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SWOT Analysis in Determining Strategies to Increase the Competitiveness of Bilih Fish Products in Lake Singkarak

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ABSTRACT

This study aims to analyze internal and external factors that influence the competitiveness of processed bilih fish (Mystacoleucus padangensis) products in the Singkarak Lake area and formulate a development strategy based on the results of a SWOT analysis. The study uses a qualitative descriptive approach supported by quantitative weighting of the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices. Data were obtained through field observations, in-depth interviews with 20 key respondents, and supporting literature studies. The results show that the total IFE value is 1.80 and the EFE value is 2.40, which places the bilih fish processing business in Quadrant I (Aggressive Strategy/Growth Strategy). This condition indicates that external opportunities are still large and internal strengths are good enough to be developed. The main recommended strategies include developing product innovations based on local taste and culture, increasing digital technology and marketing capacity, strengthening digital cooperative institutions, and legal protection through halal certification, PIRT, and the geographical indication label "Singkarak Lake Bilih Fish." The blue economy approach and triple helix collaboration (government, academics, business actors) are important foundations for encouraging sustainable local economic growth and supporting the achievement of SDGs 8, 12, and 14.

Keywords: ***bilih fish, blue economy, competitiveness, Singkarak Lake, SWOT***

INTRODUCTION

Lake Singkarak is one of the largest lakes on the island of Sumatra, located in West Sumatra Province, Indonesia. The lake covers an area of approximately 107.8 km² and plays a vital role as a water resource supporting various needs of the surrounding community, including irrigation, fisheries, and tourism (Mayasari et al., 2025). One endemic commodity with high economic and socio-cultural value in this region is the bilih fish (Mystacoleucus padangensis) (Sari et al., 2016). The bilih fish is not only a source of protein for the local community but also serves as a culinary identity and a unique tourist attraction for the region, connecting the ecological, economic, and socio-cultural aspects of the communities surrounding the lake.

In recent years, bilih fish processing has become a primary livelihood for communities around Lake Singkarak, particularly in Nagari Tikalak, Muaro Pingai, and Singkarak (Syaifullah & Hidayah 2024). Processed bilih fish products, such as fried bilih, crispy bilih, and balado bilih, have become widely available in local markets and become popular souvenirs for tourists (Yulisti, 2022). However, the competitiveness of these products remains low compared to processed fish products from other regions, such as Lampung or West Java. This is due to several factors, including limited processing technology, a lack of product innovation, poor packaging design, and limited access to digital markets and modern distribution networks.

According to the West Sumatra Provincial Maritime Affairs and Fisheries Service (2024), bilih fish production has fluctuated significantly over the past five years. Declining catches during certain seasons have led to unstable raw material supplies, impacting production continuity and selling prices. Furthermore, aquatic environmental degradation due to domestic waste and tourism activities has also impacted the bilih fish population in the wild (Yulisti, 2022; Maestro et al., 2025). This situation demands adaptive strategies to increase efficiency, added value, and product competitiveness to ensure the sustainability of the bilih fish processing industry.

In the context of sustainable development, the development of bilih fish farming is strongly relevant to the blue economy concept and the Sustainable Development Goals (SDGs), particularly SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), and SDG 14 (Ocean Ecosystems) (Munthe & Munthe, 2024). The blue economy approach emphasizes the importance of sustainable, efficient, and innovative fisheries resource management to provide economic benefits without compromising ecosystems (Pasaribu et al., 2025).

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis is an appropriate method for formulating a strategy for developing the competitiveness of bilih fish products. Through this analysis, various internal (strengths and weaknesses) and external (opportunities and threats) factors that influence the product's competitive position in the market can be identified. Thus, the results of the SWOT analysis can form the basis for formulating a targeted and sustainable development strategy based on local potential. The purpose of this study is to analyze the internal and external factors that influence the competitiveness of bilih fish products in the Singkarak Lake area and determine a bilih fish business development strategy to increase the competitiveness and economic sustainability of the communities around the lake.

THEORETICAL FRAMEWORK

Competitiveness of Local Fishery Products

Product competitiveness is defined as a product's ability to survive and thrive in the market through quality excellence, differentiation, innovation, and marketing effectiveness. For locally resource-based fishery products, competitiveness is strongly influenced by resource characteristics, processing capacity, business institutions, and market access. Bilih fish, an endemic commodity of Lake Singkarak, has the potential for competitive advantage based on its biological and cultural uniqueness, but this advantage can only be realized if supported by an appropriate development strategy (Porter, 2001; Sari et al., 2016). In this study, the competitiveness of bilih fish products is positioned as the main variable (dependent variable) influenced by internal and external business conditions.

SWOT Analysis and IFE–EFE Matrix

SWOT analysis is a strategic approach to identifying internal factors (Strengths and Weaknesses) and external factors (Opportunities and Threats) that influence business performance. Using the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices allows for a quantitative assessment of the level of influence of each factor, allowing a business's strategic position to be determined more objectively (David, 2011).

Within the framework of this research:

1. Internal factors (strengths and weaknesses) are treated as internal independent variables , which include product taste, availability of raw materials, processing technology, packaging, and marketing.
2. External factors (opportunities and threats) are external independent variables , which include policy support, tourism and consumer trends, competition, and aquatic environmental conditions.

Blue Economy as a Foundation for Sustainability

The blue economy concept emphasizes the efficient, innovative, and sustainable use of aquatic resources to support economic growth without damaging ecosystems. In the fisheries sector, the blue economy encourages a shift from resource exploitation to increased product added value, supply chain efficiency, and strengthened business capacity (Pauli, 2010; Munthe & Munthe, 2024).

In this study, the blue economy serves as a normative framework explaining that strategies to increase the competitiveness of bilih fish products must align with the sustainability of the Lake Singkarak ecosystem. Therefore, product innovation, marketing digitalization, and institutional strengthening are considered more relevant than increased production based on exploitation.

The Triple Helix Approach to Developing Fisheries MSMEs

The triple helix approach emphasizes collaboration between government, academia, and business actors in promoting innovation and knowledge-based economic development. The government plays a role in regulation and facilitation, academia in research and technology transfer, and business actors in implementation and commercialization (Etzkowitz & Leydesdorff, 2000).
In the context of this research, the triple helix approach serves as a strategic supporting variable that strengthens the relationship between internal and external factors and product competitiveness. Weak synergy between these factors often contributes to low innovation, technological limitations, and weak marketing among fisheries MSMEs.

Theoretical Gap of Research

Most previous studies have analyzed the competitiveness of fisheries MSMEs partially, either through SWOT analysis without considering environmental sustainability, or through the blue economy without mapping measurable business strategies. The theoretical gap lies in the lack of studies that integrate quantitative SWOT (IFE-EFE) with the blue economy and the triple helix approach in the context of endemic inland fishery products. Therefore, this study develops a conceptual framework that links internal and external business factors with the competitiveness of bilih fish products through a SWOT analysis, with the blue economy as a sustainability principle and the triple helix as a mechanism for strengthening development strategies.

RESEARCH METHODS

This research uses a qualitative descriptive approach with simple quantitative support. This approach was chosen because it provides a comprehensive overview of the state of the bilih fish processing business, including its potential, problems, and development opportunities within the socio-economic context of the community in the Lake Singkarak area. The research was conducted directly in the field, emphasizing a deep understanding of the situation at the business level and local fisheries institutions.

The research location was purposively determined in Nagari Tikalak, Solok Regency, West Sumatra Province, known as one of the main centers for bilih fish production and processing. This location was selected based on the consideration that Nagari Tikalak is an area with active bilih fish processing activities and has a significant contribution to the economy of the community around Lake Singkarak. The research was conducted from May to September 2025, encompassing field observation, data collection, interviews, and analysis of research results.

The data used in this study consisted of primary and secondary data. Primary data were obtained through direct observation of the production, packaging, and marketing of processed bilih fish products, as well as through in-depth interviews with business actors, village officials, and representatives of the local Fisheries Service. A total of 20 key respondents participated in the interviews, which used a semi-structured guide to ensure in-depth yet focused information. Furthermore, a structured questionnaire with a Likert scale of 1–4 was used to assess the level of importance and influence of each factor included in the Strengths, Weaknesses, Opportunities, and Threats (SWOT) category. Secondary data were obtained from official government documents, such as reports from the Maritime Affairs and Fisheries Service, data from the Central Statistics Agency (BPS), and various scientific literature and previous research relevant to the development of fisheries businesses and MSMEs based on local resources.

The data analysis stage is carried out through four main steps. First, identification of internal and external factors, namely by determining the elements of strengths, weaknesses, opportunities, and threats that affect the competitiveness of processed bilih fish products based on the results of interviews and supporting literature. Second, the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices are weighted, where each factor is given a weight (0.0–1.0) and a score (1–4) to assess the level of influence and importance on business sustainability. The final value is

obtained from the multiplication of the weight and score (Final Value = Weight × Score). Third, the results of the IFE and EFE analysis are used to determine the business's position in the SWOT matrix, so that it is known whether the business is in an aggressive, defensive, diversified, or turn-around strategy. Fourth, based on the mapping results, a business development strategy is formulated by combining SWOT factors into four strategic categories, namely Strength–Opportunity (SO), Weakness–Opportunity (WO), Strength–Threat (ST), and Weakness–Threat (WT).

To maintain the validity and reliability of the research results, source triangulation was conducted by comparing data obtained from business actors, local governments, and academics. In addition, focus group discussions (FGDs) were conducted with POKLAHSAR and the Fisheries Service to verify the SWOT analysis results. Consultations with experts in fisheries resource management and MSME marketing were also conducted to ensure the relevance of the resulting strategies to actual conditions in the field. With this combination of qualitative and quantitative methods, the research is expected to provide a comprehensive understanding of the determinants of the competitiveness of bilih fish products and produce recommendations for realistic development strategies, based on local potential, and oriented towards the sustainability of the blue economy in the Lake Singkarak area.

RESULTS AND DISCUSSION

General Description of the Bilih Fish Processing Business in Lake Singkarak

The bilih fish processing industry in the Lake Singkarak area has been developed for generations and has become a primary source of livelihood for the lake's coastal communities. The products produced are diverse, including fried bilih, crispy bilih, balado bilih, and dried shredded bilih. These products have a distinctive flavor that attracts tourists and are widely recognized as souvenirs from West Sumatra.

Most of these businesses are members of fishery product processing and marketing groups (POKLAHSAR), which operate independently with limited support from local governments. Production processes remain traditional, using simple tools like large woks, wood stoves, and a natural drying system dependent on weather conditions. Consequently, productivity and product quality are suboptimal.

Additionally, other challenges include unattractive packaging design, minimal product innovation, and weak digital marketing capabilities, which contribute to the low competitiveness of bilih fish products in the modern market. On the other hand, the potential of the culinary tourism market and support from regional policies offer significant opportunities to increase the added value of bilih fish products. Therefore, a comprehensive business development strategy is needed to encourage sustainable local economic growth.

Internal and External Factor Analysis

The results of the identification of internal and external factors were obtained from in-depth interviews with business actors, field observations, and questionnaires distributed to 20 key respondents representing business actors, village officials, and supporting agencies. These factors were then grouped into Strengths, Weaknesses, Opportunities, and Threats.

Table 1. SWOT Analysis of Processed Bilih Fish Products (Mystacoleucus padangensis) in Lake Singkarak

Aspect	Key Factors	Strategic Implications
Strength	1. The taste is distinctive and unique because it comes from fish endemic to Lake Singkarak. 2. The community's social and cultural support for local products is very strong. 3. Raw materials are available locally from local fishermen.	Leveraging the uniqueness of local taste and cultural identity to strengthen product brands and expand market share through local wisdom-based promotions and culinary tourism.
Weakness	1. Processing technology is still traditional. 2. The packaging design is not attractive. 3. Digital promotion and e-commerce utilization are still low.	It is necessary to increase production capacity through training in processing technology, development of modern packaging, and improvement of digital

Aspect	Key Factors	Strategic Implications
		marketing capabilities.
Opportunity	1. Increasing the trend of culinary tourism and ecotourism in the Lake Singkarak area. 2. Government policy support for the development of local resource-based MSMEs. 3. Changes in consumer behavior that tend to choose natural and environmentally friendly products.	Utilizing the momentum of tourism and government policies to expand the product market and develop processed bilih fish products as an icon of the regional blue economy.
Threat	1. Fluctuations in raw material availability due to lake ecosystem degradation and overfishing. 2. Competition with processed fish products from outside the region. 3. Weak protection of geographical indication labels and trademark rights.	Strengthening business institutions through digital cooperatives and legal protection of products through halal certification, PIRT, IPR, and the IG label "Ikan Bilih Danau Singkarak."

Internal Factor Analysis (IFE)

The results of the weighting and assessment of internal factors using the Internal Factor Evaluation (IFE) matrix are presented in the following table.

Table 2. Internal Factor Evaluation (IFE) Matrix

No	Internal Factors	Weight	Score	Value (Weight × Score)
Strength				
1	The taste is distinctive and widely known by the public	0.15	4	0.60
2	High social and cultural support from the community	0.10	3	0.30
3	Raw materials are available locally	0.10	3	0.30
Weakness				
4	Processing technology is still simple	0.15	2	0.30
5	The packaging design is not attractive	0.10	2	0.20
6	Limitations of digital promotion	0.10	1	0.10
Total		**1.00**		1.80

A total IFE score of 1.80 indicates that the business's internal strength is still moderate. This indicates that despite the product's unique taste and strong social support, innovation and technological capacity still need to be improved.

External Factor Analysis (EFE)

External factor analysis was conducted to assess the opportunities and threats that impact business sustainability. The weighted results are presented in the following table.

Table 3. External Factor Evaluation (EFE) Matrix

No	External Factors	Weight	Score	Value (Weight × Score)
Opportunities				
1	The culinary and ecotourism potential of Lake Singkarak	0.20	4	0.80
2	Government support for fisheries MSMEs	0.10	3	0.30
3	Consumer trends towards local and environmentally friendly products	0.10	3	0.30
Threats				

No	External Factors	Weight	Score	Value (Weight × Score)
4	Fluctuations in raw materials due to overfishing and pollution	0.20	2	0.40
5	Competition with substitute products from outside the region	0.20	2	0.40
6	Lack of geographic label protection	0.20	1	0.20
Total		**1.00**		**2.40**

The total EFE score of 2.40 indicates that external opportunities remain substantial. These opportunities stem primarily from culinary tourism trends, government policy support, and increasing consumer awareness of sustainable local products.

Visualization of IFE and EFE Analysis Results

To provide a clearer picture of the internal strength position and external opportunities of the bilih fish processing business, the following is a visualization of the comparison of the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) score results.

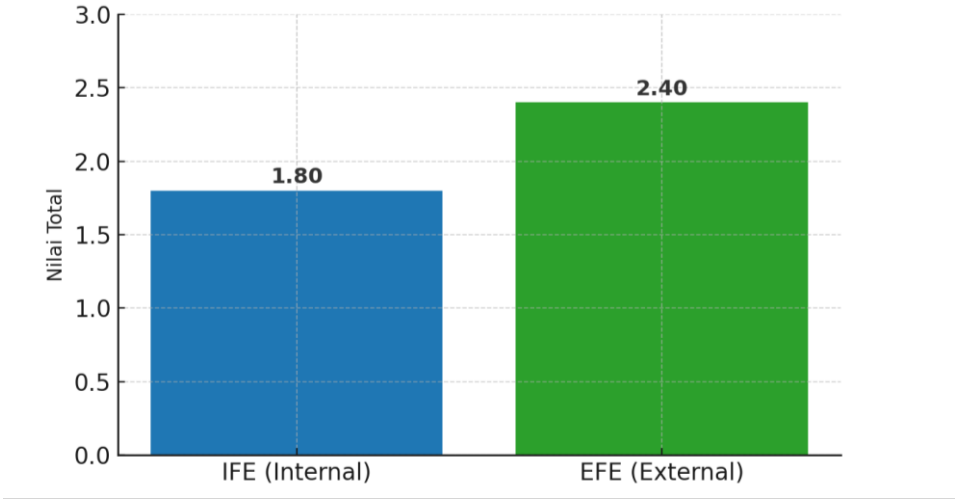

Figure 1. Singkarak Bar Graph of IFE and EFE Values for Bilih Fish Processing Businesses in Lakes

The graph shows that the EFE value (2.40) is higher than the IFE value (1.80), indicating that the bilih fish processing business has greater external opportunities than its internal strengths. This indicates the need for an aggressive growth strategy to strengthen internal capacity through technological innovation, packaging, and digital marketing to optimally utilize external opportunities.

Strategic Business Position Based on SWOT Quadrant

Based on the combined IFE (1.80) and EFE (2.40) values, the bilih fish processing business is positioned in Quadrant I (Aggressive Strategy/Growth Strategy), indicating that the business has significant opportunities and sufficient internal strengths for development. This position encourages the implementation of growth strategies through innovation, digitalization, and strengthening community-based institutions.

Table 4. SWOT Quadrant Matrix of Bilih Fish Processed Products in Lake Singkarak

Strengths	**Opportunities**	**Threats**
	SO (Strength–Opportunity) Strategy: 1. Increase product innovation based on local taste and culture. 2. Develop digital promotion and culinary tourism of Lake Singkarak. 3. Optimize government support in strengthening MSMEs and the blue economy.	ST (Strength–Threat) Strategy: 1. Strengthening legality and product protection through halal certification, PIRT, IPR, and the IG label "Ikan Bilih Danau Singkarak." 2. Maintaining the quality and distinctive taste so as not to be defeated by substitute products from outside the region. 3. Building a regional brand based on cultural and ecological identity.
Weaknesses	WO (Weakness–Opportunity) Strategy: 1. Increasing the capacity of business actors through training in processing, packaging, and digital marketing technology. 2. Collaboration between academics, government, and business actors (triple helix).	WT (Weakness–Threat) Strategy: 1. Establishing digital cooperative institutions to strengthen the supply and distribution chain. 2. Developing a joint production system to maintain the continuity of raw materials. 3. Involving the younger generation in product innovation and promotion.

SWOT Quadrant Visualization

The following image shows the position of the bilih fish processing business in Quadrant I (Aggressive Strategy) in the SWOT diagram, with the X axis representing internal factors (strengths–weaknesses) and the Y axis representing external factors (opportunities–threats).

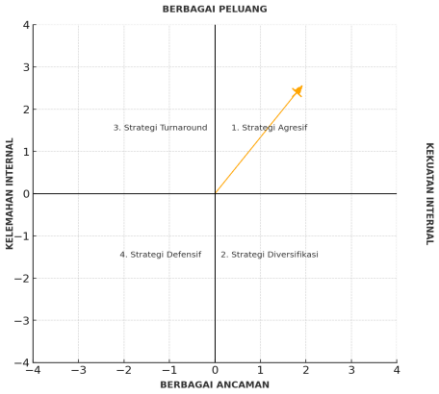

Figure 2. SWOT Quadrant Diagram of Bilih Fish Processing Business in Lake Singkarak

A position in Quadrant I indicates that an aggressive strategy is necessary. The primary focus should be on product innovation, digital promotion, and institutional collaboration (the triple helix) to drive sustainable growth.

Discussion

The SWOT analysis results indicate that the development of processed bilih fish products has great potential to be developed as a superior commodity based on the blue economy in West Sumatra. An aggressive strategy is needed to capitalize on external opportunities such as culinary tourism trends and government policy support. Synergy between the government, academics, and business actors (triple helix) is a key factor in increasing product competitiveness. Local governments need to strengthen regulations, capital facilitation, and promotion, as emphasized by Pasaribu et al. (2025) that adaptive economic policies can increase the efficiency of sustainable natural resource management. Meanwhile, academics play a role in applied research and processing technology innovation. Munthe & Munthe (2024) explain that the blue economy approach functions as an economic recovery strategy that aligns with sustainable development in the marine sector.

From a socio-cultural perspective, community support for local products such as bilih fish strengthens regional identity and economic value. This aligns with Yulisti's (2022) findings regarding the importance of local culinary innovation in sustainable tourism in the Lake Singkarak area. Furthermore, a study by Syaifullah & Hidayah (2024) emphasized that local wisdom and ethnoscience

in the bilih fish fishing tradition contribute to environmental awareness in coastal communities. Ecologically, environmental degradation and anthropogenic activities impact the bilih fish population, as studied by Maestro et al. (2025). Therefore, increasing the capacity for technological innovation and legal protection for products such as halal certification, PIRT, IPR, and the geographical indication label "Ikan Bilih Danau Singkarak" are strategic steps to support sustainability. The implementation of digital innovation and promotion strategies is also aligned with the principles of Sustainable Development Goals (SDGs) 8, 12, and 14, namely sustainable economic growth, responsible consumption and production, and protection of aquatic ecosystems. Thus , the development of the bilih fish business is not only oriented towards increasing economic value, but also maintaining the environmental sustainability of Lake Singkarak as an important ecosystem for the local community.

CONCLUSION

Based on the results of the SWOT analysis of the bilih fish (Mystacoleucus padangensis) processing business in the Singkarak Lake area, it can be concluded that the competitiveness of this business is influenced by internal strengths such as distinctive taste, socio-cultural support from the community, and the availability of local raw materials, but still faces weaknesses in simple processing technology, unattractive packaging design, and low digital promotion. On the external side, there are great opportunities through culinary tourism trends, government policy support for MSMEs, and increasing consumer interest in natural and sustainable products, although threats remain in the form of fluctuations in raw materials, competition from products outside the region, and weak legal protection. The total IFE value of 1.80 and EFE of 2.40 indicates that the business is in Quadrant I (Aggressive Strategy), indicating great development potential with strengthening innovation and production technology.

Suggested development strategies include product innovation and digital promotion based on local culture (SO), increasing the capacity of business actors through training and collaboration (WO), strengthening product legality through certification and IPR (ST), and establishing digital cooperative institutions to maintain supply chains and raw materials (WT). These efforts align with the blue economy concept that balances economic, environmental, and social aspects through a triple helix approach between government, academics, and business actors. Overall, this research supports the achievement of SDGs 8, SDG 12, and SDG 14 through strengthening the local economy, sustainable production, and conserving the Lake Singkarak ecosystem.

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