmers. The Solok Radjo Cooperative is one example of a successful coffee cooperative that has actively developed Arabica coffee production and processing activities in Solok Regency, West Sumatra. The cooperative has gained recognition for producing high-quality Arabica coffee with unique sensory characteristics that meet market preferences. Solok Radjo Cooperative was established to help coffee farmers improve the quality and selling value of their coffee products (Yusmarni et al., 2020). This cooperative focuses on the development of Arabica coffee, which is one of the leading commodities in the region (Ashardiono & Trihartono, 2024). The existence of cooperatives plays a crucial role for farmers to unite and collaborate in overcoming various challenges in the production line. One tangible example is the Solok Radjo Cooperative, which has a competitive advantage in the coffee product industry, particularly in the characteristics of the Arabica coffee flavor it produces. Based on this potential, this study aims to examine in

depth three main aspects. First, this study describes how the Arabica coffee cultivation process is carried out by the Solok Radjo Cooperative. Second, an analysis is conducted to describe the post-harvest processing that transforms Arabica coffee beans (green beans) into ready-to-consume coffee powder. Third, this study focuses on analyzing the amount of added value created from the process of transforming coffee beans into coffee powder at the cooperative.

THEORITICAL REVIEW

Through this approach, this study is expected to provide both theoretical and practical contributions to various parties. For the author and future researchers, this study can broaden knowledge, understanding, and practical experience regarding the downstream processing of coffee products, while also serving as a valid academic reference for future value-added analysis studies. On the other hand, for agro-industry business actors, this research provides concrete information regarding projections of added value and estimated revenue obtained, which can serve as strategic indicators in the development of business scale. Finally, for the government and relevant policymakers, this analysis is expected to contribute ideas and serve as objective consideration in establishing regulations and development programs for a sustainable coffee processing industry.

METHODOLOGY

Design, Location, and Data Sources

The basic method used in this study is quantitative descriptive. This research was conducted in June 2025 at Koperasi Solok Radjo, located at Jl. Lingkar Aie Dingin, Jorong Data, Nagari Aie Dingin, Kecamatan Lembah Gumanti, Kabupaten Solok, West Sumatra Province. To support the analysis, the data collected in this study consist of primary and secondary data. Primary data were obtained directly from the main source through in-depth interviews with key informants, involving the leadership and two employees of Koperasi Solok Radjo. Meanwhile, secondary data were obtained indirectly through literature document studies or third parties relevant to the research topic.

Research Variables

The variables observed in this study are structured based on the three main research objectives.

- **Cultivation Process:** To address the first objective regarding the description of the Arabica coffee cultivation process, the variables observed include environmental factors, plant maintenance techniques, and post-harvest handling that affect the final quality of coffee beans.
- **Post-Harvest Processing Process:** To answer the second goal regarding the processing of Arabica coffee beans into ground coffee, observations are focused on three main sub-variables, namely:
    1. The raw materials used, including the type, humidity, cleanliness, and defects in the coffee beans.
    2. The processing process, including roasting, roasting temperature, doneness level, and cooling.

3. Grinding process, including the diversity of coffee powder sizes and the type of grinding applied.

- **Value-Added Analysis:** Finally, to address the third objective related to the value-added analysis of the transformation of coffee beans into ground coffee, the observed variables focus on the groups of output, input, and price. The specific components measured include the volume of output produced (kg/production), the volume of raw materials used (kg/production), labor allocation (Man-Days/production), output price (IDR/kg), as well as the prevailing average labor wage (IDR/kg).

The data analysis used in this study includes qualitative and quantitative descriptive analysis. Qualitative descriptive analysis is conducted to answer the first and second research objectives, which are to describe the cultivation and processing of Arabica coffee beans into ground coffee at Solok Radjo Cooperative. Qualitative descriptive analysis is used to obtain a depiction of the coffee cultivation and processing system at Solok Radjo Cooperative, which includes a description of the business and the techniques of processing Arabica coffee into ground coffee. Quantitative descriptive analysis is conducted to answer the third research objective, which is to analyze the added value from processing Arabica coffee beans into ground coffee at Solok Radjo Cooperative during a single production process. The purpose of calculating the added value is to determine how much added value is obtained by Solok Radjo Cooperative. Untuk menganalisis besar nilai tambah tersebut, dapat dijelaskan dengan menggunakan analisis nilai tambah metode Hayami.

RESULTS

Arabica Coffee Cultivation at Solok Radjo Cooperative

Arabica coffee plants (Coffea Arabica) are one of the leading plantation commodities that have high economic value in both domestic and international markets. The Solok Radjo Arabica coffee cultivated comes from the Sigarar Utang and Kartika varieties. The Arabica coffee cultivation carried out by the Solok Radjo Cooperative is as follows:

A. Seed Selection

The seeds used are coffee beans of good quality. The effort made to obtain good seedlings is by taking physiologically mature coffee fruits from parent plants that are 5 years old. For the preparation of planting media, Koperasi Solok Radjo uses polybags measuring 15 x 20 cm, and the polybags are filled with planting media consisting of 50% soil, 30% manure, and 20% husks. Rahardjo (2012) states that good seeds are obtained from coffee fruits harvested at the physiological maturity stage and come from healthy parent trees over 4–5 years old, thus producing superior seedlings with good growth potential. The planting medium for coffee nurseries should preferably use a mixture of soil, manure, and other organic materials such as husks to maintain aeration and fertility of the medium, and it is recommended to use polybags of appropriate size so that root growth is optimal.

B. Land Management

The land that will be planted with coffee is first cleared, then planting holes are made with a spacing of 1 x 2 meters. Before coffee planting, the prepared land is given dolomite fertilizer; 1 hectare of land requires 400-800 kg of dolomite fertilizer, and each planting hole is given 2 kg of organic fertilizer with a spacing of 30 cm x 30 cm. Organic fertilizer is the basic fertilizer used by the Solok Radjo Cooperative, which aims to provide the main nutrient supply for coffee plants. After the planting holes are given manure, the planting holes are then left for 2 weeks so that the fertilizer decomposes well. Rahardjo (2012) states that in Arabica coffee cultivation, land preparation is an important stage that affects the growth of coffee plants, starting with land clearing to reduce weeds and facilitate soil processing. Plant spacing needs to be considered so that the plants get enough room for root and canopy development. The application of dolomite before planting is necessary to increase the soil pH, which is generally acidic in coffee farmland, so that the nutrients in the soil can be optimally available to the plants. The use of organic fertilizers such as manure in the planting holes can improve soil structure, increase organic matter content, and provide nutrients slowly for the coffee plants.

C. Fertilization

The care carried out by the Solok Radjo cooperative involves planting shade trees and fertilizing using organic fertilizer (layer hen compost) and chemical fertilizers (NPK, Phoska, Urea). Fertilizing coffee aims to meet the needs for macro and micronutrients. Fertilization for coffee plants over 1 year old is done twice a year, at the beginning and end of the rainy season. Fertilization is done by spreading fertilizer in a circle under the canopy or 30-50 cm from the coffee stem, with a fertilization hole depth of 5-10 cm, then covered again with soil. Rahardjo (2012) states that good care involves using shade trees to regulate the farm's microclimate, fertilizing with organic and chemical fertilizers to meet nutrient needs, and applying proper timing and fertilization techniques to support the growth and production of high-quality Arabica coffee.

D. Pest and Disease Control

Solok Radjo Cooperative carries out pest and disease control manually, namely by directly pruning coffee plants that are attacked by pests or diseases, as well as biological control using pheromones. Pheromones are traps for borer beetles on coffee plants obtained through government assistance. The types of pests that often disturb the growth of coffee plants are whiteflies, borer beetles, and leaf spots. Adang. A. and Benny. R (2018) explained that one effort that can be made to improve both the productivity and quality of the products is to have healthy plants free from pest and disease attacks or disturbances so that the harvest results increase with high-quality coffee.

E. Harvesting

Arabica coffee harvesting at the Solok Radjo Cooperative is carried out starting at the age of 2 years, with the harvesting process done once every 15 days. The harvesting technique used by Solok Radjo is picking the red cherries. Arabica coffee harvesting at the Solok Radjo Cooperative, which begins at the age of 2 years, is explained by Yusianto (2006) that Arabica coffee plants usually

start bearing fruit and can be harvested at the age of 2-3 years after planting, depending on the variety and maintenance conditions. Rahardjo (2012) stated that the coffee harvesting interval is carried out every 10-15 days to maintain the quality of the harvested beans, because the ripeness of coffee fruits is not uniform within a single branch.

F. Post-harvest

Arabica coffee after harvest is continued with several processes until it becomes green beans. The post-harvest process carried out at the Solok Radjo Cooperative is as follows:

Sorting (Water Sorting)

After picking, the cherry fruits are soaked in water. The fruits that sink are considered of good quality, while the fruits that float (damaged, green, dirty) are discarded.

Drying

Solok Radjo Cooperative uses drying houses/plastic domes to protect from direct sunlight and the risk of rain, speeding up the drying process without reducing quality. The coffee cherries are spread evenly on racks or tarps, then naturally dried while frequently turning them to ensure even drying and prevent molding. This process takes quite a long time, about 30–45 days, until the moisture content of the cherries reaches around 10–12%.

Peeling Dry Skin

After the water content reaches around 11–12%, the dried coffee cherries are then peeled using a huller machine to separate the dry skin from the coffee beans (green bean). The shrinkage of the cherry to green bean is a weight change that occurs due to the reduction of water content and the removal of non-core parts of the coffee fruit. The shrinkage that occurs in this process reaches 7:1, which means that every 7 kilograms of coffee cherries will produce 1 kilogram of green beans.

Arabica Coffee Bean Processing at Solok Radjo Cooperative

The process of processing Arabica coffee beans into ground coffee at Solok Radjo Cooperative uses various equipment such as roasting machines, grinders, and sealers. The process of processing coffee beans into ground coffee carried out by Solok Radjo Cooperative.

1. Coffee bean sorting

   The sorting carried out by the Solok Radjo Cooperative is done manually to separate damaged coffee beans from those of good quality.

2. Roasting

   The sorted coffee beans (best quality) are then subjected to a drying process by roasting using a roasting machine at a temperature of 180°C-200°C. The roasting process takes 10-15 minutes or is marked by the coffee beans turning brown.

3. Cooling

   After roasting coffee beans, they must be cooled first. Cooling the coffee beans takes 5-7 minutes.

Grinding

The cooled coffee beans are then ground using a grinder machine. The coffee powder with a medium coarseness produced by Koperasi Solok Radjo has a texture that is neither too fine nor too coarse.

4. Packaging

In packaging, it is necessary to pay attention to weight, type of packaging, and density. The packaging carried out by the Solok Radjo Cooperative uses drip bags, sachet plastics, and packaging boxes. The weight of the coffee powder packaging is 10 grams per sachet, and each box of coffee powder consists of 5 sachets. For more details, the stages of processing Arabica coffee beans at the Solok Radjo Cooperative can be seen in Figure 1.

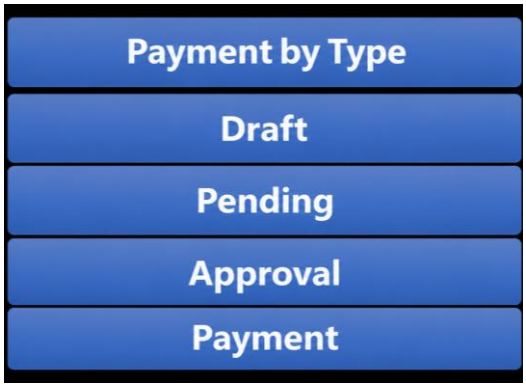

Figure 1. Arabica Coffee Processing

Analysis of the Added Value of Coffee Beans into Ground Coffee at Solok Radjo Cooperative.

Table 1. Production of Coffee Beans into Ground Coffee at Solok Radjo Cooperative Production

Production To	Date/Month/Year	Amount of Coffee Bean Raw Material (kg)	Coffee Powder Yield (kg)
1	June 5, 2025	10	8,7
2	June 12, 2025	10	8,7
3	June 19, 2025	10	8,7
4	June 26, 2025	10	8,7
Amount		40	34,8
Average/production		10	8,7

Based on Table 1, Solok Radjo Cooperative uses 10 kg of raw materials in a single production and produces 8.7 kg of coffee powder. This is due to the reduction in moisture content during roasting, with a moisture loss of 13% per kilogram of coffee beans during the roasting process. Each process of processing 10 kg of coffee beans can produce 8.7 kg of coffee powder / 174 boxes with a weight of 50 g per box and a selling price set by Solok Radjo Cooperative of IDR 65,000 per box.

Table 2. Number and Wages of Labor at Solok Radjo Cooperative

Production To	Date/Month/Year	Amount of Coffee Bean Raw Material (kg)	Day	Wages IDR 100,000/day
1	June 5, 2025	8,7	2	200.000
2	June 12, 2025	8,7	2	200.000
3	June 19, 2025	8,7	2	200.000
4	June 26, 2025	8,7	2	200.000
Amount		34,8	8	800.000
Average/production		8,7	2	200.000

The research results show that the production process is carried out every Thursday, with working hours of 5-7 hours per production. The work duration for a single production is 6 hours with a daily workforce of 8 HOK/month.

Table 3. Contribution of Other Inputs in Coffee Powder Processing at the Solok Radjo Cooperative

No	Supporting Materials	Amount	Unit	Price	Total
1	Electricity	59,16	kwh	80.000	80.000
2	Plastic	3.480	Sheet	1.000	3.480.000
3	Drip bag	3.480	Sheet	500	1.680.000
4	Packaging Box	696	Box	3.500	2.436.000
Amount					7.676.000

The total cost of supporting materials or other input contributions used by Koperasi Solok Radjo during one month is IDR. 7,676,000.

Table 4. Results of Analysis of Added Value in Coffee Powder Processing at Koperasi Solok Radjo, Lembah Gumanti District, Solok Regency.

No	Variable	Notasi	
Output, Input, and Price			
1	Output (Box/1 month of production)	A	696
2	Raw material input (kg/production)	B	40
3	Direct labor (HOK/production)	C	8
4	Conversion factor (kg output/kg raw material)	D = A/B	17,4
5	Labor coefficient (HOK/kg of raw material)	E = C/B	0,2
6	Product price (IDR/unit)	F	65.000
7	Average labor wages (IDR)	G	100.000
Acceptance and Profit			

8	Raw material input price (IDR/kg)	H	130.000
9	Other input contributions (IDR /kg)	I	266.416,67
10	Output value (IDR /kg)	J = D x F	1.131.000
11	a. Added value (IDR /kg)	K = J – H - I	734.583,33
	b. Added value ratio (%)	L = (K/J) x 100%	64,95
12	a. Labor income (IDR /kg)	M = E x G	20.000
	b. Labor compensation (%)	N = M/K x 100%	2,72
13	a. Profit (IDR /kg)	O = K - M	714.583,33
	b. Profit rate (%)	P = O/J x 100%	63,18
Reward for Factors of Production			
14	a. Margin (IDR /kg)	Q = J - H	1.001.000
	b. Labor income (%)	R= M/Q x 100%	1,99
	c. Contribution of other inputs (%)	S = I/Q x 100%	26,61
	d. Company profit (%)	T = O/Q x 100%	71,39

From the calculation of value added in Table 4, it is known that the production/output result for one month of the production process is 696 packages. The raw material/input used amounts to 40 kilograms. The raw material used here is dry Arabica coffee beans of good quality, measured in kilograms. The labor calculated in this study includes all workers involved in the coffee powder production process. In one month of production, the required labor is 8 HOK with wages paid of IDR. 100,000/HOK, consisting of 2 men. Each worker works together and has different tasks in the production process. The conversion factor is the result of the division between production/output and the amount of raw material/input used. The conversion factor in the calculation above is 17.4. This means that every 1 kilogram of processed dry coffee beans will produce 17.4 boxes of coffee powder. The labor coefficient is the result of dividing labor per HOK by the amount of raw material/input used in one month of production. The labor coefficient in the coffee powder processing of Solok Radjo is 0.2. This indicates that 1 kg of coffee beans requires 0.2 labor, which means that processing 10 kg of coffee beans requires 2 HOK.

The price of raw materials/inputs is IDR 130,000 per kilogram. This coffee powder is pure coffee powder made from coffee beans without any added mixtures and comes from quality coffee beans. Other input contributions are IDR 266,416.67 per kilogram. The value of the product/output is the result of the conversion factor with the average product price. The value of the product/output in the value-added calculation is IDR 1,131,000 per kilogram. The result of this product value minus the cost of raw materials and the cost of

other input contributions yields a value added of IDR 734,583.33 per kilogram of raw materials.

If the added value is divided by the product/output value, a value-added ratio of 64.95 percent is obtained, meaning that the processing of coffee powder provides a positive added value. Direct labor income is the result of multiplying the labor coefficient by the average wage. In the calculation of the added value above, the direct labor income provided for each kilogram of raw coffee beans processed into coffee powder is IDR 20,000. Thus, the labor share in coffee powder processing is 2.69 percent; this percentage is obtained by dividing the labor share by the added value and multiplying by 100.

Further analysis of the coffee powder from Koperasi Solok Radjo shows that the profit obtained is IDR 714,583.33. The profit rate is 63.18 percent. This amount is quite significant because the higher the profit, the higher the profit ratio obtained. The results of this added value analysis can also show the margin from raw coffee beans into coffee powder at Koperasi Solok Radjo, which is distributed to direct labor income, contributions from other inputs, and company profit. This margin is the difference between the product value and the price of raw coffee beans per kilogram. For each processing of 1 kilogram of coffee beans into coffee powder at Koperasi Solok Radjo, a margin of IDR 1,001,000 is obtained. This value is distributed to each factor: direct labor income 1.99 percent, contributions from other inputs 26.61 percent, and company profit 71.39 percent.

DISCUSSION

The results indicate that processing Arabica coffee beans into ground coffee at the Solok Radjo Cooperative generates a high added value of IDR 734,583.33 per kg with an added value ratio of 64.95% and a profit rate of 63.18%. These findings demonstrate that downstream processing activities significantly increase the economic value of coffee compared to selling coffee beans as raw materials. The high added value is closely related to the transformation process, including sorting, roasting, grinding, and packaging, which create a product with greater market acceptance and a higher selling price. The substantial added value generated by Solok Radjo Cooperative is consistent with the value-added theory proposed by Hayami, which states that agroindustrial processing enhances product utility through changes in form, quality, and marketability. The cooperative not only sells coffee as a primary commodity but also develops a finished product with stronger branding and consumer appeal. The use of drip-bag packaging further contributes to product differentiation and increases consumers' willingness to pay, thereby improving profitability.

These findings are supported by the study of Abebe & Awoke (2025) which reported that processing coffee beans into value-added coffee products significantly increases farmers' and cooperatives' income due to higher selling prices and broader market opportunities. Their study emphasized that coffee agroindustry contributes not only to income generation but also to strengthening rural economic resilience through local resource utilization. Similar conditions

can be observed at Solok Radjo Cooperative, where value-added activities create a more profitable business model than the direct sale of green beans.

Furthermore, the findings are in line with the research of Addisie & Tebarek (2023), who found that cooperatives play an essential role in improving coffee quality standards, facilitating market access, and increasing the competitiveness of coffee products. The success of Solok Radjo Cooperative in maintaining quality through selective harvesting, water sorting, controlled drying, and standardized roasting supports this argument. These quality-control measures enable the cooperative to produce premium Arabica coffee that commands a higher market price. The profit distribution analysis also reveals that company profit accounts for 71.39% of the processing margin, while labor receives only 1.99% and other inputs account for 26.61%. This indicates that the economic benefits of processing activities are largely derived from managerial efficiency and product value enhancement. Similar findings were reported by (Tamru & Minten, 2023)who concluded that value-added coffee enterprises generally obtain higher profit margins when they integrate production, processing, and marketing activities within a single management system. Such integration reduces transaction costs and allows producers to capture a larger share of the final product value.

Overall, the study confirms that downstream processing of Arabica coffee at Solok Radjo Cooperative is economically feasible and highly profitable. The combination of good agricultural practices, effective post-harvest handling, quality-oriented processing, and attractive packaging has successfully created substantial added value. These findings imply that strengthening coffee agroindustry development through technology adoption, product diversification, and market expansion can further increase the competitiveness and sustainability of coffee cooperatives in Indonesia.

CONCLUSIONS AND RECOMMENDATIONS

From the results of the research and discussion, it can be concluded as follows. Arabica coffee cultivation carried out at Koperasi Solok Radjo includes seed selection, soil processing, fertilization, pest and disease control, harvesting, and post-harvest. The process of processing coffee beans into ground coffee carried out by Koperasi Solok Radjo starts with coffee bean sorting, roasting, cooling, grinding, and the final stage is packaging. The added value obtained from processing Arabica coffee beans into ground coffee at Koperasi Solok Radjo, Lembah Gumanti Subdistrict, Solok Regency, is IDR 734,583.33 per kg with an added value ratio of 64.95% and total profit of IDR 714,583.33 per kg with a profit rate of 63.18%.

FURTHER STUDY

Future research is recommended to analyze the added value of Arabica coffee using a broader sample involving several coffee cooperatives and agroindustries in different regions. Further studies may also examine the influence of product diversification, branding strategies, and digital marketing on the added value and profitability of coffee processing businesses. Additionally, comparative analyses between various coffee processing methods could provide deeper insights into strategies for enhancing the competitiveness and sustainability of the coffee agroindustry.

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