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Research Article

Evaluation of the Value Added Cream Cheese Production in Samarinda

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Abstract: There are chances for small and medium-sized businesses (SMEs) to boost local agricultural economies and increase profitability due to the rising demand for value-added dairy products. This study uses the Hayami approach to evaluate the value distribution along the production chain in order to investigate the economic potential of cream cheese production in Samarinda, Indonesia. In-depth producer interviews, cost documentation, questionnaires, and production process observations were used to gather primary data. Identifying the main cost components and evaluating value generation at the processing step were the main objectives of the investigation. The results show that processing adds a substantial amount to the total product value, with the acquisition of raw materials and packaging being the main sources of expense. Maximizing by-products like whey, implementing cost-effective packaging, and optimizing input sourcing are all ways to boost profitability. According to the report, local cream cheese makers can become more resilient and competitive by focusing on specialized markets, improving branding, and fortifying supply chain integration. These observations serve as the foundation for business plans and regulatory suggestions meant to promote long-term expansion in the artisanal dairy industry.

Keywords: Circular Economy; Dairy; Valorization; Value Chain; Whey.

1. Introduction

The production of dairy-based products such as cream cheese offers significant value-added potential for farmers and small and medium enterprises (SMEs) within the dairy value chain, particularly in regions that continue to face limitations in fresh milk production, as is the case in many parts of Indonesia. The country still imports a substantial portion of its processed dairy products and depends on imported raw materials for several dairy items, making the development of local dairy processing an important strategy for strengthening food security and improving farmers' incomes (Darmawan, 2024).

Cream cheese is a relatively simple derivative of fresh milk in terms of processing technology; however, it provides opportunities to increase profit margins through product diversification, packaging, and branding, as well as through the utilization of by-products such as whey for further valorization. Previous studies have demonstrated that variations in processing methods—such as the use of ultrafiltered milk, cream substitution, and whey control—can significantly affect the physicochemical characteristics and yield of cream cheese, thereby making it relevant for both cost-based value-added analysis and quality assessment (Mehner et al., 2024; Onishi et al., 2025).

To evaluate the contribution of processing to producers' or SMEs' incomes, the Hayami method—often referred to as the Hayami method in more recent literature—provides a cost-based analytical framework that calculates the value-added ratio by subtracting intermediate production inputs from the market value of the output. This method has been widely applied

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in food processing studies, including dairy products, to determine the extent of value addition generated during processing and sales (Franceschi et al., 2020).

Beyond direct value-added measurement, a value chain approach that incorporates the potential utilization of by-products, such as whey, alongside local marketing strategies, can enhance both the economic impact and sustainability of cream cheese production at the municipal or district level. Research on by-product valorization and value chain management in cheese production highlights opportunities for improving efficiency and eco-efficiency when processing and distribution are optimized (Priyashantha & Lundh, 2021).

2. Preliminaries or Related Work or Literature Review

Value-Added Analysis Using the Hayami

The Hayami method, first introduced in the late 1980s, offers a cost-based framework for analyzing value added in processed agricultural products. It computes the Value-Added Ratio (VAr) by accounting for the difference between output value and intermediate inputs relative to the output value (Hayami et al., 1987).

Economics and Valorization of Whey and Dairy-byproducts

Cheese whey, a primary by-product of cheesemaking, represents 80–90% of the milk volume used and contains substantial nutritional components—approximately 55% of milk nutrients, including proteins, lactose, and minerals (Asunis et al., 2020). Due to its high biochemical and chemical oxygen demand (BOD/COD), whey poses significant environmental disposal challenges unless properly valorized (Barba, 2021; Pires et al., 2021). Recent efforts have explored diverse valorization pathways: Whey can be transformed into whey butter, whey cheese (e.g., ricotta), protein concentrates, lactose, and various functional additives (Wu et al., 2024). Through microbial or enzymatic bioprocesses, whey can be converted into high-value compounds such as lactobionic acid, while other processes enable the production of bioplastics, biofuels, biosurfactants, and biochemicals in a biorefinery model (Costa et al., 2022; Lestari et al., 2020).

Examples of Cleaner Production in Small-Scale Dairy Processing

Studies in Indonesia demonstrate both environmental and economic pressures to handle whey responsibly. For instance, a small-scale mozzarella cheese factory implemented cleaner production practices by transforming whey waste into yogurt, kefir, and liquid fertilizer, illustrating both waste reduction and value generation (Brighenti et al., 2021). Such initiatives align with broader sustainability goals and circular economy principles.

3. Proposed Method

This study employed a descriptive quantitative approach using a case study on cream cheese production units made from cow's milk in Samarinda City. Primary data were collected through business surveys and cost recording, as well as in-depth interviews with SME operators. The survey recorded the quantity and composition of raw materials (milk, cream, culture), all variable costs (raw materials, labor, energy, packaging), and product selling prices. Cost data were recorded per batch and converted to a per-kilogram basis for value-added analysis using the cost-based Hayami method (Hayami et al., 1987), namely:

$$\boldsymbol{VA = Selling\ price - (Raw\ material\ costs + Other\ variable\ cost)}$$

where VA represents the value added per unit.

Cost and value-added analyses were conducted by calculating VA for each production unit. Subsequently, a sensitivity analysis was performed to assess the effects of ±10–30 % changes in raw material prices (milk, culture), packaging costs, and selling prices on VA in order to evaluate business profitability. In addition, a value chain analysis was carried out by comparing margins from the milk procurement stage through processing, distribution, and sales, as recommended in Hayami-based literature for determining value-added levels at each stage (Hayami et al., 1987; Onishi et al., 2025). Table 1 summarizes the variables and formulas that will be used in calculating Hayami's value-added analysis.

Table 1. Variables and Formula for Calculating Hayami's Added Value.

Variables	Information	Unit	Formula
Output Value (Y)	Total revenue from sales of final product (Cream Cheese)	Rp/kg product	Selling Price per kg of product
Main Raw Material Costs (MRMC)	Cost of fresh cow's milk used per kg of final product	Rp/kg product	Milk Quantity (L) x Milk Price (Rp/L)
Supporting Raw Material Costs (SRMC)	Cost of starter culture, rennet, salt, lemon/vinegar per kg of final product	Rp/kg product	Amount per kg of product
Utility Cost (UC)	Electricity and water costs per kg of final product	Rp/kg product	(Monthly Electricity Cost + Monthly Water Cost) / Total Monthly Production
Packaging Cost (PC)	Container/packaging cost per kg of final product	Rp/kg product	Number of packages per kg of product x Price of package per unit
Total Intermediate Input Cost (I)	Total MRMC + SRMC + UC + PC	Rp/kg product	MRMC + SRMC + UC + PC
Value Added (VA)	Value added through the production process	**Rp/kg product**	**Y - I**
Labor Compensation (L)	Direct labor wages per kg of final product	Rp/kg product	Monthly Wages / Total Monthly Production
Equipment Depreciation (D)	Allocation of equipment depreciation costs per kg of final product	Rp/kg product	Monthly Depreciation Cost / Total Monthly Production
Business Profit (P)	Net profit earned after all costs are covered	**Rp/kg product**	**VA - L - D**
Value Added Ratio (VAR)	Percentage of added value to output value	%	(VA / Y) * 100%

Source: (Hayami et al., 1987)

Qualitative data from interviews were thematically analyzed to identify challenges (e.g., regulations, access to capital, technology, marketing) and opportunities for value enhancement (e.g., local branding, whey utilization). Supporting studies on whey valorization indicate the potential to increase company profits by up to 24 % through by-product utilization (Banaszewska et al., 2014; Kim et al., 2022).

4. Results and Discussion

Main and Supporting Raw Materials of Cream Cheese

According to Table 1, the most expensive ingredient in Samarinda's cream cheese production is fresh cow's milk, which accounts for roughly 60.87% of the total output value. This result is in line with a study on the production of artisanal cheese on South African farms, which revealed that turning milk into cheese, as opposed to just selling raw milk, greatly raised farmers' profits and created new business prospects. Product quality is prioritized when high-value-added inputs like rennet and starting cultures are used. Co-procurement tactics and long-term supplier contracts help lower price volatility and stabilize margins, as raw material costs have the greatest impact on margins (Salinas-Martínez et al., 2020).

Table 2. Main and Supporting Raw Materials of Cream Cheese.

Raw Materials	Unit	Price per Unit (Rp)
Fresh Cow's Milk (Raw Milk)	Liter	17,500
Cheese cream starter culture	Pack	200,000
Rennet	5ml	40,000
Kitchen Salt	Kg	9,500
Lemon/Citric Acid	Kg	25,000

Fresh cow's milk, which costs IDR 17,500 per liter and is comparable to the national average for premium raw milk in Indonesia, is the main cost factor in the making of cream cheese, according to Table 2. The cost structure's preponderance of milk is in line with research showing that raw milk usually makes up more than 60% of all input expenses for artisanal cheesemaking. As observed in small-scale dairy businesses in emerging countries, the use of high-value components like rennet (IDR 40,000 per 5 ml) and starter cultures (IDR 200,000 per pack) underlines the artisanal nature of production and its reliance on quality-driven processing (Priyashantha, 2025). Without sacrificing product quality, procurement optimization through bulk buying or cooperative sourcing may help stabilize input prices and boost profitability (Nyamakwere et al., 2022).

Furthermore, diversifying the milk supply helps strengthen the supply chain and lessen reliance on outside vendors. Examples of this include integrating with upstream dairy farming or using milk from nearby cooperatives. Vertically integrated artisanal cheese makers were better able to control raw material costs and maintain consistent product quality (Nyamakwere et al., 2022). The implementation of quality-based milk payment schemes is made possible by this integration, which incentivizes farmers to produce raw milk of superior quality that can be used to make premium cream cheese.

Labor and Overhead Costs

According to Table 3, the monthly cost of direct labor (one full-time equivalent) is IDR 3,500,000, which is a fair percentage for SMEs engaged in manual dairy processing. This aligns with worker cost contribution efficiency criteria of 4–6% in artisanal cheese businesses [4]. While utility expenses like water (IDR 500,000/month) and electricity (IDR 750,000/month) are still moderate, packaging costs per unit (IDR 5,500) are relatively high, indicating the need for cost-cutting measures such economies of scale in purchasing or local sourcing (Rejeesh & Anto, 2023). The modest capital expenditure indicated by the low monthly depreciation cost (IDR 500,000) is typical of small-scale enterprises, although it may limit mechanization and throughput (Oliveira et al., 2021).

Table 3. The Result of Labor and Overhead Costs.

Fee Type	Unit	Estimated Monthly Cost (Rp)
Direct Labor	Month	3,500,000
Electricity	Month	750,000
Water (PDAM)	Month	500,000
Equipment Depreciation	Month	500,000
Packaging (per unit output, e.g., 250ml jar)	Unit	5,500

Additionally, raising workforce proficiency through focused training initiatives can boost worker output and product quality. Even low-cost interventions, such organized process manuals and on-the-job technical mentoring, can boost yield efficiency by up to 8%, according to studies conducted in small-scale dairy businesses. While eco-packaging technologies may simultaneously minimize packaging expenses and boost market appeal,

utility costs could be further reduced on the overhead side by implementing energy-efficient equipment and streamlining production schedule.

Value-Added of Cream Cheese

Results from the Hayami technique are shown in Table 4, which indicates a value-added ratio (VAr) of 24.37%. This indicates that processing, not raw materials, accounts for over 25% of the selling price of cream cheese. This is in line with standards for artisanal dairy products, where a competitive VAr of 20–30% is deemed appropriate. Their dominance in the cost structure is highlighted by the fact that the primary and supporting raw material costs account for 64.25% of the output value (Onishi et al., 2025). A possible area for efficiency improvement is indicated by the packaging costs, which are 9.57% more than average for artisanal cheese products.

Table 4. Results of Hayami Method Value Added Analysis per kg of Cream Cheese.

Variabel	Value (Rp/kg product)	Percentage of Output Value (%)
Output Value (Y)	230,000	100.00%
Main Raw Material Cost (MRMC)	140,000	60.87%
Supporting Raw Materials Cost (SRMC)	7,775	3.38%
Utility Cost (UC)	4,167	1.81%
Packaging Cost (PC)	22,000	9.57%
Total Intermediate Input Cost (I)	173,942	75.63%
Added Value (VA)	56,058	24.37%
Labor Compensation (L)	11,667	5.07%
Equipment Depreciation (D)	1,667	0.72%
Profit of Effort (P)	42,724	18.58%
Value Added Ratio (VAR)	-	24.37%

While depreciation only makes up 0.72% of production value, labor compensation accounts for 5.07%, which indicates low capital intensity as well as potential limits on automation-related productivity improvements. With a profit share of 18.58%, small-scale dairy businesses surpass the 15% viability criterion. Profits could rise by as much as 20–25% by incorporating by-product valorization, such as whey protein concentrates or whey-based drinks. Furthermore, a clear route to increased profitability is provided by by-product valorization. Research has indicated that the use of whey in agricultural fertilizers, drinks, or protein concentrates can boost profit margins by as much as 25% while lowering environmental impact. Furthermore, including branding and regional narratives may improve perceived value and make premium pricing tactics possible (Banaszewska et al., 2014).

An extended market strategy that targets specific consumer segments, such as health-conscious consumers and the expanding artisanal cheese industry in metropolitan areas, could further increase the value-added ratio. SMEs can command price premiums of 15–20% in competitive dairy markets if they successfully differentiate themselves through product innovation and sustainability claims (Houessou, S.O., Dossa, L.H., Rodrigue, V.C.D., Houinato, M., Buerkert, A., Schlecht, 2019). When combined with improvements in operational efficiency, this market positioning might boost the VAr above 30%, making Samarinda's cream cheese production extremely profitable and cost-resistant (Entrena-Barbero et al., 2024).

The process of converting milk into cream cheese generates a Value-Added Ratio (VAR) of 24.37%. This implies that for every IDR 1,000 of the selling price, IDR 243.7 represents the value created through the processing stage rather than the value of the raw materials themselves. Total intermediate input costs reach IDR 173,942/kg, accounting for 75.63% of the output value. The cost of the main raw material (fresh milk) dominates the cost structure at 60.87% , while packaging contributes 9.57%, which is considered high compared to other artisanal cheese industry standards. The resulting profit is IDR 42,724/kg or 18.58% of the output value, exceeding the 15% business viability criterion

The low equipment depreciation cost, which accounts for only 0.72% of the production value, indicates the use of highly manual technology that limits production capacity and quality consistency. Packaging costs reaching nearly 10% act as a barrier to profitability; SMEs face difficulties in accessing high-quality food-grade packaging at wholesale prices due to their small production scale. Cream cheese production generates liquid waste (whey) amounting to 80–90% of the volume of milk used. The practical challenge is that investing in equipment to process whey into value-added products, such as protein drinks or fertilizer, is often considered too expensive for small-scale producers

5. Conclusions

The study shows that Samarinda's cream cheese industry has a lot of potential to be a lucrative and long-lasting business opportunity for small and medium-sized businesses. Using the Hayami technique, the study demonstrates how processing operations significantly impact the total product value, with raw material procurement and packaging serving as major cost drivers. Profitability and competitiveness could be further increased by implementing creative packaging solutions, strengthening supply chain ties, and increasing procurement efficiency.

Beyond the immediate financial benefits, the results highlight the significance of using by-products, especially whey valorization, as a means of achieving revenue diversification and environmental responsibility. Market visibility and customer attractiveness can be increased by utilizing branding techniques and reaching out to niche markets. All things considered, maintaining the long-term resilience and sustainability of regional cream cheese manufacturing will require cultivating a more integrated value chain, from dairy farming to the distribution of the finished product.

To enhance value-added aspects, the local industry is advised to: Supply Chain Integration: Strengthen relationships with dairy farmers through quality-based milk payment schemes to ensure a consistent supply of premium raw materials. By-Product Valorization: Process whey into functional drinks or kefir, which has the potential to increase profit margins by 20–25% while simultaneously reducing environmental impact. Niche Branding Strategy: Target health-conscious consumer segments in urban areas by highlighting "local product" and "artisanal cheese" narratives, which could increase the value-added ratio to over 30%.

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Data Availability Statement: The data supporting the findings of this study are derived from surveys, interviews, and direct observations of cream cheese production units in Samarinda, Indonesia.

Conflicts of Interest: The authors declare no conflict of interest

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