

## Fish Production Constraints in Ethiopia: A Review

<sup>1</sup>Alebachew Tilahun, <sup>1</sup>Adamo Alambo and <sup>2</sup>Abebaw Getachew

<sup>1</sup>Wolaita Sodo University School of Veterinary Medicine, Ethiopia

<sup>2</sup>Agarfa Federal Agricultural Teaching Vocational and Educational Training College, Ethiopia

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**Abstract:** Fish has historically played an important role in food security in many countries and contributes to do so in globally, providing 15-20 percent of animal protein intake. Fish farming has been practiced in different parts of the world like Europe. At present, the country Ethiopia has an estimated annual total exploitable fish potential of 51,481 tons, which can meet only 79 percent of the current actual demand, 55 percent of the projected demand in 2010 and 44 percent of the projected demand in 2015, based solely on population size. Lake Tana, Ashenge, Hayk, Koka, Ziway, Langano, Awassa, Abaya and Chamo are among the Potential fish rich lakes found in Ethiopia. The main commercial species contributing to the total landing are *Oreochromis niloticus*, *Labeohori*, *Clarias gariepinus*, *Barbus* species and *Latesniloticus*. Fish is highly nutritious, so even small quantities can improve people's diets. Several reasons like environmental degradation, poor fisheries development, increased illegal fisheries, traditional fishing system and climatic changes attributed to the low production in the country.

**Key words:** Ethiopia • Fish • Production challenge

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### INTRODUCTION

Fish farming has been practiced in different parts of the world like Europe, Canada, East Asia, China, Africa and developing countries like Nigeria [1]. It has been in practice since the ancient civilization of Egypt and China. More than 120 million people throughout the world are estimated to depend on fish for all or part of their income. Conservation of communities implies knowledge of the number and distribution of species of any particular area. As habitat degradation continues on a global scale, maintenance of species richness has become a central issue of conservation biology [2].

It is estimated that the inland fisheries of Africa produce 2.1 million tons of fish, which represents 24% of the total global production from inland waters [3]. According to Food and agricultural organization [1] developing countries accounted for 49 percent of world exports by value and 59 percent by volume in 2006. With growing trade in fish products, there is growing concern about the possible effects on developing country consumption and nutrition [4].

Ethiopia is the largest livestock populations in the Africa. The livestock sector accounts for over 26 percent of agricultural GDP (2009/10) and 8 percent of export earnings (2010) and can produce over 51,500 tons of fish per annum. However, their exploitation and consequently their contributions to food security and growth in the country are minimal despite the technologies capable of resolving the problems of livestock and fisheries production [5].

At present, the country Ethiopia has an estimated annual total exploitable fish potential of 51,481 tons, which can meet only 79 percent of the current actual demand, 55 percent of the projected demand in 2010 and 44 percent of the projected demand in 2015, based solely on population size [6]. Fish is highly nutritious, so even small quantities can improve people's diets. Fish provides about 20 percent of animal protein intake in developing countries and this can reach 90 percent in Small Island Developing States (SIDS) or coastal areas. Fisheries can also contribute indirectly to food security by providing revenue for food-deficient countries to purchase food. Fish exports from low-income, food-deficient countries are equivalent to 50 percent of the cost of their food imports [7].

Several reasons attributed to the low production among which the lack of fishing tradition and low fish consumption habit of most people is frequently quoted. Traditionally, small-scale or artisanal fisheries are used to characterize those fisheries that were mainly non-mechanized with low level of production due to constraints faced by the fishermen [8]. In Ethiopia the rate of degradation of the environment, mainly by deforestation and overgrazing of grasslands by cattle, is very high [9] and leads to approximately 1.5 billion tons of soil lost every year from the highlands. This has already resulted in a decrease in biodiversity of the fish fauna in the different drainage basins and the Rift Valley Lakes [10].

Fish is a crucial source of protein and the dried form, a common condiment. Over 500,000,000 people in developing countries depend directly or indirectly on fisheries and aquaculture for their livelihood [11]. Nevertheless, the fishing sector of the economy has various problems. Among others, mismanagement of the resource, inappropriate policies and institution, inadequate technical and material backup to the sector and market are the major ones. Moreover, the Ethiopian lakes, on which the inland fishing is mainly practiced, are threatened by catchment's deforestation, shore damage, water pollution, siltation, over fishing [12]. Spreading awareness of fish welfare has resulted in the need for a more humane slaughter system. In 1996, the Farm Animal Welfare Council of United Kingdom's expressed the view that none of the methods used to kill trout commercially were acceptable in terms of animal welfare [13].

Even though fish provides a vital source of food employment and crucial source of protein, recreation, trade and economic well being for people throughout the world. In now days, there is an increment of human population in Ethiopia and the rest developing countries and obvious that the demand of food will be increased. Little attention has been given for fish welfare and production constraint of the fish and there was no study conducted regarding the welfare issues and major production constraint of fish in Arbaminch, Ethiopia. In the society, have less awareness for control and prevent illegal activity fishing communities of Lake Chamo and Abaya. However, several factors were affecting on the fish production and welfare, due to over fishing, illegal fishermen, irrigation and fishing on the closed area, shore cultivation, deforestation and use illegal mesh size. Studies to reveal the magnitude of this problem are

lacking and scanty in the present study area.

Therefore, the principal objectives of this study was;

- To review fish production constraints

## Literature Review

**Potential Fish Rich Lakes in Ethiopia and Common Fish Species:** The importance of fish products in many coastal, lake and floodplain areas is very much greater than this global average [14]. The main commercial species contributing to the total landing are *Oreochromis niloticus*, *Labeohori*, *Clarias gariepinus*, *Barbus* species and *Latesniloticus* [15]. Besides, to its captured fisheries importance, Tilapia is one of the most important species for 21<sup>st</sup> century aquaculture and is produced in more than 100 countries [16]. Tilapia is the leading species caught and consumed in Ethiopia, although this does not seize for all groups and for all areas. This is reported by different researchers, Nile Tilapia (*Oreochromis niloticus*) is the dominant fish species of the landings [17].

The species of catfish *Chrysichthys* are widely distributed in fresh and brackish waters in West Africa where there are commercially important fish [18]. The Nile perch is of great commercial importance in East Africa (Especially the Lake Victoria Basin), where the fishery has brought modernization (e.g. electricity) and profitability for fishing villages that were traditionally based on subsistence fishing [19]. The introduction of the Nile perch, *Latesniloticus*, in the late 1950s/ early 1960s had major ecological consequences and it was thought that some 200 endemic haplochromine species (which predation by the Nile perch [20]. The fresh water fish fauna of Ethiopia is a mixture of Nilo-Sudanic, East African and endemic forms [21]. The highland East African forms are found in the northern rift valley lakes (Lake Awassa, Ziway and Langano and Highland lakes (Lakes Hayk and Tana). The genera include *Barbus*, *Clarias*, *Garra*, *Oreochromis* and *Varicorinus*. They are related to fishes of Eastern and Southern Africa and Arabian Peninsula. Ethiopia widely distributed *L. intermedius* sub-dominant. However, five species occurred in three or more lakes. These were *Oreochromis niloticus* (Nile tilapia), *Labeobarbus intermedius* (common large barb), *Clarias gariepinus* (African catfish), *Garradembecha* and *Cyprinus carpio* (common carp). With the exception of Lake Tana all fish communities showed a low species richness (Maximum of 6 species) [22].

Table 1: Potential fish rich lakes in Ethiopia

Lakes	All species	Species contributing =1%of abundance
Ashenge	2	2
Hayk	4	3
Tana	17	3
Koka	5	5
Ziway	4	2
Langano	5	5
Awassa	5	2
Abaya	6	4
Chamo	4	3

Source: Jacobuset al.[22]

**Fish Habitat:** Conservation of communities implies knowledge of the number and distribution of species of any particular area. As habitat degradation continues on a global scale, maintenance of species richness has become a central issue of conservation biology. This is particularly the case with the fish fauna of inland waters. Habitat alteration and destruction is generally the major cause of most extinction of freshwater fishes [22]. In comparison to marine fisheries, inland fisheries production is relatively small, representing only 6% of global production. In Africa, marine fisheries production (4.7 million tons) is also much larger compared to inland fisheries (2.1 million tons) but in a smaller scale than at the global level. Ethiopia has an agrarian dominated economy, with 85% of the total employment, 98% of the total calorie supply, 70% of industrial raw material supplies, over 45% of GDP and 90% of the foreign currency earning. Despite its important roles, however, it fails to meet the minimum food requirements of the population [23].

Fish is an extremely perishable food item [24]. Fish is one of the known aquatic animals used for human consumption as food. Aquatic animals in general do contain a high level of protein (17-29%) with an amino acid profile, similar to that of the meat of land animals. Fish products are essential to food security, providing over 1 billion people with their main source of protein and more than 4.3 billion people with about 15 per cent of their average per capita animal protein intake [25]. Fish proteins are particularly important for preschool-aged children and pregnant women [26]. The flesh of a fish is also readily digestible and immediately utilizable by the human body, which makes it suitable for complementing the high carbohydrate diets. Compared with land animals (With some exceptions, such as shellfish), aquatic animals have a high percentage of edible flesh and there is little wastage [5].

**Fish Welfare:** Researchers concerned about animal welfare generally presume that animals are capable of suffering or discomfort [27]. In order to consider the welfare of an organism, it must be conscious of at least some basic emotion. Thus, fish welfare should only be of concern if fish are not only aware but also conscious. That is, the fish must have the ability to subjectively experience pain, coldness, comfort, discomfort and to consciously differentiate perceived internal states as ‘good or bad’, ‘pleasant or unpleasant’, etc. Such ability, termed sentience, is a necessary attribute for concerns about animal welfare [28-29]. Fish are capable of suffering and we approach this by considering the controversial issue of whether they experience physical damage as pain [30]. The three main indicators of humane slaughter are that excitement, pain and suffering in the pre-slaughter handling is minimized, that the animal becomes insensible to pain within less than 1 second of the application of any aversive stunning or slaughter procedure and that this state of insensibility persists until the animal is dead. These features are a legal requirement for animal slaughter in United Kingdom, being a part of the “Welfare of Animals (Slaughter or Killing)[31].

**Challenge of Fish Production**

**Environmental Degradation:** Increases in subsistence agricultural growth, deforestation, municipal and industrial effluents and human encroachment on the shoreline has given rise to historically unprecedented nutrient loadings into the lake [32]. Degradation and depletion has the most immediate impact on rural poverty, food insecurity, malnutrition and under-nutrition are closely linked to the degradation of environment, as poverty depletes natural resource, which in turn aggravates the suffering of the rural poor. When people's survival is at stake they are forced to farm marginal lands, to reduce fallow periods, to cut vital forests in their search for arable land or fuel, to overstock fragile rangelands and to over Fish Rivers, lakes and coastal waters [33]. Nevertheless, the fishing sector of the economy has various problems. Among others, mismanagement of the resource, inappropriate policies and institution, inadequate technical and material backup to the sector and market are the major ones. Moreover, the Ethiopian lakes, on which the inland fishing is mainly practiced, are threatened by catchment’s deforestation, shore damage, water pollution, siltation and eutrophication and over fishing [12]. In Ethiopia, there has been a great increase in the extent of irrigation schemes in recent years [21].

**Problems Facing Fisheries Development:** An estimated 90 percent for the 38 million people recorded by the food and agricultural organization globally as fishers and fish-farmers are classified as small-scale [3]. In addition more than 100 million people are estimated to be employed in other fisheries associated occupations, particularly in processing and trading, bringing the total estimated to be directly or indirectly employed in small-scale fisheries and aquaculture to be about 138 million in 2002 [34]. Those facing fisheries in the natural habitat which include: Over fishing, Obnoxious and unconventional fishing practice such as the use of chemical poison (ichthyotoxic) plants and the use of unregulated mesh sizes [35].

The constraints and vulnerability of fisheries communities are mainly due to resource depletion, increasing competition on open access resources, inequitable use of resources, natural disasters like storms and over-reliance on one type of asset and lack of options. Moreover, lack of government support, remote locations and poor services, low literacy and innumeracy and weak organization capacity are other factors that expose fishing communities to poverty. The number of fishermen and fishing gears increased the fishery resource has become so scarce and the common pool fishery resource which is the source of livelihood to the fishing communities become at risk [14].

#### **Regulation and Control of fish Production Challenges**

**Stop Illegal Fishery and Trader:** The fish stocks decline and the demand for fish and seafood increases, illegal fishing and the trade of illegal fish is becoming an increasingly reactive option for some operators. At the same time governments around the world are working together to tighten the controls on fishing vessels, fishing activities, the transport of fish and the trade of fish in an effort to stop illegal fishing and to be manage their fishery resources [36].

**Climatic Changes:** Relevant current and future global climatic changes include an increase in mean air temperature, shifting precipitation patterns and an increase in extreme weather events. The impacts of climate change and variability on inland fisheries and aquaculture production will be different [25]. Production of fish in Sub-Saharan Africa is important not only for domestic food security, but also to community livelihoods and national economies [26]. Climate change also poses threats to marine and freshwater species and habitats. Fluctuations

in water temperature, ocean currents, upwelling and biogeochemistry are leading to productivity shocks for fisheries [37].

The higher altitude, the more temperate the climatic condition. Most of these lakes are currently not interconnected, but Lake Chamo and Lake Abaya (Southern Rift Valley Lakes) were connected until a few decades ago and Lake Ziway and Lake Langano are interconnected by rivers via Lake Abijata [38]. Lake turbidity was determined by measuring light extinction using Secchi disc (250 mm diameter). Dissolved oxygen concentration was determined by use of the original Winkler titration method described in [39].

**Management of the Fishery:** The major cause appears to be the destructive fishing in the river mouths while the fish are in route to their spawning grounds upstream [40]. For the interests of the majority of the fishermen in lake Ziway, the management of fisheries is preferably to rely on closed seasons, closed fishing areas, restriction on number of fishers, catch quotas, mesh size restriction, restriction on beach seines and banning beach seines [41]. It has also been recognized that the efficiency and implement ability of the management measures are often highly dependent on the support gained from the interested parties' [42]. Reported integrate upstream forest and wet land protection and rehabilitation activities in to the conservation, development and management of water resources and protection of the interface between water bodies and land such as lake shores, river banks and wet lands [43].

#### **CONCLUSION**

In this survey research, there were multiple welfare and production problems. Increased illegal fisherman, increased fishing closed area, increased shore cultivation, many landing site, increased illegal fishing materials, deforestation, irrigation and shortage of knowledge were the major constraints that contribute for poor welfare and production in the study area. In addition, wet land used for animal grazing and increased water turbidity was observed in Abaya and Chamo lakes. Moreover low access for transportation, poor practice of managing harvested fish, poor fish conservation practices, inhumane method of stunning were practiced in both Abaya and Chamo lakes. Average caught fish has been declining over the last few years due to too many fishers and illegal gears, use of

small mesh size/fishing for juveniles and on the breeding grounds and open accesses as the reason for stock reduction.

In light of the aforementioned conclusion the following recommendation were forwarded;

- Awareness creation on fish welfare and production through training, extension service should be encouraged by the concerned bodies.
- Further research should be conducted to explore abundance of fish species and their disease
- The government and public should be responsible to control deforestation, irrigation, small mesh size and shore cultivation.

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