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Evaluation of the Feasibility of Milk Processing Business Investment in West Sumatera

Annisa Suci Rahmadini[a], Alfi Asben[b*], Kurnia Harlina Dewi[c]

[a,b,c]*Department of Agricultural Industry Technology, Universitas Andalas, Padang, Indonesia*

[b]*Email: alfi_asben@yahoo.com*

Abstract

Dairy products are beneficial for human health. The implementation of investment for the milk processing industry has a strong relationship with the aspect of financial feasibility. Based on this, the implementation of investment for the milk processing industry requires a study of the cost structure and financial feasibility. The purpose of the study was to determine the evaluation of the feasibility of investment in milk processing businesses in West Sumatra with several criteria: Net-Benefit Cost Ratio (Net-B/C-ratio), Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Periods (PBP). The research method uses a survey; the data collected is primary data and secondary data. The results of the cost structure study for the milk processing industry with a production capacity of 300,000 liters of pasteurized milk and 24,000 liters of yogurt each year require a total investment cost of Rp 2,776,620,000, consisting of fixed investment costs of Rp 2,524,200,000 and working capital costs of Rp 252,420,000. The depreciation value each year is Rp171,983,000. The production cost (total fixed costs and variable costs) is Rp. 6,237,533,000, - per year, with revenues of Rp. 6,840,000,000, - per year, and net income after income tax of Rp. 469,924,260, - per year. The results of the analysis of investment feasibility criteria The average Net-B/C is 2.5, NPV is Rp 5,292,392,421, IRR is 22.9%, and PBP for 5 years is 2.9 months. Based on the results of the investment analysis for the milk processing industry in West Sumatra, it is financially feasible with high profitability.

Keywords: Evaluation; investment feasibility; milk processing industry.

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** Corresponding author.*

1. Introduction

Milk and dairy products are an important part of the human diet [1]. Dairy products and their derivatives have nutritional, functional, and physiological values that are beneficial to human health [2]. Dairy products made from cow's milk are in high demand due to their strong curd structure, distinctive taste, and therapeutic properties [3]. Therefore, milk and dairy products are an important component of the human diet and are often consumed in childhood, adulthood, and among the elderly worldwide [4]. Milk and dairy-based products are highly susceptible to bacterial contamination due to their high nutrient and water content, resulting in reduced shelf life of dairy products, as well as risks to consumer health [5]. To ensure hygiene and safety, a pasteurization or Ultra High Temperature (UHT) process is necessary [6]. In addition, milk can be processed into yogurt, kefir, cheese, and other milk-based products [2].

With the development of dairy farming in West Sumatra, it is necessary to develop a milk processing industry as part of supporting the sustainability of the Free Nutritious Meals (MBG) program. Dairy products that have been widely developed are pasteurized milk and yogurt. The three dairy centers that produce pasteurized milk and yogurt are Agam Regency (Keju Lasi), Solok Regency (Sirukam Dairy Farm), and Padang Panjang City (Serambi Milk) [7].

Pasteurized milk is milk that is safe and of high quality sustainably [8], because it has been heated at a minimum temperature of 72°C for 15 seconds or at a temperature between 63-66°C for 30 minutes, then immediately cooled to a temperature of 10°C, processed aseptically, and stored at a maximum temperature of 4.4°C (BSN. SNI 01-3951-1995). Meanwhile, yogurt is one of the processed milk products that is rich in nutritional value and also has a unique taste so that it is liked by consumers [9]. In addition, yogurt has various functions, including maintaining the balance of intestinal flora, lowering blood cholesterol, cleaning free radicals, and preventing the formation of lipid peroxidation.

The development of dairy products requires investment from investors. Investment is the process of planting or saving funds or capital for a certain period of time with the aim of making a profit [10]. To find out whether the development of dairy products can generate profits for investors, a feasibility analysis of the investment is needed. The feasibility analysis is reviewed from the aspect of investment so that financial feasibility can be seen. The feasibility analysis of the cow's milk processing business produced feasibility parameters of PBP 2 years 1 month, NPV IDR 1,379,738,166.36, and IRR 31.4%. Furthermore, the economic analysis of the milk processing business conducted by [11] showed an NPV value of IDR 2,723,162,185, IRR 36.99%, and a B/C ratio of 1.48. This means that the NPV value is greater than zero, the IRR is greater than the bank interest rate (equivalent to 10%), and the B/C ratio is greater than 1; this shows that it is economically feasible to be implemented.

Feasibility analysis of investment in a company is important to make more appropriate investment decisions [12]. Meanwhile, a financial study of a business needs to be carried out to determine the funds needed for the establishment, operation, management and objectives of relevant obligations to examine the extent to which the project will achieve appropriate results for its stakeholders [13]. According to [14], sources and costs of capital,

funding requirements, investment assessment standards, cash flow preparation, and sensitivity analysis are important components in the feasibility analysis of investment.

The steps in analyzing the investment feasibility of a business are preparing an initial estimate of investment and operational costs, conducting an initial assessment of financial feasibility, and conducting a comprehensive financial analysis of various alternatives. Reference [15] stated that the business cycle will affect the company's cost structure decisions, which reflect the relative proportion of fixed costs and variable costs in the company. The calculation of the cost structure and financial feasibility analysis includes investment costs (I), fixed costs (FC), variable costs (VC), total costs (TC), total revenue (TR), profit (TR-TC), and R/C ratio (TR/TC) [16].

Based on this, the development of the milk processing industry in West Sumatra needs to be evaluated on the feasibility of investment carried out with quantitative parameters namely, Net-Benefit Cost Ratio (Net-B/C-ratio), Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Periods (PBP). According to [17] the Net-Benefit Cost Ratio (Net-B/C-ratio), Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Periods (PBP) are basic criteria that are useful for making investment decisions. The application of the NPV method in making actual corporate financial decisions requires adjustments and improvements combined with various environments and situations [15]. The assessment of investment feasibility using NPV, which prioritizes financial feasibility analysis, will reject investment businesses with a net cash flow value less than capital because investors will suffer losses [18]. The Internal Rate of Return (IRR) has been used for years by economists and engineers to estimate the profitability (or potential profitability) of a project [19]. When combined with Net Present Value (NPV), IRR is the second measure of profitability needed, while PayBack Period (PBP) is one of the oldest methods in evaluating capital budgeting decisions [20]. This technique is defined as the number of years required to recover the investment costs of a project. This study aims to evaluate the feasibility of investing in a milk processing business in West Sumatra with several criteria: Net-Benefit Cost Ratio (Net-B/C-ratio), Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Periods (PBP).

2. Methods

The research was conducted from June to August 2024 in the milk processing industry centers of Agam Regency, Padang Panjang City, and Solok Regency, West Sumatra Province. The materials and tools used in this study were questionnaire sheets. The types of data used in this study include primary data and secondary data. Primary data were obtained from field surveys by conducting interviews and filling out questionnaires with related actors aimed at determining whether the dairy product processing industry is financially profitable. The purposive sampling technique was used to select the research location. Reference [21] explains this technique as a data collection technique by selecting samples that have been considered, in this case based on the fact that Agam Regency, Padang Panjang City, and Solok Regency are centers of dairy cattle development in West Sumatra Province.

The purpose of investment feasibility analysis is to determine the increase in company wealth as measured by the increase in stock value. The variables that need to be analyzed are: investment costs, production and revenue costs, profit and loss projections, and cash flow projections. While the quantitative parameters of financial

feasibility analysis are indicated by indicators such as: benefit cost ratio (B/C), internal rate of return (IRR), net present value (NPV) and payback period (PBP).

2.1. Net B/C Ratio

The net benefit-cost ratio is a comparison between the present value of net benefits and the present value of net costs. The net benefit-cost ratio is calculated using equation (1).

$$Net\ B/C = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t}} \qquad (1)$$

Where:

Net B/C = Net benefit cost ratio

Bt = Benefit in year t

Ct = Cost in year t

i = Interest rate

t = Period of year, t = 0, 1, ….. n

B/C values can be grouped into three, namely:

B/C > 1 = Feasible (benefit greater than cost)

B/C < 1 = Not feasible (benefit is smaller than cost)

B/C = 1 = Project benefit equals cost benefit

2.2. Net Present Value (NPV)

NPV is the total net value of the present value of profits minus the NPV over the investment analysis period. NPV is calculated using (2).

$$NPV_t = \sum_{t=k+1}^{n-1} \frac{B_t - C_t}{(l+i)^t} - \sum_{t=0}^{k} \frac{I_t}{(l+i)^t} \qquad (2)$$

Where :

NPV = Net Present Value in year t

Bt = Project benefits in year t

Ct = Project cost in year t

It = Initial investment in year t

i = Interest rate

n = Economic life of the project

t = Period

2.3. Internal Rate of Return (IRR)

IRR is the rate of return that makes the NPV equal to 0, or the maximum interest rate that occurs on an investment, where the net profit of the investment is equal to its net cost. The determination of the IRR value is calculated using equation (3).

$$IRR = i_1 + (i_2 - i_1)x \frac{(NPV_1)}{(NPV_2 - NPV_1)} \quad (3)$$

Where:

IRR = Internal Rate of Return

I_1 = Discounted factor with positive PV value

I_2 = Discounted factor with negative PV value

NPV_1 = PV positive

NPV_2 = PV negative

2.4. Pay Back Period (PBP)

PBP is a time period that shows how long investment costs can be returned. PBP is calculated using (4).

$$PBP = t + \frac{CCF_t}{CCF_{t-1}} \quad (4)$$

Where:

PBP = Pay back period

t = The last period of negative cash flow

CCF_t = Cumulative cash flow at time t

CCF_{t-1} = Cumulative cash flow at time t-1

In general, the shorter the PBP, the better the industry. PBP = t at the time of the NPVt flow if NPVt > 0 or positive.

3. Result and Discussion

To evaluate the feasibility of investment in the milk processing industry in West Sumatra, an analysis of the estimated cash outflow and inflow during the investment period is carried out. The basic assumptions used to determine the feasibility of the milk processing industry include the condition of the milk processing industry when the study was conducted, adjusted to the determination:

- Estimated investment period is ten years.
- At the end of the project, the residual value of the building is 50% of the initial value.
- The final value of machinery and equipment is 10%, and the final value of office equipment and utilities is 50%. Office equipment and utility equipment have an economic life of 3 years, utility equipment 5 years, and pre-investment costs 10 years.
- Maintenance costs are 10% of the initial value.
- The operating hours of the industry are 8 hours per day for 25 working days each month, which is equal to 200 hours each month or 300 days each year, while the milk processing industry produces 2400 hours/year.
- The price of fresh cow's milk is IDR 12,000/liter.
- The selling price of pasteurized milk is IDR 20,000/liter.
- The selling price of yogurt is IDR 35,000/liter.
- The selling price of pasteurized milk is IDR. Full production industry from the first to the tenth year according to the economic limits of the project.
- Each year using a fixed price for cost calculation
- Interest Rate of 6%.
- Depreciation calculation using the straight-line method where the residual value is 10%
- The tax rate for domestic taxpayers and permanent establishments is 22% of taxable income each year.
- Working capital costs are 10% of the following year's sales.

3.1. Investment Costs of Milk Processing Industry

Investment costs are costs used to establish a milk processing industry. According to [22], investment costs are

costs invested in order to prepare business needs to be ready to operate properly. Investment costs include fixed investment costs and working capital costs. Based on the results of the cost analysis for the development of the milk processing industry, which includes 2 products, namely pasteurized milk and yogurt, the calculation of the total investment cost is IDR 2,776,620,000, and fixed investment costs are IDR 2,524,200,000. A summary of the fixed investment costs of the medium-scale milk processing industry can be seen in Table 1.

Tabel 1: Fixed investment cost components of the milk processing industry (pasteurized milk and yogurt)

Component	Total Value (Rp)
Pre-invesment costs	11.000.000,-
Land and buildings	740.000.000,-
Supporting facilities	16.000.000,-
Machinery and equipment	1.484.600.000,-
Office equipment	272.600.000,-
Sub Total	2.524.000.000,-
Contingency	252.420.000,-
Total	2.776.620.000,-

3.2. Depreciation Calculation

Depreciation shows the decrease in the value of tangible company assets, such as buildings, machinery, and equipment for production, and so on, over time and use. According to [23], depreciation is a decrease in physical value over time and use. The depreciation calculation method used is the straight-line method. The straight-line method takes into account the economic life of the initial price and the residual value. Economic life is the useful life of the machine or equipment so that the machine or equipment is said to be no longer economically profitable. The calculation results show that the depreciation value each year is Rp. 171,983,000. Details of this depreciation calculation can be seen in Table 2.

Tabel 2: Calculation of depreciation value

Component	Total Value (Rp)
Pre-invesment costs	1.100.000,-
Land and buildings	45.000.000,-
Supporting facilities	0,-
Machinery and equipment	98.649.000,-
Office equipment	27.234.000,-
Total	171.983.000,-

3.3. Production Costs and Revenue

Reference [24], production costs are all expenses incurred by a company to produce goods or services. Furthermore, production costs, according to [25] are the costs required to convert raw materials into ready-to-

use products. Production costs and revenues are obtained from fixed and variable costs. The production costs of the milk processing industry (total fixed costs and variable costs) in the first year and beyond are IDR 6,237,533,000. The production is in accordance with the capacity of the available tools and machines. The revenue obtained in the first year and beyond is IDR 6,840,000,000. These prices and revenues are calculated at fixed prices during the operational period. Information regarding prices and revenues can be seen in Table 3.

Tabel 3: Milk processing industry revenue

Year to	Production per year (liters)	Fixed Cost (Rp/Year)	Variable Cost (Rp)	Selling Price (Rp)	Revenue (Rp)	Total Revenue (Rp)
1	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
2	300,000 24000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
3	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
4	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
5	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
6	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
7	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
8	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
9	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-
10	300,000 24,000	1,438,733,000,-	4,798,800,000,-	20,000,- 35,000,-	6,000,000,000,- 840,000,000,-	6,840,000,000,-

3.4. Profit and Loss Projection

The profit and loss projection is a summary of the company's income and financing for each period, which is a picture of the company's financial performance. The financial report that can show the profit or loss of a company in a certain accounting period is the profit and loss report [26]. The profit and loss projection is needed to determine the level of profitability of a business. In the milk processing industry, every year the company earns a net income after deducting income tax of Rp. 5,915,690,820. The amount of this profit and loss projection can be seen in Table 4.

Tabel 4: Projected profit and loss from sales of processed dairy products in 10 years

Year	Total Penerimaan (Rp)	Total Revenue (Rp)	EBIT (Rp)	Income Tax (Rp)	Net Profit (Rp)
1	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
2	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
3	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
4	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
5	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
6	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
7	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
8	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
9	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-
10	6.840.000.000,-	6.237.533.000,-	602.467.000,-	132.542.740,-	469.924.260,-

3.5. Cash Flow Projection

Cash flow statements can be used as a tool to communicate between a company's activities and stakeholders [27]. Cash flow is calculated by subtracting cash inflow from cash outflow each year, obtaining a net cash flow for 10 years of Rp. 7,893,457,260. The positive net cash flow results for 10 years reflect the ability of the milk processing industry (pasteurized milk and yogurt) to generate very high money. As explained by [28], calculating cash flow projections is important to assess the business's ability to generate enough money to pay debts and dividends in accordance with the expected rate of return. The cash flow projections for the milk processing industry can be seen in Table 5.

Tabel 5: Cash flow projections for the milk processing industry

Year to	Total Cash Inflow (Rp)	Total Cash out (Rp)	Net Cash Flow (Rp)
0	0,-	-3.460.620.000,-	3.460.620.000,-
1	641.907.260,-	0,-	641.907.260,-
2	641.907.260,-	-2.000.000,-	639.907.260,-
3	641.907.260,-	-2.000.000,-	639.907.260,-
4	641.907.260,-	-2.000.000,-	639.907.260,-
5	641.907.260,-	-14.180.000,-	627.727.260,-
6	641.907.260,-	-2.000.000,-	639.907.260,-
7	641.907.260,-	-2.000.000,-	639.907.260,-
8	641.907.260,-	-2.000.000,-	639.907.260,-
9	641.907.260,-	-2.000.000,-	639.907.260,-
10	641.907.260,-	7.251.550.000,-	7.893.457.260,-

3.6. Investment Eligibility Criteria

The investment feasibility criteria used include Net Present Value (NPV), Internal Rate of Return (IRR), Net B/C Ratio, and Payback Period (PBP). The calculation of these criteria is based on the net cash flow in the cash flow projection. The bank interest rate used is 6%. Based on the cash flow projection, various investment criteria can be calculated as shown in Table 6.

Tabel 6: Financial feasibility of the milk processing industry

Criteria	Value
Net Present Value (NPV)	Rp. 5.292.392.421,-
Internal Rate of Return (IRR)	22.9%
Net B/C Ratio	2.5
Pay Back Period (PBP)	5 years 2.9 month

3.6.1. Net Present Value (NPV)

The NPV criterion is better than other investment criteria because it is an accurate numerical representation of the various components of an investment project and is often used [29]. A business is said to be feasible if it meets the investment criteria of NPV greater than zero. The higher the NPV value, the more feasible the business is to implement. In addition, NPV is also positively related to the risk level of a business. An NPV value less than zero indicates that the business is not feasible to implement because it will only result in losses. Table 5 shows the results of net income over a period of 10 years and then multiplied by the bank interest rate at this time. By using the present value investment method (NPV), an investment is considered feasible if its value is greater than zero. With a bank interest rate of 6% per year and an investment period of 10 years, the calculation of the NPV value shows a positive figure of IDR 5,292,392,421, which indicates that the company will receive net benefits from the investment over the next 10 years.

3.6.2. Internal Rate of Return (IRR)

IRR is a comparison with a predetermined interest rate to measure its feasibility. The interest rate used in this analysis is 6%. If the IRR value is greater than the interest rate, the business is declared feasible. However, if the IRR is smaller than the interest rate, it means that the business is not feasible to run. This is because the industry will not be able to return the capital. The medium-scale pasteurized milk and yogurt industry in West Sumatra has an IRR value of 22.9%, meaning that the milk processing industry in West Sumatra is profitable to run and feasible to run.

3.6.3. Net B/C Ratio

The net B/C ratio criteria of a business are declared feasible if the B/C value obtained is greater than 1. This indicates that the benefits received by a business must be able to cover all costs incurred and still have more capital for the continuity of its business. And it is declared unfeasible if the B/C value is less than 1, meaning

that the benefits of this business cannot cover all costs that have been incurred, which results in it being unprofitable to implement. In the medium-scale milk industry in West Sumatra, the B/C value obtained is 2.5 and is declared feasible to run.

3.6.4. Pay Back Period (PBP)

Payback Period (PBP) is the period of return of capital, where the faster the capital can be returned, the better for business activities, because the capital can be used for other costs. The business can still be carried out if, during the business, the capital can be returned before the project life has ended. And if the project life has ended but the capital has not been returned, the business should not be carried out. And the results of the calculation showed that the medium-scale milk industry in West Sumatra got its capital back after the business had been running for 5 years, 2 months, and 27 days. So that the medium-scale milk processing industry in West Sumatra is feasible to run based on the payback period assessment criteria.

The results of the analysis of several financial feasibility criteria for the evaluation of investment in the milk processing industry with an investment cost of Rp 2,776,620,000 showed that the NPV value was at a positive figure of Rp 5,292,392,421, IRR 22.9%, which far exceeds the interest rate of 6%, a net benefit-cost ratio greater than 1, and PBP achieved in a short period of time, namely 5 years 2.9 months. Judging from the results of the criteria analysis, this milk processing industry is very feasible to develop. The financial feasibility analysis of the milk processing industry was also carried out by [30], with an investment of Rp. 15,371,347,627,-, obtaining an NPV of Rp. 6,163,715,302,-, IRR of 16,367%, Average Rate of Return (ARR) of 15%, PBP of 3 years 8 months, and Profitability Index (PI) of 1.4. Reference [31] explained that the minimum capacity to produce positive NPV in the milk processing financing scheme is 5,867 liters/day, NPV Rp. 2,786,820,519, IRR 24.99%, Net B/C 1.41, PBP 3.73 years.

3.6.5. Sensitivity Analysis

Sensitivity analysis is a method used to examine the extent to which elements in the financial aspects of the economy affect decisions taken on changes in certain elements due to possible risks that occur in the milk processing industry supply chain. Sensitivity analysis is conducted to determine the effect of changes that occur in the revenue and expenditure sectors. The variables changed in the sensitivity analysis are based on the risk of increasing raw material prices and decreasing selling prices in the milk processing industry. If the price of raw materials increases by 10%, then this milk processing industry can still be feasible to run with an NPV value of Rp. 3,777,363,774, an IRR of 12.4%, and a net B/C ratio of 2.088, while the PBP is 9 years 1.9 months. Details of the sensitivity analysis are shown in Table 7.

Table 7: Sensitivity Analysis of the Risk of Increases in Raw Material Prices and Decreases in Selling Prices in the Milk Processing Industry

Criteria	Base	10% increase in raw material prices	10% reduction in selling price
Net Present value NPV	Rp. 5,292,392,421,-	Rp. 3,777,363,774	Rp. 1,721,563,365
Internal Rate of Return (IRR)	22.9%	12.4%	7.4%
Net B/C Ratio	2.5	2.088	1.506
Pay Back Period (PBP)	5 years 2.9 months	9 years 1.9 months	9 years 5 months

4. Conclusions

The results of the financial analysis of the feasibility of investment in the milk processing industry in West Sumatra with a total investment cost of Rp 2,776,620,000, consisting of fixed investment costs of Rp 2,524,200,000 and working capital costs of Rp 252,420,000. The depreciation value each year is Rp. 171,983,000. To produce 300,000 liters of pasteurized milk and 24,000 liters of yogurt each year, the production cost (total fixed costs and variable costs) is Rp. 6,237,533,000 per year, with revenues of Rp. 6,840,000,000 per year and net income after income tax of Rp. 469,924,260 per year. The results of the analysis of the investment feasibility criteria The net B/C average is 2.5, the NPV is Rp. 5,292,392,421, the IRR is 22.9%, and the PBP is 5 years and 2.9 months. Based on the results of the analysis of financial feasibility criteria, it can be concluded that investment for the milk processing industry in West Sumatra is financially feasible with high profitability.

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