



E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2019; 7(4): 206-211

© 2019 IJFAS

www.fisheriesjournal.com

Received: 23-05-2019

Accepted: 28-06-2019

**Alemayehu Abebe Wake**

Batu Fish and Other Aquatic  
Life Research Center, Batu,  
Ethiopia

**Tamiru Chalchisa Geleto**

Department of Rural  
Development and Agricultural  
Extension, Jimma University,  
Ethiopia

## Socio-economic importance of Fish production and consumption status in Ethiopia: A review

**Alemayehu Abebe Wake and Tamiru Chalchisa Geleto**

### Abstract

Fish provide not only high-value protein but also an important source of a wide range of essential micronutrients, minerals and fatty acid. In Ethiopia, Fish consumption status is diverse in a different part of the country and challenge in accessibility within a large group of population. This review paper organized with the specific objective of Socio-economic importance of Fish production and consumption status in Ethiopia. As literature data confirm that, due fast-growing human population, rising incomes and urbanization are increasing fish consumption pattern from time to time. Relayed to fish production, in 2016-year Ethiopia produces a total of 45,610 tones that contribute only 0.58% for the total production in Sab-Saharan countries. The reviewed data also show that demand for fish mostly seasonal and have low fish consumption level that only takes 0.4kg/Person/Year and 0.1 g/Person/Day due to strong tradition with other animal meat consumption and religious influences. Most Christians followers consider as fish acceptable when refrain from consuming any other animal products. Overall, especially for the poor fish is the only and an important source of a rich animal protein that plays a significant role in various health, environmental, social advantages and nutritional values. So, to increase fish consumption status and to improving its integration into the diet of most of the population in day to day consumption pattern, government agencies, private sector, and all fish related occupational organizations should bean emphasis on a wide awareness creation by providing training and mass advertising campaigns.

**Keywords:** Fish consumption, Fish production, socioeconomic importance, Ethiopia

### 1. Introduction

#### 1.1 Background and Justification

Providing adequate food for a rapidly increasing human population is one of the greatest challenges this day in the world. To be more specific, seafood bases play an important role in filling the nutritional requirements of human beings <sup>[23]</sup>. Globally fish production is about 154million tons per years with the consumption level of 18.5 kg per capita per year <sup>[22]</sup>. Projections also indicate that the aggregation of global fish supply will increase to 186 million tons (2030) compared to the 154 million tons (year, 2011) <sup>[40]</sup>. Similarly, globally fish consumption rates are growing faster than the global population growth, because of increased incomes and awareness of the health benefits associated with consuming fish, as well as rising urbanization <sup>[5]</sup>. In addition to directly providing high-quality food, fisheries and aquacultures create economic value through the production, trade, and marketing of wild and farmed fish <sup>[13]</sup>. The Ethiopian economy is heavily dependent on the agricultural sector that challenged with poor cultivation practices and frequent drought. Being the dominant sector, agriculture contributes about 46.3% of the total gross domestic product (GDP), 60% of exports, 98% of the total calorie supply, 70% of industrial raw material suppliers and 80% of total employment <sup>[19]</sup>. From agricultural sectors fish have a significant role for the fishing community on their livelihood security. But, from the total, it contributes only 0.02% to its Gross Domestic Product (GDP) <sup>[30]</sup>. Ethiopia is a land-locked country which has approximately 7400 Km<sup>2</sup> surface area of major lakes and 7185 Km long river network <sup>[18]</sup>.

The importance of fisheries to the Ethiopian economy, until 50 years ago, was insignificant due to abundant land-based resources and a sparse population density. But, from the 1940s and 50s, the rapid population growth, which resulted in a shortage of cultivable land and depletion of land resources, forced the people to look for other occupations and sources of food from water resources at a subsistence level.

### Correspondence

**Alemayehu Abebe Wake**  
Batu Fish and Other Aquatic  
Life Research Center, Batu,  
Ethiopia

The rapidly growing demand for fish in the capital city by foreigners and modern town-dwellers contributed to the start of commercial fishing as a new practice in Rift Valley lakes (from the 1950s) and, later, in Lake Tana late 1980s [3].

Spending on fisheries capacity building is an area of rural development as it plays a fundamental role in creating employment opportunities, providing dietary preferences for the middle-income consumer group, and meeting nutritional needs of the poor regions [40]. Despite these benefits, many people often preferred red-meat over-consuming seafoods. Consumption of fish is one of the most important in health that attributed to the omega-3 long-chain polyunsaturated fatty acids present in fish.

Protein profile of fish contains up to 22 of the essential amino acids in a well-balanced ration [23]; low cholesterol level compared to red meat and is easily digestible due to its high soft tissue. As its high nutritional value, fish is highly recommended as a dietary component for both the young and the old. However, fish consumption preferences are affected by the consumer's geographic, social and cultural characteristics [33]; socio-economic background, food consumption patterns, personal health status, attitudinal dimensions, society, age, household income and education level [31]. This review paper organized based on socioeconomic contribution and consumption status of fish production status in Ethiopia.

## 2. Literature review and Discussion

### 2.1 Fish production and consumption status in Ethiopia and the rest of Africa

As the global fast growing food production sector, the future expansion of fish as food is expected to come from aquaculture in the next decades. Currently, more than 30% of the continent's population, or roughly 200 million people, consume fish as the main animal protein source and micronutrition [2]. Africa's fast-growing human population outstrips growth in fish supply, and most of the continent's wild fish populations are fully exploited. Therefore, aquaculture production must more than double by 2050 to satisfy the projected fish demand [14]. Despite fish providing 19% of animal protein intake in Africa, the annual per capita fish consumption remains lower than the global levels [15].

The key driving forces behind increased fish consumption are rapid population growth, rising incomes, urbanization, a growing appreciation of healthy and nutritious fish-based food, and innovations in processing and packaging technologies and distribution channels [5]. Besides, 12.3 million people in Africa work in the fisheries and aquaculture sector, with 6.1 million (50%) being employed as fishers, 5.3 million (42%) as processors and 0.9 million (8%) as fish farmers [16]. In terms of economic value, fish produces an estimated total of US\$24 billion annually, accounting for 1.26% of gross domestic product (GDP) [16]. However, even if the continent has good potential to produce more, they

perform below expectation as comparing with the existing potential.

Aquaculture production is dominated by tilapia farming, which is also the most popular fish from a consumer perspective [17, 23]. From the below information (Table 1), in both aquaculture and capture fishery Egypt, Nigeria, Uganda, Tanzania and Kenya has the highest fish production country from Sub-Saharan Africa country. Egypt and Nigeria produce 2,747,731 tons in 2016 that account 35% from the total of 7,847,388 tones in Sab-Saharan Africa countries which is strongly higher than Ethiopian fish production status [20]. The same report FAO [20], show that, the country of Ethiopia produces a total of 45,610 tones that contribute only 0.58% for the total production in Sab-Saharan countries.

The inland capture fishery sectors provide most of the sub-regions' fishery production including Ethiopia. As different literature show that fish catches from wild sources have been declining, due to multiple anthropogenic pressures that need to support with aquaculture farms. A report of 2016 shows that, related to aquaculture production the country Ethiopia is very far and low as compared with top producers in Africa. From the total fish production of 45,610 tons, aquaculture contributes only 91 tons which share only 0.2% in total domestic Fish supply [23].

**Table 1:** Capture and aquaculture production of fish status in Ethiopia and the rest of Easter African subregion in 2016

Country	Capture Fisheries Production (Tons)	Aquaculture Production (Tons)	Total Domestic Fish Supply (Tons)	Aquaculture as a Share of Fish Production (%)
Sub-Saharan Africa	7,254,848	592,540	7,847,388	7.8
Egypt	335,613	1,370,660	1,706,273	81.73
Nigeria	734,731	306,727	1,041,458	30.62
Uganda	396,205	117,590	513,795	22.9
Tanzania	371,228	10,742	381,970	2.8
Kenya	165,135	18,658	183,793	11.3
Ethiopia	45,519	91	45,610	0.2
Rwanda	29,334	4,847	34,181	14.2
Burundi	20,120	1,326	21,446	6.2

Source: FAO, 2018a [23].

Beside on consumption status, again Eastern African Region exhibits remarkably low levels of fish consumption per capita (average of 5.1kgs/person/years) compared to the rest of Africa (10.1kg), and global level of 19.8kg (Table 1). From the below data (Table 1), only Uganda's per capita fish consumption of 12.5 kg was higher than the rest of Sub-Saharan Africa. However, the country of Ethiopia, have low fish, animal, and total protein intake across Eastern African countries. They only take 0.4kg/Person/Year and 0.1 g/Person/Day [21, 24, 37] which is very far from the world and African average consumption level. It also contributes only 0.2 percent of the total annual protein consumption.

**Table 2:** The fish, animal, and total protein intake Ethiopia and some Eastern African countries in 2013, compared to Africa and the global status

Region/Countries	Population (Thousands)	Total Food Fish Supply (Tonnes)	Fish Consumption (kg/Person/Year)	Fish Protein (g/Person/Day)	Animal Protein (g/Person/Day)	Fish/Animal Protein (%)	Fish/Total Protein (%)
World	7,162,118	142,126,714	19.8	5.4	32.1	16.9	6.7
Africa	1,110,636	11,225,497	10.1	2.9	16.0	18.4	4.4
Uganda	37,579	469,773	12.5	3.7	12.4	30.1	
Tanzania	49,253	352,304	7.2	2.3	10.4	22.5	4.0
Rwanda	11,777	52,910	4.5	1.5	5.8	25.1	2.5

Kenya	44,354	181,227	4.1	1.2	15.8	7.3	1.9
Burundi	10,163	20,145	2.0	0.6	2.2	28.1	1.7
Ethiopia	94,101	39,347	0.4	0.1	7.7	1.6	0.2

**Source:** FAO, 2015; FAO, 2018b and UN-DESA, 2017) [21, 24, 37].

The country Ethiopian has a strong tradition of livestock rearing and meat consumption. The Ethiopian Orthodox Church observes several fasting periods as well as fasting days every week when meat is not consumed. Most Christians consider fish acceptable during those periods, though some strict followers will not eat any animal product (Brook, 2012). The survey result conducted by Asefa [6] shows that demand is higher than supply especially, in Ethiopian fasting season. The price of fish per kg was higher in fasting season and lower when not fasting. As the rule of demand law: when price increase the demand was decrease and vice versa. But, in this case, it is not supported by the demand law because of in fasting season the only allowed meat type is fish even if the price is high the supply was not enough for consumers [6].

Fish consumption is heavily biased towards quite limited geographical areas and also heavily weighted towards fasting (55 days in March/April, 15 days in August) and two days in a week (Wednesdays and Fridays) as well as other periods which may be less widely observed [27]. These factors give rise to some particular characteristics of fish consumption in Ethiopia. Increasing scarcity (apparently reflecting both rising demand and supply constraints) has resulted in rising real prices for fish, so there is an increasing tendency for fish to be a luxury product consumed by higher income groups. This is because of religious influences on consumption patterns; the demand for fish is only seasonal. During lent, Christians who abstain from eating meat, milk, and eggs consume fish, since fish is the substitute of meat [6].

Besides this, fish consumption trends become low due to: poor in integrating fish into the diet of most of the population, religious influences on consumption patterns, the demand for fish is only seasonal and the limited supply of the product and its high price [7]. Even if the available stocks of these fishery waters will be fully exploited in the near future, both current and future demand for fish by the population cannot be met. The study conducted by Ignatius and Zelalem [26], confirm that on lake Ziway the largest amount of fish landing occurs between January and March while the minimum is during the summer season (June to September).

The highest fish harvest season coincides with the highest demand period which happens to be the fasting season of Ethiopian Orthodox religion followers who consume mostly fish meals. The data also revealed that some of the sample households go for fishing only during these fasting months. Moreover, the country's fish consumption system differs from place to place. Towns and roadside vicinity of the nation are the most frequent fish consumers. The estimated fish consumption in a small radius around water bodies of Hawassa, Arba Minch, and Gambella may be placed at approximately 10 Kg/year per capita [23].

As the study results conduct at selected Potential Areas of the Tigray Region, Northern Ethiopia indicate that from the interviewed population 10.7%, 45.2%) and 30.7%) are consumed in every day, occasionally and on fasting days respectively [8]. In another case, the households in Somalia consume fish at least once to twice a week [22]. Additionally fish consumption was higher in summer (45.5%) and lowest in autumn (2.2%) seasons and mainly consumed with vegetables (28.4%), Injera (23.4%), bread (11.0%), and rice (4.4%), and is part of a lunch meal (42.4%), breakfast (8.3%),

and dinner (5.2%) [8]. In Somali and other East African societies, fish is mainly consumed with Injera, rice, spaghetti, and bread [22].

According to Awot *et al.* [8], the main factors affecting fish consumption and the type of fish consumed at Potential Areas of the Tigray Region were found to be the availability of fish in the consumer vicinity (21.8%), cost (13.8%), taste and smell of raw fish (17.4%), the known health benefits (7.7%), and lack of appropriate preservation and knowledge of fish preparation (9.9%). Community awareness was the key point for changing the view of a certain community [35].

From this finding fish availability, fish test, lack of adequate knowledge in fish handling and processing is one of the major factors for fish consumption status in the study area. This result clearly indicates that if the fish production is well accessible and affordable for any community with appropriate training, its utilization and consumption level will be increased that improve the nutritional status of money peoples. The same result also indicates that there is a statistically significant association with the religion of respondents and their fish consumption habit due to religious influences on consumption patterns [8].

## 2.1 Socio-economic importance of Fishery sector in Ethiopia

Fish and fishery products remain the most well-traded food items worldwide [20, 32]. The sector is good as the source of income, food and job creation [10]. International trade is crucial to the fisheries sector, especially in the least advanced economies, through the creation of employment, supplying food, generating income, and thus contributing to maintaining food and nutrition security [32, 25]. Despite the relatively high contribution of developing countries to global trade, millions of people in developing countries consume fish protein in their diets, compared to those living in developed countries [12]. As Ayilu *et al.* [9], assessment result and WB [39], report indicates that fish is an affordable and accessible source of protein for approximately 400 Million Africans.

Animal protein is the most deficient or undersupplied nutrient in most rural communities' diets of the country in general [29], fish is the only and an important source of animal protein especially for the poor who cannot afford to buy other animal protein. Its consumption has various health, environmental, social advantages and nutritional that is essential to cognitive and physical development, especially in children, and are an important part of a healthy diet over other terrestrial animal meat [23]. It is an important source of energy and protein, comparable to or better than many terrestrial types of meat [38]. The consumption of fish and seafoods, in general, are having several nutritive and health benefits.

The fish meat contains several essential amino acids, highly unsaturated fatty acids, high level of iron, calcium and iodine, and Vitamin A. Furthermore, fish meat has been stated to improve intelligence, treat skin conditions, improve brain development and decrease risk of heart diseases, asthma, Alzheimer's disease, cancer, obesity, and diabetics and others [23, 28]. Fish is a primary source of essential nutrients for pregnant mothers and children, especially nutrients like, an omega-3 fatty acid that is critical for early brain development [36]. Despite these benefits, many people often preferred red-

meat over-consuming seafoods.

The artisanal freshwater fishery is one of the most important economic activities in Ethiopia. The sector plays an important role in the livelihood security of the community through both direct consumption and income generation. According to Asefa <sup>[7]</sup>, report specifies that fish contribute for peoples in two ways; one fish serves as a major food item to the beneficiaries and secondly it provides cash income which is ultimately used for the purchase of a variety of food items. In 2010, Ethiopia realized about 14,000,000 USD\$ from its capture fishery, while a total of 40,000 livelihoods were positively impacted upon by the fishery sector in the year <sup>[7]</sup>.

The sector is a good means to create job opportunities for young labor force and large family size households in rural, pre-urban and urban unemployed. The rural areas of Ethiopia where substantial fishing takes place benefit from the economic activities of the fishers and their related operations. This is especially so around the Great Rift Valley and other areas surrounding the lakes, reservoirs, rivers and other small water bodies <sup>[4]</sup>.

According to Abebe and Hossein <sup>[1]</sup>, the report demonstrates that participating in fishing has contributed 55% improvement in incomes of households. In most countryside areas the farmers who have access to land has concentrated more in crop farming than other alternative income sources like fishing. Those households with less land and a lower number of oxen are moved to fishing as it enables them to diversify their income sources. As assessment result done by Abebe and Hossein <sup>[23]</sup> confirm that, in areas where land is scarce and access to irrigation is minimal, fishing is considered as an alternative income source used to diversify livelihood strategies. In relation to fish consumption pattern, 95% of the households consume fish at household level from the total households who participates in fishing activities and only 34% of household is consumed fish at household level from non-participates in fishing activities. The study result conclude that participation on fishing activities is statistically significant in fish consumption pattern at the 1% level. This implies how fish is contributing to the households' food security and nutritional requirements.

40-60 percent of the fish body is being wasted as offal every day and year in the shoreline of the water bodies. Due to its an excellent source of protein, fish meal-processing and utilizing as concentrated feed for other animal have a bilateral benefit: that keeping our ecosystem from pollution and creating another income opportunity. In addition, fish has attracted many tourists and has contributed to getting a considerable foreign exchange. The tourist catches fish as recreational vale when they get permission from the near-by Agricultural office or from the Ministry of Agriculture after paying money in advance before fishing. The number of fishes to catch per day per hook is limited up to five fish only and is not allowed for the commercial purpose <sup>[23]</sup>.

### 3. Conclusion and Recommendation

Fishing plays an important role in the livelihood security of the community through both direct consumption and income generation. Fish is often considered to be a 'rich food for poor peoples. So, it significantly contributes to food security and cash income which is ultimately used for the purchase of a variety of food items. As different literature indicates that the fish consumption per head per year of the country is very low as compared with the rest of sub-Saharan countries due to poor in integrating fish into the diet, lack of accessibility and

its seasonality, limited supply and religious influences.

- So, for increasing its contribution on the side of income generation or food consumption, the government, non-governmental organizations and all stakeholder should be establishing real fish marketing system that ensures its accessibility in all part of the country.
- To make more accessible, inspire farmers, public and private investment are needed in order to expand fish production farm (aquaculture) in all potential area at all farm village in addition to utilizing capture fishery.
- Government agencies, private sector, and all fish related occupational organizations should be an emphasis on a wide awareness creation by providing training and mass advertising campaigns with the goal of increasing consumption and improving related to integrating fish into the diet of most of the population in day to day consumption pattern.

### 4. Acknowledgment

I would like to express my appreciation to my Advisor Mr. Tamiru Chalchissa (MA) and also, I would like to give my thanks to my instructor Dr. Abayineh Amare (Assistant Professor, Jimma University) those give their time and effort in this paper organization. Finally, I want to extend my gratitude to all my friends who helped p me with all my success.

### 5. Reference

1. Abebe E, Hossein A. Fish Value Chain and Its Impact on Rural Households' Income: Lessons Learned from Northern Ethiopia, 2018. Available online, file:///C:/Users/USER/Downloads/Fish\_Value\_Chain\_and\_Its\_Impact\_on\_Rural\_Household.pdf (accessed on June 6/2019).
2. African Union Commission New Partnership for Africa's Development (AUC-NEPAD). Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods, 2019. Available online: <https://www.nepad.org/caadp/publication/malabo-declaration-acceleratedagricultural-growth> (accessed on May 20/2019).
3. Alayu Y. Fish production, processing and utilization in the Lake Tana fisheries; Polish development cooperation program; Implementation of Ecohydrology - a transdisciplinary science for integrated water resources and sustainable development in Ethiopia; Bahir Dar Fishery and Aquatic Life Research Center, 2012.
4. Alazer S. Ethiopia: Emphasis on Modern Fish Harvesting Development, 2016. [allafrica.com/stories/201603100972.html](http://allafrica.com/stories/201603100972.html)
5. Anderson JL, Asche F, Garlock T, Chu J. Aquaculture: Its role in the future of food. In *Frontiers of Economics and Globalization*; Emerald Publishing Limited: Bradford, UK, 2017, 159-173.
6. Assefa M. Assessment of fish products demand in some water bodies of Oromia, Ethiopia; *International Journal of Agricultural Sciences*. 2013; 3(8):628-632.
7. Assefa M. Fish Production, Consumption and Management in Ethiopia; *Research Journal of Agriculture and Environmental Management*. 2014; 3(9):460-466.
8. Awot T, Beyenech G, Michael E, Amaru A, Niraj K, Tsegay T *et al.* Trends in Fish Consumption and

- Community's Behavior in Selected Potential Areas of the Tigray Region, Northern Ethiopia; Ethiopian Journal of Veterinary Science and Animal Production (EJVSAP), 2018; 2(1):60-71.
9. Ayilu R, Theodore O, Antwi-Asare P, Anoh A, Tall N, Sloans C *et al.* Informal artisanal fish trade in West Africa: Improving cross-border trade." Penang, Malaysia, 2016. Available online: <http://www.fao.org/docrep/019/i3640e/i3640e.pdf> (accessed on May 10/2019).
  10. Bilame O. Contribution of Lake Victoria small-scale fisheries to poverty alleviation. A Case Study of Tanzania Small-scale Fisheries. Agricultural Science and Technology, 2012; 2:1268-1278.
  11. Brook L. Report on the Value Chain Assessment of the Fishery Sector in Ethiopia. Food and Agriculture Organization Sub-Regional Office for Eastern Africa Addis Ababa, 2012, 131.
  12. Bush S, Oosterveer P. Governing Sustainable Seafood; Taylor & Francis Group: New York, NY, USA, 2019.
  13. Cai J, Huang H, Leung PS. Understanding the Contribution of Aquaculture and Fisheries to GDP; FAO Fisheries and Aquaculture Technical Paper No. 606; FAO: Rome, Italy, 2019, 80.
  14. Cai J, Leung PS. Short Term Projection of Global Fish Demand and Supply Gaps; FAO Fisheries and Aquaculture Technical Paper No. 607; FAO: Rome, Italy, 2017.
  15. Chan CY, Tran N, Pethiyagoda S, Crissman CC, Sulser TB, Phillips MJ. Prospects and challenges of fish for food security in Africa. Glob. Food Security, 2019, 17-25.
  16. De Graaf GJ, Garibaldi L. The Value of African Fisheries; Vol FIPS/C1093, FAO: Rome, Italy, 2019; 67p, Available online: <http://www.fao.org/documents/card/es/c/d155e4db-78eb-4228-8c8c-7aae5fc5cb8e/> (accessed on May 16/2019).
  17. De San M. Report of Five EAC's Countries Aquaculture Situation, Needs and Regional Expectations; Report/Rapport: FAO Smart Fish Publication No. SF-FAO/2013/12; FAO: Arusha, Tanzania, 2013.
  18. Dejen E, Mintesnot Z. A generic GIS based site suitability analysis for pond production of Nile Tilapia (*Oreochromis niloticus*) in Ethiopia. In the Fourth Annual Conference of the Ethiopian Fisheries and Aquatic Sciences Association. Addis Ababa, Ethiopia: EFASA, 2012.
  19. Ethiopia Economy Profile (EEP). Agriculture in Ethiopia, 2015. The free encyclopedia. <https://en.wikipedia.org/wiki/Economy-of-Ethiopia>.
  20. Food and Agriculture Organization (FAO). (2018a). World Aquaculture Performance Indicators (WAPI) Aquaculture Production Module (WAPI-AQPRN v.2018.1); FAO: Rome, Italy, 2018. Available online: [www.fao.org/fishery/statistics/software/wapi/enpdf](http://www.fao.org/fishery/statistics/software/wapi/enpdf) (accessed on 25 November 2018).
  21. Food and Agriculture Organization (FAO). FAO Yearbook. Fishery and Aquaculture Statistic; Rome, Italy, 2015.
  22. Food and Agriculture Organization (FAO). Fish consumption in Somalia. CAADP Workshop. Information for better livelihoods. The European Commission Swiss Agency for development and cooperation (EU-SDC) donor's technical partner report. Fisheries and Aquaculture department of food and agriculture organization of the United Nations, Rome, Italy, 2013, 4-6.
  23. Food and Agriculture Organization (FAO). The state of world fisheries and aquaculture. Fisheries and Aquaculture department of food and agriculture organization of the United Nations, Rome, Italy, 2014, 75-76.
  24. Food and Agriculture Organization (FAO). World Aquaculture Performance Indicators (WAPI)-Fish Consumption Module (WAPI-FISHCSP v.2018.1); FAO: Rome, Italy, 2018b. Available online: [www.fao.org/fishery/statistics/software/wapi/enpdf](http://www.fao.org/fishery/statistics/software/wapi/enpdf) (accessed on 26 November 2018)
  25. Fugazza M. Fish Trade and Policy: A Primer on Non-Tariff Measures, 2019. Available online: [https://unctad.org/en/PublicationsLibrary/ser-rp-2017d7\\_en.pdf](https://unctad.org/en/PublicationsLibrary/ser-rp-2017d7_en.pdf) (accessed on May 15/2019).
  26. Ignatius M, Zelalem B. The role of fishery in livelihood security of fishing communities around lake Ziway, Eastern Showa Zone, Oromia Regional State, Ethiopia; Institute of Development Studies, Bindura University of Science Education, Zimbabwe, 2011.
  27. Lemma AH. Fisheries production system scenario in Ethiopia; International Journal of Fisheries and Aquatic Studies, 2017; 5(1):79-84
  28. Mebratu A, Alemayehu S, Taffesse P, Dorosh D, Sinafikeh A. Crop production in Ethiopia: Regional patterns and trends. The International food policy research institute (IFPRI) sustainable solutions for ending hunger and poverty. Summary of ESSP II Working. 2015; 16:1-5.
  29. Mekonnen H, Lemma A. Plant species used in traditional smallholder dairy processing in East Shoa, Ethiopia. Journal of Tropical Animal Health Prod, 2011; 43:833-841
  30. Ministry of Agriculture (MOA). Annual production of fish in Ethiopia. Unpublished report of the Ministry of Agriculture and rural development, Federal Democratic Republic of Ethiopia, Addis Ababa, Ethiopia, 2015, 1-7.
  31. Olsen SO. Understanding the relationship between age and seafood consumption: The mediating role of attitude, health involvement and convenience. Food Quality and Preference. 2007; 14:199-209.
  32. Organization for Economic Co-operation and Development (OECD) and Food and Agriculture Organization of the United Nations (FAO). Chapter 8. Fish and seafood. In OECD/FAO Agricultural Outlook 2018-2027; FAO: Rome, Italy, 2018.
  33. Pieniak Z, Kołodziejczyk M, Kowrygo B, Verbeke W. Consumption patterns and labelling of fish and fishery products in Poland after the EU accession. Food Control, 2011; 22(6):843-850.
  34. Rothuis A, Turenhout M, van Duijn A. Aquaculture in East Africa; A Regional Approach Roem, A., Rurangwa, E., Katunzi, E., Shoko, A., Kabagambe, J.B., Eds.; A Regional Approach LEI Report IMARES C153/14|LEI14-120(University and Research Centre); Wageningen University: Wageningen, The Netherlands, 2014, 54.
  35. Sintayehu B, Seblewengel L. Fish consumption pattern and determinants at house hold level in Asella town, South Central Ethiopia. Nutrition. 2015; 6(5):159-170.
  36. Swanson D, Robert B, Shaker A. Mousa. Omega-3 fatty acids EPA and DHA: health benefits throughout life.

- Advances in Nutrition: An International Review Journal 2012; 3(1):1-7.
37. United Nations Department of Economic and Social Affairs (UN-DESA) World Population Prospects: The 2017 Revision, Key Findings and Advance Tables; UN-DESA: New York, NY, USA, 2017.
  38. United States Department of Agriculture (USDA) Agricultural Research Service USDA Food Composition Databases, 2016. Available online; <https://ndb.nal.usda.gov/ndb/search/list> (Accessed on June 6/2019).
  39. World Bank WB. Africa program for fisheries, 2012. Available online; <http://documents.worldbank.org/curated/en/467181468194349929/pdf/788150WPOBox370r0Fishes00PUBLIC0.pdf> (Accessed on June 6/2019).
  40. World Bank (WB). Fish to 2030: Prospects for Fisheries and Aquaculture, the World Bank, 2013. Available online: <http://www.fao.org/docrep/019/i3640e/i3640e.pdf> (accessed on May 10/2013).