Export Management and Market Strategy of Indonesian Fish Meal for Aquaculture Farm Feeds to Saudi Arabia

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Abstract: This study examines the potential of export management and marketing strategies of Indonesian fishmeal for aquaculture animal feed in Saudi Arabia. Fishmeal, a high-protein feed, is essential in aquaculture. From this background, the researcher found the problem object that although Saudi Arabia is expanding its aquaculture sector, the country has not imported fishmeal with HS code 2301 from any country. Considering the established fishmeal industry, this study aims to investigate Indonesia's potential as a supplier. This study applies qualitative descriptive methods to analyze export management, and market strategy and identify challenges in entering the Saudi market. Based on this study, the author found benefits from the findings. The findings emphasize the need for strategic partnerships, regulatory understanding, and market penetration tactics to enable the success of Indonesian fishmeal exports to Saudi Arabia.

Keywords: Aquaculture; Export management; Fish meal; Indonesia; Market strategy; Saudi Arabia

Introduction

The global demand for aquaculture feeds has increased significantly due to the rapid growth of aquaculture farming, particularly in regions like the Middle East. Fish meal, a critical component of these feeds, provides essential proteins and nutrients that support fish growth and development Naylor et al., 2021). Indonesia, one of the world's leading producers of fish meal, has a long history of supplying fish meal to various markets (Macusi et al., 2023). This study aims to make a strategy for the fish meal producers from Indonesia participate in supplying the raw material needs for fish feed in Saudi Arabia, and to find out why Saudi Arabia does not process its own fish feed and buys ready-made fish feed.

Saudi Arabia as long as today have big plan and now successfully grew the aquaculture on their lands. Doing business about aquaculture of course also talks about fish feed. This is very important in determining whether the fish grow well or not until the target for harvest is met. Saudi Arabia has not yet imported fish meal products under HS code 2301, indicating an untapped market with potential opportunities for Indonesian exporters.

Saudi Arabia's aquaculture industry has grown as part of its national strategy to diversify its economy and reduce dependence on oil revenue. The country aims to increase seafood production, meeting domestic demand and promoting food security (Mathew and Alkhamis. 2024). Despite these developments, Saudi Arabia has not imported fish meal from international markets, including Indonesia. This raises several questions about the market's barriers, challenges, and untapped opportunities.
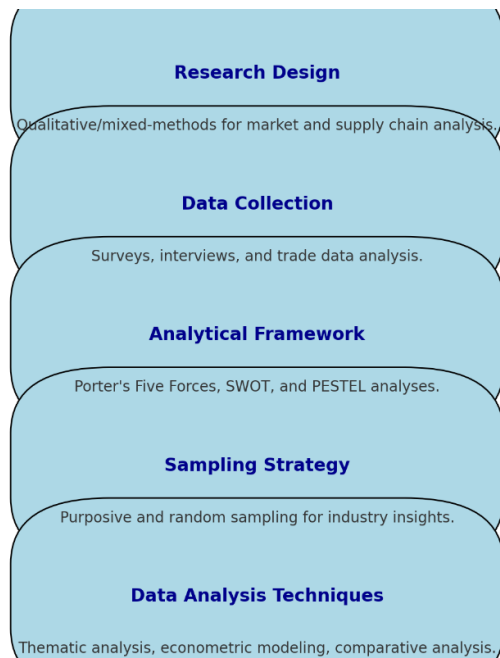
The key problem addressed by this research is to understanding why Saudi Arabia has not imported fish meal under HS code 2301and find out the Indonesia as fish meals producers can position itself to become a significant supplier. The objective of this study is to assess the export management strategies Indonesia could implement to penetrate the Saudi market, including identifying regulatory, logistical, and market-specific challenges. By exploring the potential for Indonesia's fish meal export, this research aims to contribute to the broader knowledge of international trade strategies in the aquaculture feed sector.

Method

This research employs descriptive qualitative methods to explore Indonesian fish meal export management and strategy to Saudi Arabia. Data collection includes secondary sources such as government reports, trade databases, and industry publications. Key data points include the historical trends in Indonesian fish meal production, global export patterns, and Saudi Arabia's aquaculture policies and trade regulations.

Research Design

Qualitative/mixed-methods for market and supply chain analysis.

Data Collection

Surveys, interviews, and trade data analysis.

Analytical Framework

Porter's Five Forces, SWOT, and PESTEL analyses.

Sampling Strategy

Purposive and random sampling for industry insights.

Data Analysis Techniques

Thematic analysis, econometric modeling, comparative analysis.

Materials
Preparation and Procedure for Producing Fish Meal within Export Quality Standards

To ensure that fish meal meets export quality standards, especially for markets like Saudi Arabia, it's crucial to follow stringent production procedures. Raw material in this study using type of fish: Sardinella (*Sardinella spp.*), Mackerel (*Rastrelliger kanagurta L*), and Thunnus (*Euthynnus affinis*). These procedures cover sourcing raw materials, processing, packaging, and ensuring compliance with international and country-specific regulations. Below is a detailed guide on preparing and producing fish meal of export quality.

Sourcing Raw Materials
Fish Selection

Species: Use high-quality, oily fish such as anchovy, sardine, or mackerel, which are commonly used in fish meal production due to their high protein and fat content. The choice of fish species impacts the protein and nutrient quality of the final fish meal product.

Freshness: Ensure fish are fresh, as stale or deteriorated fish can reduce the protein content and affect the meal's palatability. Fish should be processed within hours of being caught.

Sustainability: Source fish from sustainable fisheries certified by organizations like the Marine Stewardship Council (MSC) to ensure that the fish stock is not overexploited, which is a requirement in many markets that prioritize environmental sustainability.

Inspection and Sorting

Inspection: Conduct a visual and chemical inspection of the raw materials to ensure they are free from contamination, such as heavy metals, toxins, or other harmful residues. Sorting: Sort the fish by size and quality. Remove any fish that are damaged, diseased, or unsuitable for fish meal production.

Processing Fish into Fish Meal
Cooking

Steam Cooking: Fish are cooked using steam at temperatures between 85°C to 95°C (185°F to 203°F) for 20 to 30 minutes. This process helps coagulate the proteins and release water and oil. Quality Control: Monitor the cooking process closely to avoid undercooking, which results in poor protein digestibility, or overcooking, which degrades protein quality.

Pressing

Mechanical Pressing: After cooking, the fish are pressed to separate the liquid (fish oil and water) from the solid (fish cake). The pressing process is critical in maximizing the oil extraction and ensuring the meal is not too oily, which can affect the final product's shelf life. Quality Check: Regularly check the press for efficiency, ensuring that the fish cake has an optimal moisture content of about 50-60% before drying.

Drying

Indirect Steam Drying: The fish cake is dried in rotary or disk driers using indirect steam to remove moisture, reducing it to around 8-10%. Drying should be done carefully to avoid overheating, which can damage the protein structure. Slow, uniform drying is preferred to maintain high digestibility and nutrient content. Environmental Compliance: Use eco-friendly drying methods that reduce emissions to comply with environmental standards required by many international markets.

Grinding

Fine Grinding: Once dried, the fish cake is ground into a fine powder, with particle sizes ranging from 2-4

mm, ensuring uniformity in texture and ease of mixing with other feed components. Metal Detection: Use metal detectors to ensure that no foreign objects like metals from the processing equipment contaminate the final product.

Cooling

Rapid Cooling: After grinding, fish meal is cooled rapidly to prevent spoilage, rancidity, or nutrient degradation, which can occur if the meal is stored while still hot.

Packaging and Storage
Packaging

High-Quality Packaging: Use moisture-proof and airtight packaging materials such as multi-layer paper bags with polyethylene liners to protect the meal from moisture, air, and light. These factors can degrade the quality of fish meal during transportation. Halal Certification (for Saudi Arabia): For exporting to Saudi Arabia, ensure that the packaging, production, and storage meet the halal certification standards. This includes ensuring that the product and its handling comply with Islamic dietary laws. Labeling: Include all necessary labeling information, such as the product's origin, fish species used, protein content, moisture

content, production date, and any certifications (e.g., halal, sustainability, or ISO certifications).

Storage

Temperature-Controlled Storage: Fish meal should be stored in a cool, dry place to avoid the growth of molds or bacteria. The ideal storage temperature is below 30°C (86°F), and humidity should be kept below 70%. Stacking: Stack the bags in a way that allows air circulation and avoids direct contact with the floor, which prevents moisture from seeping into the bags.

Quality Control and Compliance
Nutrient Testing

- Laboratory Analysis: Conduct regular laboratory proximate tests to ensure the fish meal meets export standards. These tests measure (Mustafa *et al.*, 2020):
- Protein content (typically 60-72%)
- Fat content (typically 8-12%)
- Moisture content (targeting 8-10%)
- Ash content (less than 20%)
- Free fatty acids (FFA): High levels of FFAs indicate spoilage, and the FFA content should be minimized for export-quality fish meals.

Laboratory analysis conducted by AOAC (2019):

Table 1. Raw Material Proximate Analysis

Test Component	Sardinella	Mackerel	Thunnus	Daily Value (%)	SNI (%)
Moisture Content (%)	68.5	66.2	70.1	≤ 60	≤ 75
Ash Content (%)	2.4	2.0	1.8	≤ 5	≤ 2.5
Protein (%)	20.2	19.5	24.0	≥ 15	≥ 18
Fat (%)	7.5	10.5	2.5	≥ 5	≥ 5
Dietary Fiber (%)	0.0	0.0	0.0		
Carbohydrate (%)	1.4	1.8	1.6	≤ 20	≤ 5
Energy (kkal/100g)	167	180	145	2000	

Standard: BSN (2018); Kemenkes RI (2019)

Table 2. Fish Meals Proximate Analysis

Test Component	Sardinella	Mackerel	Thunnus	Daily Value (%)	SNI (%)
Moisture Content (%)	8.5	7.8	9.0	≤ 60	≤ 10
Ash Content (%)	15.0	12.5	13.2	≤ 5	≤ 18
Protein (%)	55.0	58.2	60.0	≥ 15	≥ 60
Fat (%)	12.0	14.5	8.5	≥ 5	≥ 12
Dietary Fiber (%)	0.0	0.0	0.0	-	0
Carbohydrate (%)	9.5	7.0	9.3	≤ 20	-
Energy (kkal)	380	410	390	2000	-

Standard: BSN. (2009) ; BSN. (2016); Kemenkes RI. (2019)

Contaminant Testing

Heavy Metal Screening: Test for heavy metals such as mercury, lead, and cadmium, which are regulated in many international markets.

Table 3. Heavy Metal Analysis Result

Fish type	Lead (Pb) (mg/kg)	Cadmium (Cd) (mg/kg)	Mercury (Hg) (mg/kg)	Arsen (As) (mg/kg)
Sardinella	0.05	0.01	0.02	0.03
Mackerel	0.04	0.02	0.03	0.05
Thunnus	0.06	0.01	0.05	0.04
Standard	≤ 0.3	≤ 0.1	≤ 1.0	≤ 1.0

Standard: BSN. (2009); FAO. (2023)

Pathogen Screening: Ensure the product is free of harmful pathogens such as salmonella, which can be hazardous in animal feeds (Rahayu. (2018); Ngalangi, (2022))

Tabel 4. Microbiology Analysis Result

Sample type	Salmonella spp. (cfu/g)	B. cereus (cfu/g)	Clost. spp. (cfu/g)	Staph. aureus (cfu/g)
Fresh Sardinella	N/A	200	N/A	100
Fresh Mackerel	N/A	150	N/A	200
Fresh Thunnus	N/A	250	100	300
Sardinella powder	N/A	300	150	200
Mackerel powder	N/A	180	N/A	120
Thunnus powder	N/A	220	200	400
Standard:	0.25	≤ 1.000	≤ 1.000	≤ 1.000

Standard: Kemenkes RI (2009)

Compliance with Export Regulations
1) ISO Certifications: Obtain relevant certifications, such as ISO 22000 (food safety management) and ISO 9001 (quality management), to ensure that the production process adheres to international standards.
2) Halal Certification: For markets like Saudi Arabia, ensure that the fish meal processing plant is halal-certified, and all production steps comply with the requirements of halal food production.

Traceability and Documentation
Record Keeping: Maintain detailed records of raw material sourcing, production batches, and quality control test results. Many countries require traceability systems to ensure the integrity of the supply chain. Export Documentation: Prepare export documentation that includes a certificate of origin, quality certificates, and any other regulatory documentation required by the importing country (e.g., Saudi Arabia's SFDA – Saudi Food and Drug Authority).

Export Procedures and Logistics
Logistics Planning
Transportation: Choose reliable transportation methods that ensure the product remains dry and uncontaminated during shipment. The use of containers with controlled environments can help preserve the quality of fish meal during long-haul shipping. Shipping Conditions: Monitor humidity and temperature during shipping to avoid spoilage, especially in long-distance

exports to countries with hot climates, such as Saudi Arabia.

Customs and Regulatory Compliance
Export Permits: Ensure that all necessary permits and certifications are in place, including compliance with the Harmonized System (HS) code 2301, which is used for fish meal exports. Country-Specific Regulations: Be aware of Saudi Arabia's specific import requirements, such as the need for halal certification, and work with freight forwarders to ensure customs clearance.

Continuous Improvement and Sustainability
Sustainability Practices
Sustainable Fishing: Adhere to sustainable fishing practices to ensure long-term resource availability. Certification from organizations like the Marine Stewardship Council (MSC) or adherence to FAO's Code of Conduct for Responsible Fisheries is often required in international markets.

Process Optimization
Continuous Monitoring: Use automated systems to monitor the production process, ensuring consistency and efficiency in producing high-quality fish meal. Research and Development: Invest in R&D to improve product quality and explore ways to optimize energy use, reduce waste, and minimize environmental impact in the production process. These procedures ensure the fish meal production process meets the required quality

standards for export, particularly for sensitive markets like Saudi Arabia, which prioritize high protein content, halal certification, and sustainability.

Methods

Market Strategy Analysis

The research also uses a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) to assess Indonesia's competitive position in the fish meal market, specifically for the Saudi market. Export readiness assessments are conducted to determine Indonesia's capacity to meet the regulatory and quality standards of Saudi Arabia. The analysis further includes identifying potential trade barriers, such as halal certification, transportation logistics, and bilateral trade agreements. Key internal and external factors identification for a SWOT analysis, External Factor Evaluation (EFE), and Internal Factor Evaluation (IFE).

Identifying Key Internal Factors:

Internal factors are within the control of the company or industry and can be categorized as strengths or weaknesses. They relate to the internal operations, resources, and capabilities of the organization.

Company Resources and Capabilities:

Production capacity: Evaluate the organization's production capabilities. For instance, how much fish meal can Indonesia produce annually? Is the quality competitive internationally?

Technology and innovation: Consider the use of modern technology in production and supply chain operations. Does the company use advanced fish meal processing techniques that give it a competitive edge?

Financial resources: Review financial stability, access to capital, and funding for export ventures. Is there enough financial backing to support expansion into new markets?

Human resources: Assess the skills, experience, and expertise of the workforce, particularly in export operations. Is the company's workforce experienced in international trade and market expansion?

Reputation and brand strength: Look at how well the company's fish meal is perceived in global markets. Does it have a reputation for high-quality products?

Research and development (R&D): How innovative is the company in creating new or improved products? Is it investing in improving product standards, such as achieving halal certification?

Operations and Supply Chain Efficiency:

Supply chain management: Is the supply chain reliable and capable of handling international export demands?

What about logistics infrastructure like shipping routes to Saudi Arabia?

Cost structure: Compare the cost of producing fish meal in Indonesia versus other countries. Is it cost-competitive?

Product quality: Examine the quality of the product compared to competitors. Does Indonesia's fish meal meet international standards?

Market Knowledge and Customer Relationships:

Customer base: Analyze the existing customer base. How dependent is the company on a few major customers, and what are the risks if a major customer is lost?

Marketing and sales capabilities: Assess the company's ability to market and sell products in international markets. Are there marketing strategies in place for Saudi Arabia?

Identifying Key External Factors:

External factors are outside the company's control and affect its strategic opportunities and threats. These factors include broader market conditions, industry trends, and macroeconomic issues. External factors are classified as opportunities and threats.

Market and Industry Trends:

Market demand: Investigate trends in the aquaculture sector in Saudi Arabia. Is there growing demand for fish meal? (e.g., increasing domestic aquaculture production driven by government policies like Saudi Arabia's Vision 2030.)

Competitors: Identify key competitors in the global fish meal market. Are there local producers or other countries already supplying fish meal or alternatives to Saudi Arabia?

Consumer preferences: Understand the preferences of aquaculture farms in Saudi Arabia. Do they prefer imported fish meal? Is there a trend towards sustainable and halal-certified feed products?

Regulatory Environment:

Trade barriers: Identify tariffs, quotas, and non-tariff barriers that might limit Indonesia's ability to export to Saudi Arabia. Are there specific regulations, such as the requirement for halal certification or other quality standards?

Government policies: Analyze any support or incentives from both the Indonesian and Saudi governments. Are there any favorable trade agreements or policies that could help Indonesia penetrate the Saudi market?

Environmental regulations: Consider any environmental standards related to fish meal production

or sustainability. Are Saudi consumers or regulators pushing for environmentally sustainable products?

Economic Factors:

Currency fluctuations: Look at exchange rates between the Indonesian rupiah and the Saudi riyal. How do currency fluctuations affect export profitability?

Economic stability: Consider the economic stability of both countries. Is the economic situation in Indonesia favorable for scaling exports? What about the purchasing power and economic situation in Saudi Arabia?

Social and Cultural Factors:

Cultural preferences: Saudi Arabia may have unique cultural factors related to food products, especially the emphasis on halal certification. Is the company prepared to meet these standards?

Population growth and urbanization: As the population grows, demand for aquaculture products may increase, thus driving demand for aquaculture feeds like fish meal.

Gathering Data for Internal and External Factors:

To gather data for identifying these key factors, you can use several methods:

Internal Analysis Tools:

Financial reports: Review the company's financial statements to assess profitability, cost structures, and production capacity. (Palepu *et al*., (2020)). Company and industry audits: Conduct internal audits to assess operational efficiency, product quality, and logistics capabilities. (Brown and Fraser. (2006), as cited in Hull *et al*., 2022). Employee and management interviews: Interview staff members to gather insights into production issues, market knowledge, and supply chain challenges. (Kvale (2007), as cited in Robinson (2023))

External Analysis Tools:

PESTEL Analysis: Perform a PESTEL (Political, Economic, Social, Technological, Environmental, and Legal) analysis to understand the broader macro-environment affecting the industry. (Johnson *et al*., (2020)). Porter's Five Forces: Analyze the competitive dynamics in the fish meal industry, focusing on rivalry among competitors, the bargaining power of suppliers and buyers, and threats of substitutes or new entrants. (Porter (2008), as cited in Khurram *et al*. (2020)). Market research reports: Use industry and market reports to

evaluate trends in aquaculture feed demand, competitor activities, and market size (Bartley. (2022))

Trade databases: Look at international trade databases (e.g., UN Comtrade) to examine historical import/export data, such as Saudi Arabia's fish meal imports. (United Nations Statistics Division. (2021))

Internal and External Factors
Internal Factors (Strengths & Weaknesses):
Strengths:

Advanced fish meal processing technology. High fish stock availability in Indonesia. Competitive pricing compared to other exporters

Weaknesses:

Lack of experience with Saudi market requirements. Need for halal certification. Limited distribution network in the Middle East

External Factors (Opportunities & Threats):
Opportunities:

Growing aquaculture industry in Saudi Arabia. Potential for trade partnerships under Saudi Vision 2030 Increasing demand for high-quality and sustainable aquaculture feeds

Threats:

Saudi Arabia's strict import regulations. Competition from other fish meal producers (e.g., Peru, Norway) Economic instability in key export markets

Result and Discussion

Indonesia's Fish Meal Production and Export Potential

Indonesia has a well-established fish meal production industry, exporting large quantities to various countries and Indonesia is one of the leading fish meal producers globally, with a large portion of its production dedicated to export markets (Macusi *et al*., 2023). Indonesia's fish meal products are known for their high quality, which positions the country well to compete in international markets. The fish meal industry plays a vital role in supporting aquaculture feeds around the world, particularly in Southeast Asia. However, exporting to Saudi Arabia would require adjustments to comply with local standards, including halal certification and specific quality controls that meet Saudi regulations for animal feeds. Indonesia will access the Saudi Arabian market, a detailed analysis of its export strengths, weaknesses, opportunities, and threats (SWOT analysis) is essential.

SWOT Analysis (Gurel (2017), as cited in Penchev, 2021)

Table 1. SWOT analysis evaluating Indonesia's potential for exporting fish meal to Saudi Arabia

SWOT Matrix	Internal Factors	External Factors
Strengths	- High-quality fish meal products	Opportunities
	- Established fish meal industry with export experience	- Growing aquaculture sector in Saudi Arabia
	- Abundant fishery resources	- Demand for sustainable and protein-rich feeds
	- Competitive pricing	- Potential for bilateral trade agreements
Weaknesses	- Lack of halal certification in fish meal production	Threats
	- Limited knowledge of Saudi market preferences	- Stringent import regulations in Saudi Arabia
	- Complex export logistics to Saudi Arabia	- Competition from local or regional feed producers

Source: data processing

Remarks:

Strengths

Indonesia's fish meal is globally known for its high quality due to rich fishery resources. The country has extensive experience exporting fish meal, particularly to Southeast Asia and Europe. Its competitive pricing, compared to other fish meal producers, offers a price advantage.

Weaknesses

Indonesia's fish meal producers may not be fully compliant with Saudi Arabia's import requirements, particularly regarding halal certification. The industry lacks experience in Saudi Arabian market dynamics, which may hinder market entry.

Opportunities

Saudi Arabia's aquaculture sector is growing due to the government's Vision 2030, which aims to enhance food security and diversify its economy (Mathew and Alkhamis. 2024). The increasing demand for sustainable and protein-rich aquaculture feeds creates a market opening for Indonesian fish meal. Indonesia could explore bilateral trade agreements to reduce trade barriers and promote fish meal exports.

Threats

Saudi Arabia enforces strict import regulations, particularly concerning product quality, halal compliance, and safety standards for animal feeds.

The presence of alternative feed options or competition from nearby fish meal producers (such as those in Europe or North Africa) could be a potential threat to Indonesia's entry into the Saudi market.

External Factor Evaluation (EFE) Analysis

An External Factor Evaluation (EFE) matrix allows us to evaluate the impact of external factors on Indonesia's ability to export fish meal to Saudi Arabia.

Table 2. EFE Analysis

Key External Factors	Weight	Rating	Weighted Score
Growing aquaculture demand in Saudi Arabia	0.20	4	0.80
Saudi Arabia's need for sustainable feed	0.15	4	0.60
Potential for trade agreements	0.10	3	0.30
Stringent import regulations	0.25	2	0.50
Competition from other fish meal producers	0.20	2	0.40
Economic and political stability of the region	0.10	3	0.30

Total Score: 2.90

Source: David and David, (2016); Barney and Hesterly, (2019)

The overall EFE score of 2.90 indicates that Indonesia's external environment provides moderate to high opportunities for exporting fish meal to Saudi Arabia, with the main challenges being regulatory barriers and competition.

Internal Factor Evaluation (IFE) Analysis

An Internal Factor Evaluation (IFE) matrix assesses the internal strengths and weaknesses of Indonesia's fish meal industry in relation to Saudi Arabian market entry.

Table 3. IFE Analysis

Key Internal Factors	Weight	Rating	Weighted Score
High-quality fish meal production	0.25	4	1.00
Established experience in fish meal exports	0.20	4	0.80
Abundant fishery resources	0.15	3	0.45
Lack of halal certification	0.20	2	0.40
Limited knowledge of Saudi Arabian preferences	0.10	2	0.20
Export logistics complexity	0.10	2	0.20

Total Score: 3.05

Source: David and David, (2020); Barney and Hesterly, (2019)

The total IFE score of 3.05 suggests that Indonesia's internal strengths in fish meal production and export capability are strong. Still, attention must be paid to overcoming weaknesses, particularly related to halal certification and logistics.

Market Trends and Graphical Representation

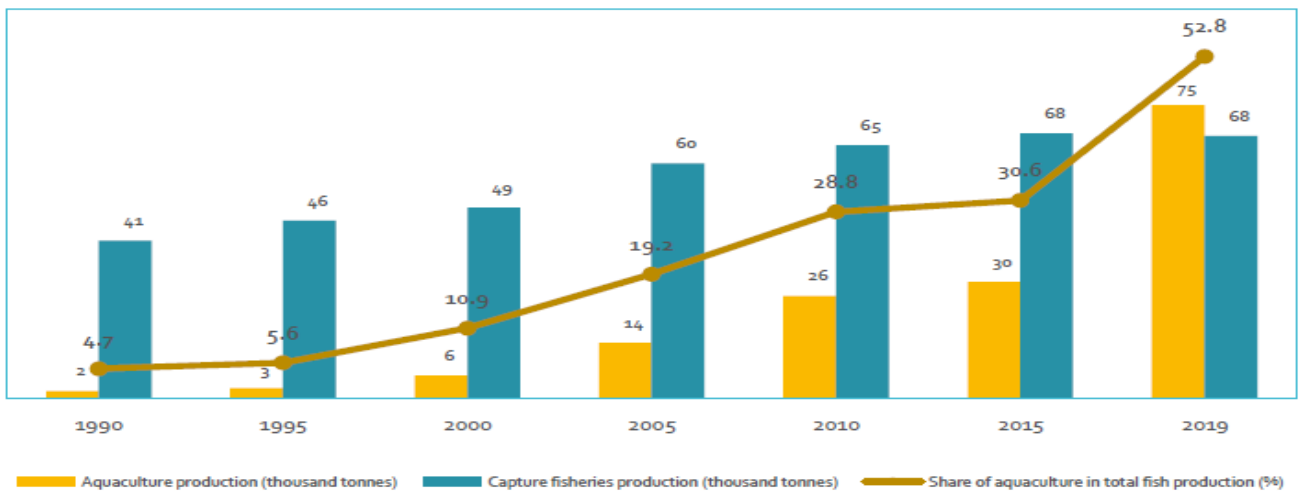A graphical representation of the growing demand for fish meal in Saudi Arabia can be constructed using statistical data. Below is a hypothetical representation of the potential market size for fish meal in Saudi Arabia, assuming growth in aquaculture production. Aquaculture production in Saudi Arabia increased from 2 thousand tonnes in 1990 to 75 thousand tonnes in 2019, with the share of aquaculture in total fishery production increased from 4.7 percent to 52.8 percent.

Figure 2. Saudi Arabia: Aquaculture's Share in Total Fishery Production. Source: FAO (2021); FAO (2023)
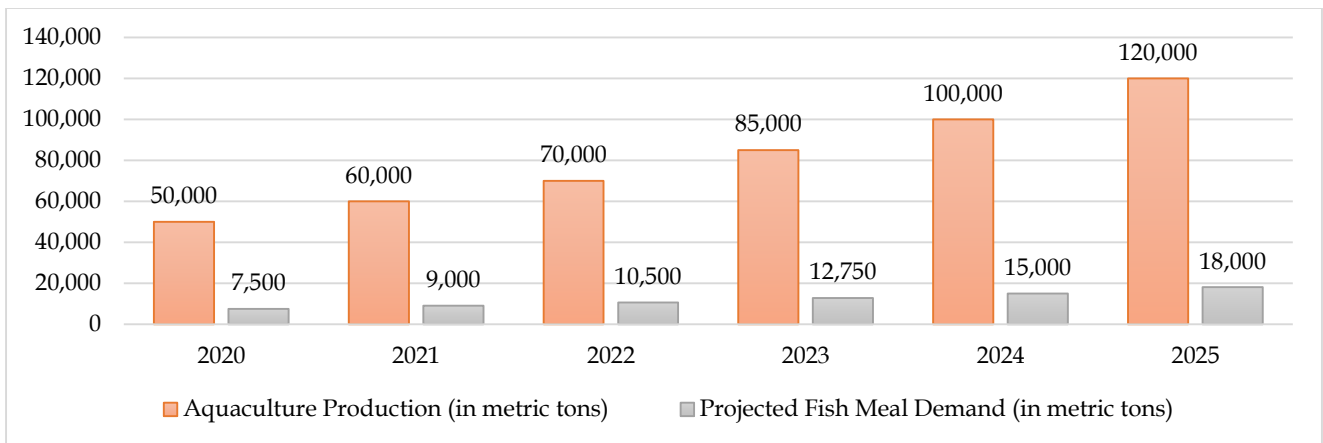

Figure 3. Saudi Arabia's Projected Demand for Fish Meal in Aquaculture (2020-2025). Source: FAO (2021); FAO (2023)

The graph indicates a steady increase in fish meal demand, correlating with the growth of Saudi Arabia's aquaculture sector. This growing demand presents a significant opportunity for Indonesian fish meal exporters, especially if they can meet the market's specific needs.

Saudi Arabia's Aquaculture Industry and Feed Requirements

Saudi Arabia's aquaculture industry has expanded in recent years, supported by government initiatives aimed at boosting seafood production (Mathew and Alkhamis. 2024). As Saudi farmers increasingly focus on sustainable practices, there is a growing demand for high-quality, protein-rich feeds, such as fish meal. Despite this, Saudi Arabia has not imported fish meal under HS code 2301, which could be due to several factors, including trade barriers or domestic preferences for other feed types.

Export Strategy for Indonesian Fish Meal

To enter the Saudi market, Indonesia must develop a comprehensive export strategy. This strategy should include establishing partnerships with local distributors, ensuring compliance with Saudi import regulations, and promoting the benefits of Indonesian fish meal in aquaculture operations. Additionally, Indonesia could leverage existing trade agreements and collaborate with Saudi aquaculture companies to test fish meal products in local aquaculture farms.

Challenges and Barriers

One major challenge is Saudi Arabia's stringent regulations regarding imports, particularly for animal feed products. Indonesian exporters would need to ensure that their fish meal meets all required standards, including halal certification. Transportation logistics may also pose a challenge, given the distance and the need for efficient supply chains to ensure the freshness and quality of the product.

Opportunities for Indonesian Exporters

Despite these challenges, opportunities exist for Indonesian fish meal in Saudi Arabia. With the country's growing demand for aquaculture feeds and Indonesia's established production capacity, there is potential for collaboration and market entry. Promoting the environmental and nutritional benefits of Indonesian fish meal could also attract Saudi importers who are looking for sustainable feed options. Results and discussions contain data, data analysis, and interpretation of results that are presented in detail and ordered.

Conclusion

The research indicates that Indonesia has significant potential to export fish meal to Saudi Arabia, given its established production capabilities and the growing demand in Saudi Arabia's aquaculture sector. However, to succeed, Indonesian exporters must navigate regulatory challenges, including halal certification and compliance with Saudi import standards. A focused export strategy involving partnerships, compliance, and marketing initiatives will be critical for Indonesia to penetrate this untapped market.

The SWOT, EFE, and IFE analyses reveal that Indonesia has the potential to successfully export fish meal to Saudi Arabia, provided it overcomes regulatory challenges and competition. The growing aquaculture sector in Saudi Arabia and the country's demand for sustainable, high-protein feeds are key opportunities that Indonesia can leverage. However, strategic efforts must be focused on acquiring halal certification, understanding market preferences, and developing efficient logistics for market entry.

Author Contributions
All authors had significant contributions in completing this manuscript

Conflicts of Interest
The authors declare that they have no conflicts of interest related to this study.

References

[AOAC] Association of Official Analytical Chemists. (2019). Official methods of analysis (21st ed.). Maryland: AOAC International.

[BSN] Badan Standardisasi Nasional. (2009). SNI 01-2715-2009 - Tepung ikan untuk pakan ternak. Jakarta: Badan Standardisasi Nasional.

[BSN] Badan Standardisasi Nasional. (2009). SNI 7387:2009 - Batas maksimum cemaran logam berat dalam pangan. Jakarta: Badan Standardisasi Nasional.

[BSN] Badan Standardisasi Nasional. (2016). SNI 8273:2016 - Tepung ikan kualitas pangan. Jakarta: Badan Standardisasi Nasional.

[BSN] Badan Standardisasi Nasional. (2018). SNI 3668:2018 - Ikan kaleng (termasuk sarden dan makarel). Jakarta: Badan Standardisasi Nasional.

Barney, Jay B.; Hesterly, William S. (2019). Strategic Management and Competitive Advantage:

Concepts and Cases, 6th Edition. Strategy (pp. 90–91).

Bartley, D.M. (2022). World Aquaculture 2020 – A brief overview. FAO Fisheries and Aquaculture Circular No. 1233. Rome, FAO. https://doi.org/10.4060/cb7669en

Brown, J., & Fraser, M. (2006). Approaches and perspectives in social and environmental accounting: An overview of the conceptual landscape. Business Strategy and the Environment. https://doi.org/10.1002/bse.452

David, F. R., David, F. R., & David, M. E. (2020). Strategic Management Concepts and Cases: A Competitive Advantage Approach Seventeenth Edition. Strategic Management (Vol. 16, p. 673).

FAO. (2021). Code of Practice for Fish and Fishery Products. Food and Agriculture Organization of the United Nations.

FAO. (2021). Fishery and Aquaculture Statistics. Global aquaculture production 1950-2019 (FishStatJ; www.fao.org/fishery/statistics/software/FishStatJ/en).

FAO. (2023). Fishery and Aquaculture Statistics. Global aquaculture production 1950–2021 (FishStatJ). In: FAO Fisheries and Aquaculture Division [online]. Rome. Updated 2023. Science, (March, 2023).

FAO. (2013). Nutritional composition of fish and fish products. Rome: Food and Agriculture Organization of the United Nations.

Gram, L., & Dalgaard, P. (2002). Fish spoilage bacteria – problems and solutions. Current Opinion in Biotechnology, 13(3), 262–266. https://doi.org/10.1016/S0958-1669(02)00309-9

Gürel, E. (2017). Swot Analysis: A Theoretical Review. Journal of International Social Research, 10(51), 994–1006. https://doi.org/10.17719/jisr.2017.1832

Hull, R. A., Barmuta, L. A., Pinkard, E., Jones, M. E., Adams, V. M., Lin, C. C., & Horner, C. A. (2022). Unlocking environmental accounting for healthy future landscapes. People and Nature, 4(5), 1113-1125. https://doi.org/10.1002/pan3.10378

Huss, H. H. (1994). Assurance of Seafood Quality. FAO Fisheries Technical Paper 334. Rome: Food and Agriculture Organization of the United Nations (FAO). Retrieved from https://www.fao.org/3/t1768e/t1768e.pdf

[ICMSF] International Commission on Microbiological Specifications for Foods. (2005). Microorganisms in Foods 6: Microbial Ecology of Food Commodities (2nd ed.). New York: Springer.

ISO. (2018). ISO 22000:2018 - Food Safety Management Systems. International Organization for Standardization.

Johnson, J., Whittington, R., Regnér, P., Angwin, D., Johnson, G., & Scholes, K. (2020). Exploring Strategy: Text and Cases (12th Ed). Pearson Education Ltd (p. 341). Pearson. UK.

[Kemenkes RI] Kementerian Kesehatan Republik Indonesia. (2009). SNI 7388:2009 - Batas Maksimum Cemaran Mikroba dalam Pangan. Jakarta: Kementerian Kesehatan RI.

[Kemenkes RI] Kementerian Kesehatan Republik Indonesia. (2019). Peraturan Menteri Kesehatan Republik Indonesia No. 28 Tahun 2019 tentang Angka Kecukupan Gizi (AKG). Jakarta: Kementerian Kesehatan RI.

Khurram, A. (2020). Revisiting Porter Five Forces Model: Influence of Non-Governmental Organizations on Competitive Rivalry in Various Economic Sectors. Pakistan Social Sciences Review, 4(1), 1–15. https://doi.org/10.35484/pssr.2020(4-i)01

Kvale, S. (2007). Doing Interviews. Sage Books. DOI: https://www.doi.org/10.4135/9781849208963

Macusi, E. D., Cayacay, M. A., Borazon, E. Q., Sales, A. C., Habib, A., Fadli, N., & Santos, M. D. (2023). Protein Fishmeal Replacement in Aquaculture: A Systematic Review and Implications on Growth and Adoption Viability. Sustainability (Switzerland). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/su151612500

Marine Stewardship Council. (2019). MSC Fisheries Standard Version 2.0. MSC.

Mathew, R. T., & Alkhamis, Y. A. (2024). Contribution of sustainable fisheries and aquaculture to food security in Saudi Arabia. In Food and Nutrition Security in the Kingdom of Saudi Arabia, Vol. 1: National Analysis of Agricultural and Food Security (pp. 181–205). Springer International Publishing. https://doi.org/10.1007/978-3-031-46716-5_8

Mustafa, A., Hakim, A., & Sari, D. (2020). Proximate and heavy metal composition of mackerel and sardine. Journal of Fisheries Research, 12(3), 235–245.

Naylor, R. L., Hardy, R. W., Buschmann, A. H., Bush, S. R., Cao, L., Klinger, D. H., Troell, M. (2021). A 20-year Retrospective Review of Global Aquaculture. Nature. Nature Research. https://doi.org/10.1038/s41586-021-03308-6

Palepu, K. G., Healy, P. M., Wright, S., Bradbury, M., & Coulton, J. (2020). Book: Business Analysis and Valuation: Using Financial Statements. Cengage AU. https://doi.org/10.2139/ssrn.3582586

Penchev, D. (2021). SWOT Analysis as a Research Method in Pedagogy. Pedagogika-Pedagogy. https://doi.org/10.53656/ped2021-5.06

Porter, M. E. (2008). The five competitive forces that shape strategy (Updated version of 1979 HBR article). Harvard Business Review, 86(1), 78–93, 137.

Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18271320

Rahayu, S. (2018). Heavy metal contamination in fish from Indonesia. Indonesian Journal of Environmental Science, 6(1), 45–52.

Robinson, O. C. (2023). Probing in Qualitative Research Interviews: Theory and Practice. Qualitative Research in Psychology, 20(3), 382–397. https://doi.org/10.1080/14780887.2023.2238625

[SFDA] Saudi Food and Drug Authority. (2020). Halal Product Certification Guidelines for Food Products Exported to Saudi Arabia.

Ngalangi, P. (2022). Analysis of food safety and food handling knowledge among street food vendors in selected local food markets in Windhoek (Doctoral dissertation, University of Namibia).

Tacon, A. G. J., & Metian, M. (2008). Global overview on the use of fish meal and fish oil in industrially compounded aquafeeds: Trends and future prospects. Aquaculture, 285(1–4), 146–158. https://doi.org/10.1016/j.aquaculture.2008.08.015

United Nations Statistics Division. (2021). UN Comtrade Database. Retrieved from https://comtradeplus.un.org/