

A STUDY ON THE GLOBAL SCENARIO OF THE AQUACULTURE INDUSTRY

Illuri Venkatanarayana*
Prof. N.Kishore Babu**
P.Raja Babu***

ABSTRACT

The aquaculture industry is one of the most promising sectors in the world. It has a long history of cultivation. The industry provides both economic activity and food security to the world. The aquaculture sector is especially crucial for Sustainable Development Goal 14 Conserve and sustainably utilise the oceans, seas, and marine resources for sustainable development. With its scope and others, the sector may contribute to the achievement of all of the Sustainable Development Goals. In this study, we focussed on global fisheries and aquaculture production from various regions of the world, Consumption and utilisation of the production, employment of the industry and trade of the production. From the analysis, it is observed that in the production segment among the five regions of the world, Asia has the lion's share in production as well as employment. Oceania has the least production region in the world. China has occupying a major producing country in all nations. In 2018, international trade in fisheries and aquaculture was 67 million tonnes, accounting for 38% of total production. A total of 221 states and territories reported fish trading activities, exposing approximately 78% of fish and fishery items to international trade competition.

Keywords: Aquaculture Industry, Global Production, Consumption, Employment, Trade.

Introduction

Aquaculture has a long and illustrious history dating back 4000 years. The beginnings of aquaculture are thought to have occurred between 2000 and 1000 B.C., according to the authors. Aquaculture was said to have originated in China, particularly for the species known as common carp. 'The Classic of Fish Farming,' written by Chinese author Fan Li in 473 B.C., is considered the first treatise on scientific fish cultivation. The aquaculture sector has evolved through decades, merging in with its environmental, social, economic, and cultural surroundings, and benefiting immensely from scientific progress in the twentieth and twenty-first centuries. As a result, the aquaculture business has grown exponentially, now delivering more than half of the world's fish for human consumption. Aquaculture, which accounts for half of the total fish production, has given low-cost food and nourishment to millions of people while also sustaining a large section of the country's rural population. It has the fastest yearly growth rate of any food production system (about 6%).

The United Nations released the 2030 Agenda for Sustainable Development in September 2015, a stunning roadmap for global peace and prosperity. Countries displayed a tremendous commitment to take bold and revolutionary changes to put the world onto a more sustainable and inclusive path by adopting the 2030 Agenda. However, after 5 years of unequal development and with fewer than 10 years to go, it is obvious that action to reach the 17 Sustainable Development Goals

* Research Scholar, Department of Commerce and management studies, Andhra University, Visakhapatnam, Andhra Pradesh, India.

** Professor, Department of Commerce and management studies, Andhra University, Visakhapatnam, Andhra Pradesh, India.

*** Assistant Professor, Department of Commerce, Government Degree College, Chintalapudi, Eluru District, Andhra Pradesh, India.

(SDGs) is not yet proceeding at the needed speed or scale. In responding, at the September 2019 SDG summit, the United Nations Secretary-General called on all sectors of society to mobilize for a Decade of Action to accelerate the development of sustainable solutions to the world's most pressing challenges, ranging from poverty and inequality to climate change and closing the finance gap. The fisheries and aquaculture industry can help secure all of the SDGs, but it is central to SDG 14 – Conserve and sustainably utilise the oceans, seas, and marine resources for sustainable development. As the custodian of four of the ten indicators of SDG 14 development, FAO has to increase the global momentum to guarantee healthy and productive oceans, a momentum that will be accelerated further during the second United Nations Ocean Conference (FAO 2020). The food and Agriculture Organisation is a technical agency that was established to combat hunger and poverty. Nonetheless, as we approach a world of 10 billion people, we must acknowledge that the number of undernourished individuals has been increasing since 2015. While there is no perfect solution to solve this challenge, there is no question that we will need to employ novel approaches to produce more food, secure access to it, and enhance nutrition. While catching fisheries will continue to be important, aquaculture has already shown its critical role in global food security, with production increasing at a rate of 7.5% per year since 1970.

Review of Literature

Rosamond L. Naylor, Ronald W. Hardy, and Alejandro H. Buschmann (2021) have examined global aquaculture trends from 1997 to 2017, taking into account all industrial sub-sectors and emphasizing aquaculture's integration into the global food chain. Inland aquaculture has made the greatest contribution to world production volumes and food security, particularly in Asia. Aquaculture feed efficiency and fish nutrition have also improved significantly, decreasing the fish-in–fish-out ratio for all fed species. However, these services' measurement, price, and market development are still uncommon. Pathogen, parasite, and pest management is an industry-wide concern, and the consequences of climate change on aquaculture are unknown and difficult to confirm. During these 20 years, pressure on the aquaculture sector to embrace full sustainability measures has improved governance, technology, siting, and management in many situations.

Benedetto Sicuro (2021) An examination of 68 years of FAO data on global aquaculture production was conducted. They assessed aquaculture's origins, development, and ties to the rest of the world. Their research uncovers an unexpected regularity that throws fresh light on aquaculture, placing it in the ideal theoretical setting alongside fisheries. For a functional definition of aquaculture diversification, speciation dominance, variance, and redundancy must be considered. They observed that Aquaculture variety demonstrates that aquaculture is modern colonization of the aquatic domain, having just achieved its peak value of 428 11 species, of which 29 1 will provide 80% of worldwide annual output. An unusual and perhaps informative image of modern aquaculture and its perspectives emerges from a historical and geographical examination of global aquaculture variety.

Jessica A. Gephart, Christopher D. Golden (2020) Aquaculture includes a wide variety of species and production methods, resulting in a wide range of social, economic, nutritional, and environmental concerns. As a result, the development of aquaculture will have an impact on human well-being and ecosystem health outcomes. Using a qualitative scenario method, the authors investigate probable aquaculture futures and their significance in nutrition security. For their analysis, four scenarios depicting systems are chosen, which are either localized or worldwide and oriented toward optimizing sectorial economic growth and equity elements of sustainability. Within each scenario, the potential contribution of aquaculture to increasing nutrition security is assessed. While aquaculture might well be "nutrition-sensitive" in any of the scenarios, its contribution to addressing health disparities is more likely in the economic and political context of a more globally harmonized trade environment and economic policies oriented toward social equity and environmental sustainability.

Halley E. Froehlich Claire A. Runge, Rebecca R. Gentry, Steven D. Gaines, and Benjamin S. Halpern (2018) The overall worldwide capture of wild seafood has been essentially stable over the previous two decades, implying that the growing demand for seafood will have to rely mostly on aquaculture (i.e., aquatic farming). Cultivated aquatic species are increasingly reliant on agricultural feed inputs, raising worries about further straining crops and land usage for feed. The relative effect and potential of aquaculture, on the other hand, remains unknown. We model and analyse how different types of aquaculture contribute to and compare with feed and land usage of terrestrial meat production, as well as how geographical patterns could alter by mid-century if appetites shift toward more cultured seafood and less meat. Using country-level aquatic and terrestrial data, we show that aquaculture requires fewer feed crops and land, even though it accounts for more than one-third of protein production.

Need for the Study

Following a comprehensive review of the relevant literature, it is observed that there is some study on species variety, nutrition, and food security. However, there is no special research on the global scenario of the aquaculture business, therefore we are initiating one.

Objectives of the Study

The objectives of the study are:

- To study the status of the global aquaculture industry
- To examine the Capture, production, Usage, and Consumption of the Aquaculture products.
- To study the Employment, trade and Commerce of the Aquaculture Industry.

Methodology

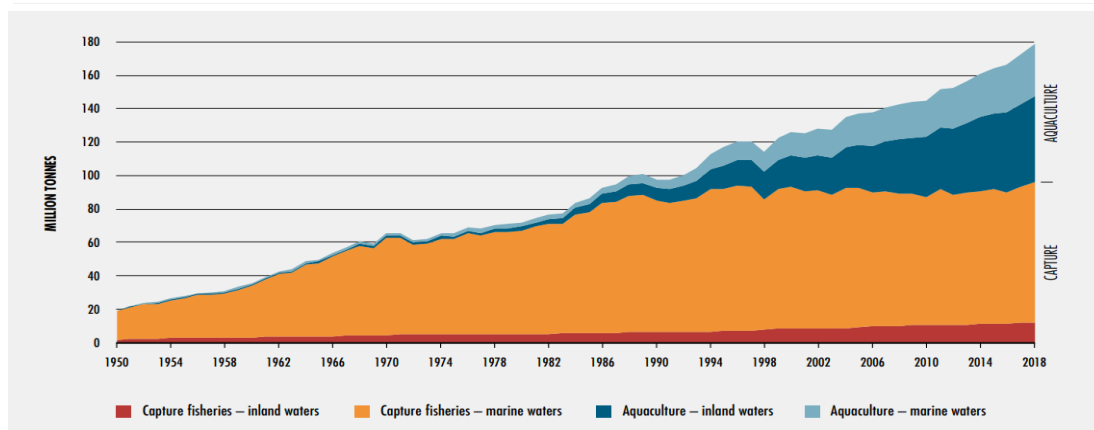
The analysis relied on secondary data from The State of World Fisheries and Aquaculture, FAO 2020, as well as FAO statistics. They concentrated on aquaculture capture and production, as well as aquaculture use and consumption. Aquaculture product employment and commerce.

Global Scenario of the Aquaculture Industry

Global fish output was predicted to exceed 179 million tonnes in 2018, with a total first-sale value of USD 401 billion, with aquaculture accounting for 82 million tonnes and accounting for USD 250 billion. In aquaculture production the top seven generating nations of world capture fisheries accounted for over half of all catches, with China accounting for 15%, followed by Indonesia at 7%, Peru at 7%, India at 6%, the Russian Federation at 5%, the United States of America 5%, and Vietnam 5%. The top 20 producing nations contributed to almost 74% of total catch fisheries production.

World Capture Fisheries and Aquaculture Production,

	1986-1995	1996-2005	2006-2015	2016	2017	2018
	Average per year					
	<i>(million tonnes, live weight)</i>					
Production						
Capture						
Inland	6.4	8.3	10.6	11.4	11.9	12.0
Marine	80.5	83.0	79.3	78.3	81.2	84.4
Total capture	86.9	91.4	89.8	89.6	93.1	96.4
Aquaculture						
Inland	8.6	19.8	36.8	48.0	49.6	51.3
Marine	6.3	14.4	22.8	28.5	30.0	30.8
Total aquaculture	14.9	34.2	59.7	76.5	79.5	82.1
Total world fisheries and aquaculture	101.8	125.6	149.5	166.1	172.7	178.5

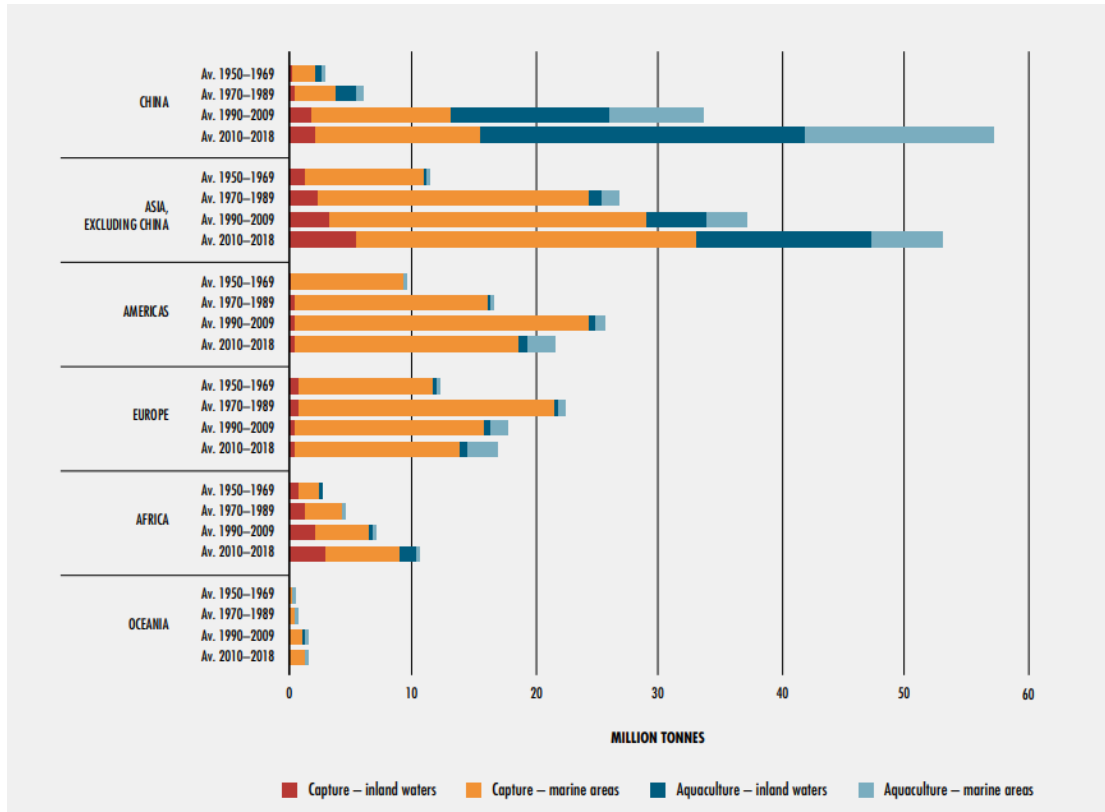


Source: The state of world fisheries and Aquaculture, FAO 2020

In terms of capture, overall production grew from 86.9 million tonnes in 1986-1995 to 96.4 million tonnes in 2018. In 2018, the inland capture production was 84.4 million tonnes, while the marine capture production totalled 12 million tonnes. In 2018, 51.3 million tonnes were produced by inland aquaculture, whereas 30.8 million tonnes were produced by marine aquaculture. From 1986 to 2018, total aquaculture production climbed by 75.3 per cent, from 101.8 million tonnes to 178.5 million tonnes.

Regional Contribution to World Aquaculture Products

Inland water captures accounted for 12.5 per cent of overall capture fisheries production. Since the mid-2000s, Asia has accounted for two-thirds of worldwide inland output, accounting for more than 80% of the total inland catch. Inland catches are especially crucial for food security in Africa, which accounts for 25% of worldwide inland catches, while Europe and the Americas account for the remaining 9%. In 2018, global aquaculture fish output hit an all-time high of 114.5 million tonnes, with 32.4 million tonnes of aquatic algae and 26,000 tonnes of decorative seashells and pearls contributing to the total. Finfish (54.3 million tonnes – 47 million tonnes from inland aquaculture and 7.3 million tonnes from marine and coastal aquaculture) led farmed fish output in 2018, followed by molluscs (17.7 million tonnes), primarily bivalves, and crustaceans (9.4 million tonnes). The contribution of worldwide aquaculture to global fish output reached 46.0 per cent in 2018, up from 25.7 per cent in 2000, and 29.7 per cent in the rest of the world, excluding China, compared to 12.7 per cent in 2000. Aquaculture's proportion of Asian fish output (excluding China) increased to 42.0 per cent in 2018, up from 19.3 per cent in 2000. Asia dominates fish farming, producing 89 per cent of the global total in volume terms during the previous 20 years. Over the same time, Africa and the Americas gained their proportion, whereas Europe and Oceania fell marginally. Outside of China, other major producing countries (Bangladesh, Chile, Egypt, India, Indonesia, Norway, and Vietnam) have gradually increased their proportion of global aquaculture output. Since 1991, China has produced more farmed aquatic food than the rest of the world combined. Aquaculture accounted for 17.9 per cent of total fish output in Africa, 17.0 per cent in Europe, 15.7 per cent in the Americas, and 12.7 per cent in Oceania. From the following graph, we shall understand the world's capture fisheries and aquaculture production from 1950 to 2018.



Source: The state of world fisheries and Aquaculture, FAO 2020

Asia dominates fish farming, producing 89% of the global total in volume terms during the previous 20 years. Over the same period, Africa and the Americas gained their proportion, whereas Europe and Oceania fell marginally. Outside of China, other major producing countries (Bangladesh, Chile, Egypt, India, Indonesia, Norway, and Vietnam) have gradually increased their proportion of global aquaculture output. Since 1991, China has produced more farmed aquatic food than the rest of the world combined. However, as a result of government measures implemented in 2016, fish farming in China increased by just 2.2% and 1.6% in 2017 and 2018, respectively. World aquaculture contributed 46.0 per cent of global fish output in 2018, up from 25.7 per cent in 2000, and 29.7 per cent in the rest of the world, excluding China, compared to 12.7 per cent in 2000. Aquaculture accounted for 17.9 per cent of total fish output in Africa, 17.0 per cent in Europe, 15.7 per cent in the Americas, and 12.7 per cent in Oceania at the regional level. Aquaculture accounted for 42.0 per cent of Asian fish output (excluding China) in 2018, up from 19.3 per cent in 2000. Inland aquaculture generated the majority of farmed fish (51.3 million tonnes, or 62.5 per cent of the global total), primarily in freshwater, up from 57.7 per cent in 2000. Finfish output declined progressively from 97.2 per cent in 2000 to 91.5 per cent (47 million tonnes) in 2018, but production of other species groups grew, mainly through freshwater crustacean farming in Asia, which included shrimp, crayfish, and crabs.

Aquaculture Industry Production - Utilization & Consumption

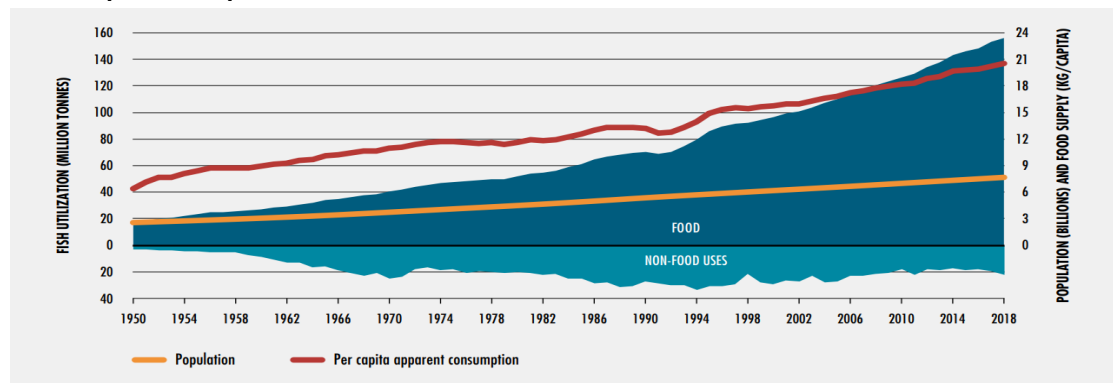
Human consumption accounted for 156 million tonnes of the total, or an annual supply of 20.5 kg per inhabitant. The remaining 22 million tonnes were allocated for non-food applications, mostly fishmeal and fish oil production.

	1986-1995	1996-2005	2006-2015	2016	2017	2018
	Average per year					
	<i>(million tonnes, live weight)</i>					
Utilization²						
Human consumption	71.8	98.5	129.2	148.2	152.9	156.4
Non-food uses	29.9	27.1	20.3	17.9	19.7	22.2
Population (billions) ³	5.4	6.2	7.0	7.5	7.5	7.6
Per capita apparent consumption (kg)	13.4	15.9	18.4	19.9	20.3	20.5

Source: The state of world fisheries and Aquaculture, FAO 2020

There is significant potential to boost the industry's sustainability by proactively managing by-products to maximize human edible output (Julien R.Stevens, 2018). From the above figures, it is to be observed that in 2018, over 88 per cent (156 million tonnes) of global fish output was consumed directly by humans. The remaining 12% (22 million tonnes) was utilized for non-food purposes, with 82 per cent (or 18 million tonnes) going toward the production of fishmeal and fish oil. From 67 per cent in the 1960s, the proportion of fish consumed for direct human consumption has climbed dramatically. As the most favoured and expensive type of fish, live, fresh, or cold fish continued to account for the lion's share (44 per cent) of fish used for direct human consumption. It was followed by frozen fish (35%), prepared and preserved fish (11%), and cured fish (10%).

Consumption of Aquaculture Products



Source: The state of world fisheries and Aquaculture, FAO 2020

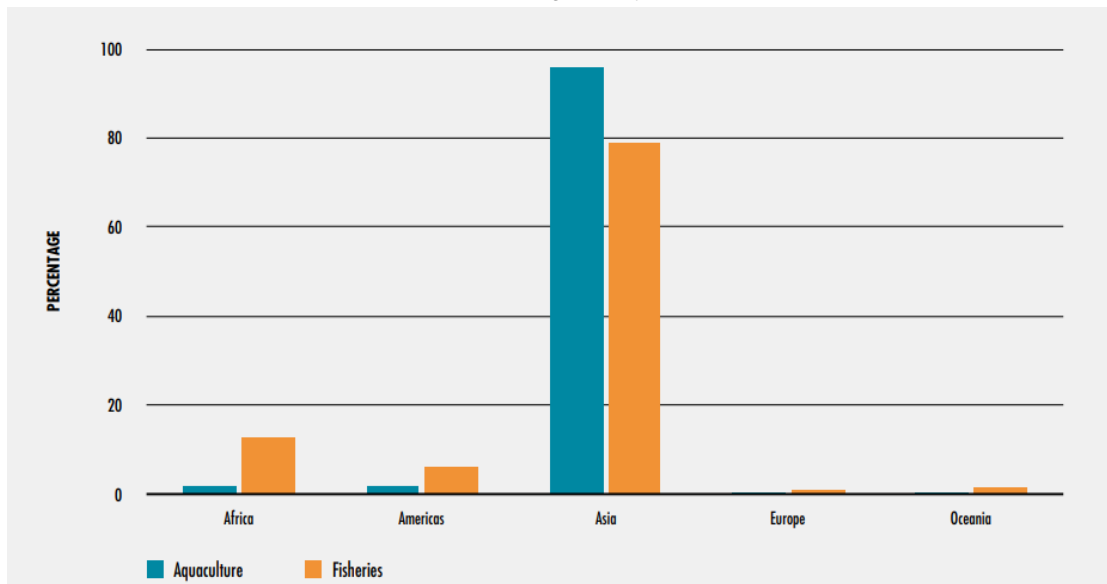
As we can understand Fish consumption climbed at an annual rate of 2.4 per cent, from 5.2 kg per capita in 1961 to 19.4 kg in 2017. Among them, the least developed nations (LDCs) increased their consumption by 1.3 per cent per year, from 6.1 kg in 1961 to 12.6 kg in 2017. Because of increased fish output and imports, this rate has risen dramatically in the previous 20 years, reaching 2.9 per cent each year. Fish consumption in low-income food-deficit countries (LIFDCs) grew at a steady yearly pace of roughly 1.5 per cent from 4.0 kg in 1961 to 9.3 kg in 2017. In 2017, fish consumption accounted for 17% of the worldwide population's animal protein consumption and 7% of total protein consumption. Fish provides more than 3.3 billion people with 20% of their average per capita animal protein consumption globally, reaching 50% or more in countries such as Bangladesh, Cambodia, the Gambia, Ghana, Indonesia, Sierra Leone, Sri Lanka, and other small island developing States (SIDS).

Aquaculture Industry - Employment

	1995	2000	2005	2010	2015	2018
	(thousands)					
Aquaculture						
Africa	69	100	189	255	355	386
Americas	279	257	241	336	377	388
Asia	7 426	12 355	14 826	17 910	19 533	19 617
Europe	98	104	100	118	115	129
Oceania	6	8	8	6	10	12
Total	7 878	12 825	15 364	18 625	20 390	20 533

Source: The state of world fisheries and Aquaculture, FAO 2020

The aquaculture industry has created a lot of jobs all around the world. The overall employment has registered at 7,878 thousand in 1995 and it increased to 15,364 thousand in 2015, after a decade it has grown to 20390 thousand. In 2018 it was marked 20533 thousand of world employment. Asia provides the most number of jobs in all five areas of the world. In the year 1995, Asia employed 7426 thousand people. In 2000, it was 12355; in 2005, it was 14826; in 2010, it was 17910; in 2015, it was 19533; and in 2018, it was 19617 thousand. The American region is in the second position, followed by Africa, Europe and Oceania. Due to the low portion of the Aquaculture scope and environmental disorders, Oceania has marked the least in providing employment.



Source: The state of world fisheries and Aquaculture, FAO 2020

Overall, Asia has the most fishermen and aquaculture employees (85% of the global total), followed by Africa (9%), the Americas (4%), and Europe and Oceania (1% each). Africa has seen a consistent expansion in the sector's employment figures, with the majority of workers still employed in fishing. Aquaculture employment in Africa continues to grow but at a slower pace. With its huge absolute number of people engaged in the primary sector of aquaculture and fisheries, Asia continues to develop in terms of employment in the industry, but at a steadier rate. Oceania is likewise experiencing a tiny but steady growth in employment, with fisheries remaining stable and aquaculture's low numbers progressively increasing. Employment in fishing and aquaculture has been falling in the Americas and Europe. However, in Europe, aquaculture employment has been quietly growing while fisheries employment has been dropping since 2010.

Aquaculture Production - Trade

Fish and fishery products continue to be among the world's most traded food commodities. International commerce in fisheries and aquaculture was 67 million tonnes in 2018, accounting for 38% of total production. A total of 221 states and territories reported some fish trading activity, exposing about 78 per cent of fish and fisheries goods to international trade competition. Following a severe decrease in 2015, commerce rebounded in 2016, 2017, and 2018, with yearly growth rates of 7%, 9%, and 5% in value terms, respectively. Overall, from 1976 to 2018, the value of global fish exports increased from USD 7.8 billion to a peak at USD 164 billion, at an annual growth rate of 8 per cent in nominal terms and 4 per cent in real terms (adjusted for inflation). Over the same period, global exports in terms of quantity increased at an annual growth rate of 3 per cent, from 17.3 million tonnes. Exports of fish and fish products represent about 11 per cent of the export value of agricultural products (excluding forest products).

	1986-1995	1996-2005	2006-2015	2016	2017	2018
	Average per year					
	<i>(million tonnes, live weight)</i>					
Trade						
Fish exports - in quantity	34.9	46.7	56.7	59.5	64.9	67.1
Share of exports in total production	34.3%	37.2%	37.9%	35.8%	37.6%	37.6%
Fish exports - in value (USD billions)	37.0	59.6	117.1	142.6	156.0	164.1

Source: The state of world fisheries and Aquaculture, FAO 2020

In addition to being the largest producer, China has been the largest exporter since 2002 and the third largest buying country in terms of value since 2011. Since 2004, Norway has been the second-largest exporter, followed by Vietnam (since 2014), India (since 2017), Chile, and Thailand. Between 1976 and 2018, developing nations boosted their share in international fish commerce, rising from 38% to 54% of worldwide export value and 34% to 60% of total volume. In 2018, the European Union (34 per cent in terms of value), the United States of America (14 per cent), and Japan were the top three fish importing markets (9 per cent). These percentages were 33 per cent, 22 per cent, and 21 per cent, respectively, in 1976. In 2018, developing-country imports of fish and fish products accounted for 31% of worldwide total value and 49% of the total quantity, compared to 12% and 19% in 1976. Oceania, Asia's emerging countries, Latin America and the Caribbean continue to be strong net fish exporters. A fish trade gap exists between Europe and North America. In terms of volume, Africa is a net importer, but in terms of value, it is a net exporter. Imports of African fish, mostly inexpensive small pelagic and tilapia, are a significant source of nutrition, particularly for communities who rely on a limited variety of basic foods.

Conclusion

The study found that the aquaculture industry grew steadily from 1985 to 2018. In terms of output and employment, Asia is the largest of the five areas. However, it is noteworthy to note that only China has the most famous producers in Asia. If other countries focused on the growth of the aquaculture industry, it would enhance output and jobs. There is potential for the least amount of loss of production in post-harvesting of aquaculture, resulting in the highest yield. The aquaculture industry has a lot of potential in terms of employment and trade and commerce

References

1. Naylor, R. L., Hardy, R. W., Buschmann, A. H., Bush, S. R., Cao, L., Klinger, D. H., Little, D. C., Lubchenco, J., Shumway, S. E., & Troell, M. (2021, March 24). A 20-year retrospective review of global aquaculture - Nature. Nature; www.nature.com. <https://www.nature.com/articles/s41586-021-03308-6>
2. World aquaculture diversity: origins and perspectives Benedetto2021 Sicuro Volume 13, Issue3 June 2021 Pages 1619-1634 <https://onlinelibrary.wiley.com/doi/abs/10.1111/raq.12537>
3. Jessica A. Gephart, Christopher D. Golden (2020) Browse journals by subject. (n.d.). www.tandfonline.com. Retrieved May 13, 2022, from <https://www.tandfonline.com/doi/full/10.1080/23308249.2020.1782342?scroll=top&needAccess=true>
4. Comparative terrestrial feed and land use of an aquaculture-dominant world Halley E. Froehlich Claire A. Runge, Rebecca R. Gentry, Steven D. Gaines, and Benjamin S. Halpern (2018) <https://www.pnas.org/doi/abs/10.1073/pnas.180169215>
5. The rise of aquaculture by-products: Increasing food production, value, and sustainability through strategic utilisation - ScienceDirect. (2018, January 17). The Rise of Aquaculture By-Products: Increasing Food Production, Value, and Sustainability through Strategic Utilisation - ScienceDirect; www.sciencedirect.com.
6. FAO. 2020. *The State of World Fisheries and Aquaculture 2020. Sustainability in action*. Rome. <https://doi.org/10.4060/ca9229en>
7. FAO. 2020. *The State of World Fisheries and Aquaculture 2020. Sustainability in action*. Rome.
8. Page numbers vi,2,3,5, and 7 <https://doi.org/10.4060/ca9229en>.

