Systematic Review, Trends of Fish Production and Aquaculture Development in Amhara Region, Ethiopia

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Executive Summary

Review entitle: Systematic review, trends of fish production and aquaculture development in Amhara Region. The Amhara National Regional State (ANRS) is one of the nine ethnic divisions of Ethiopia. It is located in the north western and north central part of Ethiopia. Amhara region has a rich diversity of ichthyofauna in its lakes, rivers and reservoirs, although they are poorly known in terms of potential and taxonomic characteristics. Fishing is an age-old practice in these water bodies. Amhara region is the richest water resource in Ethiopia such as Lakes (Lake Tana, Lake Gudera, Logo, Ardibo, Zegena, Tirba, Maiyber and Damss (Tekeze, Koga, Angerebe reservoir, Geray, ribe and Tana beles). Major rivers Abby/ Nile, Tekeze, Awash. Objective of this review to deliver well organized scientific information trends of fish production in Amhara Region. Data was collected Seven consecutive years’ data collected from livestock and fishery sectors each year annual report at region. Purposive sampling techniques were applied to collect data. up-to-date picture was also taken. Raw data is change to information by using Microsoft excel 2003 and 2007. Results: when we see in amhara fish production trend, there is up and down. Fish production in aquaculture was the least among others. This show that aquaculture is infant stage in the Region. When we see world aquaculture, aquaculture leads fishery. Fish handling and processing is backwar in the region.

Key words: Amhara region; Fish production; Aquaculture development and Fishing materials

Introduction

Ethiopia is uniquely rich in water resources. It has numerous water bodies including ponds, lakes, rivers, reservoirs and wetlands (Tessema A. et al, 2014). The inland water body of Ethiopia is estimated to encompass about 7,400 km² of lake area and a total river length of about 7,000 km. Fish (Mitike JA (2014). As an important food item that has significant socioeconomic contribution as a source of income, employment and cheap protein for marginal people in developing countries including Ethiopia (Asmare E. et al., 2015). Food security of poor people, as most inland fish production goes for subsistence or local consumption (FAO, 2004). According to the study by the Ethiopian Ministry of Economic Development and Cooperation, 50 percent of the Ethiopian population are living below the food poverty line and cannot meet their daily minimum nutritional requirement of 2200 calories (MOPED, 1999). The inland fishery of Africa is contributed about 2.1 million tonnes of fish per year, it represents (24%) of the total world fish production from inland water bodies (FAO, 2004). Fishery has significant role that contributes to the economy of the country (Mitike, 2015). It

Aquaculture in Africa contributes less than 1% of total global fish production (FAO, 2000). Integrated livestock-fish culture is still at a rudimentary stage and few successful impacts are documented in Africa (Rasowo et al., 2008).

The lowland part covers mainly the western and eastern parts with an altitude between 500-1500 meters above sea level. Areas beyond 2,300 meters above sea level fall within the “Dega” climatic Zone, and areas between the 1,500-2,300 meter above sea level contour fall within the “Woina Dega” climatic zone; and areas below 1,500 contour fall within the “Kolla” or hot climatic zones. The Dega, Woina Dega and Kolla parts of the region constitute 25%, 44% and 31% of the total area of the region, respectively. The annual mean temperature for most parts of the region lies between 15°C-21°C. The State receives the highest percentage (80%) of the total rainfall in the country. The highest rainfall occurs during the summer season, which starts in mid June and ends in early September. Amhara region has a rich diversity of ichthyofauna in its lakes, rivers and reservoirs, although they are poorly known in terms of potential and taxonomic characteristics. Fishing is an age-old practice in these water bodies (Abebe A, 2004). Amhara Region fish production potential above 40,000 tone fish meat (CSA 2017/2018).

Amhara Region
Location, Demographics, Topography and Climate

The Amhara National Regional State (ANRS) is one of the nine ethnic divisions of Ethiopia. It is located in the north western and north central part of Ethiopia. The State shares common borders with the state of Tigray in the north, Afar in the east, Oromiya in the south, Benishangul-Gumuz in the south west, and the Republic of Sudan in the west. The capital city of the State of Amhara is Bahir Dar. The Amhara Region has a population of 20,660,826; urban inhabitants number 2,439,388 (11.8%) and rural 18,221,429 (88.2%) of the population (Awulachew, S. et al, 2007). With an estimated area of 159,173.66 square kilometers, this region has an estimated density of 108.2 people per square kilometer. For the entire Region 3, 983,768 households were counted which results in an average for the Region of 4.3 persons to a household, with urban households having on average 3.3 and rural households 4.5 people. The State of Amhara is topographically divided into two main parts, namely the highlands and lowlands. The highlands are above 1500 meters above sea level and comprise the largest part of the northern and eastern parts of the region. The highlands are also characterized by chains of mountains and plateaus. Ras Dejen (4620 m), the highest peak in the country, Guna (4236 m), Choke (4184m) and Abune-Yousef (4190m) are among the mountain peaks that are located in the highland parts of the Region.

Lakes, Rivers Fisheries and Fish Farming in Amhara Region

The State of Amhara is divided mainly by three river basins, namely the Abbay, Tekeze and Awash drainage basins. The Blue Nile (Abbay) river is the largest of all covering approximately 172,254 Km². Its total length to its junction with the White Nile in Khartoum is 1,450 Km, of which 800 km is within Ethiopia. The drainage-basin of the Tekeze river is about 88,800 km². In addition, Anghereb, Guang, Ayima, Millie, Kessem and Jema are among the major regional rivers. The flow of these rivers reach maximum volume in the rainy season (from June to September), lake tana, the largest lake in Ethiopia, is located at centre of the region. Besides, other crater lakes like Zengeni, Tirba, Lugo and Ardibo and are small lakes that are found in the region. The rivers and lakes of the region have immense potential for hydroelectric power generation, irrigation, fishery and aquaculture development (Awulachew, S. et al, 2007).

The region has a rich diversity of ichthyofauna in its lakes, rivers and reservoirs, fishing are longstanding practice in these water bodies (Abebe Ameha, 2004).

Tekeze Reservoir, an artificial lake, covers a total area of 16000 ha. Its location is characterised by an altitude of 1,145 m above sea level, a annual average rainfall of 150-700 mm and temperature of 15-40°C. It is bordered by three woredas namely Abergele, Ziqwala, Sahilaseyemt from Waghimra zone, Tselemt from North Gonder zone in Amhara region and Tsanqwa Abergele from Tigray region. The lake provides an ideal environment for the feeding and growth of available commercial fish stocks, such as the Bagrus, clarias, tilapia & common carp species. Wag Himra is highly drought-prone area and the most affected by the challenges of under nutrition. Furthermore, the current episodes of drought that occur tend to be severe. Improve productivity and sustainability of existing livelihoods of vulnerable household is the main focus of preventative intervention in food and nutrition security. The government understands that the challenging nature of the malnutrition situation in Ethiopia cannot be addressed using traditional methods. These call for diversification of livelihoods. Therefore reservoir fishery is one of nutrition-smart agriculture intervention area that can contribute to ensure food availability at household level. This coincides with ‘Seqota’ Declaration goals that are promoting nutrition security in the most food insecure areas of the country through innovation. This will be managed under the National Nutrition Programme.

Reservoir Fisheries
In the region, there are also many small and big reservoirs that have potential for fisheries. For example, the Tekeze Hydroelectric power reservoir has an area of 160 km² (160,000ha) and 90% of its area is found in Amhara region. It has 1000 tons of fish production potential. The Koga Irrigation Reservoir with an area of 1800 ha has a considerable fisheries potential, 111 tons/year.

Fish Farming in the Region
Fish farming is an interest of both the federal and the regional government. The Ethiopian government has identified aquaculture as one of the strategic areas of intervention to address the problem of food insecurity and poverty in the rural areas. It is considered an important economic activity that supports diversification, integration and improvement in rural livelihoods (MoA and FAO, 2009). The National Aquaculture Strategy (NADS) was approved in 2009 with the overall objective to define a regulatory framework and to build a strong basis for the development of aquaculture in the country. The Federal NADS is supported by "The determination of the Amhara National Regional Region Fisheries Development, Protection and Utilization Proclamation No 92/2003" which is
stated detail in article 6 and sub articles 1-5 of the proclamation No 92/2003. So aquaculture has a good policy support. In Amhara region, the current fish farming system is extensive operations in several small rural-based fishponds with sizes of between 100 and 300 m². Fish culture in cages and/or pens has not yet started. Candidate species for aquaculture include tilapia (Oreochromis niloticus) and the African catfish (Clarias gariepinus). The research and extension outreach services in fish farming are very limited.

The riverine spawners of Labeobarbus species ascend 40 to 50 km upstream rivers from August to October. They spawn in fast flowing, shallow, and well-oxygenated gravel beds of small tributaries of the river; and possibly in the main channel. Heavy rainfall usually starts in June and peaks in July and August in the Lake Tana area. During this time the tributary rivers increase in volume and cause massive soil erosion. As a result of the inflow of sediment and dissolved organic compounds, turbidity, increased water level, or a combination of both is hypothesized to serve as environmental cues to trigger spawning migration of Labeobarbus species to River mouths (Eshete Dejen, 2010).

<table>
<thead>
<tr>
<th>Model used</th>
<th>Estimated productivity kg/ha/year</th>
<th>Estimated potential yield in tons/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marshal (1984)</td>
<td>50</td>
<td>17536</td>
</tr>
<tr>
<td>Marshal (1984)</td>
<td>27</td>
<td>9450</td>
</tr>
<tr>
<td>Crul (1992)</td>
<td>43</td>
<td>15159</td>
</tr>
<tr>
<td>Schlesinger and Regier (1982)</td>
<td>18</td>
<td>6300</td>
</tr>
<tr>
<td>Henderson and Welcome (1974)</td>
<td>63</td>
<td>22050</td>
</tr>
<tr>
<td>Toews and Griffith (1979)</td>
<td>57</td>
<td>19950</td>
</tr>
<tr>
<td>Schlesinger and Regier (1982)</td>
<td>42</td>
<td>14700</td>
</tr>
<tr>
<td>Average</td>
<td>42.86</td>
<td>15000</td>
</tr>
</tbody>
</table>

**Table 1: Fish Potential yield estimate of Lake Tana.**

**Traditional fish handling and processing**

Fish production of Lake Tana increase year to year the reason may be accessibility of food and good water quality (Fresh water which is free from salt). Common fish species found in Lake Tana are Tilapia, Catfish, Labeobarbus and Beso.

The processing of fish at Lake Tana widely takes place in a traditional system which takes place mainly under non-hygienic conditions on land for gutting, filleting or drying with little to no regard for safety.
Following this artisanal processing, the fish are transported on foot to local markets and restaurants and hotels in the surrounding town of the production area. Some local traders transport whole, gutted or filleted fish to Addis Ababa, which is about 565 km, without cold chain transport facilities. At the southern part of the lake, there are more than 100 women who directly buy fish from the fishers and sell the fish by moving house to house. These women are the most disadvantaged group of the society. On the more distant part of the lake (northern part, Dembia, Takusa and Alefa), due to inaccessibility of landing sites, problem of transport network and limited market for fresh fish, huge amount of fish is sundried/wet fish and exported to Sudan. On landing sites fish are gutted and splitted then hung up to dry on the strings. Fish is also dried on rocks and stones to use the energy of the sun. Dried fish is then packed in to sacks for storage and transportation to Sudan market. Typically sun-dried fish is in poor hygiene conditions.

Fish processing and loss

Objective of This Systematic Review
To deliver well organized scientific information trends of fish production in Amhara Region

Data Collection Methods
Seven consecutive years’ data collected from livestock and fishery sectors each year annual report at region. Purposive sampling techniques were applied to collect data. up-to-date picture was also taken.

Data Analysis
Raw data is change to information by using Microsoft excel 2003 and 2007 and the finding expressed in graph, table and pictures

Results
Seven years fish production trends in Amhara Region were highest in lakes rather than other water bodies. Generally fish production aquaculture is very less than open water bodies. Fish production in rivers greater than dams (Figure 11).

Aquaculture development in Amhara Region was lower compare to water resource potential but it shows incremental change. Aquaculture development is infant stage in Africa countries including Ethiopia (Figure 12). 2016-2018 there was reduction of aquaculture development the reason may be political instability in Ethiopia which affects aquaculture development (Figure 12).

Figure 10: Trends of fish production.

Figure 11: Fish production trends in seven years in Amhara region.
Fries input delivers or distribution in Amhara Region in seven years Seed, feed and water are material basis for aquaculture development in the world so there was up and down fries distribution in the region. The up and down fries distribution the reason may be farmers, experts and government commitment poor. It shows there is no sustainability aquaculture in the region due to different factors. In Amhara Region there are only one fries/ fingerlings multiplication center which are found in Bahir Dar.

All are traditional fish drying techniques in societies. Fish drying trends increase year to year except 2017 and 2018 which is danger periods or political instability in Ethiopia. Fish drying experience of farmers increase time to time, it shows role of experts extension support high (Figure 14).

Fish post harvest loss protection trends in Amhara Region. In this region farmers dried fish indifferent ways

- Salt drying
- Air drying
- Sun drying

Amhara Region has high water resource potential compare to national water resources so I advices investors join aquaculture development, they will be successful

Amhara Region has different agro ecology and aquaculture fish species, the regional government should be utilized the resource extremely

Fish production in Aquaculture should be greater than capture fisheries

Government should be give high attention fishery and aquaculture sectors in the region

Fish Feed processing plant should be establish for success of fishery and aquaculture

Fish material processing plant will be establish

Aquaculture integrated with irrigation, hydropower and other agricultural activities

References


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