Global Fish Production, Consumption, Export, and Import Status

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Abstract

Regarding global concern, fish production, consumption, and international trade have witnessed significant changes in recent decades because of technological improvements, shifts in consumers' preferences over food and diets, and economic integration. This study aims to give a comprehensive overview of the current state of the fish industry globally, including factors such as production, consumption, and trends in export and import. Production of fish from either wild fishing or farming, which includes both capture fisheries and aquaculture, has gone to an extent that is hard to imagine. Based on the data available, fish production up to 2023 achieved even two hundred million metric tons, of which aquaculture had a significant share. The advancement of technology and species breeding, better fish farming practices, and renewability have become major driving forces in aquaculture production, especially in Asian countries, where the high production level emanates from. Aquaculture, however, seems to be growing at a steadier pace despite the current rate of capture fisheries facing issues like overfishing, climate change, and habitat deterioration that call for increased control and improved fishing methods. Consumption behavior has also changed; fish has now become part of the staple diet considering the nutritional value it has. The average consumption of fish has increased, particularly in developing nations, where fish contribute significantly to protein consumption. The average global

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per capita consumption stood at approximately twenty-one kilograms per year, hence boosting the requirements due to factors such as increased income levels, increased population density, and more focus on health.

Keywords: *Fish, Production, Consumption, Aquaculture, Fishery.*

Introduction

With the increase in fish consumption trend, fish production, and its trade has grown considerably. Due to its high nutritional value with positive effects on human health, its demand is rising sharply (Food and Agriculture Organization , 2012). Production from wild catches is on the decline and/or stagnant with no hope for further increase due to over and indiscriminate fishing. Its role in fulfilling the seafood demand is decreasing. Then aquaculture or culture in captivity is the only option we are left with that can bridge the gap between demand and supply specifically in poor nations (Tacon & Metian, 2008). In 2022 globally 184.1 million tons of fish was produced which is 1.2% higher than observed in the previous years. Aquaculture production is on the rise with an annual growth rate of approximately 7%. The remaining sources are slightly behind when their total production is compared to the production in 2015 and 2020.

Aquaculture's expansion is therefore highly fascinating due to its reliable output compared with other seafood production sources where production is opportunistic (Food and Agriculture Organization, 2021). In developing nations, about five hundred million people are dependent on aquaculture and fisheries for their livelihood (Saghir, et al., 2019). As aquaculture production is related to market demand, it is playing a pivotal role in the economy of the rural population. Countries with advanced aquaculture have significantly increased their fish production capacity (Kochan, Guillén, Hunter, & O'Mahony, 2009). China for example produced 41,108,304 from

aquaculture and only 16,167,443 T from capture fisheries in 2012. A similar trend has been observed in some other Asian countries. For example, Bangladesh, Indonesia, and Vietnam produced 190,291 T, 445,460, 463,300 T, and more fish from aquaculture respectively (Mohsin, et al., 2022). India, Norway, Thailand, Chile, Myanmar, and the Philippines are some other countries where aquaculture is emerging swiftly (Verity, et al., 2007).

Most of the inland aquaculture is semi-intensive where more than one species is cultured which is at the lowest food web. The species cultured are herbivorous which include three Chinese carps Aris ichthys nobilis, Ctenopharyngodon idellus, Hypophthalmichthys molitrix, and three Indian carps Katla Labeo rohita, Cirrhinus mrigala (Diana, 2009).

Methodology

This study employed a qualitative research methodology with an exploratory design. It utilized desktop research, observation, content analysis of literature, and a deductive approach. The study compiled an extensive examination of the current literature on fish production and aquaculture, as well as the efficacy of fish as a human nutrient, by analyzing journals, research articles, reports, and other relevant publications. The data collection encompassed information on global fish catch volumes, fish farming techniques, and nutritional profiles of fish. An analysis was conducted to examine the correlation between fish consumption and its impact on human health, specifically focusing on aquaculture techniques and fish farming technologies.

The acquired data was methodically divided into organized categories, which included fisheries, aquaculture, and the optimization of fish nutrition. The writing process involved composing concise and unambiguous prose, accurately referencing credible sources, and utilizing them as evidence to

support the key themes. The text underwent a thorough review and revision process to ensure clarity, coherence, and precision. Subsequently, an abstract was crafted to succinctly summarize the key findings of the research

Global Fish Production and Aquaculture

Now the farmers have also started to culture imported Tilapia species called GIFT. Its culture is still limited. The culture of catfish or snake-headed fishes is negligible due to its requirement for high protein diets (Bostock, et al., 2010). Ornamental fish culture is at the beginning and mostly limited to urban indoor facilities. The government and some non-government groups have started working on cages and pen culture. Efforts are quite meager and at an experimental stage and have not been proven yet fruitful (Tlusty, 2002). Intensive fish culture has not been started yet due to an energy crisis because this fish culture system is highly energy intensive. For further promotion and expansion of aquaculture, some marine species can be cultured under the control of the environment near the ocean. Milkfish, sea bass, pearl spots, mollusks, grey mullets, sea grass, and cobia can be quoted as a few examples (Shahzad, 2022).

The government and private sectors are striving to introduce intensive fish culture to intensify fish production for easy and cheaper availability to consumers (Gjedrem, Robinson, & Rye, 2012). The important forms of intensive culture are cage, pen, and culture in cemented nurseries which can significantly enhance inland or coastal production. These efforts will not only enhance fish production but will also teach local fish farmers hands-on training (Tidwell & Allan, 2001). It will be hard to introduce aquaculture species to the ocean environment. Nonetheless, several marine species can be introduced in aquaculture practices. Important of them are grey mullets, milkfish, pearl spots, finfish, cobia, and sea bass.

As mentioned earlier, capture fisheries are declining g in most of the world nations compared to aquaculture output. This decline in capture fisheries can be attributed to high fuel prices and the negative impact of climatic changes (Blanchard, et al., 2012). Hence global seafood trade comprises a variety of fish and products from both sources. Technically speaking there are fifty-five trade flows. The value of each trade flow is over USD 400m per year (Sharma & Nikolik, 2022). There are also some additional trade flows with comparatively lower values. Their value ranges between USD 200m and USD 400m (Finegold, 2009). These trade flows witness the nature and variety of the products. Although there was only a little increase in the amount of goods traded, the combination of inflation and high prices resulted in a significant growth in trade income. Trade revenue reached USD 193.5 billion, representing a 10.7 percent gain compared to the previous year. Much of this growth may be attributed to Ecuador, China, and Norway, who are projected to have a 20 percent rise in exports, reaching a total of USD 8.1 billion. Ecuador saw a positive outcome from increased output, solidifying its status as the leading worldwide exporter (Food and Agriculture Organization, 2021).

In 2021, production exceeded one million tons, and it is expected to expand by 30 to 35 percent in 2022. In May, international salmon prices reached their highest point in a decade. This, together with the significant increase in prices for groundfish, resulted in an 18 percent rise in Norwegian export income. The United States of America and China, which together represent 36 percent of the import value, saw import growth rates of 13 percent and 11 percent, respectively. The European Union, which is the biggest market in terms of value, had a decrease in the quantity of imports, but the value of imports only increased by 1 percent (Da, Widanarni, & Ma, 2015).

This ever-increasing demand puts a lot of pressure on natural resources challenging the sustainability of inland and marine fisheries. It has been observed that most of the seafood exports come from the developing countries. Out of a total of ten exporters seven are from developing countries (Rehman, Deyuan, Hena, & Chandio, 2019). Ecuador and India export shrimp and Chile export salmon to developed countries. Norway is the top exporter of salmon to 27 European countries and the UK. Its export value is USD 8.7bn. Canada ranks second. It exported shrimp of value USD 3.34bn to the USA in 2021. In this grading, India ranked in third position. In the same year, India exported farmed Vannamei shrimp to the USA worth USD 3.3bn. People of the US like this species of shrimp and hence receive 80% of their requirement from India. In 2021, 27 European countries along with UK, China, and the USA imported seafood worth USD 80bn. This is 50% of the total seafood trade in 2021 (Food and Agriculture Organization, 2021). The European Union and the UK remained at the top. They alone spent USD 34bn on seafood imports in 2021. Salmonids, shrimp, and crabs were major contributors to these imports. All three species accounted for 91% of the total seafood imports.

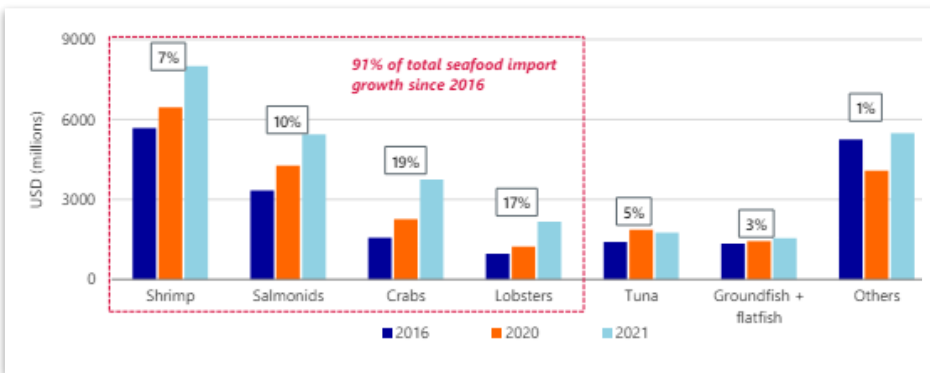

Figure 3: Premium seafood has been responsible for import increases since 2016

Despite a significant rebound observed in Covid-19 overall import of seafood remained on the rise. For example, from 2013 to 2021, China's import volumes of expensive forms increased from 4.4% to 10.1%. As mentioned earlier salmonids, crabs, shrimp, and fish meal contributed to year-on-year increases (Fig. 2).

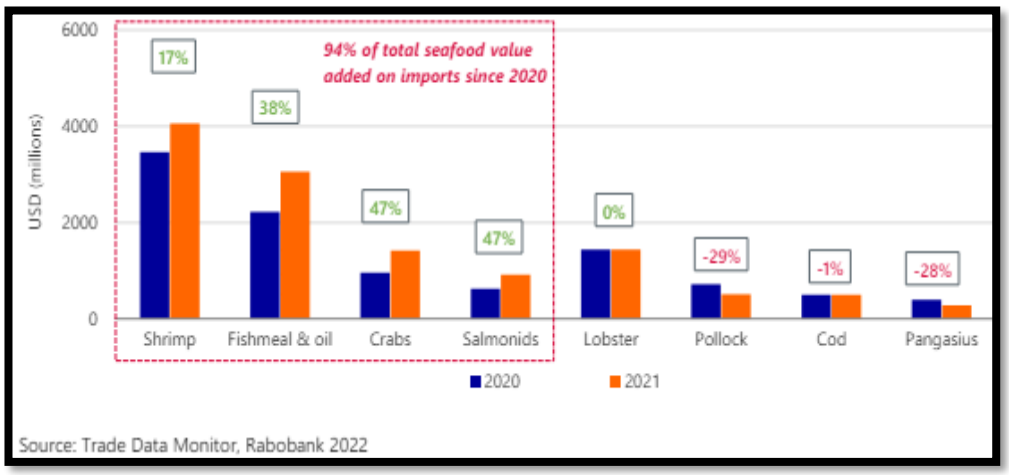

Figure 4:Increases trend in the import of shrimp, fishmeal, and oil, crabs, and salmonids

Since 2013 though there remained an increasing trend in the import of these seafood species but during the pandemic this trend was shifted to higher-value proteins such as beef, shrimp, and salmonids. These protein sources outperformed others with year-on-year growth in trade value of 16%, 17%, and 20%, respectively (Fig. 3).

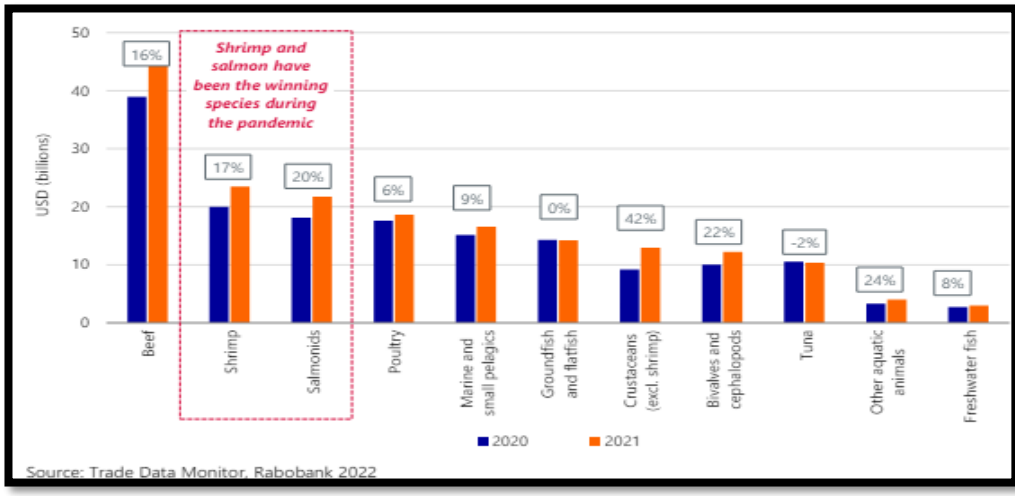

Figure 5: Increasing trend in the trade of beef, shrimp, and salmonids

In the future, it is expected that demand for seafood in general and premium species in specific will be on the rise. India and Ecuador are well-positioned to invest in emerging trends simultaneously meeting the gaps in export rankings (Tacon & Metian, 2008). However unprecedented soaring prices for many seafood species due to rising freight and energy costs and recession in some countries may influence the seafood demand subsequently affecting the value of trade flows and seafood market prices (Desilva & Soto, 2009). This scenario makes the fish unavailable not only to the fishing communities, but end consumers cannot get the required number of fish (Verschuere, Rombaut, Sorgeloos, & Verstraete, 2000). As its importance in human food is well established then for its sustainable supply to the consumer communities, we must work hard to enhance its production whether from marine resources, inland fisheries, or from aquaculture (Jenner, 2018). To achieve these targets long-term planning is urgently required to address challenges like governance, sustainability, demographic conditions, and

economic constraints. Both aquaculture and fisheries are equally facing these challenges in nature and effect (Rakocy, Masser, & Losordo, 2019).

Fish Production and Aquaculture in Pakistan

Aquaculture production is not very evident in Pakistan because of its low expansion pace. However, it is slowly gaining momentum in Pakistan when compared to other nations mentioned above (Rehman, Deyuan, Hena, & Chandio, 2019). Therefore, it requires significant impetus to meet the emerging fish demands of the masses. Currently, crustacean hatcheries are under construction in Karachi. KPK province is also taking the start in fish farming (Bird, Pradhan, Bhavani, & Dangour, 2019). It has immense potential for trout culture in northern areas of the province. Production from these units will be exclusively for local consumption (Fig. 4). The government of KPK is generously lending support to newly emerging farming units.

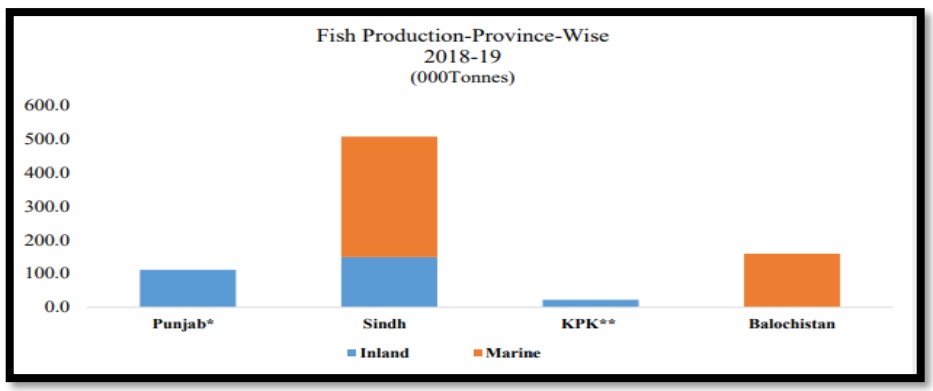

Figure 6: Marine and inland fish production seems almost stagnant from 2000 to 2019. Marine production however is still high (USSEC, 2020)

Cyprinus Carpio is quite common in most countries all over the world but is not liked in Pakistan due to its in-pond breeding and digging food habit (Kasan, Ghazali, Ikhwanuddin, & Ibrahim, 2017). Production break-up of these species has been given in Fig. 5 below:

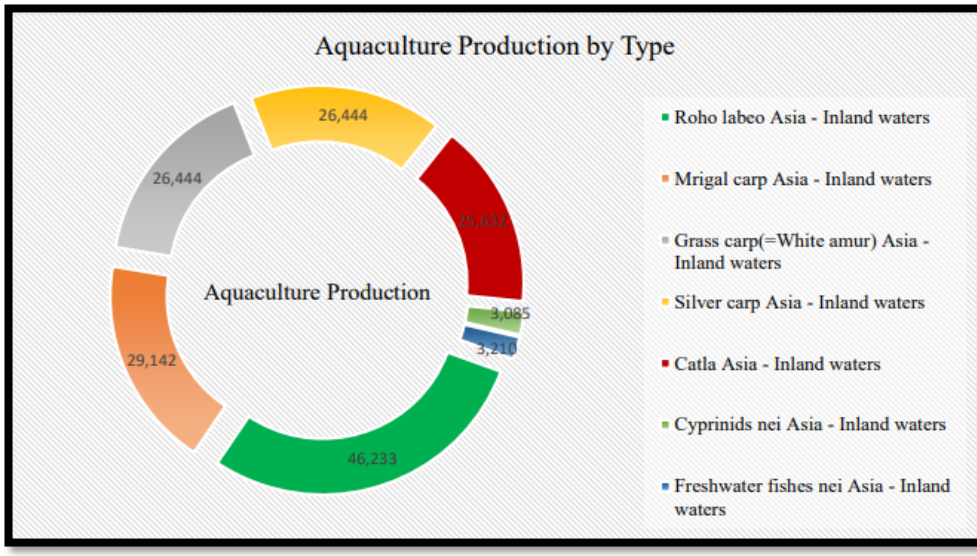

Figure 7: Species ratios in Pakistani aquaculture

For further expansion of aquaculture more marine species can be introduced in Pakistani water bodies. Among them, crustaceans, mollusks, and seaweed are commercially important and can be a new addition to inland water bodies.

Pakistan however despite overfishing, and global recession in this industry showed historic the highest seafood exports of $469 m. This sector blames restrictions in the foreign markets, as the reason for low exports. Lifting the ban can enhance its value up to $1 billion. One of the most important among others is the US ban on the shrimp trade which has entered its sixth year (Lashari, et al., 2016). Like the USA EU has also imposed a ban on seafood exports from Pakistan since 2007. Currently, five hundred Indian companies and 104 Iranian companies are exporting seafood to the EU but there is none from Pakistan (Farooq, 2023). Pakistan however is exporting two hundred tons of tuna worth USD 200 m to Iran following the informal route.

Fish is an equally popular dish in both developing and developed countries. In Pakistan, it however could not get that status that it should. Hence, Pakistan, its consumption is 2kg per person per year which is far less than the average global consumption which is 17 kg per person per year or even higher in some countries of the world (Daudpota, et al., 2016). Some say it is due to the export of fish which increases its prices at the local level due to less supply in the market. Because marine catches are the main fish sources. Its share of exports is also extremely high, which is 70% of total fish exports. But from a fish consumption point of view, it carries little weight. A more crucial factor is the non-adoption of fish as food.

Moreover, pollution has prevented people from consuming that fish. Compared to other meat sources fish is cheap and economical to eat, which nullifies the assumed high price factor. Most of the countries from the developing world have adapted it quite successfully but Pakistan is still lagging quite behind due to different feeding options and habits (Da, Widanarni, & Ma, 2015). The addition of fish to the diets of young children, and pregnant and breastfeeding women can significantly increase fish consumption. Subsequently, it will give a new impetus to enhance its production per unit of area (Daudpota, Kalhoro, Shah, Kalhoro, & Abbas, 2014). Fisheries can boost the economy in several ways and means. It can be a source of livelihood for the coastal communities. It can generate revenue by export because it is the most traded food and feed commodities.

Currently, total fish production in Pakistan is about 0.807 million metric tons. Marine fisheries share 62 % of this total and the rest comes from aquaculture. At the global level, however, aquaculture/captive resources supplied half of the total consumption up to 2020. Proportionate to its demand

and nutritional value little attention has been devoted to its development and promotion in Pakistan.

Fish Consumption Trend

Fish and other aquatic foods also called "seafood" are collected from both freshwater and marine environments. They can play a fundamental role in fulfilling the nutritional and food security goals of the masses (W, et al., 2002). Both developed and developing nations prefer it to have in their meals. Due to the continuous increase in world population, there is a proportionate increase in the demand for fish and fish products (Akbaraly & Brunner, 2008). Fish demand is continuously on the rise irrespective of developed or developing communities. The main drivers are population growth, better economy, and subsequent upgradation of living standards of the individuals, and urbanization (Xun & He, 2012).

Development in the production and processing of fish and its easy availability are some other drivers promoting fish consumption. But most important is the health consciousness of the people who prefer to have it under its health-improving and sustaining attributes (Ern, Huong, Cong, Bayley, & Wang, 2014). Since 1950 demand for fish has been rising equally in both developed and developing countries @ 2.5 percent per annum. In more populated countries like China and India, likely, demand for fish will further expand persistently (Curhan, Eavey, Wang, Rimm, & Curhan, 2014; Daudpota, Kalhoro, Shah, Kalhoro, & Abbas, 2014). Thanks to it being a "highly accessible and affordable source of animal proteins and micronutrients." Its role is more prominent in coastal areas. Whether it is due to geographic or cultural reasons fish and seafood consumption varies a lot among the countries as well as in different regions in the same country (BS, et

al., 2019). It is not unsurprising that coastal nations consume up to 80kg of fish per capita. Maldives and Iceland are the main examples of this category.

Portugal, South Korea, and Japan come next. The opposite is true in landlocked countries (Curhan, Eavey, Wang, Rimm, & Curhan, 2014). For example, fish consumption per capita is less than 1kg in Ethiopia, Tajikistan, and Afghanistan. Globally fish consumption per capita was the highest in 2019 which touched the figure of 20.5 kg (Food and Agriculture Organization, 2021). Talking chronologically, it was 9.9 kg in the 1970s, 12.5 kg in the 1980s, 14.4 kg in the 2000s, and 19.6 kg in 2010. Compared to the other countries of the world, fish consumption per capita in the country is extremely low. It is only 2kg per capita, far lower than even the global average which is 17 kg per capita (Shahzad, 2022).

The local markets of Islamabad and Rawalpindi receive most of their stock from Terbela, Shahpur, Mangla Dams, and Chashma Barrage. Private producers also contribute a lot to these and other markets in the country. The well-known variety 'Kasuri Rahu' is supplied to these markets from the Lahore market (Tlusty MF, et al., 2019). Due to pollution, fish production in Rawal Dam is declining.

In any strategic planning or national food security plans the fish sector is often ignored or dropped entirely. Scientists focus on the sustainability of biodiversity and the economic contribution of fish but farmed seafood must be considered in the context of its nutritional contribution and environmental sustainability (BS, et al., 2019). At the same time, the production of seafood and its consumption for the betterment of human beings should be considered in a broader context. Hence at food security planning and implementation forums, it should be given due importance in proportionate to its level of contribution to local consumption and overall export (BS, et al., 2019). This

will reduce competition among fish species cultured and harvested and will help the promotion and gain importance in the context of the diversity of foods in each or proposed food system (Tlusty MF, et al., 2019).

Apart from marine fisheries, dams, lakes, ponds, and rivers which are also called inland fisheries are not less important from a fisheries point of view. After oceans, it is an important internal national activity which is providing food, nutrition, and income to the inhabitants. Fisheries add to the national income from exports of whole fish or its products (BS, et al., 2019). Compared to this activity, its share of GDP is little. Such activities can then play a pivotal role in enhancing the fish consumption trend and pace.

Conclusion

Fish deserves a central position in food security and nutrition strategies. Therefore, it is quite imperative that in any inter-sectoral, national food security and nutrition policies fish should be given a special focus to make it an integral element for its further development and promotion. Special programs need to be devised to promote nutrition education. Emphasis on small-scale producers and local markets can pave the way to enhancing the current consumption rate of fish. Designing nutritional programs specifically for children and deprived women needs to be addressed to meet their macro and micronutrient deficiencies. Over and indiscriminate fishing should be discouraged to sustain the ocean life and inland water resources. Steps should be taken to improve the economic conditions of the fishers and fishers should decrease their reliance entirely on fish so the resources can be protected from touching the threshold level. Conducting regular intra-household studies for a better understanding of the nutritional status of the population can help to alleviate nutritional deficiencies. At the same time, it is important to monitor the threats and risks involved in culturing and harvesting aquatic fauna from

poachers, pollutants, and climatic changes. There is a stringent need to promote the export of fish, and its products to earn foreign exchange improving national and individual economic conditions.

Recommendations

- Promotion of the aquaculture sector is vital in Pakistan. Establishing a federal aquaculture department is strongly advised to address and resolve the various issues hindering the progress of the aquaculture sector. Without such dedicated attention, it will be difficult to effectively address the challenges faced by this overlooked industry. It will contribute to increasing fish output, raising awareness among residents, implementing the newest global aquaculture technologies, and creating numerous job possibilities in the industry, particularly for young people as well as those who are educated or illiterate.
- There is an urgent requirement to aid with the development of shrimp farming in coastal regions. The local fishing population should be encouraged to engage in aquaculture in tidal farms and to promote shrimp cultivation, ensuring easy access to shrimp seed for the local region. It would also serve as a crucial source of revenue from exports.
- Additionally, it is imperative to enhance fish productivity by prioritizing the establishment of pen and cage fish farms within local populations.
- The cultivation of prawns, shrimp, oysters, and seaweed, which is a worldwide trend for socio-economic progress, should be promptly embraced in Pakistan.
- Enhancements in value add and post-harvest technology are necessary to enhance export revenues.

- It is imperative to initiate microfinance initiatives. These programs are designed to stimulate fish farmers and encourage the growth of aquaculture.
- The government should organize training on fish cultivation, fish farm planning, hatchery construction, safety precautions, risk management, feeding technologies, and breeding techniques for fish farmers.

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