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## Global Fish Farming Market Analysis: Environment, Fish Types and Sustainable Practices

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### Abstract

The global fish farming market is segmented by environment (freshwater, brackish water and marine water) and fish type (fin fish and others). Freshwater farming is projected to dominate the market by 2029, driven by government support in regions like China, Bangladesh and Thailand. The rising demand for dietary nutrition, including omega-3 supplements, propels the sector's growth. The "others" category, including hardy fish varieties, is anticipated to experience accelerated growth during the forecast period due to their adaptability and increasing domestication. Techniques such as recirculating aquaculture systems (RAS) and cage systems are gaining traction for high-value species like salmon, reflecting advancements in technology and sustainability practices. Asia continues to lead global production, contributing 89% of farmed fish output, with significant contributions from China, India and Bangladesh. As aquaculture expands, sustainable practices are critical to mitigate environmental impact and support long-term industry viability.

**Keywords:** Fish farming, freshwater aquaculture, sustainable aquaculture, omega-3 supplements, Asia aquaculture, aquaculture sustainability.

### Introduction

The global fish farming market has witnessed substantial growth over recent decades, driven by rising demand for fish and seafood as vital sources of protein, dietary nutrients and omega-3 fatty acids. Fish farming, or aquaculture, involves the cultivation of aquatic organisms in controlled environments and has emerged as a critical solution to meet global seafood demand while alleviating pressure on overexploited wild fish stocks. Segmented by environment—freshwater, brackish water and marine water—and by fish type—fin fish and others—the market presents diverse opportunities for stakeholders. Freshwater aquaculture holds a dominant position, supported by government policies and initiatives in key regions like Asia, where countries such as China, Bangladesh and Thailand have established robust freshwater farming systems. This segment's dominance is further

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fuelled by strategies promoting sustainable aquaculture, which align with global efforts to enhance food security.

The fish farming market is also shaped by the adaptability of certain fish species, including carp, tilapia and catfish, as well as the growing popularity of high-value species like salmon and trout. Emerging technologies, such as recirculating aquaculture systems (RAS) and offshore aquaculture techniques, have improved efficiency and minimized environmental impact, fostering the sector's sustainability. This study explores the global fish farming market's segmentation, production trends, technological advancements and challenges. It highlights the crucial role of Asia as a production hub, the adoption of innovative aquaculture techniques and the increasing focus on sustainability to ensure long-term industry growth. Through detailed analysis, the study provides insights into how the market is evolving to meet global demands while addressing environmental and socioeconomic challenges.

### **Global Fish Farming Market is segmented by Environment and Fish Type:**

The global fish farming market is categorized based on **environment** and **fish type**, allowing for a detailed understanding of production dynamics and market preferences. Segmenting by **environment** highlights the various habitats used for fish farming, such as freshwater, marine and brackish water environments. Freshwater aquaculture dominates the market due to its lower operational costs and accessibility, while marine aquaculture is significant for high-value species and export markets. Brackish water aquaculture serves as a niche segment, suitable for species that thrive in mixed-salinity conditions. By **fish type**, the market segmentation focuses on species such as salmon, tilapia, catfish, carp and others. This classification reflects consumer demand, regional preferences and economic value. Salmon and tilapia are among the most commercially significant fish, driven by their global popularity, nutritional benefits and adaptability to farming systems. Carp dominates in Asian markets, particularly China and India, due to traditional consumption patterns and large-scale production. Catfish, on the other hand, is favored in regions like North America and Africa for its cost-effectiveness and ease of cultivation. This segmentation provides insights into how environmental conditions and species-specific requirements influence market trends, production strategies and trade dynamics, enabling industry stakeholders to optimize operations and meet diverse consumer needs effectively.

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- i) **Based on the Environment**, the market can be broken down into three categories: brackish water, marine water and freshwater. By 2016, it is anticipated that the freshwater category will hold the biggest market share. The support of freshwater fish farming by various governments in countries such as China, Bangladesh and Thailand led to the freshwater sector becoming the most lucrative subsegment of the worldwide. As a result, the freshwater sector dominated the overall market. And it is anticipated that this trend would carry over into the projection period. For instance, in Bangladesh, the fisheries strategy that was approved in 1998 contained a policy for freshwater fish farming. This policy was intended to advance freshwater fish culture in the nation, which in turn drove the growth of the market. Over the period covered by the forecast, these are the primary factors that will be responsible for driving the expansion of this sector of the global market.
- ii) **Based on the Fish Type**, the market can be broken down into two categories: fin fish and others. The component known as "Fin Fish" is broken down even further into categories such as "Pompano," "Snappers," "Groupers," "Salmon," "Milkfish," "Tuna," "Tilapia," "Sea Bream," and "Seabass," amongst others. The Others part is broken down even further into sub-categories such as carps, mackerels, sea bream and other varieties. During the time of the forecast, it is anticipated that the growth of the others category would accelerate to a CAGR of xx%. This category's domination can be attributed to the hardiness and adaptability of these fish, which has led to their extensive domestication across the world. As a result, this segment has a greater market share. In addition, a rise in demand for fish in the field of dietary nutrition for the manufacture of omega-3 dietary supplements propels the industry of fish farming forward. These are the primary factors that are expected to propel expansion of the others sector in the global market over the course of the upcoming projected period.

### **Techniques of Manufacture:**

Several different techniques, such as pond-based systems, cage-based systems and recirculating aquaculture systems, are all viable options for cultivating fish commercially (RAS). The technique of production that is used is determined by a number of criteria, including the type of animal being raised, the location of the farm and environmental and animal welfare considerations. In 2016, pond-based systems accounted for 66% of total global production, indicating that they continue to be the

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most popular approach for the production of farmed fish. On the other hand, cage systems and RAS are gaining popularity, particularly for high-value species like salmon and prawn, which can be kept in these systems. The process of rearing fish in cages or netting enclosures in natural bodies of water like rivers, lakes, or oceans is referred to as cage systems. On the other hand, RAS entails cultivating fish in indoor tanks or ponds that are equipped with a closed water circulation system that not only recirculates but also filters the water in order to keep the water quality stable. This strategy is especially helpful in locations where access to clean water is limited.

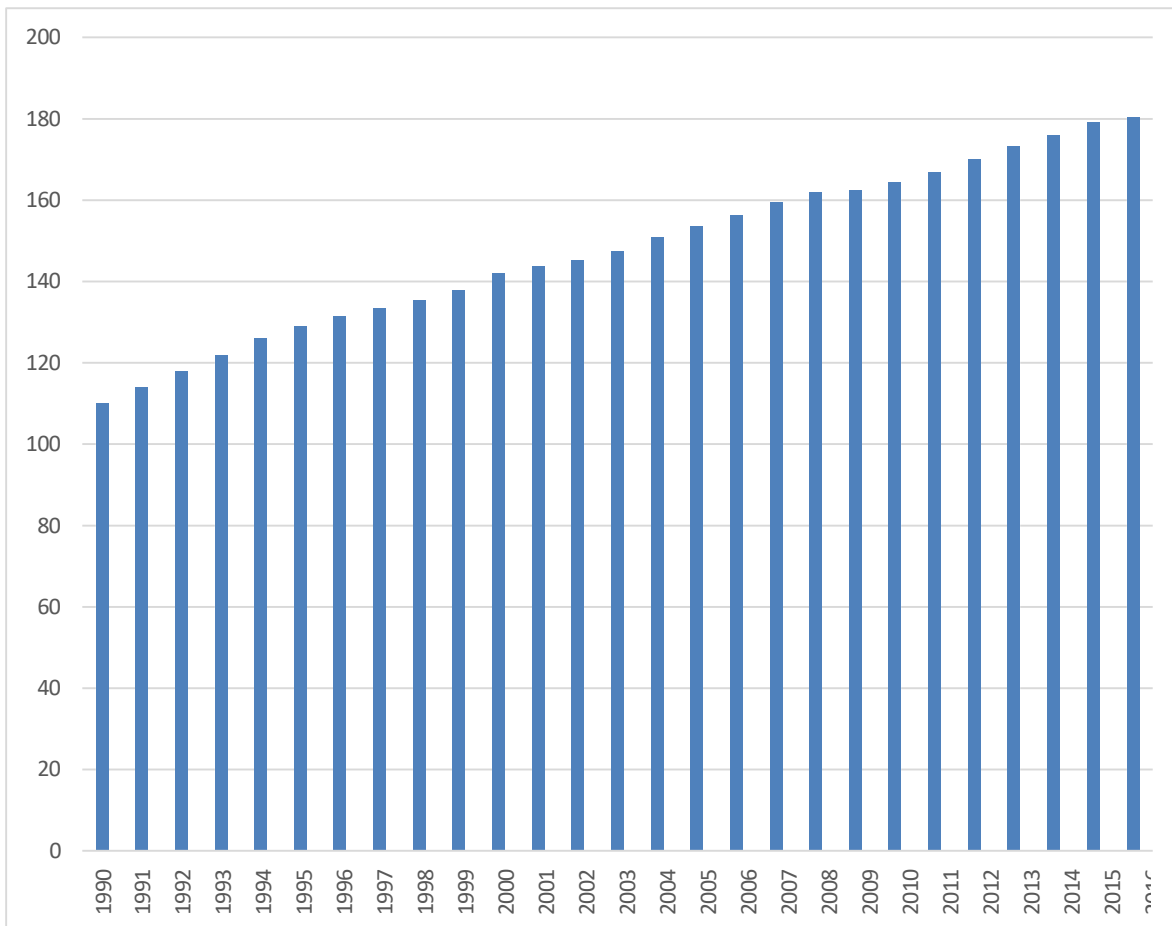
### **Variety of Animal Species:**

Throughout the course of the last decade, there has been a proliferation of a wide variety of fish and other aquatic organisms in aquaculture. Although carp, tilapia and catfish continue to be the species that are farmed the most frequently around the world, there has been an increasing interest in farming species that have a greater value, such as salmon, trout and shrimp. In coastal regions, such as those found in Norway, Chile and Scotland, the vast majority of salmon and trout are raised in captivity using cage systems. On the other hand, prawn are typically raised in pond-based systems in tropical countries such as Southeast Asia and Latin America. Some regions include. There has also been a rise in people's interest in cultivating species that aren't used for food, such as fish and plants that live in water. RAS, which allow for exact control of both the water quality and temperature, are frequently used in the farming of these species. Throughout this time period, there were also substantial advancements made in the technology pertaining to aquaculture. Recirculating aquaculture systems, which enable the production of fish in a closed environment, were increasingly adopted to lessen the negative impact that fish farming has on the surrounding ecosystem. In addition, there was a rising interest in the use of alternative fish species and feeds, such as algae and insects, which could assist to lessen the sector's dependency on wild fish populations. This could help to ensure the sustainability of the industry.

**Table 1:** *Production of Fishes Species*

Year	Production (in million tonnes)
1990	110.1
1991	114.1
1992	117.9
1993	121.8
1994	126
1995	128.9
1996	131.4
1997	133.4
1998	135.4
1999	137.9
2000	142.1
2001	143.8
2002	145.3
2003	147.5
2004	150.9
2005	153.5
2006	156.3
2007	159.4
2008	162
2009	162.4
2010	164.4
2011	166.9
2012	170
2013	173.2
2014	176
2015	179.2
2016	180.3

Source: World Food and Agriculture – Statistical Yearbook

**Figure 1:** *Production of Fishes Species*

The production of fish species from 1990 to 2016 demonstrates a consistent upward trend, reflecting the growing global demand for seafood, advancements in fishing technology and aquaculture expansion. The data, as presented in the table, shows a steady increase in production from 110.1 million tonnes in 1990 to 180.3 million tonnes in 2016, with minimal fluctuations or declines. The data on fish production from 1990 to 2016 reveals several key observations that highlight the dynamics of the fishing industry and its adaptation to global demands and challenges. A continuous **growth trend** is evident, with an average annual increase of 2-3 million tonnes over the 26-year period. This sustained growth reflects advancements in fisheries management and the widespread adoption of sustainable aquaculture practices, which have been critical in addressing the overfishing of natural water bodies. Aquaculture, as an alternative, has bolstered production while mitigating pressures on wild fish stocks. While the overall trend

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is positive, occasional **plateaus and peaks** indicate periods of slower growth. For instance, between 2009 and 2010, production increased minimally from 162 million tonnes to 162.4 million tonnes. Such stagnation could be linked to environmental challenges, including marine ecosystem degradation, stricter enforcement of fishing regulations, or global economic downturns affecting the industry's capacity to expand operations. A significant factor in the consistent rise, particularly post-2000, is the **influence of technology and aquaculture**. Technological innovations in breeding, feeding and maintenance of aquatic species have revolutionized aquaculture, making it a reliable contributor to the global fish supply. These advancements have led to higher yields, reduced reliance on natural water bodies and more efficient resource use. The increasing fish production also correlates with **global demand and population growth**. As the global population rises and dietary preferences shift toward protein-rich foods like seafood, the demand for fish has grown steadily. Moreover, for many nations, fish serves as a vital export commodity, driving economic incentives to increase production. This dual role of fish as a dietary staple and an economic driver underscores its significance in meeting global food security needs. **Environmental considerations** play a crucial role in sustaining this growth. Efforts to address the negative impacts of overfishing, such as the establishment of marine conservation zones, implementation of fishing quotas and adherence to international agreements, have helped preserve fish stocks. These measures ensure that production can continue to grow sustainably without compromising future resources. The observations underscore a balanced approach to meeting increasing demand while promoting sustainability, leveraging technological innovations and addressing environmental challenges to maintain and enhance fish production globally. The sustained increase in fish production highlights a balance between meeting growing demand and advancing sustainability. However, the reliance on aquaculture and the pressure on natural ecosystems necessitate continued innovation and conservation to address challenges such as climate change, pollution and habitat destruction. This data provides a critical foundation for future policies and research aimed at enhancing the resilience of fisheries and ensuring the long-term availability of this vital food source.

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## Conclusion

The global fish farming market is poised for sustained growth, driven by increasing demand for fish as a vital source of protein, dietary nutrients and omega-3 fatty acids. Freshwater aquaculture continues to dominate the market, supported by government initiatives and favorable policies in key regions, particularly in Asia, which accounts for the majority of global production. The adaptability of species such as carp, tilapia and catfish, alongside the rising demand for high-value species like salmon and trout, further strengthens the market's outlook. Technological advancements, including recirculating aquaculture systems (RAS) and cage-based farming, are playing a pivotal role in enhancing production efficiency and reducing environmental impacts. These innovations, coupled with sustainable practices such as alternative feeds and offshore aquaculture, address critical challenges of resource dependency and ecological balance, ensuring the industry's long-term viability. Achieving sustainability remains a pressing challenge, requiring concerted efforts to implement environmentally responsible methods and equitable access to resources. As fish farming expands into new regions, including Africa and Latin America, the focus on sustainability will be instrumental in ensuring global aquaculture meets the growing demand without compromising the environment. The global fish farming market demonstrates significant potential, underpinned by advancements in technology, strategic policies and growing consumer demand for sustainable seafood. By addressing challenges and fostering innovation, the industry is well-positioned to contribute to global food security while preserving ecological integrity for future generations.

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