

Evaluation Of Raw Material Procurement And Added Value Of Premium Freshwater Salted Fish Products Based On Seasonality In Tulang Bawang Regency

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ABSTRACT

This study aims to evaluate the procurement of raw materials for freshwater salted fish based on the six-right principles and to analyze the added value of leading agroindustrial products in Tulang Bawang Regency during the dry and rainy seasons. Data were collected through a census method involving 37 business units from December 2023 to February 2024, using a descriptive quantitative approach. The results show that raw material procurement practices vary by season. In the dry season, procurement was appropriate in terms of location, quality, and price, but less accurate regarding timing, type, and quantity. In the rainy season, only location and quality criteria were consistently met. Lais fish consistently generated the highest added value, while the lowest varied between gabus and baung fish depending on the season. These findings highlight the need for adaptive, season-based strategies and call for a re-evaluation of lais fish as a flagship product due to its limited availability as an endemic species.

Keywords: Added value, Raw material procurement, Salted fish, Six-right principles

INTRODUCTION

Tulang Bawang Regency is one of the regions in Lampung Province that has great potential in the fisheries sub-sector, both in terms of capture fisheries and aquaculture. Based on data from the Lampung Province (Badan Pusat Statistik, 2023), Tulang Bawang Regency is recorded as one of the largest contributors to fisheries production in Lampung Province with a total production of 59,779 tons in 2019. However, the utilization of this potential is still not optimal, because most of the fishery products are sold in fresh form without going through a processing process that can increase added value and price stability.

One form of agroindustry with potential for development in Tulang Bawang Regency is the freshwater salted fish processing industry. Salted fish as a processed product has advantages in terms of shelf life, higher economic value, and broad market potential, both within and outside the region. However, the freshwater salted fish processing business in this area faces a number of significant obstacles. Among these are the failure to fulfill the principles of proper raw material procurement in terms of quantity, quality, timing, type, price, and location. The dependence of business actors on the availability of fish from natural sources makes the supply of raw materials unstable, especially during the dry season. This indicates the need to evaluate the raw material procurement practices carried out by business actors to ensure production efficiency (Tauhid, Hidayati, & Hanum, 2017).

Salted fish processing has not yet maximized its potential to provide significant added value for businesses. The simple salting process, lack of innovation in processing, and instability in raw material prices are the main factors contributing to the low added value generated. However, according to the theory of added value Hayami (1987), each stage of processing that changes the form, location, or time of use of a commodity should increase the selling value of the final product. Therefore, it is important to quantitatively measure the amount of added value obtained by

freshwater salted fish businesses so that it can be used as a basis for policy-making for the development of the fishing industry in this region.

Considering these challenges and opportunities, this study examines the suitability of the 6 Right procurement principles and the added value of freshwater salted fish products in different seasons. The findings of this study are expected to provide a scientific basis for the formulation of effective, efficient, and sustainable fisheries agro-industry development strategies in Tulang Bawang Regency.

RESEARCH METHOD

This study applied a census method with a quantitative descriptive approach. According to Sugiyono (2022), the census method is a data collection technique that involves all members of the population as respondents, especially when the population size is small. The research location was determined purposively because Tulang Bawang Regency is the main center of freshwater salted fish agroindustry. The geographical characteristics of the region, which is dominated by swampland and rivers, have encouraged most of the community to depend on fishing for their livelihood. The evaluation of freshwater salted fish raw material procurement in this study was analyzed based on the application of the six principles, namely timeliness, place, type, quality, quantity, and price, in each season as stated by (Assauri, 1999). This six-right approach refers to the study by Kartika, Prasmatiwi, & Kasymir (2022) and is in line with the analysis used by (Sulistioningrum, Murniati, & Nugraha, 2022). The assessment of expectations for each criterion is presented in Table 1.

Table 1. Assessment indicators for component 6 accuracy

6 Right	Expectation Indicator	Assessment Score		
		Right (3)	Less Right (2)	Not Right (1)
Right Time	Availability of fresh fish every day	When all expectation indicators are met	If only one or two indicators are met	If none of the indicators are met
Right Place	A strategic location, easily accessible by various modes of transportation, and equipped with comfortable facilities.	When all expectation indicators are met	If only one or two indicators are met	If none of the indicators are met
Right Types	Consistent availability of fish species that meet market demand	When all expectation indicators are met	If only one or two indicators are met	If none of the indicators are met
Right Quality	Characteristics of fish such as bright and clear skin color, bright and prominent eyes, firm flesh, and a fresh smell.	When all expectation indicators are met	If only one or two indicators are met	If none of the indicators are met
Right Quantity	Sufficient raw materials in accordance with production capacity and continuity of availability throughout the season.	When all expectation indicators are met	If only one or two indicators are met	If none of the indicators are met
Right Price	The ability to purchase raw materials to generate value added.	If the price is in line with the maximum limit set by businesses during a particular season	If the price is sometimes appropriate and sometimes not	If the price does not match the set limit at all

Value-added analysis is a process of evaluating data and information using approaches, principles, methods, and techniques of analysis that are appropriate to the desired outcome (Triabiantoro, Suzana, & Sumaryam, 2015). In this study, the procedure for calculating the value added of salted fish using the Hayami method includes the stages of identifying production inputs and outputs, determining product selling prices and input costs, and calculating value added, value added ratio, and the contribution of production factors to value added based on the formula developed by (Hayami, 1987), as presented in Table 2.

Table 2. Procedure for calculating the added value of salted fish using the Hayami method

No	Variable	Value	Unit
Output, Input, Price			
1	Output	(1)	(Kg/production cycle)
2	Input	(2)	(Kg/production cycle)
3	Direct Labor	(3)	(HOK)
4	Convention Factor	(4) = (1)(2)	(Kg/production cycle)
5	Labor Coefficient	(5) = (3)(2)	(HOK/Kg)
6	Output Price	(6)	(Rp/Kg)
7	Labor Wages	(7)	(Rp/HOK)
Revenue and Profit (per kilogram of raw material)			
8	Raw Material Value	(8)	(Rp/Kg)
9	Other Input Prices	(9)	(Rp/Kg)
10	Salted Fish Value	(10) = (4)x(6)	(Rp/Kg)
11	a. Value Added	(11a) = (10)-(8)-(9)	(Rp/Kg)
	b. Value Added Ratio	(11b) = (11a)/(10)x100%	(%)
12	a. Labor Compensation	(12a) = (5)x(7)	(Rp/Kg)
	b. Labor Share	(12b) = (12a/11a)x100%	(%)
13	a. Profit	(13a) = (11a)-(12a)	(Rp/Kg)
	b. Margin Profit	(13b) = (13a/11a)x100%	(%)
Compensation for Factors of Production			
14	Margin	(14) = (10)-(8)	
	a. Direct Labor Income	(14a) = (12)/(14) x 100%	(%)
	b. Other Input Contributions	(14b) = (9)/(14) x 100%	(%)
	c. Company Profits	(14c) = (13a)/(14) x 100%	(%)

Source: Hayami, 1987

RESULTS AND DISCUSSION

A. Evaluation Of Salted Fish Raw Material Procurement Based On The Six Right Principles

The 6 Right criteria component for raw material availability is a concept in procurement that refers to the main principles that must be met to ensure the availability of the right fish raw materials in terms of quantity, time, place, quality, type, and cost. The Six Rights criteria components in raw material procurement by freshwater salted fish businesses during the dry and rainy seasons in Tulang Bawang Regency are presented in Table 3.

Table 3. Component criteria 6 appropriate procurement of raw materials for freshwater salted fish agroindustry during the dry season and rainy season

6 Right	Number of Business Operators											
	Dry Season						Rainy Season					
	Not Right		Less Right		Right		Not Right		Less Right		Right	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Time	0	0	23	62	14	38	31	84	6	16	0	0
Place	1	2	1	2	35	96	1	2	1	2	35	96
Types	0	0	37	100	0	0	0	0	37	100	0	0
Quality	0	0	0	0	37	100	0	0	0	0	37	100
Quantity	26	70	11	30	0	0	37	100	0	0	0	0
Price	0	0	0	0	37	100	0	0	20	54	17	46

Source: Primary Data Analysis (2024)

Analysis of Table 3 shows significant variations between the dry season and the rainy season in the fulfillment of six indicators of raw material procurement accuracy (6 Right), namely time, place, type, quality, quantity, and price. This evaluation is important in identifying weaknesses in the raw material supply chain and potential seasonal adaptive strategies.

Right Time

The right time of raw material procurement shows significant disparities between seasons. During the dry season, only 38% of businesses reported punctual procurement, while the remaining 62% reported delays. This limitation is due to unstable supply schedules despite low river levels and relatively easy fishing conditions. The irregularity of supply is allegedly due to a lack of coordination and a fixed schedule-based logistics system. During the rainy season, timeliness decreases dramatically, with 84% of businesses stating that procurement is not timely. The dominant factors are high rainfall, seasonal flooding, and transportation disruptions that cause delays in supply. Research by Sartika & Mokodompit (2024) confirms that extreme weather dynamics greatly affect the rhythm of fishing and fish distribution, which leads to untimely procurement. Meanwhile, according to Massiseng, Ummung, & Daris (2025), a fisheries logistics system that is not responsive to weather conditions is a major obstacle in maintaining the stability of supply times.

Right Place

As many as 96% of business actors stated that raw materials were procured in the right place both during the dry and rainy seasons. This accuracy was supported by the proximity of raw material sources to production sites (0.5–1 km), as well as adequate road accessibility. Road infrastructure that can be traversed by two- or three-wheeled vehicles allows distribution to continue even when the weather changes. The geographical proximity between the fishing location and the processing location can affect logistics efficiency, transportation costs, and quality resilience. The concept of “near-site procurement” also increases the competitiveness of small businesses in the fisheries value chain.

Right types

All business operators (100%) stated that the types of fish obtained did not meet their main production needs, both during the dry season and the rainy season. This reflects the instability of the availability of main species such as *lais* fish (*Kryptopterus spp.*), which are often not found consistently throughout the year. This phenomenon is exacerbated by the lack of control over the capture of fish species that are becoming rare and the suboptimal regulation of fishing zones. Budiyaniti, Iskandar, & Partasmita (2018) stated that the types of fish caught are highly dependent on the season, water currents, and fishing techniques used. In addition, Massiseng et al. (2025) reveal that fluctuations in fish species and the lack of conservation efforts have resulted in a decline in the sustainability of species-specific fish processing businesses.

Right Quality

The quality of raw materials is consistently high, with 100% of businesses stating that fish quality meets standards in all seasons. This is attributed to the local practice of selling fish alive or fresh and the relatively short distribution distance. Processing also tends to be carried out immediately after capture, thereby reducing the chance of quality degradation. According to Primyastanto, (2014), the quality of fishery raw materials is greatly influenced by post-catch speed, environmental temperature, and initial handling practices. In areas with short supply chains and a culture of quick sales, the quality of raw materials tends to be optimally maintained.

Right Quantity

Accurate quantity is the most problematic aspect, especially during the rainy season. During the dry season, 70% of businesses reported that raw materials were insufficient to meet production needs, and during the rainy season this figure rose to 100%. This decline in availability is caused by the fish migration season, excessive fishing intensity, and the effects of flooding that destroy fish habitats in shallow waters and swamps. Rais, Wulandari, & Dharyati (2018) state that seasonal cycles greatly affect fish catch yields, especially in rivers and swamps.

Right Price

Pricing accuracy during the dry season is relatively high, with 100% of businesses reporting stable and appropriate prices. This correlates with abundant catches and stable supply in local markets. However, during the rainy season, only 46% of businesses report accurate pricing, while the remaining 54% complain of inappropriate prices. The imbalance between supply and market demand during extreme seasons triggers market failure that cannot be overcome without intervention from the logistics and distribution system. This is also reinforced by the findings of Wahadi, Yana, & Rusdiyana (2025) that the stability of fish prices in coastal areas is highly dependent on seasonal fluctuations and market access.

Recommendations to Ensure the Sustainability of Raw Material Availability

The sustainability of fish resources in the Tulang Bawang River is essential for maintaining the ecological balance of aquatic ecosystems and ensuring the continuity of raw material supplies for agro-industrial activities. As one of the primary freshwater fish sources in Lampung Province, this river not only contributes to economic activities but also provides animal protein for local communities. Moreover, fish play an important ecological role in controlling aquatic organism populations and serving as indicators of water quality (Effendi, 2024). Therefore, sustainable resource management must adopt a holistic, ecosystem-based, and participatory approach grounded in scientific and social principles.

Community extension and empowerment are crucial in enhancing fishermen's awareness of river ecosystem conservation. Education should include the identification of protected fish species, environmentally friendly fishing techniques, and restrictions during spawning seasons to strengthen compliance and collective resource stewardship. Alongside these efforts, strict control of overfishing through the enforcement of regulations on minimum fish size, appropriate fishing gear, and the prohibition of destructive methods such as poison or electric shocks is necessary to maintain long-term stock stability (FAO, 2020).

Habitat restoration and conservation initiatives are equally important. Actions such as reducing domestic and industrial pollution, rehabilitating watersheds, and protecting spawning and nursery areas can sustain the ecological processes vital to fish population growth (Halawa, 2025). In addition, law enforcement supported by community-based monitoring (co-management) ensures effective compliance, as community participation enhances monitoring effectiveness and local accountability (Sutinen & Kuperan, 1999). Integrated management supported by multi-stakeholder collaboration among local governments, fishing communities, academics, private sectors, and NGOs is fundamental. Such partnerships facilitate adaptive management policies, regulate seasonal catch quotas based on ecological carrying capacity, and ensure the long-term sustainability of fishery resources in the Tulang Bawang River.

B. Value Added Of Products During The Dry Season And Rainy Season

Value added is an increase in the value of a commodity as a result of inputs, either through a change in form (form utility), a change in location (place utility), or storage for a certain period of time (time utility) (Hayami, 1987). In the context of the salted fish agroindustry, value added refers to the increase in product value obtained through the processing of fishery commodities into semi-finished or finished goods that are ready for consumption, resulting in a higher selling price compared to raw commodities. Processing raw materials such as fish and salt as supporting materials provides greater economic value than if they were sold fresh. In Tulang Bawang Regency, there are five types of freshwater salted fish from capture fisheries that are leading products, namely salted gabus fish (*Channa striata*), baung fish (*Mystus nemurus*), tembakang fish (*Helostoma temminckii*), seluang fish (*Rasbora argyrotaenia*), and lais fish (*Kriptopterus bicirrhis*). The selection of these leading products is based on the amount of value added and profits obtained, market demand, and the availability of raw materials from the Tulang Bawang River, which is the main source for salted fish processing businesses. Information on the amount of value added of each product during the dry and rainy seasons is presented in Table 4 and Table 5.

Value Added of Salted Fish Products During the Dry Season

Value added is an important indicator in assessing the economic contribution of an agro-industrial process, including in the processing of freshwater salted fish. During the dry season, the availability of fish raw materials from the Tulang Bawang River tends to be higher, so that the production process can run more optimally. Table 4 presents data on the value added of five types of leading salted fish products produced in Tulang Bawang Regency, namely gabus, baung, tembakang, seluang, and lais fish. The following is a description of each commodity based on production input-output, conversion, margin, and distribution of returns to production factors:

Table 4. Value added of salted fish in the freshwater salted fish agroindustry during the dry season in Tulang Bawang Regency

No	Variable	Unit	Fish Value				
			Snakehead	Baug	Tembakang	Seluang	Lais
Output, Input, Price							
1	Output	(Kg)	37,01	23,00	30,48	25,81	11,82
2	Input	(Kg)	74,03	46,00	60,95	51,61	23,64
3	Direct Labor	(HOK)	3,18	3,18	3,18	3,18	3,18
4	Convention Factor	(Kg)	0,50	0,50	0,50	0,50	0,50
5	Labor Coefficient	(HOK/Kg)	0,04	0,07	0,05	0,01	0,13
6	Output Price	(Rp/Kg)	96.388,89	132.000,00	57.380,95	70.000,00	154.318,18
7	Labor Wages	(Rp/HOK)	75.000,00	75.000,00	75.000,00	75.000,00	75.000,00
Revenue and Profit (per kilogram of raw material)							
8	Raw Material Value	(Rp/Kg)	35.555,56	43.880,00	13.261,90	15.000,00	23.272,73
9	Other Input Prices	(Rp/Kg)	2.668,15	2.212,02	2.192,16	2.399,25	1.734,92
10	Salted Fish Value	(Rp/Kg)	48.194,44	66.000,00	28.690,48	60.000,00	77.159,09
11	a. Value Added	(Rp/Kg)	9.970,74	19.907,98	13.236,41	21.645,00	52.151,44
	b. Value Added Ratio	(%)	20,69	30,16	46,14	36,07	67,59
12	a. Labor Compensation	(Rp/Kg)	3.225,14	5.190,22	3.916,99	1.071,00	10.100,96
	b. Labor Share	(%)	32,35	26,07	29,59	4,95	19,37
13	a. Profit	(Rp/Kg)	6.745,60	14.717,76	9.319,42	20.574,00	42.050,48
	b. Margin Profit	(%)	67,65	73,93	70,41	95,05	80,63
Compensation for Factors of Production							
14	Margin		12.638,89	22.120,00	15.428,57	25.000,00	53.886,36
	a. Direct Labor Income	(%)	25,52	23,46	25,39	4,29	18,74
	b. Other Input Contributions	(%)	21,11	10,00	14,21	13,42	3,22
	c. Company Profits	(%)	53,37	66,54	60,40	82,29	78,04

Source: Primary Data Analysis (2024)

The analysis of salted fish commodities during the dry season shows considerable variation in efficiency, profitability, and value-added distribution across different species. Salted cork snakehead fish (*Channa striata*) demonstrates moderate competitiveness, with a selling price of IDR 96,388.89 per kg and a value added of IDR 9,970.74 per kg of raw material. Although its value added ratio is relatively low (20.69%), the profit share of 53.37% indicates a balanced production system that remains economically viable in the market.

Salted baug fish (*Mystus nemurus*) exhibits strong economic performance, generating value added of IDR 19,907.98 and a high profit rate of 73.93%. With a selling price of IDR 132,000.00 per kg and a conversion factor of 0.5, this commodity shows efficient processing and high profitability, supported by a significant profit share (66.54%) within the margin structure. Meanwhile, salted tembakang fish (*Helostoma temminckii*) is characterized by lower raw material and selling prices, yet it maintains high production efficiency. With value added of IDR 13,236.41 and a ratio of 46.14%, this product provides a balanced distribution of income between labor (25.39%) and profit (60.40%), demonstrating its potential as a stable, medium-value commodity.

Salted seluang fish (*Rasbora argyrotænia*) achieves the second highest value added (IDR 21,645.00 per kg) and the highest business profit share (82.29%), highlighting its strong profitability despite minimal labor cost contributions (4.29%). Its value added ratio of 36.07% reflects a high degree of cost efficiency, making it a lucrative product for processors. Salted lais fish (*Kriptopterus bicirrhis*) remains the most profitable commodity, with value added of IDR 52,151.44 per kg and a profit rate of 80.63%. The large profit proportion (78.04%) and high value added ratio underscore its superior economic advantage, confirming its strategic role as the leading product in the salted fish agroindustry during the dry season when raw material availability is optimal.

Value Added of Salted Fish Products during the Rainy Season

During the rainy season, the salted fish production process faces several challenges, particularly related to a decline in the availability of raw materials due to increased river water discharge, which affects catches. Nevertheless, processing continues with varying degrees of efficiency between commodity types. The following is a description of

the value added of each leading salted fish product based on input-output indicators, margins, and the distribution of returns to production factors:

Table 5. Value added of salted fish in the freshwater salted fish agroindustry during the rainy season in Tulang Bawang Regency

No	Variable	Unit	Fish Value				
			Snakehead	Baug	Tembakang	Seluang	Lais
Output, Input, Price							
1	Output	(Kg)	16,18	13,10	14,40	19,11	4,43
2	Input	(Kg)	32,36	26,20	28,81	38,23	8,86
3	Direct Labor	(HOK)	2,02	2,02	2,02	2,02	2,02
4	Convention Factor	(Kg)	0,50	0,50	0,50	0,50	0,50
5	Labor Coefficient	(HOK/Kg)	0,06	0,08	0,07	0,01	0,23
6	Output Price	(Rp/Kg)	182.083,33	152.600,00	47.619,05	70.000,00	195.909,09
7	Labor Wages	(Rp/HOK)	75.703,13	75.703,13	75.703,13	75.703,13	75.703,13
Revenue and Profit (per kilogram of raw material)							
8	Raw Material Value	(Rp/Kg)	68.083,33	65.600,00	11.619,05	18.516,13	43.181,82
9	Other Input Prices	(Rp/Kg)	2.073,01	1.950,85	1.793,62	2.259,42	1.463,49
10	Salted Fish Value	(Rp/Kg)	91.041,67	76.300,00	23.809,52	60.000,00	97.954,55
11	a. Value Added	(Rp/Kg)	20.885,33	8.749,15	10.396,86	39.224,45	53.309,24
	b. Value Added Ratio	(%)	22,94	11,47	43,67	65,37	54,42
12	a. Labor	(Rp/Kg)	4.722,51	5.833,04	5.304,69	1.059,84	17.241,87
	Compensation						
	b. Labor Share	(%)	22,61	66,67	51,02	2,70	32,34
13	a. Profit	(Rp/Kg)	16.162,82	2.916,11	5.092,16	38.164,60	36.067,36
	b. Margin Profit	(%)	77,39	33,33	48,98	97,30	67,66
Compensation for Factors of Production							
14	Margin		22.958,33	10.700,00	12.190,48	41.483,87	54.772,73
	a. Direct Labor	(%)	20,57	54,51	43,52	2,55	31,48
	Income						
	b. Other Input	(%)	9,03	18,23	14,71	5,45	2,67
	Contributions						
	c. Company Profits	(%)	70,40	27,25	41,77	92,00	65,85

Source: Primary Data Analysis (2024)

The analysis of salted fish agroindustry during the rainy season shows variations in value added, efficiency, and profit distribution among different freshwater fish commodities. Salted cork snakehead fish (*Channa striata*) demonstrates the highest profitability component, with a conversion factor of 0.5 and value added of IDR 20,885.33 per kg of raw material. The margin distribution dominated by company profits at 70.40% indicates strong economic returns but relatively low labor absorption.

In contrast, salted baung fish (*Mystus nemurus*) exhibits lower profitability, with value added of IDR 8,749.15 and a profit share of only 27.25%. The high proportion of labor income (54.51%) suggests that this commodity is labor-intensive but faces efficiency constraints, possibly due to lower product prices or higher processing costs. Meanwhile, salted tembakang fish (*Helostoma temminckii*) achieves moderate efficiency, generating value added of IDR 10,396.86 and distributing margins more evenly across labor (43.52%) and profit (41.77%), showing balanced economic benefits for processors and workers.

Salted seluang fish (*Rasbora argyrotaenia*) stands out as a high value-added commodity, with a ratio of 65.37% and a profit share of 92.00%, reflecting exceptional efficiency and strong market value despite minimal labor contribution. Lastly, salted lais fish (*Kriptopterus bicirrhis*) ranks as the most economically advantageous product during the rainy season, with value added reaching IDR 53,309.24 per kg and a profit proportion of 65.85%. The high profitability of lais fish underscores its superior market potential and processing efficiency, making it the leading commodity among the analyzed species.

Comparison of Added Value of Freshwater Salted Fish Products between Dry Season and Rainy Season

Salted fish production in Tulang Bawang Regency is carried out traditionally on a household industrial scale, with the main objective of adding value to freshwater fishery products. The results of the analysis show significant differences in value added between commodities and between the dry season and the rainy season, as presented in Table 6. The value added generated is influenced by several factors, such as the availability of raw materials, selling prices, and market demand.

Table 6. Comparison of the added value of freshwater salted fish products between the dry season and the rainy season in Tulang Bawang Regency

No	Type of Salted Fish	Added Value (Rp/Kg)	
		Dry Season	Rainy Season
1	Snakehead fish	9.970,74	20.885,33
2	Lais fish	52.151,44	53.309,24
3	Seluang fish	21.645,00	21.645,00
4	Baung fish	19.907,98	8.749,15
5	Tembakang fish	13.236,41	10.396,86

Source: Primary Data Analysis (2024)

The difference in the added value of freshwater salted fish commodities between the rainy and dry seasons in Tulang Bawang Regency shows complex dynamics influenced by environmental fluctuations, raw material availability, and market behavior. Based on the analysis results in Table 6, there are variations in added value between commodities. Cork snakehead fish and lais fish experience an increase in value added during the rainy season, while baung and tembakang fish experience a decline. Seluang fish tend to be stable, while tilapia shows constant value added due to raw material supplies that are not affected by the season. This pattern indicates that value added is not only determined by the production side, but also by external factors such as natural conditions and consumer demand.

During the rainy season, high rainfall causes an increase in the volume of river water and swamp areas, making fishing activities difficult because fish spread out over a wider area. This phenomenon limits the supply of raw materials, which has an impact on the increase in the price of fresh fish as the main input in salted fish production. These conditions drive up production costs, but at the same time can also increase the selling price of processed products due to the reduced supply of fresh fish in local markets. In situations like this, processed products such as salted fish become an attractive alternative for the community, mainly because of their greater durability in conditions of unstable fisheries food distribution.

The dry season provides more conducive conditions for fishing, as river water levels and swamp areas recede, facilitating access to fishery resources. This increases the availability of raw materials and lowers input prices, thereby reducing the cost of producing salted fish. However, the oversupply of fresh fish causes demand for salted fish to decline, as consumers prefer fresh fish, which is cheaper and easier to obtain. Nevertheless, the dry season offers advantages in terms of processing, particularly the drying process, which becomes faster and more efficient.

Supply stability does not always guarantee high added value if it is not balanced with commensurate market demand. Therefore, developing more adaptive marketing strategies and educating consumers about the benefits of processed products are important in increasing the added value of cultivated commodities. Differences in added value between seasons indicate the need for adaptive business management strategies based on market information. According to Fadhil, Halim, Agustina, & Ramadhani (2025), value added is created from a combination of production efficiency and competitive advantages, including responses to external dynamics such as seasonal changes. Salted fish producers need to develop flexible approaches to raw material procurement, production process adjustments, and marketing innovations. Local governments also have an important role in providing processing technology support and market access, as emphasized by Kementerian Kelautan dan Perikanan (2020) in its strategy to strengthen the small-scale fish processing industry.

By integrating a seasonal approach and consumer preferences, salted fish businesses in Tulang Bawang Regency can increase value added in a sustainable manner. Technological innovations in processing, product diversification, and strengthening the supply chain are key to responding to dynamics triggered by environmental and socio-economic factors. This approach is in line with the principles of sustainable fisheries development, which emphasize a balance between productivity, efficiency, and business resilience (FAO, 2016).

Recommended Freshwater Salted Fish Products in Tulang Bawang Regency

Tulang Bawang Regency has great potential for developing the freshwater salted fish processing agroindustry, especially those based on river fishing. Based on an analysis of nine main commodities, there are four products recommended as top products, namely: salted cork snakehead fish, salted baung fish, salted fish, and salted seluwang

fish. The selection of these four commodities considers several key factors, including: the size of value added, market demand stability, and the availability of raw materials in nature.

Snakehead fish occupy a leading position because they have a distinctive taste that is popular with the public, high nutritional content, and significant economic value. In addition to being caught in the wild, cork snakehead fish are also being farmed in river cages, which ensures a stable supply of raw materials. According to Listyanto & Andriyanti (2009), cork snakehead fish have great potential as a processed commodity due to their high albumin content and firm texture, making them highly marketable, both fresh and processed, such as salted fish. Baung fish, a popular local fish species, also has high added value and stable demand throughout the year. Although its availability in nature tends to fluctuate, this fish is still commonly found in the Tulang Bawang River. The advantage of baung fish in salted fish products lies in its distinctive savory taste and its ability to adapt to various river conditions. Tembakang fish and seluwang fish are the preferred choices because they are the most abundant species in nature. Their relatively stable populations in the Tulang Bawang River make them the main raw materials in small to medium-scale salted fish production. In addition, demand for salted fish products from these two species increases significantly during the rainy season, when the supply of fresh fish is limited. Consumer preference for salted fish increases during the rainy season because it has a longer shelf life than fresh fish.

Challenges and Alternatives for Development in the freshwater salted fish industry in Tulang Bawang include high dependence on the availability of raw materials from nature, which is greatly affected by seasonal fluctuations. To overcome this uncertainty, entrepreneurs need to diversify their products based on cultivated commodities such as tilapia, catfish, patin, and mujair. Cultivated commodities offer advantages in terms of supply control, price stability, and the potential for new market development. This is reinforced by the FAO (2016) statement that diversification of fishery commodities is a key strategy in adapting to environmental change and market uncertainty. Tilapia is an example of a cultivated commodity that has begun to be used as salted fish. Although demand is not yet high, its price stability makes it a potential commodity in the long term. In addition, further research is needed to improve the taste and texture of salted products from these aquaculture commodities. Innovations in processing, such as vacuum salting or solar drying techniques, can also help improve product competitiveness.

Special Case: Salted Lais Fish (*Kryptopterus bicirrhis*)

Salted lais fish is a product with high added value, distinctive taste, and considerable demand. However, it is not recommended as a flagship product due to the scarcity of raw materials in nature. Lais fish are endemic fish that are currently experiencing population pressure due to overfishing, habitat degradation, and the introduction of invasive species. Moyle & Leidy (1992) argue that the causes of declining freshwater fish diversity include overexploitation, pollution, and the introduction of ecologically competitive alien species. The introduction of non-endemic fish such as tilapia and red pacu can disrupt the stability of aquatic ecosystems and exacerbate the scarcity of native fish. According to Yudha (2009), the introduction of alien species has the potential to damage the structure of local fish populations due to competition for food and living space, as well as bringing diseases that disrupt natural ecosystems. Although not a leading product, salted lais fish still has high economic and cultural value and can be developed as a premium product for certain consumers who appreciate its unique taste and quality. However, conservation efforts and fishing restrictions are necessary to ensure the sustainability of lais fish resources.

CONCLUSION

This study concludes that the procurement of raw materials for the freshwater salted fish agroindustry in Tulang Bawang Regency differs between the dry season and the rainy season. During the dry season, procurement is considered appropriate in terms of location, quality, and price, but not in terms of timing, type, and quantity. Conversely, during the rainy season, only location and quality meet the criteria for appropriateness. Product value added also shows seasonal variations, with lais fish consistently providing the highest value added, while cork snakehead fish or baung fish provide the lowest value added. Although lais fish show the best economic performance, their status as an endemic species with limited availability needs to be considered in determining them as a superior product. Therefore, raw material diversification strategies and conservation approaches are crucial for the sustainability of the salted fish agroindustry in this region.

RECOMMENDATIONS

Based on the results of this study, it is recommended that freshwater salted fish businesses implement seasonal adaptive strategies in raw material procurement and improve production efficiency through innovation and product diversification, including the use of cultivated commodities. Stakeholders need policy support in strengthening the supply chain, developing small-scale processing technology, and conserving endemic fish to maintain business sustainability. Future researchers are expected to conduct further studies on cost efficiency, market preferences, and the development of environmentally friendly alternative processing technologies to increase the value added of products in a sustainable manner.

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DISCLOSURE

The authors state that there are no conflicts of interest related to this study. The research was carried out independently, free from any financial or external influence. All processes of data collection, analysis, and interpretation were conducted with full objectivity and transparency to maintain the validity and reliability of the results. The authors also confirm that no external funding or resources were obtained that could have affected the study's outcomes or conclusions. Furthermore, no third parties were involved in the study's design, implementation, or dissemination.

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