

## THE ROLE OF FISH IN GLOBAL FOOD AND NUTRITION SECURITY: CURRENT ASPECTS AND FUTURE PROSPECTS

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### ABSTRACT

This article describes the current aspects and future prospect of fish usage in consumer's meals to cover the deficiency of essential fatty acids, vitamins, and minerals, globally. Currently, most of the human population is facing health problems such as cancer, depression, early aging, heart, brain, and autoimmune diseases, etc. due to the lack of essential elements in the routine diet. Fish is blessed as an enriched source of Omega-3, Calcium, Iodine, IL-1, Lysine, Vitamin A, D3, and many more to combat above mentioned problems. Fish is not only a reliable source of income generation from the beginning of the World Era but also provides essential nutrients to the poor community. Traditionally, it is the source of earnings for more than 100 million people and supplies livelihood to 660-820 million people worldwide. It is estimated that fish production and consumption are going to increase from 178.5 to 204.4 million tons and 18.7 kg per capita to 22.5 kg, respectively, during 2018-2030. This review highlights the role of fish in global food and nutrition security by providing protein and essential nutrients to the community to attain the Sustainable Developmental Goals of the United Nations.

## 1. INTRODUCTION

The global human population will increase from the current 7.8 billion persons to about 9 billion in 2050 mainly due to a rapid population growth rate in developing countries (World Population Clock, 2020). This situation is raising hunger and affecting almost 821 million people, globally (FAO, 2019). Almost 14% of the humans in the world are protein and energy deficient (Béné *et al.*, 2015). Therefore, the human population is facing severe problems of food security due to the sudden rise in hunger and malnutrition issues.

Fish and its foodstuffs are beneficial for protein, fatty acids, and vitamins which play a vital part in the food security and economy of the globe. The Fish and its yield are also helpful in uplifting human livelihood mainly in developing countries (Chan *et al.*, 2019). As regards, sixty million people are related to the inland fisheries which sustain almost 12% of the population of the world. In general, nearly 93-97 million people of the world are associated with culturing, capturing, processing, marketing, and retailing of fish (FAO-Food & Nations, 2014). Women are also connected in small-scale processing as well as retailing of fish in local level markets which need less skill and producing a sufficient income for their families (Huntington & Hasan, 2009). Almost 79% of fish were produced by developing countries in 2020.

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More than 29,000 fish species are present globally. From which 1500 are recognized by humans. At present, fish production with a major share of aquaculture is rising @1.5% per year. It is not required the land for Fish farming. However, it can be kept in barren areas simply in water ponds which are beneficial for those countries which have less and land with low quality (Martin et al., 2013). Furthermore, recently introduced bio-flock technology for fish farming requires less space and management than conventional farming. Concerning small-scale farmers, it is very important to keep the smaller native breeds besides the carp. It can be noticed that it does not put much trouble. However, the overall economic condition of farmers becomes superior with more revenue. The *Gudusiachapra* is kept with carps in India (Duarah & Mall, 2020). *Tilapia* spp, *Heterobranchusbodorsalis*, *Clariasgariiepinus*, *Mugiespp*, *Chrysichthysnigrodigitatus*, *Heterotisniloticus*, *Ophiocephalusobscure*, *Cyprinuscarpio*, and *Megalospp* are the most common cultured species of fish (Adewuyi et al., 2010).

Fish is a cheaper protein source, vitamins, and other important micronutrients than beef or mutton mainly in developing countries (Garcia & Rosenberg, 2010). Fish consumption in a regular diet can accomplish the protein, vitamins, minerals, and some fatty acids deficiencies (Muir, 2013). Its meat is an instant supply of omega-3 unsaturated fatty acids. These FAs are very essential for a strong body (Calder, 2018). A raise in fish eating is a great accomplishment from the last half-century because per capita requirement is rising from 9.9 kg to 18.4 kg from 1960 to 2009, respectively. Fish can be consumed in different preserved forms which are dried, smoked, and powdered forms. These preserved forms of fish can be moved easily to remote areas (Huntington & Hasan, 2009). Fish farming and its products are very helpful which carry out the local market demands if fish farming is done on a small level. Large-scale farming could facilitate exports.

Many by-products are obtained from wild fish processing. These products are being utilized in the feed of livestock and aquaculture. Fish oil and fishmeal like by-products are an easily digestible source of constituents which are adopted in the feed of farmed fish (Sofia, 2018). United Nations (2018) has formed 17 Sustainable Development Goals in the Resolution to transform the world in 2030. From which, three goals such as no poverty, zero hunger; sustainable production, and consumption could be applied to fisheries and aquaculture. This sector can fulfill the

nutritional requirement of human being and bring prosperity to the community (Duarah & Mall, 2020). Therefore, this article aimed to review the current aspects and future prospective of fish's role in global food security and nutrition.

### **Fish production**

The current and future expected fish production in 2030 in different regions of the world is shown in Table 1. Fish production in 2018 has reached 179 million tons which is expected to attain 204 million tons in 2030. The share of aquaculture in overall fish production is 46% which is likely to increase 53% in 2030. Asia is the biggest producer of fish in the world that has a share of 19.2%. The number of people who are linked in fisheries and aquaculture can differ by diverse regions of the world. More than 59.5 million people were attached to fisheries and aquaculture in 2018 (Table. 2). Small-scale fisheries can give 90% of the resources in the marine fisheries zone (World Bank, 2012). The highest number of fishers and aquaculture workers are from the Asian region (85% of the world total) and next is Africa (9%). The employment rate is steadily increasing in Africa especially in aquaculture whereas; employment rate is declining in America and Europe.

### **Current scenario of fish industry**

The seafood sector can provide protein and has a significant contribution in supplying food worldwide. In China, the increasing demand for seafood is providing the opportunity for aquaculture and global fishermen to improve their economic status (Batka et al., 2015). The largest growth of shrimp and tilapia aquaculture has been observed in Latin America, Southeast Asia, India, and the Caribbean. Shrimp and salmon aquaculture has significantly increased in the last two decades and marine biologists are also trying to begin the breeding of other species. Several marine fish (domestic) are carnivores and wildlife is needed to be used in their feed to fulfill their feeding requirements for effective breeding.

In the US, the best aquaculture business is the catfish industry and its growth and development lead the business of fish farms to complex and intensive management. The strategies for catfish marketing and agribusiness market are common (Engle, 2003). Fisheries are contributing to the marine system and food security by producing grazing fish. Their function is covered by the myth which is edible fish are not good for the use of humans. Furthermore, policymakers are currently working on the organization of

these fishes so that their contribution should be enhanced to food security and economic development. To achieve a balance, consumers and industry play a vital role, which helps in maintaining the aquaculture and animal feed on one hand and help in poverty reduction and food security on other hand (Alder *et al.*, 2008). Many research trials related to fisheries are in progress in the upper Mekong region. In this region, fisheries and fish are observed to determine the threats, and found major threat is hydrological changes followed by overfishing and extraterrestrial species introduction. Certain river systems said that the major threat is water pollution to migratory fish of Upper Mekong, but the low-lying areas of Upper Mekong's migratory fish are threatened by dam construction. For the migratory fish, Nanla and Buyuan River are considered as best breeding grounds on a priority basis (Kang *et al.*, 2009).

The ecosystem and management practices have affected total fish production. The production of cichlid tilapia in Africa is seven times more than in Asia. There are many negative effects of environments on non-native fish which include increased resource competition, environmental degradation, land grazing, the spread of diseases, and mixing. Keeping in view these factors alone, seldom, it's sufficient to effectively quantify the general impact on the biodiversity which is presented (Gozlan *et al.*, 2010). For a very long, the fishery has been a traditional part of families of coastal fishing and is a resource of income for over 100 million people internationally.

The marine ornamental fish industry is also flourishing nowadays. However, its sustainability is in danger due to the exploitation of coral reef areas due to different reasons. Furthermore, due to insensitive shipping and poorer husbandry practices, the over-harvesting of particular organisms and the increase in the level of mortality can badly affect the wild stocks, which warn a burning call to make biologically sustainable management practices for the marine ornamental creature (Madhu *et al.*, 2009).

Fine aquaculture is civilized from high-intensity industrial production. It's a need for effective injections to cultivate the Fish at high density and also to prevent chronic and emerging types of diseases. Effective vaccination might have a constructive role in reducing the utilization of antibiotics. It was published that the beginning of vaccines in Norway with Atlantic salmon (Salarsalar) at the end of 80's and the start of 90's decreased the use of an antibiotic

(Brudeseth *et al.*, 2013). A very much active industry is Atlantic salmon aquaculture in coastal and coastal industries. For the past two decades, the fishery of Lake Victoria has been under increasing pressure. Fish production starts in the early 90s but now the catching of several species is declining. Furthermore, in the export market, the demand for dagaa (*Rastrineobolaargentea*) and Nile perch (*Latesniloticus*) fish of Lake Victoria is very high. Due to the dramatic commercial change, the present circumstances exist. It has taken place in Lake Victoria over the past 20 years (Abila, 2003).

#### ***Nutritive and health values of fish***

Fish is a vital origin of protein, essential fatty acids, vitamins, and minerals. Fish meat is higher in nutrients that are needed to the body such nutrients are absent in the cereal-based diet (Aberoumand, 2012). Fish contain 12-25% protein with a higher biological value. It contains most of the essential amino acids that are very beneficial for human consumption (Vladau *et al.*, 2008). Digestibility of fish is higher than the protein of plant sources in addition to this fish helps in the absorption of other sources of protein like maize; its proteins are partially absorbed due to the minute amount of lysine. All the essential amino acids are balanced in fish along with the high level of lysine that's the reason when fish is consumed with plant sources protein, the net intake of protein absorption is higher (Thilsted, 2012).

Eicosatetraenoic acid (EPA) and docosahexaenoic acid (DHA) are the two essential fatty acids that are present in many marines and freshwater fishes (Steffens, 1997). The risk of cardiovascular diseases is a decline by the consumption of fish having an abundant amount of these fatty acids. These essential fatty acids also act against depression, autoimmune diseases, and inflammation through the elevation of IL-1. Fish also protects our body against psoriasis, rheumatoid arthritis, crohn's disease, ulcerative colitis, and so on so forth (Simopoulos, 2002). A long time ago, fish was contemplated as 'brain food', due to the higher mental level of people that consume fish. Many researchers believe that fish helps in brain growth and reproduction. Fish play a vital role in other body functions as well.

One million premature deaths in a year due to deficiency of minerals, and vitamins highlight the need of creating awareness to focus on human nutrition improvement. Fish are an affluent source of iron, zinc, and vitamin A

(Thilsted, 2012). Vitamin A is an excellent antioxidant that helps in relieving stress and chronic diseases (Olson, 1996). Due to nutritive and health benefits, fish consumption has been significantly increased from the last decade. Fish contains DHA, a particular omega-3 fatty acid that stimulates the brain development of infants during the gestation period of their mother (Torpy et al., 2006). The demand for fish oil is very high and acquire from the head of tuna fish and used in school feeding meals (Thilsted et al., 2014).

In Bombay (India) fish is comparatively cheaper than meat, milk, or eggs. An ascertainment was carried out on 13 domestic species of fresh, salted, and dried fish for contributing to protein and minerals. It is observed that salted and dried fish provide more and good quality protein and minerals than fresh fish, at the same expense. The vitamin A contents of 15 varieties of domestic fish liver oils, estimated in Carr-Price blue units, were all higher than samples of the cod liver oil used in the domestic areas. The component of global seafood production is shellfish. It is the source of polyunsaturated fatty acids, essential amino acids, digestible proteins, bioactive peptides, carotenoids, astaxanthin, vitamins (vitamin B12), minerals (zinc, copper, selenium, potassium, sodium, inorganic phosphate, and iodine), and also other nutrients. However, the health of shellfish can be compromised by some facts like exposure to unwanted environments, false handling practices, unhealthy farming, and several other threats like parasites, pathogenic organisms, heavy metals, biotoxins, industrial and environmental pollutants, allergy-causing compounds, and process-related additives such as bisulfate and antibiotics. Mentioned threats can be prevented by proper precaution from harvesting to the consumption stage. Furthermore, all seafood items including shellfish are properly examined by native public health, international and governmental organizations (Venugopal & Gopakumar, 2017).

### ***The economic potential of fish***

Fish significantly pays its role through all forms of life; moreover, it covers earlier forms of life. Now a day fish serves as a significant source of food for people globally. The task of transferring or conveying fishes from their natural habitat to one's plate offers healthy life to humans. Mostly 660 to 820 million people deriving their incomes from the fisheries and aquaculture industry over the globe. In Hindustan, almost 10 million people survive upon fish to fulfill their livelihood of bread and butter (Gogoi, 2015).

Currently, the role of aquaculture in total fish production is increasing and playing an important role in the GDP of various countries. Because of increasing in the number of the human race expansion and cessation in the growth of capturing fishes, it is direly needed to enhance the chain of supply from aquaculture to fulfill the livelihood (De Silva & Soto, 2009). Almost 70% of the total produced is analyzed earlier to the trade. Most of the needed ravage 20 to 80 percent is produced which is consumed as fish meal, fish silage, and fish sauce. Fish by-products are valuable sources and can be used as valuable crucial products such as gelatin, collagen, minerals, oils, amino acids, proteins, and so on and so forth.

Usually, duck droppings are used as a substitute for accessory feed which accounts for almost 60 percent of invest in fish culture (Abdel-Hakim et al., 2000). Marine fishing has brought revolutionary structural changes in the last few decades. In Albania, fisheries sector comes with regional values though on a national scale, it's not crucial as the Albanian Agriculture sector, however it provides revenues to government administration from license fees and other various taxes. Moreover, it's still ignored with having no supervision though it generates as such as other sectors of Albanian market (Filoko, 2005). Fishes are basic export of Iceland, and it provides almost 33% share in the total export of the country. A few numbers of people are involved as employ in fishing and fish processing. However, the economy is largely unprotected with any change in earnings from fish export (Kristinsson, 1987) From the coastal shore site of Peru and Cerro Azul, The Fish and mammal bones light monitory quality just before Inca take over in 1470 A.D. with the help of pack llamas, dried and stored fishes were transported (Marcus et al., 1999). The definite strength of this sector is 80 to 85 billion dollars yearly. Moreover, with accessible base industry, there is an uncountable number of minor economical moves from boat building to international transport that is being supported by world fisheries. Thereafter these activities are rarely concentrated during evaluating economical crash. North-west Islands of Europe constitute a group called Shetland which financially totally depends on marine-based assets. The employment rate has significantly increased due to fish capturing, processing, packaging, and export activities (Coull, 1996).

Ukrainians have increased fish culture and production by storing the large sized fish seed (fingerlings) and by their use in feeding rice bran and oil cakes (especially groundnut



oil cake). The total average share of feed expense was 7%, just which shows poor feed input use in fishponds (Radheysyam *et al.*, 2013). In meanwhile, it can be stated that 60 to 70 percent of their industry is in shade. The fish industry is playing an important role in food security and nutrition, it should be presented with a number of indications to represent or provide agricultural products. The basic theme of showing statically results on bio sources with aboriginal problems and emerging proposals is to give a rising humanitarian block of domestic activity (Radheysyam *et al.*, 2013).

Marine fishing has contributed a lot to uplifting the social and economic growth in various communities throughout the Islands and Highlands of Scotland. Carp fish is one of the primary species that has customary fishing in Israel. Fish in ponds are fertilized and fed with husky grains, oils, and lupins. To rescue health, we should work on agricultural science to develop new methods of farming for friendly environmental fish production. Fish farming with sustainability encloses new millennium, by using hydroponics with agriculture, we can gain a new modern technique such as aquaponics that can help in increase in sustainable agriculture and provide us sustainability to uplift economy with the efficiency of additional production (Blidariu & Grozea, 2011).

Water flow in Pakistan has thousands of aquatic lives; among them, fish has its economic value because of their demand and supply. Magnolia also has about 31 different species with subspecies, they play a pivotal and crucial role in their economy. Most of the landlocked countries are bestowed with lakes; among them, saline and freshwater come in from them they catch their annual fishing. Lack Hoysgol has a catching potential of 200 to 400 tons annually. Years ago, Lake Buyr had the highest fishing capacity but now it has just 130 tons so there is a dire need to increase the modern methodology of aqua-agriculture to increase fish utilization especially in Mongolian territories because their current utilization is very low (1kg per person per year).

Pakistan has grown up in recent years with the fish production capacity of 131,000 tons and two hundred twenty-six million USD value in 2011. Pakistan looks to utilize modern ways for increasing their ways in the export of seafood (Kartika, 2014).

### ***Export potential of fish and fish products***

Global trading had greatly been affected by the exchange of fish and fish products. A chief part of the fish industry is occupied by tilapia, shrimp, salmon, and catfish (Anderson & Anderson, 2003). In global trading, 37% of total trade is accompanied by fish and fish by-products. This is the largest contribution to the food industry. While other major food items such as meat and milk have 9.8% and 6.7% input in the global market. According to a survey, about 77% of whole seafood produced throughout the globe is exported every year (Tveterås *et al.*, 2012). The export of fish has fetched US\$77 billion with annual growth of 7% in the last decade. The fish trade has not only expanded in numbers but also in species. Currently, 800 species of fish are traded in 197 countries (Disdier & Marette, 2010).

Developing states of the world make a major contribution to the food industry. Fifty percent of the total seafood exports were made by developing countries in the year 2010. In the same year, about 23% of total foodstuff was imported by these countries (Swartz *et al.*, 2010). Future predictions about the fish industry indicate that this business will flourish at slower rates of 3.1% as in 2012 (FAO Outlook, 2013), and is expected to 1.8% in 2022 (Kobayashi *et al.*, 2015). Internationally, supply and demand issues were resolved by introducing the gravity law. According to gravity law, "International market exchange is proportional to the outcome of commercial masses of trading countries and is inversely proportional to the terrestrial distances between them" (Stone & Jeon, 1999).

The gravity model was applied to measure the standards of food safety and tax-free exports to the United States of America and Europe (Disdier & Marette, 2010). In the 19<sup>th</sup> century, Japan had been the biggest exporter in the world, but in the 20<sup>th</sup> century, the country has imported seafood. China, India, Spain, the US, Canada, Norway, and Pakistan are the main fish trading countries of the world (Kazemi *et al.*, 2017). The best strategic action plan of the food industry led China to make 14.1 billion dollars in export since 2002 (Mallory, 2018). After China, Norway is the second prime exporter of seafood to the world. Seafood added 11% of the total economy of Norway in 2017 (Gautvedt, 2015). Vietnam has a 3260 km long coastline. This long-range makes the country strong for marine resources. The country has an Exclusive Economic Zone (EEZ) of 1 million km<sup>2</sup>. The whole marine stock of the

Vietnam of seafood is 3.1 million metric tons (MT) with an exponential output of 1.4 million MT (Chanpiwat *et al.*, 2016). In 2003 marine hunting of the country was about 1.6 million MT. Seafood provides one-tenth of total income drawn from shipping to other countries (Bartley, 2005). Pakistan had also contributed to international trading. Pakistan had exported fisheries foodstuffs of about 131000 tons of 226 million dollars' worth. Although there is great seafood production in advanced countries but developing countries transport about 50% of the seafood to these highly populated developed countries (Bailey *et al.*, 2016). Seafood trading network empowers by stockholder's mutual interference (Zelbst *et al.*, 2009). In the international trading of food items, seafood is considered a major component of interest. Developing countries are playing a major role by supplying 50% of seafood items to the world. High dense population and well-established individual economics in developed countries are the major factors of seafood consumption in those countries (Fox *et al.*, 2018). The demand and supply chain of the seafood market is being used for future consumer limits, cost, and food security plans for the optimum productive strategies to ensure the food supply to the whole world (Shehata *et al.*, 2019).

#### ***Future prospects of fish***

Scientists and researchers are interested in the supply and demand problem of food items to fulfill the food security and nutritional requirements of the world. No one can deny the importance of fish in human food and therefore scientists are interested in determining its demand and supply. In this scenario, the assumptions are made based on income, population growth rate, and commercial rates of fish and its products. It is estimated that fish consumption will be increased from 18.7kg per capita to 22.5kg per capita for 2015-2030 years (Westlund, 2005).

Culturing of aquatic life is a suitable way to increase fish production without doing any harm to natural resources. According to FAO, aquaculture production is expected to reach 50% of total fish production by the year 2030 (Tidwell & Allan, 2001). Never exhausting mines; the Fishermen are acting as a fuel of the industry. These factors ensure that fishermen have a good impact on future policies regarding fish demand and supply. Effective policymaking in this sector will help in poverty elimination and fisheries industry empowerment (Béné, 2003). Fisheries landings peaked in 1989 at 89.7 million tons and have since fluctuated near this level, which indicates that

the world is harvesting fisheries stock close to its maximum yield. Fisheries harvest covers near 69 million tons of human food, so in the years 2000, 2010, and 2025 demand for aquaculture should be near about 22-24, 35-37 and 52-55 million tons, respectively. However, this high demand cannot be achieved by aquaculture with a shortfall ranging from 1-3 million tons in the year 2000 and 9-13 million tons in 2025 (Chamberlain & Rosenthal, 1995).

Now a day, farming of seaweed is also becoming more popular and aquaculture production is also showing progressive growth manner. In both fisheries and aquaculture, the world's most important producer is China. Estimates show that by the year 2025 fish catching may increase about 1% of total fish production. Management will be the most focused factor of the fish stock. It is estimated that by 2025, 84% of total fish harvest will be consumed by human beings. Production of fish cultures has surpassed fishery production in 2014 and will provide 57% of total production by 2025. Growth will be fastest in developing countries (average 9.7%). Consumption will increase up to 8%. However, the trend may show an increase or decline in developed countries. Production from fish cultures will have a major share up to 31 to 41 percent by the end of 2020. The fisheries sector is showing an expansion in terms of production and consumption because of increased population and per capita income growth (Delgado *et al.*, 2003). Therefore, an addition of 25 metric tons of fish is expected in the food supply chain.

According to the predicted trends for the future of fisheries by researchers, it is expected that the world will achieve its production target by 2050 by Rio pathways that are given as decentralized solutions, the global technology, and consumption change. The first aim is to focus on energy productiveness in specific areas, natural corridor making agriculture, and policies to make sure the distribution of food items is based on equality. Secondly, there is a special emphasis on the use of technical assistance in agriculture and fisheries to get production. And the third one is directed toward the area of consumption of food by human beings. It is reported that as the trade of fish products progresses the demand for fish is expected to increase. Fisheries are the world's fastest-growing industry. Christoph Bene and his team reported that in 2011, about 173 million tons of fish was harvested from different water ecosystems. They further stated that about 131 million tons of that harvest were used directly by human beings. But the rest of the fish harvest was not used or lost during or in the

post-harvest stage. Fish consumption is reported to have increased three folds from 6kg to 18.8kg in 1950 to 2011, respectively in the last fifty years. Trends in the human population growth show that it will exceed 9 billion by 2050. To overcome the issue of food and nutritional security, fish and aquaculture stakeholders must shift their business to a corporate setup. In the current scenario of high population, aquaculture will be the best alternative protein source (Béné *et al.*, 2015).

Increasing population and drastically changing climatic conditions harm this industry. These negative effects on industry caused an increase in the number of malnourished children on the planet from 8.5 to 10.13%. Keeping in view the population growth, it is estimated that there will be 76 to 84 million children mal nourished by 2050. Drought conditions are expected from the years 2030 to 2035. Due to global warming, an increase in temperature of 1-2% is expected till 2050 with drastic effects on water resources and crop production. Planned policies are required to cope with the harmful effects of expected environmental conditions (Nelson *et al.*, 2010). Better economic conditions resulted in increased animal-based food consumption in the last five decades (Delgado, 2003). Statistical data of FAO indicates that in the past 54 years there is an overall increase in per capita meat and fish consumption from 23kg per capita to 42kg per capita (Sans & Combris, 2015). Animal origin food consumption is usually considered less flexible in developed countries, while it is much flexible in the case of underdeveloped or developing countries due to much flexible income (Muhammad *et al.*, 2011). It is expected that consumption of animal origin products will slow down. Fish and animal meat are expected to be energized by developed countries of the world. In high-ranked economies like China and Brazil, the consumer market is considered to be at its maximum. However, many countries are showing a lower trend in the graph. This lower trend is attributed to the second nutrition transition (Rosegrant *et al.*, 2013). An increase in meat and fish consumption in developing countries is expected as there are many gaps if compared with developed countries (Vranken *et al.*, 2014).

#### ***Halal food certification and future of fish products***

In the Quran Allah (S.W.T) said “Eat of that over which the name of Allah has been mentioned, if ye are believers in His revelations” (Quran VI: 119). In Islam consumption of only those aquatic animals is prohibited having poisonous, intoxication, or hazardous effects on health.

According to the statement, fish is also halal (Latif, 2011). Fish need to grow on freshwater or saltwater as habitat and natural food for consumption (Naylor *et al.*, 2000).

Due to poor education, water scarcity, and increased pollution farms are often contaminated by sewage water, pesticides used on crops (Qiu *et al.*, 2017), and industrial wastes (Chanpiwat *et al.*, 2016). This process is contaminating the natural quality of fish meat and its certification as halal is also questionable. Scientists and researchers think that consumption of contaminated fish for a long time is highly dangerous for the body (Virtanen *et al.*, 2008). With the increase in population and advancement in technology, Muslim world is also expanding with a global impact. The Muslim population is to be expected 2.2 billion in 2030. Currently, there is 2.3 trillion US\$ business of halal products (Wilson, 2014). Improved economic conditions are also increasing the demand for fish due to enhanced per capita income (Wilson, 2014) and recommendations by medical authorities in developed countries (Kris-Etherton *et al.*, 2009). Fish by-products like fish oil and fish meal are being used in paint manufacturing, fertilizer, and animal feed (Abedin, 2018). The Halal research council has the main focus to give the consumer easy access to certified halal products. (Herpandi *et al.*, 2011). With the increase in consumption of certified halal products in the next few years, there will be a decrease in consumption of non-food items. The credit of this decline goes to increased fish consumption by humans (Tacon *et al.*, 2011).

## **2. CONCLUSION**

The objective of this article was to highlight the importance of fish in the nutritional and food security of the world. Being the important source of protein, essential fatty acids, and minerals, the consumption of fish and its products has been increased. This could be useful to overcome malnutrition in children and women, especially in developing countries. Fish consumption per capita is expected to increase to 21.8kg/capita by the year 2025 with an 8% increased consumption rate but only a 1% increase in production rate. Therefore, modern production technologies should be implemented to cope with increasing demands.

There is a need to design a global food demand and supply chain to fill the gaps between the supply and demand of the essential nutrients. As our resources are squeezing (lands

and freshwater resources), we have to pay attention to further strategies to overcome this crisis, especially the countries with more population and less area. Direct light exposure is not compulsory for fish farming. They can be farmed in the shade and deep water tanks. Global warming and water pollution are also having drastic effects on marine and freshwater life. An increase in global temperature causes the melting of glaciers, results in floods, wasting a high volume of freshwater lives including fishes. Better disease prevention and treatment strategies can increase both freshwater and farmed fish production. Breed improvement can also help in disease prevention and in production capacity. Policymakers of the world must take serious measures to minimize the effects of global warming and industrialization. National policies as special subsidies for investors can increase investment and stabilize the industry. Best plans, social awareness about the benefits of fish meat, well-designed strategies, and past experiences would take us toward a bright future in the fish industry.

### 3. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interests regarding the publication of this article.

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**Table 1:** World Fisheries and aquaculture production: Current aspects and future prospects

Regions	Production			Of which aquaculture		
	2018 (1 000 tonnes)	2030 (1 000 tonnes)	Growth of 2030 vs 2018 (%)	2018 (1 000 tonnes)	2030 (1 000 tonnes)	Growth of 2030 vs 2018 (%)
Asia	122 404	145 850	19.2	72 820	96 350	32.3
Africa	12 268	13 820	12.7	2 196	3 249	48.0
Europe	18 102	19 290	6.6	3 075	3 620	17.7
North America	6 536	6 981	6.8	660	838	27.1
Latin America and Caribbean	17 587	16 730	-4.9	3 140	4 170	32.8
Oceania	1 617	1 750	8.2	205	290	41.3
World	178 529	204 421	14.5	82 095	108 517	32.2
Developed countries	29 233	30 730	5.1	4 603	5 499	19.5
Developing countries	135 096	173 691	28.6	73 330	103 018	40.5

**Source:** FAO. 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome.

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**Table 2:** World employment for fishers and fish farmers (thousands) by region

Region	1995	2000	2005	2010	2015	2018
<b>Fisheries and aquaculture</b>						
Asia	31 632	40 434	44 716	49 427	49 969	50 385
Europe	476	783	658	648	453	402
Africa	2 812	3 348	3 925	4 483	5 067	5 407
Americas	2 072	2 239	2 254	2 898	3 193	2 843
Oceania	466	459	466	473	479	473
<b>Total</b>	<b>37 456</b>	<b>47 263</b>	<b>52 019</b>	<b>57 930</b>	<b>59 161</b>	<b>59 509</b>
<b>Fisheries</b>						
Asia	24 205	28 079	29 890	31 517	30 436	30 768
Europe	378	679	558	530	338	272

Africa	2 743	3 247	3 736	4 228	4 712	5 021
Americas	1 793	1 982	2 013	2 562	2 816	2 455
Oceania	460	451	458	467	469	460
<b>Total</b>	<b>29 579</b>	<b>34 439</b>	<b>36 655</b>	<b>39 305</b>	<b>38 771</b>	<b>38 976</b>
<b>Aquaculture</b>						
Asia	7 426	12 355	14 826	17 910	19 533	19 617
Europe	98	104	100	118	115	129
Africa	69	100	189	255	355	386
Americas	279	257	241	336	377	388
Oceania	6	8	8	6	10	12
<b>Total</b>	<b>7 878</b>	<b>12 825</b>	<b>15 364</b>	<b>18 625</b>	<b>20 390</b>	<b>20 533</b>

**Source:** FAO. 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome.

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