

Fish Oil Shortage & Price Volatility: Implications for Aquaculture & Nutraceutical Industries

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Abstract: *This whitepaper explores the escalating challenges surrounding the global supply of fish oil and its impact on the aquaculture and nutraceutical industries. The increasing demand for fish oil in nutraceuticals, combined with the precarious supply situation, has led to price inflation, prompting the substitution of fish oil with vegetable oils in aquaculture feeds. This substitution raises concerns about the reduced content of omega-3 fatty acids in aquaculture products, particularly salmon, and its potential health implications. Fish oil remains a primary source of fish oil for the omega-3 dietary supplement industry. This cancellation of the fishing season has further exacerbated the supply situation, with implications for both sustainability and pricing in the industry. In the whitepaper, we also examine the recent developments in the fish oil market, particularly its shortage, volatility, implications on price, and availability. We will also discuss the demand and supply of fish oil and the current environment surrounding the industry.*

Keywords: Fish oil, Aquaculture, Nutraceuticals, Omega-3 fatty acids, Price inflation, Substitution, Consumer demand, Fisheries, Aquaculture production, Economic factors, Consumer preferences, Edible oils market, Global supply, Sustainability, Price volatility, Fishmeal, Responsible sourcing, Production standards, Mesopelagics

1. Introduction

The global fish oil industry finds itself at a crossroads, grappling with a confluence of challenges as it navigates through 2024. Fish oil, renowned for its rich content of omega-3 fatty acids (n-3 LC-PUFA), has long enjoyed recognition for its multifaceted health benefits. It plays a crucial role in human nutritional supplements, particularly in the rapidly growing nutraceutical sector, which has surged in recent years.

However, the ascendancy of fish oil's reputation has triggered a cascade of ramifications. The burgeoning demand for fish oil in the nutraceutical sector, coupled with an increasingly unpredictable supply chain, has wrought a sharp escalation in fish oil prices. This surge in prices, in turn, has compelled the aquaculture industry to seek viable alternatives, with vegetable oils emerging as a potential substitute.

A. Consumer Demand: A Major Challenge in 2023

In the early stages of 2023, consumer demand remained robust, highlighting the unwavering appeal of fish oil and its associated health benefits. However, as we move forward into 2024, the industry faces a rather pressing challenge: the changing dynamics of consumer demand.

The fisheries and aquaculture production for 2023 portrayed a delicate balance. A marginal uptick of 0.6 percent compared to 2022 was observed, primarily bolstered by the resilient growth in the aquaculture sector, which compensated for a slight decline in wild catches. The aquaculture sector's projected growth rate for 2023 stands at approximately 2.8 percent, a rate slightly below the sector's historical average. The growth of species such as salmon and tilapia has decelerated, while others like pangasius and shrimp are on a trajectory of progressive expansion.

Challenges are also emerging on the cost front, notably the increasing production costs, particularly for feed. These escalating costs are exerting pressure on the profitability of numerous farmers, further focusing on the complex dynamics in the industry.

B. Consumer Preferences & Market Growth

The industry is not devoid of external influences, particularly on the consumer front. Concerns over potential economic downturns are gradually subsiding, but inflation and sluggish economic growth continue to constrain consumers' disposable incomes. This, in turn, has contributed to a noticeable slowdown in the growth of demand for aquatic products.

Furthermore, there is a very noticeable shift in consumer product preferences. Affordable farmed fish are gaining favor, while the appeal of increasingly pricey wild-caught whitefish is waning. These evolving consumer preferences are reshaping the market and prompting the industry to adapt.

In this rapidly evolving landscape, the fish oil industry is not an isolated entity. It is intricately connected to broader economic factors, consumer behaviors, and global market trends. As we delve deeper into this whitepaper, we will explore the far-reaching implications of these dynamics on the fish oil sector, aquaculture, and nutraceutical industries. It is a critical juncture, and how the industry responds will shape its trajectory in the years to come.

2. Projections for the Edible Oil Industry - Particularly the Fish Oil Market

Projections indicate a modest decrease of approximately 1.6 percent in production from capture fisheries in 2023. This decrease can be attributed to adverse weather conditions and reduced quotas, leading to limited catches of several crucial

species. Anchoveta catches, which already witnessed a decline of around 1 million tones between 2021 and 2022, are anticipated to drop further in 2023, driven by ongoing poor catches and the potential occurrence of an El Niño weather phenomenon in the latter half of the year.

Price dynamics continue to be a significant influence on the industry. The FAO Fish Price Index, which began at 122 points in early 2023, surged to 130 points in April, approaching the previous peak recorded in June of the preceding year. This upward price trend is anticipated to sustain the value of global trade in aquatic products at levels surpassing previous years. Notably, the price gap between

capture and aquaculture species has widened to 35 points, with specific groundfish and tuna species reaching record highs.

In the broader context, the Edible Oils market represents a substantial segment of the global economy. In 2023, this market recorded revenue of US\$117.10 billion. What is particularly noteworthy is the anticipated growth trajectory; the market is expected to expand annually by 6.72% during the period of 2023-2028. This indicates not only the financial magnitude but also the dynamic nature of the industry, where innovation and adaptation are key drivers.

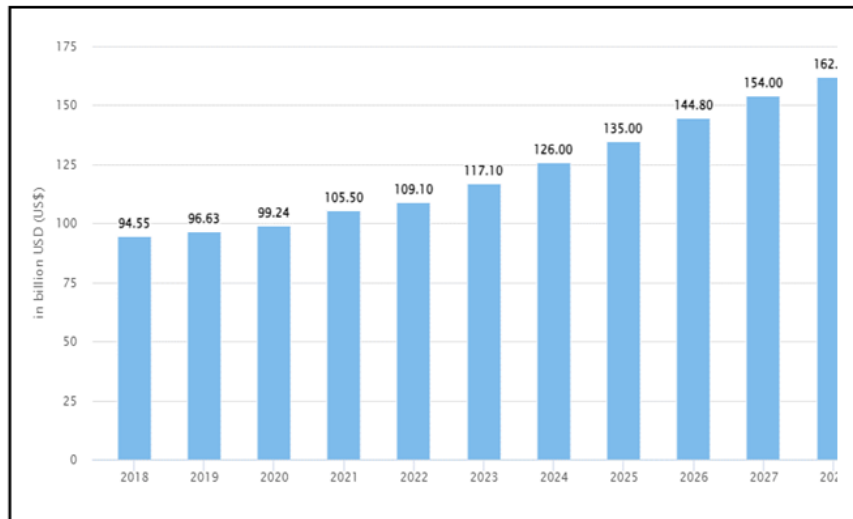


Figure 1: Revenue Growth of the Edible Oils Industry from 2018-2028

On the global stage, India takes center stage as the leading revenue generator, with an impressive figure of US\$32, 780 million in 2023. This underlines the sheer scale of the market and the diversity of consumers' preferences.

In relation to total population figures, per capita revenues paint an interesting picture, with each person contributing an average of US\$15.24 to the Edible Oils market's coffers in 2023. This metric signifies not only the economic impact of the industry but also the extent to which edible oils are woven into the fabric of daily life.

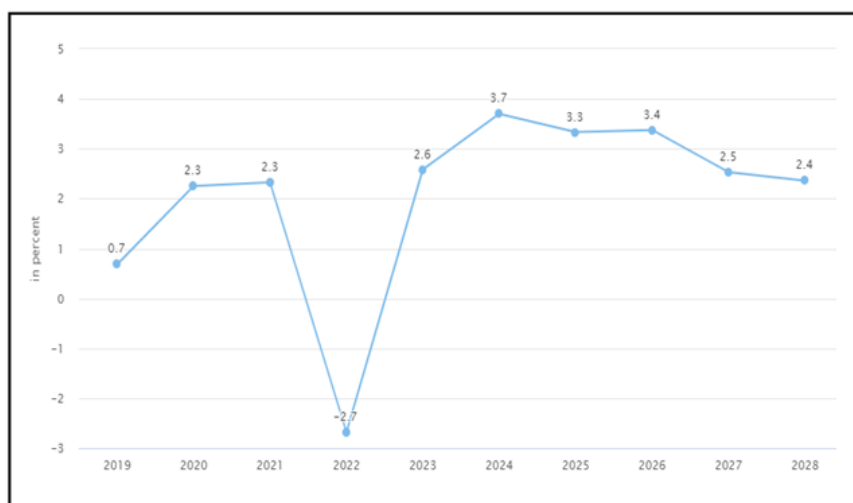


Figure 2: Volume Change in Edible Oils Consumer Demand

The volume dimension of the Edible Oils market further showcases its significance. By 2028, the market is expected to reach a staggering 28.60 billion kilograms in volume. The

year 2024 is poised for a notable volume growth of 3.7%, reflecting the market's resiliency and adaptability.

The average volume per person in the Edible Oils market is another noteworthy statistic, with an expected average of 3.20 kilograms per person in 2023. This figure reveals the ubiquity of edible oils in culinary practices and the range of culinary traditions worldwide. The average price per unit of edible oils, including fish oils, has increased from \$4.04 in 2018 to \$4.76 in 2023. By 2028, it is expected to reach \$5.67. Although fish oil price is rather volatile, the cost of soybeans, sunflower seeds, and other oil-generating seeds is relatively stable and affordable. The presence of alternative is a primary reason why this upward trend is steady. However, the growth trend did see an uptick in 2020, as COVID-19 lockdowns came into effect.

3. How is Aquaculture Propelling Growth in This Market?

Crucially, aquaculture is poised to be a primary driver of growth in the edible oils market, particularly in the fish oil segment. The production of fish oil is anticipated to grow moderately in the coming years, primarily due to better utilization of by-products from the fish processing industry and the burgeoning development of alternative raw material sources, including krill, algae, and insects. The expanding aquaculture industry plays a critical role in this scenario, propelling the demand for fish and animal feed additives in the future.

According to the Organization for Economic Co-operation and Development (OECD), aquaculture's contribution to global fish production is on a trajectory to surpass that of fisheries by 2024. This maintainable intensification of aquaculture is expected to unlock new opportunities for the growth of the fishmeal and fish oil market.

The expansion of the retail market, coupled with changes in consumers' food consumption patterns, is also expected to augment the growth. Simultaneously, the high demand for fish in the dietary nutrition industry, particularly for the production of omega-3 supplements, holds significant potential to bolster the fish oil omega-3 market.

However, the industry does face challenges; including the rising utilization of substitute feed ingredients and concerns regarding microbial contamination of aqua feed. Aquaculture is increasingly exploring alternative sources of proteins for animal feed, which may present potential roadblocks for the fishmeal and fish oil market.

4. Comparative View of Fishmeal & Fish Oil Market

To gain a holistic understanding, it is essential to consider the comparative view of the fishmeal and fish oil market alongside related markets.

1) Fishmeal & Fish Oil Market:

This market is projected to exhibit a commendable Compound Annual Growth Rate (CAGR) of 5.8% from 2023 to 2033. With an estimated market value of US\$8.76 billion by 2026, this market is poised for significant growth.

The rising consumer awareness for the use of omega-3 fatty acid consumption is a key growth factor, as fishmeal finds increasing use in fertilizers and animal feed for livestock and aquaculture.

2) Algae Omega Market:

The market for algae omega is expected to experience substantial growth, with a CAGR of 53% from 2023 to 2033. This segment is projected to reach a market value of US\$1.33 billion by 2026. The growing dietary consciousness of millennials and Generation Z is a driving factor in this market's expansion.

3) Fish-based Pet Food Market:

The market for fish-based pet food is set for notable growth, with a CAGR of 43% from 2023 to 2033. This market is expected to reach a market value of US\$12.11 billion by 2026. There is an increasing trend of awareness when it comes to the nutritional values of food ingredients are the key factors driving the demand for fish-based pet food.

C. Category-Wise Insights

Within the fishmeal and fish oil market, it is crucial to examine category-wise insights to gain a more detailed perspective.

1) Strong Supply & Demand of Salmon and Trout:

Salmon and trout are leading the segment with a growth rate of 5.6%. These species are popular sources of fishmeal and fish oil, particularly in salmon and trout feed. The global demand for Atlantic salmon, coho, and trout, as well as wild salmon species, remains stable in both traditional and emerging markets. The increase in supply growth, notably in farmed Atlantic salmon, has been observed for several consecutive years, driven by strong demand and supply growth.

2) Numerous Benefits associated with Fish-based Supplements:

Fish oil and fishmeal find substantial application in the pharmaceutical sector, particularly as raw materials for medicines and antibiotics. These products are increasingly used to treat a range of health issues, including mental illnesses. The gradual increase in consumer purchasing power and the subsequent focus on family health and well-being are further supporting market growth.

D. Regional Analysis

The geographic distribution of the fishmeal and fish oil market holds valuable insights for understanding its dynamics and growth potential.

1) United States:

The United States is anticipated to contribute a significant US\$4.6 billion by 2033, driven by favorable economic and political policies. Government support, particularly within

the country's Exclusive Economic Zone (EEZ), where it controls marine natural resources, has paved the way for the development of fish meals and fish oil. The vast area under the EEZ presents substantial opportunities for the marine industry, contributing to the expansion of the country's fish meal and fish oil markets.

2) United Kingdom:

The United Kingdom has demonstrated notable growth at 4.9%. Factors such as increased pet adoption and the rising trend of pet humanization have contributed to awareness regarding pet animal health and nutrition. The region is also experiencing significant growth in the aquaculture and pharmaceutical industries, both of which are critical markets for fishmeal and fish oil.

3) Asia Pacific:

The Asia Pacific region is expected to maintain its dominance in the fishmeal and fish oil market. In 2019, China consumed 34% of the world's fishmeal, while the rest of Asia consumed 35%. The region's market share is influenced by multiple factors, including an aging population and increased awareness of livestock health and nutrition, which drives demand for fishmeal and fish oil. Additionally, the presence of significant fishmeal and fish oil manufacturing companies has further supported the region's growth.

5. Price Volatility in the Fishmeal & Fish Oil Market

Price volatility is a prevalent and often challenging aspect of the fishmeal and fish oil market, influenced by a combination of factors including climate conditions, market forces, and consumer demand. Understanding the dynamics of price volatility is essential for industry stakeholders to navigate the market effectively.

E. Climate-Driven Volatility:

Like other natural feed ingredients, fishmeal and fish oil are highly dependent on climate conditions. Changes in weather patterns can have both positive and negative impacts on the supply of these natural ingredients. This dependency on climate conditions contributes to fluctuations in their equilibrium prices.

Price volatility in the fishmeal and fish oil market can be attributed to the unpredictable nature of climate-related factors, such as ocean temperatures, currents, and the availability of fish stocks. These factors directly affect the quantity of fishmeal and fish oil that can be produced.

F. Market Forces and Long-Term Price Inflation:

Market forces also play a significant role in causing price inflation over an extended period for goods with tight profit margins and robust demand. This holds true for natural feed ingredients, including fishmeal and fish oil, which have experienced nominal price growth over time.

The inflationary trends in the fishmeal and fish oil market are a reflection of the increasing demand for these products, particularly in the aquafeed and dietary supplement industries. As the market expands and consumer awareness of the health benefits of fish-based supplements grows, prices tend to rise.

G. Graphical Representation of Price Evolution:

The figure below showcases a visual representation of the price evolution in the fishmeal and fish oil market over the past two decades. The prices are rebased, with January 2002 as the reference point (100), and the current prices are indicated.



Figure 3: Price Evolution in the Fishmeal and Fish Oil Market

The graph clearly illustrates the inflationary trends in both fishmeal and fish oil prices over this period. It is important to note that these inflationary trends are not unique to these ingredients but are common in all natural feed ingredients.

The graph also estimates price volatility, commonly measured by the Standard Deviation, over the same period. This data demonstrates that fluctuations around the mean price are inherent to all natural ingredients.

H. Stability in Volumes and Nutritional Profile:

Fishmeal and fish oil are indispensable components of aquafeeds, providing essential nutrients for farmed fish. The stability in volumes offered over the last decade has been a key factor in their continued use.

On average, one million metric tons of fish oil and five million metric tons of fishmeal are supplied, offering a reliable source of nutrition for aquaculture. The high nutritional value of fishmeal and fish oil, combined with the stability in their production volumes, makes them preferred choices for feed producers.

I. Responsible Sourcing & Production:

Increasingly, the market demands sustainability credentials related to responsible sourcing and production. Notably, 50% of the global supply is now certified against the MarinTrust standard, which ensures that marine ingredients are sourced from fisheries practicing best sustainability practices.

Certification includes adherence to effective fishery management, compliance with national regulations, and environmental responsibility regarding emissions, discharge, and pollution. It is underpinned by international labor and social regulations.

For regions not yet certified, fishery improvement projects offer a path to improved fisheries management through collaboration with local stakeholders, businesses, and international organizations. An example is the progress made in Thailand through the MarinTrust Improver Program.

J. Use of By-Products:

The use of by-products from fish processing, such as trimmings, has become a significant driver of sustainability in the industry. Currently, approximately thirty percent of the global supply of fish meat and fish oil is produced from by-products.

Technologies for recovering and enhancing the yield of these raw materials are advancing, and by 2030, an estimated thirty-five percent of the global supply is expected to come from by-products, according to the FAO.

In regions like Vietnam, fifty percent of fishmeal and ninety percent of fish oil come from by-products, highlighting the promising potential of this approach.

K. New Horizons and Alternative Raw Materials:

Change and innovation in the industry may also arise from alternative raw materials like krill and mesopelagics. The sustainable practices in the krill industry, where catch limits are restricted to protect stocks, serve as a model for what could be achieved with mesopelagics.

6. Conclusion

The global fish oil industry is navigating a complex and evolving landscape. The rapid rise in demand for fish oil in the nutraceutical sector, fueled by its well-acknowledged health benefits, has brought about a surge in prices, subsequently prompting the aquaculture industry to explore alternative feed ingredients like vegetable oils. This transformation has far-reaching consequences, particularly for the omega-3 content in aquaculture products and, notably, the health implications for consumers.

There are several key factors and trends influencing the industry:

- **Consumer Demand & Aquaculture Growth:** The aquaculture sector plays a central role in shaping the dynamics of the fish oil industry. It has experienced steady growth, compensating for the modest decline in wild catches. Aquaculture is central to the growing demand for fishmeal and fish oil, not only due to its nutritional advantages but also the stable supply volumes it has provided over the years.
- **Projections & Price Trends:** Projections indicate fluctuations in capture fisheries production, driven by various factors including adverse weather conditions and reduced quotas. The price dynamics in the industry have been significant, with the price gap between capture and aquaculture species widening. The global edible oils market has shown robust growth and is expected to continue expanding.
- **Market Segments:** The fishmeal and fish oil market is dynamic, with various applications, and regional analyses reveal significant contributions from the United States, the United Kingdom, and the Asia Pacific. Other related markets, such as algae omega and fish-based pet food, show substantial growth.
- **Price Volatility:** Price volatility remains a common challenge due to climate-driven factors, market forces, and consumer demand. The fish oil market is highly sensitive to climate conditions, leading to fluctuations in supply and pricing. However, this trend is not unique to fish oil but is an inherent feature of natural feed ingredients.
- **Sustainability & By-Products:** The industry increasingly demands sustainability credentials, with 50% of the global supply now certified against the MarinTrust standard. By-products, such as trimmings, are a driving force of sustainability, contributing significantly to the global supply of fishmeal and fish oil. Technologies for enhancing yields from by-products are advancing, promising future sustainability.
- **New Horizons:** The industry's future holds promise with the exploration of alternative raw materials like krill and mesopelagics, which demonstrate the potential for sustainable practices and responsible sourcing.

The fish oil industry stands at a critical juncture, where consumer demand, aquaculture growth, price volatility, and sustainability efforts all converge. Navigating this evolving landscape requires a multifaceted approach, emphasizing responsible sourcing, alternative raw materials, and

adaptability in the face of changing market dynamics. As the fish oil industry continues to evolve, it is critical for stakeholders to maintain a proactive stance to ensure the stability and sustainability of this vital resource.

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