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VALUE-ADDED AND INCOME ANALYSIS OF FISH CRACKERS BUSINESS (CASE STUDY: SOUTH SIBOLGA SUB-DISTRICT, SIBOLGA CITY)

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Abstract

This study aims to analyze the added value of fish cracker production and assess the feasibility of the business in South Sibolga Subdistrict, Sibolga City. The research location was selected purposively, involving two fish cracker producers as respondents, identified using a census method. The analysis utilized the Hayami value-added method and the Revenue-Cost (R/C) ratio to evaluate feasibility. Results show that the added value generated from fish cracker processing reached Rp 225,721.14 per kilogram, with a value-added ratio of 55.22%. The monthly income from the business amounted to Rp 5,573,076.35. The R/C ratio was 1.74, indicating that the fish cracker business is financially feasible. These findings highlight the potential of small-scale fish processing industries to enhance household income and promote local economic development.

Keywords: ***Fish Crackers, Added Value, Income***

INTRODUCTION

The fisheries subsector is highly perishable, requiring immediate consumption or processing to prevent spoilage (Cortés-Sánchez, 2024). Agro-industrial processing plays a crucial role in extending the shelf life of fishery products while enhancing their economic value. By converting raw fish into processed food products, this approach not only increases product durability but also improves marketability. Among various fishery commodities, narrow-barred Spanish mackerel (*Scomberomorus commersoni*) shows strong potential for value-added processing, offering opportunities to boost income and promote sustainable fisheries development. The narrow-barred Spanish mackerel (*Scomberomorus commersoni*) is considered a commercially important species due to its favorable organoleptic properties and high nutritional value. It is known for its soft texture and savory flavor, making it more appealing compared to many other fish species. It also commands a relatively high market price. To consumers, the most important attributes of a food product are its sensory characteristics (Ravishankar, 2016). Mackerel can be processed into various products such as meatballs, dumplings, crackers, and other fish-based foods. According to Riyanto and Mardiansjah (2018), processing fishery products offers several benefits, including extending their shelf life, improving the quality of easily perishable fish, and increasing the overall value of the products.

Processed agricultural products generate value added, which refers to the increase in economic value resulting from processing activities applied to raw materials. This value is measured as the difference between the market price of the final product and the total cost of raw materials and processing. A higher value added indicates a greater economic contribution, thereby supporting broader economic growth. The generation of value added through processing not only enhances the profitability of production but also strengthens the agro-industrial sector by increasing producers' incomes (Al Hinai et al, 2022). Furthermore, the agro-industry plays a crucial role in job creation, offering employment opportunities at various scales, from large enterprises to small and micro-scale industries (Rogayah and Haryanto, 2019). Fish crackers are a type of processed food product made from a mixture of fish and flour, commonly produced in areas with abundant fish resources. The production process is relatively simple and can be conducted using either modern equipment or traditional methods, making it particularly suitable for small-scale and household-based agro-industries. Sibolga, located in North Sumatra Province, is widely recognized as the "City of Fish" due to its status as one of the region's major fish-producing areas. This makes Sibolga an ideal location for the development of fish-based agro-industries, including fish cracker production.

The limited availability of narrow-barred Spanish mackerel, a key ingredient that contributes significantly to the distinctive flavor and aroma of fish crackers, presents a considerable challenge for producers. This scarcity leads

to an increase in raw material costs, as the reduced supply drives up the market price of the fish (Rana et al., 2009). Consequently, higher production costs impact the overall profitability of fish cracker enterprises by reducing their profit margins and potentially hindering sales performance. Although processing mackerel into fish crackers does generate value added, this indicator alone is insufficient to determine the overall profitability of the business. Therefore, it is essential to conduct comprehensive research that evaluates both the value added and income generated, to assess the feasibility and economic viability of fish cracker production.

LITERATURE REVIEW

According to the Central Bureau of Statistics, the processing industry is defined as an economic activity that transforms raw materials into finished or semi-finished products with marketable economic value, either through modern technology or traditional manual methods. One important component of this sector is the fisheries processing industry, which involves the transformation of fishery products into economically valuable outputs. This industry plays a central role in the fisheries sector as it generates added value through the processing stages (Purwaningsih, 2015). Micro, Small, and Medium Enterprises (MSMEs) refer to business activities operated by individuals or business entities that require relatively low capital investment and can be managed independently. These enterprises significantly contribute to national economic development by generating income, distributing wealth more equitably, and enhancing community welfare. Moreover, MSMEs play a vital role in accelerating economic growth by creating employment opportunities, reducing unemployment and poverty, and facilitating the promotion of domestically produced goods in both local and international markets (Alansori & Lityaningsih, 2020).

Muliawan (2008) argues that a household industry is a unit of small and medium-scale enterprises or businesses engaged in a particular business field. The workers used are usually family members themselves or neighbors around them. In addition to increasing income actors business. Home industries also indirectly create job opportunities and can support government programs to reduce unemployment. Fish crackers are a type of processed fishery product made from a mixture of flour, mackerel meat, and various additional ingredients. The quality of fish crackers is largely influenced by the proportion of fish incorporated into the dough; a higher content of mackerel typically enhances the taste, aroma, and nutritional value of the final product. Mackerel serves as a key raw material in fish cracker production, contributing significantly to flavor and sensory characteristics while also increasing the protein content. Thus, the inclusion of mackerel not only improves the overall palatability but also enhances the nutritional profile of the product (Natalia et al., 2019).

MATERIAL AND METHOD

The research location was selected purposively using a purposive sampling method. The study was conducted in South Sibolga Subdistrict, Sibolga City, based on the results of a preliminary survey indicating the presence of two entrepreneurs actively engaged in the fish cracker business in the area. The sampling technique employed in this study was non-probability sampling, specifically the census (saturated sampling) method. According to Sugiyono (2019), saturated sampling is used when the entire population is included as the research sample. In this study, the total number of respondents consisted of two fish fish cracker producers.

Data were collected through both primary and secondary sources. Secondary data were obtained from relevant institutions such as the Sibolga Fishing Port, the Sibolga City Office of Cooperatives, SMEs and Manpower, and other sources including academic journals and online media. Primary data were collected through direct interviews with business owners using a structured questionnaire, as well as through field observations of their production processes. To analyze the value added from processing mackerel into fish crackers, the study employed the Hayami method. This method calculates value added as the increase in the economic value of a commodity resulting from the production process, after accounting for the costs of inputs and services used. The detailed calculation of value added using the Hayami value-added table is presented in Table 1.

Table 1. Calculation of Added Value

No.	Variables	Value
I.	***Output, Input* and Price**	
1.	*Output* (Kg)	(1)
2.	*Input* (Kg)	(2)
3.	Labor (HOK)	(3)
4.	Conversion factor	(4) = (1)/(2)
5.	Labor coefficient (HOK/Kg)	(5) = (3)/(2)
6.	*Output* price (IDR)	(6)

7.	Labor wage (Rp/HOK)	(7)
II.	**Revenue and Profit**	
8.	Raw material price (Rp/Kg)	(8)
9.	Other *input* contribution (Rp/Kg)	(9)
10.	*Output* value (Rp/Kg)	(10) = (4) x (6)
11.	a. Value added (IDR/Kg)	(11a) = (10)-(9)-(8)
	b. Value-added ratio (%)	(11b) = (11a)/(10) x 100%
12.	a. Labor income (Rp/Kg)	(12a) = (5) x (7)
	b. Labor share %	(12b) = (12a)/(11a) x 100%
13.	a. Profit (IDR/kg)	(13a) = (11a) - (12a)
	b. Profit rate (%)	(13b) = (13a)/(11a) x 100%
III.	**Factor of Production Owner's Remuneration**	
14.	Margin (Rp/Kg)	(14) = (10) - (8)
	a. Labor	(14a) = (12a)/(14) x 100%
	b. Contribution of other *inputs*	(14b) = (9)/(14) x 100%
	c. Employer benefits	(14c)= (13a)/(14) x 100%

Source: Sudiyono (2004)

Production costs are the total of all costs sacrificed during the process of processing raw materials into a finished product and ready for market. Production costs consist of fixed costs and variable costs. Revenue is the multiplication of the product price by the amount of production. The total revenue earned by producers is reduced by the total costs incurred which will result in net income. Income is the difference between revenue and all costs so that it can be interpreted that income includes gross income or total revenue and net income. Total cost, total revenue and income can be calculated as follows.

$$TC = FC + VC \quad (1)$$

$$TR = P + Q \quad (2)$$

$$\pi = TR - TC \quad (3)$$

TC is total cost, FC is total fixed cost, VC is total variable cost, TR is total revenue, P is product price and Q is production quantity.

$$R/C = \frac{TR}{TC} \quad (4)$$

The feasibility analysis uses the R/C ratio which is calculated after performing a series of preliminary financial computations. Revenue Cost Ratio (R/C) is the ratio between total revenue and total cost. Business feasibility analysis can be analyzed using the analysis method (R/C) calculated with the following formula (Soekartawi, 2006).

RESULT AND DISCUSSION

The results of the value-added calculation for fish cracker processing in South Sibolga Subdistrict, Sibolga City are presented in Table 2.

Table 2: Value Added of Fish Crackers Products/month

No.	Variable	Description	Value
I.	***Output, Input* and Price**		
1.	*Output* (Wrap)	(1)	1.308
2.	*Input* (Kg)	(2)	32
3.	Labor (HOK)	(3)	19
4.	Conversion factor	(4) = (1)/(2)	40,88
5.	Labor coefficient (HOK/Kg)	(5) = (3)/(2)	0,59
6.	*Output* price (Rp/Pack)	(6)	10.000,00
7.	Labor wage (Rp/HOK)	(7)	90.000,00
II.	**Revenue and Profit**		
8.	Raw material price (Rp/Kg)	(8)	50.000,00
9.	Other *input* contribution (Rp/Kg)	(9)	133.028,86
10.	*Output* value (Rp/Kg)	(10) = (4) x (6)	408.750,00
11.	a. Value added (IDR/Kg)	(11a) = (10)-(9)-(8)	225.721,14
	b. Value-added ratio (%)	(11b) = (11a)/(10) x 100%	55,22%

No.	Variable	Description	Value
12.	a. Labor income (Rp/Kg)	(12a) = (5) x (7)	53.437,50
	b. Labor share %	(12b) = (12a)/(11a) x 100%	23,67%
13.	a. Profit (IDR/kg)	(13a) = (11a) - (12a)	172.283
	b. Profit rate (%)	(13b) = (13a)/(11a) x 100%	76,33%
III.	**Factor of Production Owner's Remuneration**		
14.	Margin (Rp/Kg)	(14) = (10) - (8)	358.750,00
	a. Labor	(14a) = (12a)/(14) x 100%	14,90
	b. Contribution of other *inputs*	(14b)= (9)/(14) x 100%	37,08
	c. Employer benefits	(14c)= (13a)/(14) x 100%	48,02

Source: Primary Data Processed, 2024

In this study, the amount of value added generated by the fish cracker business is analyzed using the Hayami method. This method provides comprehensive information on value added, productivity, and output value, as well as the distribution of compensation to the owners of production factors (Hermanto, 1996). The average monthly production output of fish crackers in South Sibolga Subdistrict, Sibolga City is 1,308 packs, utilizing 32 kg of raw materials. This yields a conversion factor of 40.88 packs per kilogram of raw material, which is derived from the ratio of total output to input and indicates the number of cracker packages produced per kilogram of mackerel. The production process involves an average labor input of 19 HOK. The labor coefficient, calculated as 0.59 HOK per kilogram of raw material, indicates that 0.59 HOK is required to process 1 kg of mackerel. The final product is sold at a price of Rp 10,000 per pack, while the average labor cost per HOK for processing 1 kg of raw material amounts to Rp 90,000.

The average input cost of raw materials used in fish cracker production is Rp 50,000 per kilogram, with additional input contributions amounting to Rp 133,028.86. The output value resulting from processing 1 kg of mackerel into fish crackers is Rp 408,750. The value added generated through this process is Rp 225,721.14 per kilogram, resulting in a value added ratio of 55.22%. This indicates that 55.22% of the output value represents the added value of the fish cracker business in South Sibolga Subdistrict. Labor wages amount to Rp 53,437.50, accounting for 23.67% of the value added, while the remaining Rp 172,283.64 represents profit, equivalent to a profit share of 76.33%. The margin, calculated as the difference between the output value and the raw material cost, is Rp 358,750 per kilogram. Based on this margin, the return on labor is 14.90%, the return on other input contributions is 37.08%, and the return on profit is 48.02%. Based on the analysis conducted, the amount of added value of processing mackerel into fish crackers is Rp 225,721.14 and the value-added ratio is 55.22%. high value added of 55.22% or added value >40%. Then hypothesis 1 is accepted. Fish cracker production refers to the process of transforming mackerel into consumable products. The average production volume of fish crackers is presented in Table 3.

Table 3. Average Production of Fish Crackers in South Sibolga

No.	Description	Value
1	Frequency of Manufacture Monthly (days)	19 times
2	Total *output* (Kg)	132 kg
3	*Output* price (IDR)	100,000

Source: Primary Data Processed, 2024

Based on the data presented in Table 3, fish fish cracker producers in South Sibolga Subdistrict conduct production activities approximately 19 times per month, indicating a relatively consistent production frequency. The total monthly output reaches 132 kg, suggesting that although the scale may be categorized as small, the business operates regularly with a selling price of Rp 100,000 per kilogram. These findings highlight the viability of fish cracker production as a home-based or small-scale agro-industry, contributing to local economic activity and employment. Revenue is the result of multiplying the amount of *output* produced by the selling price of the product. The average amount of revenue from the fish crackers business in South Sibolga District can be seen in Table 4. Based on Table 4, the average monthly production of fish crackers in South Sibolga Subdistrict is 132 kg. The crackers are packaged in 100-gram packs and sold at a price of Rp 10,000 per pack. With a total output of 1,308 packs per month, the business generates a monthly revenue of Rp 13,080,000. This level of income indicates that the fish cracker business has the potential to contribute significantly to household earnings, especially when operating consistently and managing costs effectively.

Table 4. Average Revenue of Fish Crackers in South Sibolga

No.	Description	Total
1	Packaging (gr)	100
2	Unit (kg)	132
3	Selling price (Wrap)	10,000
4	Quantity (Packs)	1,308
	Revenue (Rp)	13,080,000

Source: Primary Data Processed, 2024

The production cost of a fish cracker business refers to the expenses incurred by entrepreneurs during the production process. These costs are categorized into fixed costs and variable costs. Fixed costs typically include equipment depreciation, while variable costs consist of raw material expenses, other input contributions, and labor wages. The average production costs incurred by fish cracker businesses in South Sibolga Subdistrict are presented in Table 5.

Table 5. Average Production Costs of Fish Crackers in South Sibolga

No.	Production Cost	Total (Rp)
1	**Fixed Cost**	
	Equipment Depreciation Cost	22,464.57
2	**Variable Cost**	
	Raw Material Cost of Mackerel	1,600,000.00
	Cost of Support Materials	
	- Tapioca flour 47 kg	512,800
	- 190 eggs	348,000
	- Salt 2.43 kg	21,915
	- Granulated Sugar 2 kg	36,000
	- Flavoring 31 Packs	15,500
	- Developer 0.24 kg	3,430
	- 101.5 kg oil	1,725,500
	- Garlic 0.63 kg	13,860
	- Red Onion 0.125 kg	5,625
	- Pepper 15 Packs	15,000
	- Ice cubes 15 packs	7,500
	- Sago flour 7.5 kg	90,000
	- 3 kg LPG gas	241,500
	- Plastic Packaging 1,308 Packs	606,390
	- Packaging Labels 1,308 Sheets	291,250
	- 23 Liter Fuel	230,000
	- Electricity Cost Kwh	708,189.08
	Total	4,234,459.08
	Labor Wage Cost	1,650,000
3	**Total Cost**	**7,506,923.65**

Source: Primary Data Processed, 2024

Based on Table 5, the average total production cost incurred by the fish cracker business in South Sibolga Subdistrict amounts to Rp 7,506,923.65 per month. This total cost comprises fixed and variable costs. The fixed cost, which includes equipment depreciation, is Rp 22,464.57. Meanwhile, the variable costs consisting of raw material expenses, supporting materials (such as flour, eggs, seasonings, and packaging), fuel, electricity, and labor wages amount to Rp 7,484,459.08. Among these, the labor wage component accounts for Rp 1,650,000. The data indicates that variable costs constitute the majority of total production expenses, reflecting the intensive use of raw materials and labor in the fish cracker production process. Income refers to the net earnings obtained by subtracting total production costs from the total revenue generated from fish cracker sales. It reflects the financial gain achieved through the processing of mackerel into fish crackers. The details of the average monthly income earned from fish cracker production in South Sibolga Subdistrict are presented in Table 6.

Table 6. Average Revenue of Fish Crackers in South Sibolga

No.	Description	Total (Rp)
1	Total Revenue (TR)	13,080,000
2	Total Cost Production (TC)	7,506,923.65
	Total Revenue	5,573,076.35

Source: Primary Data Processed, 2024

Based on Table 6, the average monthly income earned by the fish cracker business in South Sibolga Subdistrict is Rp 5,573,076.35. This figure is obtained by subtracting the total production cost of Rp 7,506,923.65 from the total revenue of Rp 13,080,000. The resulting income reflects the profitability of the business and indicates that fish cracker production contributes significantly to the economic well-being of local entrepreneurs. A business is considered feasible if it generates profit from its operations. The Revenue-Cost (R/C) ratio is a straightforward analytical tool used to assess the financial feasibility of a business. This ratio compares total revenue (TR) to total cost (TC) and indicates how much revenue is earned for every unit of cost incurred during the production process. The R/C ratio is calculated as follows:

$$R/C = \frac{13{,}080{,}000}{7{,}506{,}923.65} = 1{,}74$$

The resulting R/C value of 1.74 indicates that for every Rp 1.00 spent, the business earns Rp 1.74 in revenue. Since the R/C ratio is greater than 1, it can be concluded that the fish cracker business in South Sibolga Subdistrict is financially feasible. Therefore, the fish cracker business is financially feasible.

CONCLUSION

Based on the results of the study, it can be concluded that the fish cracker business in South Sibolga Subdistrict, Sibolga City, is financially feasible and contributes positively to the local economy. The average monthly production reaches 132 kg, resulting in 1,308 packs of fish crackers, each sold at Rp 10,000. This generates a total monthly revenue of Rp 13,080,000. The average total production cost incurred is Rp 7,506,923.65, consisting of both fixed and variable costs, including raw materials, supporting inputs, labor, and utilities. The income earned from the business is Rp 5,573,076.35 per month, indicating a healthy profit margin. Furthermore, the R/C ratio of 1.74 confirms that the business is economically viable, meaning that for every Rp 1.00 spent, Rp 1.74 is earned. This positive margin reflects effective cost management and high added value from processing mackerel into crackers. Using the Hayami method, the value-added from processing 1 kg of mackerel is Rp 225,721.14, with a value-added ratio of 55.22% and a profit rate of 76.33%, demonstrating significant returns from this home-based agro-industry. However, the sustainability of this business remains challenged by the limited availability and rising cost of narrow-barred Spanish mackerel, the key ingredient that determines product quality. Entrepreneurs are therefore encouraged to explore alternative fish types as raw materials. Additionally, government support in terms of policy, training, and access to raw materials is crucial for enhancing productivity and ensuring long-term business sustainability.

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