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Analysis of demand elasticity for processed salted fish at Maria Bintang Laut Cooperative, Diocese of Mimika, in Mimika Regency

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Abstract
Purpose: This study aims to analyze the cost structure, revenue, income, break-even point (BEP), and demand elasticity for processed salted fish at the Maria Bintang Laut Cooperative, Diocese of Mimika, to assess business feasibility and provide strategic recommendations for income improvement.
Research/methodology: The research employs a quantitative approach with a census of 60 active cooperative members out of 230 total artisans. Primary data were collected through structured interviews and field observations, while secondary data were sourced from cooperative records and government publications. Data analysis techniques include descriptive statistics, demand elasticity measurement, log-linear regression, and BEP analysis.
Results: Findings indicate an increase in production from 986 kg in 2023 to 1,431 kg in 2024, alongside higher revenues (from IDR 19.72 million to IDR 35.7 million). However, despite rising revenues, the cooperative failed to reach BEP due to high production costs, especially labor and raw materials, resulting in losses in both years. The price elasticity of demand was calculated at 1.8, suggesting that demand is highly elastic, with higher prices followed by higher demand contrary to conventional economic theory but consistent with local market dynamics.
Conclusions: Production and revenue rose, yet unprofitable; quality-driven demand requires pricing strategy and efficiency in labor and materials for profitability.
Limitations: The study is limited by a small dataset (2023–2024), restricting statistical generalization.
Contribution: This study provides practical insights for cooperatives in coastal communities to design cost efficiency, adaptive pricing, and quality-based strategies to strengthen economic sustainability.

Keywords: *Break-Even Point, Cooperative, Income, Price Elasticity of Demand, Pricing, Salted Fish*

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1. Introduction

Indonesia is a maritime country because its marine territory covers more than 74% of the country's total area (Stacey et al., 2021). Indonesia's marine wealth is abundant and serves as a major economic resource for communities, especially those in coastal areas. Many people rely on the marine and fisheries sectors for their livelihoods, either as fishermen or as processors of marine products. The utilization of marine products is not limited to personal consumption but also extends to economic activities such as selling in local markets or exporting. The fisheries sector plays a significant role in supporting Indonesia's Gross Domestic Product (GDP), reflecting its contribution to national economic

growth. In this context, fish processing has become a growing business alternative in various regions, including the Mimika Regency (Wicaksono, Sutandi, & Tembo, 2020).

Salted fish processing cooperatives serve as economic institutions that can organize community production activities while increasing the value of local products. However, in practice, these cooperatives face challenges such as fluctuations in raw material prices, unstable demand, and variable production costs that affect their profitability. Therefore, understanding demand elasticity is important for formulating marketing strategies and managing businesses. Elasticity analysis not only helps understand consumer sensitivity to price changes but also provides a basis for more appropriate pricing policies that can improve artisans' income (Imtihan & Irwandi, 2020).

Salted fish processing businesses often depend on sufficient raw material availability and natural factors (e.g., sunlight). These challenges encourage salted fish entrepreneurs to focus on efficiency improvements. This situation also motivates them to evaluate internal business management, including financial records (profit, gross revenue, and production costs), which enables the formulation of optimal efficiency strategies. Fish processing exists in various forms, from traditional products such as salted and smoked fish to modern products such as canned and irradiated fish. The purposes of processing include (1) preserving the fish, (2) converting raw materials into consumer-preferred products, (3) maintaining fish quality, (4) ensuring consumer safety from processed fish consumption, and (5) maximizing the utilization of raw materials (Dewi & Muryati, 2017; Epaga, Baihaqi, Burrahmad, & Susanti, 2019).

Salted fish is a common type of fish processing. The process starts with gutting and washing, followed by salting and drying. Differences in processing can be seen in gutting (either splitting the fish or leaving it whole) and salting, such as the amount of salt used, salting duration, and drying method. These variations are due to differences in fish type and size, processing methods, and the desired level of saltiness (Eskander, 2020). Processing is related to efforts to increase production and the value of a commodity. If the added value increases, the commodity price also increases. The capture fisheries and fish processing industries are central to the fisheries industry cluster because both involve material flow Tetrick, Fisher, Ford, and Quick (2024) and value addition processes (Santoso, Soehari, Aprianto, Andrean, & Henny, 2020). Fish is a nutritious food source with many benefits, but it also has some disadvantages.

Previous studies have shown that the price elasticity of demand and supply for salted fish is influenced by several factors. A study by Koeshendrajana, Arthatiani, and Virgantari (2021) in Bauntung Market, Banjarbaru, South Kalimantan, found that demand for certain fish is inelastic, meaning price changes do not significantly affect demand. Meanwhile, research in Padang City identified that price, consumer preferences, and income significantly affect the demand for salted fish. Understanding consumer behavior is critical in the context of microenterprises and fisheries processing cooperatives, particularly in terms of how consumers respond to price changes. The concept of price elasticity of demand helps to analyze consumer sensitivity to changes in product prices. According to Mankiw (2021), the price elasticity of demand measures how much the quantity demanded changes when the price of a good changes. This elasticity value provides important guidance for formulating appropriate pricing policies without drastically reducing demand (Nurmala, Soetoro, & Noormansyah, 2017).

For salted fish, a widely consumed product, the elasticity values can serve as a benchmark for marketing and distribution strategies. Sadoulet (1995) explained that elasticity is used to evaluate pricing policies and their impact on producer and consumer welfare. Therefore, analyzing the demand elasticity of salted fish in Koperasi Maria Bintang Laut provides important contributions not only to cooperative efficiency but also to local economic resilience. This study aims to analyze the income levels of salted fish artisans in the cooperative while identifying the factors influencing the price elasticity of demand and supply. The results are expected to provide practical recommendations for cooperatives to increase artisan income, expand market access, and mitigate risks from price fluctuations.

1.1. Research Questions

Based on the above background, this study formulates the following research questions:

1. What are the costs, revenue, income, and Break-Even Point (BEP) in the salted fish processing business at Koperasi Maria Bintang Laut, Timika Diocese, Mimika Regency?
2. What is the demand elasticity of salted fish in the business at Koperasi Maria Bintang Laut, Timika Diocese, Mimika Regency?
3. What is the price elasticity of demand for salted fish at Koperasi Maria Bintang Laut?

2. Literature review

2.1. Cost

In economic activities, cost is defined as a sacrifice in the form of money made to obtain goods or services expected to provide benefits, either immediately or in the future. In the production process, cost includes all company expenditures to acquire raw materials and other production factors necessary to produce the output. Broadly, business costs can be grouped into several categories.

a) Based on the Purpose of Expenditure
   Costs arise before operational activities begin, such as feasibility study costs (sunk costs) and opportunity costs that occur when choosing one alternative use of funds over another.
b) Based on Operational Activities
   Costs in this category are divided into operational costs, such as administration and sales, and non-operational costs, such as asset and building depreciation costs.
c) Related to Products
   There are costs directly related to the production process, such as raw materials and labor, as well as indirect costs, such as administration and marketing costs.
d) Related to Marketing Activities
   These costs include promotional expenses and sales activities that support the distribution of products.
e) Based on Production Volume
   Fixed costs do not change even if production volume increases or decreases, such as fixed employee salaries and taxes. Meanwhile, variable costs change depending on the quantity of products produced, such as raw material and daily labor costs.

In the context of the salted fish processing business, a comprehensive understanding of this cost structure is crucial for planning production efficiency and developing appropriate pricing strategies to ensure the sustainability of the business.

1) Fixed Costs

Fixed costs are defined as costs whose magnitude is not influenced by the level of production (Kristensen, 2021). Examples include salaries for permanent staff, depreciation of equipment, machinery, offices, warehouses, and land and building taxes. The characteristics of fixed costs include: the total remains constant at every production volume, cost per unit tends to be stable with changes in production volume, control is the responsibility of certain management levels, and cost recognition is based on management policies and allocation methods (Chairani, 2025).

2) Variable Costs

Other costs, aside from fixed costs, generally fall under variable costs, which vary depending on production levels (Sinambela & Djaelani, 2022). In some cases, taxes can also be categorized as variable costs if they are determined as a percentage of the net production output. Similarly, in the long term, land acquisition may be included as a variable cost owing to increases in land value. Examples of variable costs include sales and raw material costs. The characteristics of variable costs include: total costs change according to production volume, controllable by lower management levels (since production is managed by lower management), cost per unit tends to remain stable, traceable to all produced products, and direct labor costs and direct raw material costs are included as variable costs (Sa'adah, 2021; Tuwo, 2023).

Business costs are differentiated into fixed-asset investments, operational costs, and depreciation costs. Fixed asset investment covers all costs for long-term assets, including business infrastructure.

Operational costs include fixed and variable production costs, while depreciation costs account for the reduction in the value of fixed assets that cannot be reused owing to wear and tear. Depreciation is calculated annually over an asset's economic life. Depreciation refers to the systematic and periodic allocation of the acquisition cost of an asset over different periods of use (Bah, Traore, & Coulibaly, 2022). Depreciation expense can be calculated by subtracting the estimated residual value from the acquisition cost and dividing it by the estimated useful life (Akan & Kiraci, 2023; Wulansari, 2010). This can be expressed mathematically as

$$\textbf{Depreciation} = \frac{\textbf{Acquisition Value} - \textbf{Estimated Residual Value}}{\textbf{Estimated Useful Life}}$$

According to Soekartawi (2016:57), the total cost can be calculated by summing the fixed and non-fixed costs (variable costs), which can be written as:

$$\mathbf{TC = FC + VC}$$

Where:
TC (*Total Cost*) = Total production cost
FC (*Fixed Cost*) = Production fixed cost
VC (*Variable Cost*) = Production variable cost.

2.2. Revenue and Profit

In running a business, it is important to thoroughly understand the concepts of revenue and profit. Gross or total revenue reflects all income generated from sales activities, whether goods or services, over a specific period. This value is usually calculated based on the number of products sold, multiplied by the unit price. Net revenue, often referred to as business profit, is obtained by subtracting all operational costs from the total revenue. Therefore, the difference between revenue and total cost indicates whether a business is operating efficiently and profitably (Yahya, 2025). The simple formulas often used are

- **Total Revenue (TR)=Price×Quantity**
- **Profit (π)=Total Revenue–Total Cost**

Analyzing these two elements is crucial, as it helps entrepreneurs determine whether the production and pricing strategies are appropriate. For a salted fish processing cooperative, this understanding forms the basis for making rational business decisions oriented toward sustainability (Nasihin et al., 2025).

2.3. Price Elasticity of Demand and Supply

In economics, the price elasticity of demand refers to the extent to which the quantity demanded by consumers changes in response to price changes. Demand is considered elastic if price changes cause significant changes in the quantity demanded. Conversely, if the quantity demanded changes only slightly despite price changes, demand is considered inelastic. Meanwhile, the price elasticity of supply measures the producer's ability to adjust the quantity of goods offered when prices change. Elastic supply indicates that producers can easily increase or decrease production, whereas inelastic supply indicates limitations in responding to price changes, usually due to technological or resource constraints (Ariandi & Rinaldi, 2025; Istyanto et al., 2025).

1) Price Elasticity of Demand

This elasticity is calculated by comparing the percentage change in quantity demanded to the percentage change in price. The formula is:

$$\mathbf{Ep = (\%\ change\ in\ Q) / (\%\ change\ in\ P)}$$

In mathematical notation, elasticity can be written as

$$\mathbf{Ep = (P \times \Delta Q) / (Q \times \Delta P)}$$

The elasticity value helps to assess the sensitivity of consumers to price changes. The elasticity coefficient can be classified as follows:

- **Ep = 0**: Perfectly inelastic demand (unresponsive to price changes).
- **0 < Ep < 1**: Inelastic demand (limited responsiveness).
- **Ep = 1**: Unit elastic demand (price and quantity changes are proportional).
- **Ep > 1**: Elastic demand (highly responsive to price changes).
- **Ep** ∞: Perfectly elastic demand (any price change affects the total demand).

2) Income Elasticity of Demand

This type of elasticity measures the changes in demand due to changes in consumer income. The basic formula is:

EI = (% change in Q) / (% change in I)

Interpretation:

- **EI < 0**: Demand decreases as income rises → inferior goods;
- **0 < EI < 1**: Basic necessity goods (normal necessities).
- **EI > 1**: Luxury goods.
- **EI = 0**: No change in demand despite an increase in income.

Understanding this type of elasticity is important for designing effective marketing strategies and market segmentation. For example, salted fish can be classified as a necessity if demand remains stable even with changes in consumer income.

EI = (% change in Q) / (% change in I)

Interpretation:

- EI < 0: Demand decreases as income rises → inferior goods;
- 0 < EI < 1: Basic necessity goods (normal necessities).
- EI > 1: Luxury goods.
- EI = 0: No change in demand despite an increase in income.

Understanding this type of elasticity is important for designing effective marketing strategies and market segmentation. For example, salted fish can be classified as a necessity good if its demand remains stable despite changes in consumer income levels. Income demand elasticity measures the extent to which the demand for a good changes when consumer income changes. This concept is important for understanding the type of goods based on consumer responses to increases or decreases in their purchasing power. According to Mankiw (2018), income elasticity is calculated as follows:

$$E_{I=}\frac{\%\ \boldsymbol{change\ in\ quantity\ demanded}}{\%\ \boldsymbol{change\ in\ income}}$$

Interpretation:

- **E_I > 1** → luxury goods: demand increases faster than income.
- **0 < E_I < 1** → normal goods (necessities), demand rises but not sharply.
- **E_I < 0** → inferior goods; demand decreases when income rises.

In the local context, salted fish is generally categorized as a normal good because it is consumed by people across various income levels. However, among higher-income groups, the consumption of salted fish may decrease in favor of other protein sources considered more prestigious, such as fresh fish, chicken, or imported products. Conversely, when income decreases, the consumption of salted fish may increase because it is more affordable than other options. This phenomenon is also reflected in research at the Maria Bintang Laut Cooperative in Timika, where the demand for salted fish remained stable despite fluctuations in community purchasing power.

2.4. Factors Affecting Salted Fish Demand and Supply

The demand for salted fish is influenced by several key factors, including price, consumer preferences, and community income levels. Previous studies have indicated that price and taste have a significant effect on demand, whereas consumer income sometimes does not have a direct significant impact. On the supply side, several factors determine the amount of salted fish available in the market, including production costs, availability of fresh fish raw materials, technology used in processing, and weather conditions affecting drying or curing processes. For example, when raw materials are scarce or production costs increase, the quantity of salted fish supplied decreases. Conversely, if processing is more efficient and raw materials are readily available, the production quantity tends to increase. The combination of these factors creates market dynamics that artisans and cooperatives must understand to develop appropriate production and sales strategies, especially amid constantly changing market conditions (Herawan, 2019).

2.5. The Role of Cooperatives in Increasing Artisan Income

Cooperatives play a strategic role in enhancing the welfare of their members, including salted fish artisans. Through cooperatives, artisans can gain broader market access, financial support, and training to enhance their production and managerial capacity. Previous studies indicate that integrating cooperatives with markets and their ability to manage price fluctuations through collective strategies positively impact member income. For example, when raw material prices rise, cooperatives can conduct collective negotiations to reduce costs or help members maintain stable market selling prices. Furthermore, cooperatives strengthen members' bargaining positions through joint branding, collective distribution and quality assurance. In the context of salted fish processing, cooperatives' roles extend beyond economic aspects to social aspects, such as fostering solidarity among members and creating local employment opportunities for them. Understanding these theoretical insights makes the analysis of cooperatives' role in increasing salted fish artisan income highly relevant, particularly in the local context of the Maria Bintang Laut Cooperative in the Diocese of Timika.

3. Research methods

This study uses a quantitative approach to analyze the economic aspects of salted fish processing at the Maria Bintang Laut Cooperative, Diocese of Mimika. The research was conducted at the cooperative's central activity area in Timika from January to May 2025, covering the preparation, data collection, and analysis stages. The research population consisted of all 230 salted fish artisans, but only 60 active members were selected as respondents using a census method for a stronger data representation. Data were collected through structured interviews with artisans, cooperative staff, and field assistants, complemented by direct observations of the production process. Primary data included production costs, output volume, selling prices, and business income, while secondary data were obtained from cooperative records, official government reports, and relevant academic literature. The independent variables include production costs, revenue, income, break-even point (BEP), business risks, and risk management strategies, while the dependent variable is artisan income resulting from business activities.

The collected data were analyzed using several techniques. First, a descriptive analysis was conducted to describe the respondent characteristics, cost structures, and production patterns. Second, a price elasticity analysis was conducted to measure how price changes affect demand. Third, a demand function model incorporates price, consumer income, preferences, substitute goods prices, and expectations to explain the factors affecting demand volume. Log-linear regression was then used to calculate elasticity values directly through logarithmic transformation, interpreting elasticity coefficients as elastic, inelastic, or unitary. Finally, the Break-Even Point (BEP) analysis assessed business feasibility by comparing total costs and total revenue. This combination provides a comprehensive picture of business feasibility, price sensitivity, and relevant strategies for cooperatives to increase their members' income.

4. Results and discussion

4.1. Research Findings

4.1.1. Analysis of Costs, Revenue, Income, and Break-Even Point (BEP)

1) Respondent Characteristics

Table 1. Characteristics by Gender

Gender	Number of Cooperative Members	Percentage (%)
Male	30	50
Female	30	50
Total	60	100
Age of Respondents (years)	**Number (Persons)**	**Percentage (%)**
20 – 40	36	60
41 – 50	18	30
51 – 60	6	10
Total	60	100
Education Level	**Number of Respondents**	**Percentage (%)**
Did not finish elementary school	54	90
Elementary School (SD)	4	6
Junior High School (SMP)	2	4
Total	60	100
Work Experience (Years)	**Number of Respondents**	**Percentage (%)**
4	54	90
5	6	10
Total	60	100

Source: Secondary data from the Maria Bintang Laut Cooperative, processed by the researcher (2025)

Based on the data above, the majority of respondents in this study had four years of work experience, totaling 54 people or 90% of all respondents. Meanwhile, only six people (10%) had five years of experience. This composition shows that most saltfish processing craftsmen in the Maria Bintang Laut Cooperative (KMBL) already have sufficient experience in carrying out production activities. High levels of work experience are important indicators of skills, work efficiency, and practical knowledge, all of which contribute significantly to the quality and continuity of production. This also reflects a consistent learning process in the field, which should be reinforced through continuous training and business mentoring.

2) Production Costs

Production costs in the saltfish business are divided into two main components.

- **Fixed costs,** such as equipment depreciation, taxes, and rental fees.
- **Variable costs** change depending on production volume, such as the purchase of fresh fish, salt, labor, and transportation.

Data shows that monthly variable costs increased from IDR 10,194,783 (2023) to IDR 11,529,783 (2024). Total annual production costs increased from IDR 96,747,800 (2023) to IDR 111,314,417 (2024). The largest costs are incurred by raw materials and labor.

3) Revenue and Income

Business revenue increased significantly from IDR 19,720,000 in 2023 to IDR 35,700,000 in 2024. This was caused by an increase in the selling price from IDR 20,000/kg to IDR 25,000/kg, as well as an increase in the monthly production volume from 82 kg to 119 kg. However, despite the increase in revenue, the business had not yet reached the break-even point (BEP). Calculations show that in 2023, the BEP was 7,135 kg, whereas production was still below this figure. In 2024, the conditions worsened as the BEP value became negative (approximately -26 kg), indicating that the variable costs per unit were higher than the selling price per unit. This situation indicates operational losses that must be addressed by increasing prices or improving cost efficiency.

a) Fixed Capital

Fixed capital refers to capital that can be reused in production processes. The fixed capital used in saltfish processing includes drying racks, soaking and washing tubs, small and large scales, baskets, large knives, small knives, and cutting boards. The fixed capital for saltfish processing in the Maria Bintang Laut Cooperative (KMBL) is detailed in the following table.

Table 2. Fixed Capital Details for Saltfish Processing in Maria Bintang Laut Cooperative (KMBL) per Business Unit

Fixed Capital	Quantity	Price (IDR)	Fixed Asset Value (IDR)	Economic Life (Years)	Depreciation (IDR)
Drying racks	5	700,000	3,500,000	5	58,333
Soaking & Washing Tubs	3	150,000	450,000	5	7,500
Small Scales	1	35,000	35,000	5	583
Fish Baskets	2	150,000	300,000	5	500
Large Machete	1	70,000	175,000	5	2,917
Medium Machete	1	50,000	50,000	5	833
Small Machete	1	20,000	20,000	5	1,000
Knives	3	20,000	20,000	5	1,000
Cutting Board	1	35,000	35,000	5	583
Land and Building	1	150,000	150,000	5	2,500
Total	18	1,385,000	4,675,000	–	80,417

Source: Secondary data from the Maria Bintang Laut Cooperative, processed by the researcher (2025)

Based on the data above, the total value of fixed capital used in the saltfish processing business at the Maria Bintang Laut Cooperative (KMBL) is IDR 4,678,000, with the main components being drying racks, soaking tubs, scales, and cutting tools. The item with the highest investment value was the drying racks, totaling IDR 3,500,000 for five units, followed by fish baskets and washing tubs. All fixed assets have an economic life of five years, resulting in a total annual depreciation of IDR 77,917. This depreciation value is used to calculate a business's fixed costs, which will be part of the break-even point (BEP) analysis. The simple yet efficient structure of fixed capital reflects the nature of micro household-scale businesses, prioritizing functional tools with affordable investments.

b) Current Capital

Current capital refers to capital that can only be used for a single production process or in each production cycle. In the salted fish processing business, current capital includes raw materials such as fresh fish (Nine Fish [Duri], Sea Milkfish, Mouse Grouper, Gulama Fish, and Freshwater Fish) and salt. The details of the current capital in the salted fish processing business are presented in table below.

Table 3. Details of Current Capital for the Salted Fish Processing Business in 2023

Current Capital	Quantity of Wet Raw Materials (Unit/Kg)	Price (Rp)	Price of Wet Raw Materials per Month	Total Salted Fish Production per Month	Total Price of Salted Fish per Month (Rp 20,000/kg)	Total Price of Salted Fish per Year (Rp 20,000/kg)
Fish Raw Material	3,287 tons	5,000	16,435,000	82 kg	1,640,000	19,720,000
Total	3,287 kg	20,000	16,345,000	82 kg	1,640,000	19,720,000

Current Capital	Quantity (Unit/Kg)	Wet Raw Materials per Year	Price (Rp)	Total Usage per Month	Total Price per Month (Rp)	Total Price per Year (Rp)
Salt	0.2 oz	3,287 kg	10,000	5.86 kg	54,783	657,400
Total	0.2 oz	3,287 kg	10,000	5.86 kg	1,640,000	657,400

Current Capital	Quantity of Wet Raw Materials (Unit/Kg)	Price (Rp)	Price of Wet Raw Materials per Month	Total Salted Fish Production per Month	Total Price of Salted Fish per Month (Rp 25,000/kg)	Total Price of Fish per Year (Rp 25,000/kg)
Fish Raw Material	4,770 kg	5,000	23,850,000	119 kg	2,975,000	35,700,000
Total	4,770 kg	5,000	23,850,000	119 kg	2,975,000	35,700,000
Current Capital	**Salt Quantity (Unit/Kg)**	**Wet Raw Materials per Year**	**Price (Rp)**	**Total Usage per Month**	**Total Price per Month (Rp)**	**Total Price per Year (Rp)**
Salt	0.2 oz	4,770 kg	10,000	7.95 kg	79,500	954,000
Total	0.2 oz	4,770 kg	10,000	7.95 g	79,500	954,000

Source: Secondary data from Maria Bintang Laut Cooperative, processed by researcher (2025)

Based on the data above, the current capital used by the Maria Bintang Laut Cooperative in 2024 consists of the main raw material (Tetrick et al.) and supplementary material (salt). The amount of fish processed was 4,770 kg at a price of Rp 5,000 per kilogram, with a total monthly purchase cost of Rp 23,850,000. The final product amounted to 119 kg per month with an estimated selling price of Rp 25,000 per kilogram, generating monthly revenue of Rp 2,975,000 and annual revenue of Rp 35,700,000. Salt was used at 0.2 oz (0.02 kg) per 1 kg of wet fish, resulting in an annual requirement of 95.4 kg of salt. At a salt price of Rp 10,000 per kg, the total annual cost of salt was Rp. 954,000 or approximately Rp. 79,500 per month. This calculation reflects a realistic and efficient cost structure and demonstrates the importance of the correct proportion of supplementary materials to support sustainable production.

c) Working Capital

Working capital is the capital used for a single production process within a certain period. In the salted fish processing business, working capital includes fresh fish (Nine Fish [Duri], Sea Milkfish, Mouse Grouper, Gulama Fish, and Freshwater Fish), salt, labor wages, property tax (PBB), depreciation, and transportation. The details of working capital in the salted fish processing business are presented in the table below.

Table 4. Details of Working Capital for the Salted Fish Processing Business in 2023

Current Capital	Quantity (Unit/Kg)	Price (Rp)	Total Price per Day (Rp)	Total Price per Month (Rp)	Total Price per Year (Rp)
Salted Fish	8	20,000	2,500	1,640,000	19,720,000
Salt	0.2 oz	10,000	0.1953	54,783	657,400
Labor – Netting/week	2	200,000	200,000	800,000	9,600,000
Labor – Processing/week	5	100,000	500,000	2,500,000	30,000,000
Labor – Drying/week	1	700,000	100,000	2,800,000	33,600,000
Fuel Transportation	40	15,000	0.375	2,400,000	28,800,000
Property Tax (PBB)	1	150,000	-	-	150,000
Depreciation	19	-	-	1,535,000	80,417
Total	76.2	1,195,000	802,500.60	11,729,780	122,607,800

Source: Secondary data from the Maria Bintang Laut Cooperative, processed by the researcher (2025)

Based on the data above, the total working capital for the salted fish processing business in 2023 reached Rp 122,607,800 per year, with monthly expenses of Rp 11,729,780 and an average daily cost of Rp 802,500.60. These data show that labor and transportation are the main components of the production cost structure, and efficiency in these two areas is crucial for the profitability of the salted fish processing business. Optimizing cost allocation in these main components can improve operational efficiency and the competitiveness of cooperatives in the local market.

Table 5. Details of Working Capital for the Salted Fish Processing Business in 2024

Working Capital	Quantity (Unit/Kg)	Price (Rp)	Total Price per Day (Rp)	Total Price per Month (Rp)	Total Price per Year (Rp)
Salted Fish	8	20,000	2,500	2,975,000	35,700,000
Salt	0.2 oz	10,000	0.1953	79,500	954,000
Labor cost for fishing/week	2	200,000	200,000	800,000	9,600,000
Labor cost for processing/week	5	100,000	500,000	2,500,000	30,000,000
Labor cost for drying/week	1	700,000	100,000	2,800,000	33,600,000
Fuel Transportation	40	15,000	0.375	2,400,000	28,800,000
Land and Building Tax (PBB)	1	150,000	-	-	150,000
Depreciation	19	-	-	1,535,000	80,417
Total	76.2	1,195,000	802,500.60	13,089,500	138,884,400

Source: Secondary data from the Maria Bintang Laut Cooperative, processed by the researcher (2025)

Based on the data above, which presents the working capital details of the salted fish processing business in 2024, the total annual production cost reaches Rp138,884,400, with a monthly cost of Rp13,089,500. The increase in raw material and labor costs reflects higher production volumes and an expanded business scale. This demonstrates the cooperative's efforts to increase production capacity and enhance product competitiveness in the local market. With cost management efficiency, as shown in this table, the salted fish processing business has the potential to increase profit margins and improve the welfare of cooperative members.

4) Financing

a) Fixed Costs

Fixed costs are expenses incurred by the salted fish artisans at the Maria Bintang Laut Cooperative (MBLC) for production facilities and remain constant regardless of production volume. The fixed-cost components of the salted fish business include equipment depreciation and taxes.

b) Variable Costs

Variable costs are expenses that fluctuate depending on production levels. The variable cost components in the salted fish business include raw materials (salted fish such as Duri, Sea Milkfish, Grouper, Gulama, and freshwater fish), salt, transportation, and labor wages. The details of the variable costs are shown in the following table.

Table 6. Details of Variable Costs for Salted Fish Processing Business in 2023

Working Capital	Total Price per Month (Rp)
Salted Fish	1,640,000
Salt	54,783
Labor Wages	6,100,000
Transportation	2,400,000
Total	10,194,783

Source: Secondary data from the Maria Bintang Laut Cooperative, processed by the researcher (2025)

Based on the data above, the total variable cost of the salted fish processing business in 2023 reaches Rp10,194,783 per month, covering main components such as raw salted fish (Rp1,640,000), salt (Rp54,783), labor wages (Rp6,100,000), and transportation costs (Rp2,400,000). Labor costs constitute the largest proportion of the variable cost structure, reflecting the essential role of human resources in production. These data indicate that efficiency in labor and transportation can be key to reducing overall production costs and improving profitability.

Table 7. Details of Variable Costs for Salted Fish Processing Business in 2024

Working Capital	Total Price per Month (Rp)
Salted Fish	2,975,000
Salt	54,783
Labor Wages	6,100,000
Transportation	2,400,000
Total	11,529,783

Source: Secondary data from the Maria Bintang Laut Cooperative, processed by the researcher (2025)

The data above present the variable cost breakdown of the salted fish processing business in 2024, reaching a total of Rp11,529,783 per month. This indicates a larger production scale, requiring cost-efficient strategies, particularly in raw material procurement and labor management, to maintain sustainable productivity.

c) Total Costs

Based on the total costs of the salted fish processing business in 2023 and 2024, there is a significant increase from Rp96,747,800 in 2023 to Rp111,314,417 in 2024. This increase is due to higher production volumes, rising raw material prices (salted fish and salt), and increased labor and transportation costs. This cost escalation reflects the economic dynamics of the salted fish business, which is influenced by external factors such as raw material inflation and wage growth. Therefore, cost-efficient strategies are crucial for maintaining business sustainability and ensuring optimal profit margins. Additionally, careful budget planning and operational cost control are essential to preserve the financial stability of cooperatives amid changing cost structures.

5) Revenue

a) Receipts

Based on calculations, total receipts of the salted fish processing business in 2023 reached Rp19,720,000, while in 2024, it increased significantly to Rp35,700,000. This growth reflects higher production volumes and an increase in the selling price of salted fish from Rp20,000/kg to Rp25,000/kg. The increase in total receipts indicates a positive trend in market demand for products from the Maria Bintang Laut Cooperative and demonstrates an expanding market potential. With increasing receipts, cooperatives have greater opportunities to strengthen working capital, improve worker welfare, and expand the business scale. However, this revenue increase must be accompanied by efficient cost management to ensure sustainable profits.

b) Revenue

The total revenue from the salted fish business in 2023 was Rp19,720,000, which increased to Rp35,700,000 in 2024. This surge reflects both an increase in production volume from 82 kg to 119 kg per month and an adjustment in selling price from Rp20,000/kg to Rp25,000/kg. This growth demonstrates a positive market response to the cooperative's salted fish products and an effective pricing strategy. Revenue growth is a key indicator of business sustainability, enabling capital accumulation, scaling production, and expanding distribution. To maximize economic impact, cooperatives must optimize production cost efficiency and consistently maintain product quality.

c) Break-Even Point (BEP)

BEP represents the point at which a company neither makes a profit nor incurs a loss.

1. **Input and Output**
   - **The main inputs** are fresh fish, salt, labor, and transportation.
   - **Output**: salted fish produced, 82 kg/month in 2023, increasing to 119 kg/month in 2024.
2. **Fixed and Variable Costs**
   - **Variable Costs:**
     - 2023: Rp10,194,783/month
     - 2024: Rp11,529,783/month
   - **Fixed Costs** (e.g., PBB and depreciation):

    - 2023: Rp2.465.417/ month
    - 2024: Rp2.485.417/ month
  - **Total monthly production cost**
    - 2023: Rp12.660.200
    - 2024: Rp14.015.200

3. Receipts

- 2023: 82 kg × Rp20.000 = **Rp1.640.000/ month** atau **Rp19.720.000/ year**
- 2024: 119 kg × Rp25.000 = **Rp2.975.000/ month** atau **Rp35.700.000/ year**

4. Profit/Loss

- **2023**:
  Revenue – Total Cost
  = Rp19.720.000 - (Rp12.660.200 × 12)
  = Rp19.720.000 - Rp151.922.400
  = **Loss Rp132,202,400/year**
- **2024**:
  = Rp35.700.000 - (Rp14.015.200 × 12)
  = Rp35.700.000 - Rp168.182.400
  = **Loss Rp132,482,400/year**

5. Price Elasticity of Demand

- Price rises from Rp20,000 to Rp25,000 (25% increase)
- Demand increases from 986 kg to 1,431 kg (a 45% increase)
- Ep = %ΔQ / %ΔP = 45% / 25% = **1,8** (elastic → sensitive to price)

6. Break Even Point (BEP)

Use the formula:
BEP (unit) = Fixed Costs / (Price per unit – Variable cost per unit)
Simple Example:
Selling price: Rp25.000
Variable cost per kg: Total variable costs / output
= Rp11.529.783 / 119 kg = Rp96.890/kg
BEP = Monthly fixed costs / (25.000 - 96.890)
Since the value is negative, it indicates that the business has not reached the break-even point and is still incurring losses.

Although production and revenue increased from 2023 to 2024, the salted fish processing business continues to experience losses. This is due to high production costs, particularly in terms of labor and transportation. In addition, the demand elasticity value shows that consumers are quite responsive to price changes; therefore, pricing strategies need to be considered carefully. This study highlights the importance of cost efficiency and input optimization in reaching the BEP and improving profitability.

The BEP curves for 2023 and 2024 indicate that the salted fish processing business of Koperasi Maria Bintang Laut has not yet reached the break-even point in either year, as the total cost line remains above the total revenue line at different production levels. In 2023, the gap between costs and revenue was significant, reflecting an inefficient cost structure and low production levels. In 2024, although the total costs remained high, the revenue improved owing to higher selling prices and increased production volume. This comparison confirms that, despite performance improvements from 2023 to 2024, the cooperative still needs to pursue cost efficiency and sustainable production increases to reach the break-even point and achieve profits.

The BEP graph shows:

- The cost line remains above the revenue line in 2023 and 2024.
- 2024 shows revenue improvement, but it is still insufficient to reach the break-even point.
- This reflects the need for cost structure adjustments and optimization of production volumes for profitability.

Estimated Log-Linear Regression of Salted Fish Demand, 2023–2024

Variabel	Koefisien	Std. Error	t-Statistik	Probabilitas
Konstanta (α)	-9,6373	-	-	-
ln(Harga) (β)	1,6692	-	-	-
R-squared	**1,000**			

Source: Primary data analysis, 2023–2024

Notes:
- Because there are only two observations, standard errors, t-statistics, and probabilities cannot be validly calculated, indicated by "-."
- The coefficient β = 1.6692 indicates that demand is elastic with respect to price (Ep > 1).
- Model: ln(Q) = -9.6373 + 1.6692 ln(P)

This study uses a quantitative approach to calculate the price elasticity of salted fish demand based on 2023–2024 data from Koperasi Maria Bintang Laut. A log-linear regression model is used because it allows for the direct interpretation of coefficients as elasticities.

Regression Analysis Results for 2023–2024 Data
- Model equation:
  $\ln(Q) = -9{,}6373 + 1{,}6692 \cdot \ln(P)$

Where:
Q = quantity of salted fish demanded (kg)
P = price of salted fish (Rp/kg)

Interpretation:
- The price coefficient (1.6692) indicates that a 1% increase in price is followed by a 1.67% increase in demand.
- With this value, the salted fish demand is elastic because elasticity > 1.
- The R-squared value was 1.000, indicating that the model perfectly explained the data. However, because there are only two observations (2023 and 2024), the model cannot be statistically tested (t-statistics and p-values are unavailable or not applicable).

Interpretation of Results:
These findings contrast with the general economic theory, in which price increases typically reduce demand. However, in Timika's local context, price increases were accompanied by higher demand. This phenomenon is suspected to be driven by two main factors.
1. **Improved product quality in 2024** maintained consumer interest despite higher prices.
2. **The increased purchasing power of the local population** allows consumers to continue purchasing salted fish, even at higher prices.

The estimation results indicate that the demand for salted fish has a price elasticity of 1.8 based on the log-linear regression equation:

$\ln(Q) = -9{,}6373 + 1{,}6692 \cdot \ln(P)$

The regression coefficient of $\ln(P)$ = 1.6692 implies that mathematically, a 1% increase in price is associated with a 1.67% increase in quantity demanded. This indicates that the demand is elastic (Ep > 1).

However, this finding does not fully align with the law of demand, which states that when the price rises, the quantity demanded tends to decrease (Mankiw, 2018). Therefore, these results should be

interpreted contextually not as a violation of theory, but as a reflection of local consumer behavior influenced by non-price factors. Marketing literature explains similar phenomena, where price perception is often linked to perceived quality (Kotler and Keller, 2012). Consequently, while the positive relationship between price and demand may appear unusual, it is empirically valid in the local context of Mimika and aligns with value perception theory in consumer marketing. The cooperative should consider these dynamics when setting future pricing strategies, as slightly higher prices may be accepted by the market if they are balanced with good product quality and availability. The log-linear model demonstrates that salted fish demand is highly sensitive to price changes, consistent with the elasticity calculated previously, which is greater than 1. Therefore, cooperatives must exercise caution when raising prices, as increases could significantly affect demand.

a) Price Elasticity Coefficient

Based on calculations of the price elasticity of demand for salted fish at Koperasi Maria Bintang Laut using 2023 and 2024 data, the price rose from IDR 20,000/kg to IDR 25,000/kg (a 25% increase), and demand increased from 986 kg to 1,431 kg (a 45% increase). This yields a price elasticity coefficient of 1.8, indicating that demand is elastic, and consumers are highly responsive to price changes. The percentage increase in demand exceeded that of the percentage increase in price. This is likely due to product quality improvements, cooperative customer loyalty, or limited substitutes in the local market.

Further analysis using log-linear regression reinforces this result. The log-linear model, $\ln(Q) = \alpha + \beta \ln(P)$, produces a coefficient β of 1.6692, indicating that a 1% price increase results in a 1.67% increase in demand increase. This underscores that the price-demand relationship is not only mathematically strong but also has practical implications for cooperative pricing strategies. In this context, pricing strategies should account for consumer sensitivity while maintaining quality and adaptive marketing approaches to remain competitive amidst market fluctuations.

b) Price Elasticity Analysis (Ep)

Demand is a critical tool for evaluating consumer responsiveness to price changes. Data from 2023 and 2024 show that salted fish prices increased from IDR 20,000/kg to IDR 25,000/kg, and demand rose from 986 kg to 1,431 kg. The calculated price elasticity of demand (Ep) was 1.8, indicating that demand was elastic. A 1% change in price triggers a greater than 1% change in demand, demonstrating that consumers are highly responsive to price changes. This responsiveness may be due to salted fish being a preferred staple in the local market with few substitutes or because the perceived value of cooperative products increased. These findings have significant strategic implications for the Koperasi Maria Bintang Laut. High elasticity requires the cooperative to carefully adjust prices, as even small changes can substantially affect the demand. Therefore, any price adjustments should be accompanied by added product value, such as enhanced quality, packaging, and distribution services, to remain attractive to consumers. These results also provide a basis for long-term pricing policies that consider local purchasing power and product competitiveness in local and regional markets.

c) Income Elasticity

The income elasticity of demand measures the responsiveness of the quantity demanded to changes in consumer income. In the context of Koperasi Maria Bintang Laut's salted fish processing business, even without direct consumer income data, the increase in demand from 986 kg in 2023 to 1,431 kg in 2024 suggests a growing purchasing power or stronger preference for salted fish. If consumer income growth aligns with consumption trends, income elasticity can be classified as positive and elastic, indicating that salted fish is a normal good, and demand rises as income increases. Positive income elasticity implies that the demand for salted fish will likely grow with economic improvement in Mimika and surrounding areas. Cooperatives can leverage this trend by expanding their market reach and increasing their production capacity. Product development strategies, such as quality improvements, flavor variety, and attractive packaging, can enhance competitiveness as consumer purchasing power increases. Therefore, income elasticity analysis serves as a critical basis for planning expansion and developing business strategies.

4.2. Discussion

Research on the salted fish processing business managed by Koperasi Maria Bintang Laut shows significant increases in production and revenue between 2023 and 2024. Production rose from 986 kg in 2023 to 1,431 kg in 2024, accompanied by a price increase from IDR 20,000 to IDR 25,000/kg. These increases positively affected the total revenue, which grew from IDR 19,720,000 in 2023 to IDR 35,700,000 in 2024. Despite the higher revenue, the total costs also increased. The monthly variable costs increased from IDR 10,194,783 to IDR 11,529,783, with the annual total costs reaching IDR 96,747,800 in 2023 and IDR 111,314,417 in 2024. Labor and raw material costs, especially salted fish and transportation, remained the largest expense. This indicates that revenue growth was not matched by cost efficiency, and the business remained unprofitable in the long run.

4.3. Research Hypotheses

H Main Hypothesis (H1): There is a significant effect of salted fish prices on the demand for salted fish products at the Maria Bintang Laut Cooperative.
H1 Accepted: The study results indicate a significant effect between price and the quantity demanded of salted fish. With a price increase from IDR 20,000 to IDR 25,000/kg, demand increased from 986 kg to 1,431 kg, indicating a direct and significant relationship between price and demand in the study area. This confirms that price is an important factor in consumer decision making.

Additional Hypothesis (H2): The price elasticity of salted fish demand is elastic (Ep > 1), meaning that price changes significantly affect the quantity demanded of salted fish.
H2 was Accepted: The price elasticity of demand (Ep) value of 1.8 demonstrates that salted fish demand is elastic. This means that consumers are highly responsive to price changes, and the percentage change in demand exceeds the percentage change in price. This reinforces the fact that proper price management can significantly increase sales volume.

Additional Hypothesis (H3): Production volume significantly affects the income of salted fish producers at the Maria Bintang Laut Cooperative.
H3 Accepted: Production volume has a positive effect on producer income. The increase in production volume from 986 kg (2023) to 1,431 kg (2024) corresponds with the increase in total income. This implies that the greater the production volume absorbed by the market, the higher the income of the producers.

Additional Hypothesis (H4): There is a positive relationship between production cost efficiency and salted fish producers' income.
H4 Partially Accepted: Production cost efficiency is indeed necessary but was not fully achieved in 2023 and 2024, as the business had not yet reached the Break-Even Point (BEP). However, the analysis indicates that if labor and raw material cost efficiencies can be improved, profit margins can increase, thereby supporting higher income in the future.

5. Conclusions

5.1. Conclusion

1. **Production Conditions and Cost Structure**
   During the 2023–2024 period, the salted fish processing business at Maria Bintang Laut Cooperative showed increased activity, reflected in a rise in production volume from 986 kg to 1,431 kg and an increase in revenue from IDR 19,720,000 to IDR 35,700,000. Nevertheless, this growth was accompanied by substantial increases in fixed and variable costs, meaning that the cooperative had not yet reached the Break-Even Point (BEP). This indicates that cost efficiency remains a key challenge that must be addressed to ensure sustainable business operations.
2. **Demand Elasticity Analysis**
   The estimation results show that the price elasticity of salted fish demand reached 1.8, with a regression coefficient of 1.6692. This indicates that demand is elastic and that consumers are responsive to price changes. Interestingly, the price increase from IDR 20,000 to IDR 25,000 per kg was accompanied by higher demand, suggesting a positive perception of the cooperative's products by the consumers.

3. **Implications for Income and Business Development**
   The growth in demand, aligned with increased revenue, indicates that salted fish is a normal good, with demand rising as consumer purchasing power increases. Cooperatives should take advantage of this opportunity by expanding their production capacity, improving their marketing strategies, and adjusting prices to remain competitive. These efforts should be accompanied by cost management evaluation and product development to ensure that cooperatives remain relevant in local and regional markets.

5.2. Recommendations

1. **Production Cost Optimization**
   Maria Bintang Laut Cooperative is advised to conduct a thorough evaluation of cost elements, especially labor and raw materials, which constitute the largest part of total expenditures. Efficiency can be achieved through workforce training, the use of simple technology, and direct partnerships with fishermen to procure raw materials at a lower cost.
2. **Pricing and Promotion Strategy**
   With a high elasticity level, cooperatives must set prices carefully, considering market conditions and consumer purchasing power. Value-based promotional strategies, such as attractive packaging, halal labeling, and the use of social media to expand market reach, can help improve product competitiveness in the market.
3. **Product Diversification and Quality Improvement**
   To face competition and expand the market, the cooperative should develop variations of salted fish products while maintaining quality and hygiene. Standardized products with good durability will be more appealing to consumers and will open opportunities for expansion into modern markets.
4. **Partnerships and Business Networks**
   Anticipating the potential end of support from major partners such as PTFI, the cooperative should begin building strategic collaborations with local governments, NGOs, and the local private sector. This step aims to maintain business continuity and expand producers' market access.

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