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Aquaculture Development in Oromia: Distribution, Status, and Challenges of Fish Ponds

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ABSTRACT

Background: Aquaculture in the Oromia region has expanded over the past two decades, aiming to address food insecurity, enhance diets with reliable protein sources, and promote economic growth through sustainable fish farming. Despite significant challenges, including low fish production, the study assessed the distribution, status, and challenges of stocked fish ponds.
Methods: Data were collected from the Oromia Agricultural Office, Zonal offices, and site visits. These secondary and primary data were summarized and interpreted to analyze the status, identify the challenges and suggest the solutions.
Results: The region hosts over 1,119 fish ponds, with 227 (20.3%) in the Jimma Zone. Analysis of 272 ponds showed 73.53% were subsistence-sized (101-400 m²), 19.85% narrow (≤ 100 m²), and 6.8% large-scale (above 1000 m²), with no small-scale types (400-1000 m²). The surveyed ponds spanned altitudes from 1,098 to 2,640 meters above sea level, with fish being cultured within this altitude range in the region. Stocked species included *Oreochromis niloticus* (48.2% monoculture), *Clarias gariepinus* (1.2% monoculture), and a mix of the two species with *Cyprinus carpio* (31.3% polyculture). Of the 83 ponds visited, 16 (19.3%) were dried out. Fish were harvested at least once from 69.9% of ponds, while 13.3% were not harvested, and 19.3% collapsed. Major challenges identified were water shortages, shallow pond depth, improper design and management, lack of knowledge, and shortages of nets and feed.
Conclusions and recommendations: Fish production from aquaculture ponds in the Oromia region is limited due to gaps in knowledge, skills, technical capabilities and inputs. It is recommended to train farmers on aquaculture management, provide design guidance for fish pond construction, conduct expert monitoring, and have the government facilitate the availability of necessary inputs.

INTRODUCTION

The potential of fish farming (aquaculture) for achieving food self-sufficiency, nutritional security, income generation, and job creation has been recognized, and its development in Ethiopia has been promoted. More than a thousand farmers owned fish ponds in Ethiopia in 2013/14, primarily for subsistence purposes (Abegaz, 2015). In the Oromia region, the extension of aquaculture through the preparation of fish ponds on farmers' plots and stocking them with fish began ten years ago (Tugie, 2010). Additionally, irrigation reservoirs, including those in the Wonji sugarcane farm, are used for fish production. The establishment of stocked fish ponds and the growing interest of farmers in owning fish ponds are promising for the sector's development. The activities of pond preparation by farmers and fish stocking are expanding as an initiative in all zones of the region, supported by the advice and aid of fishery extension workers. The primary source of fish seed for stocking these ponds has been Batu Fishery and Aquatic Research Center. The contribution of aquaculture to Ethiopia's fish production was less than 1%, whereas world aquaculture's contribution to global fish production reached 46% and is rapidly increasing at a rate of 5.3% per year (FAO, 2020).

According to a study by the FAO Sub-regional Office for Eastern Africa (FAO SFE) (Rothuis et al., 2012), based on GIS-assisted modeling, about 15,158 km² is highly suitable and 871,731 km² of land in Ethiopia is moderately suitable for *O. niloticus* pond culture. Despite the large number of reported fish ponds, annual fish production from aquaculture in Ethiopia was only 80 tonnes (MoA, 2022), indicating very low productivity. Productivity of a given farm is influenced by many factors: biological, environmental, and technical. The performances of the stocked fish ponds in the Oromia region have not yet been evaluated. This study aimed to assess the agro-ecological distribution of fish ponds, pond types, fish species, and the socio-economic benefits of fish ponds, to identify challenges, and recommend solutions for the sector's development.

MATERIALS AND METHODS

Descriptions of the study areas

This assessment included fish ponds in the Jimma, South-West Shoa, North Shoa, East Shoa, West Hararghe, and West Arsi Zones where aquaculture ponds are established (Fig. 1). These zones were purposefully selected to address the region's aquaculture potential areas. Representative districts and fish ponds from different agro-ecologies in each zone were randomly selected for sampling based on information from the Zonal Agricultural Offices. Most of the ponds covered in this study were prepared specifically for fish culture.

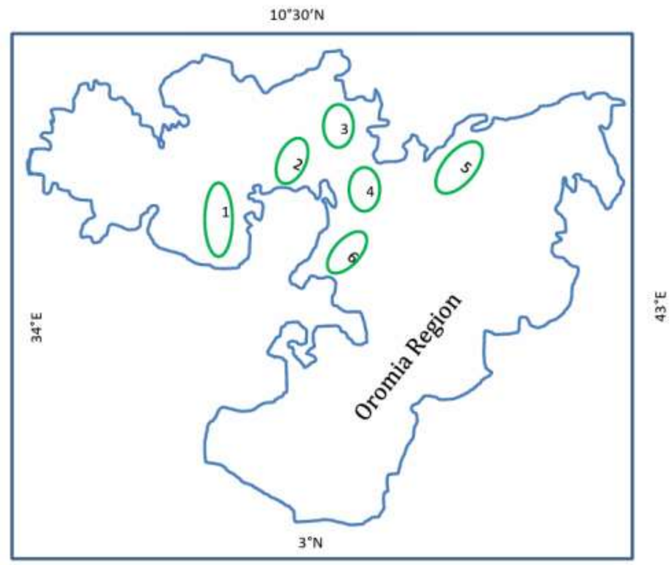

Figure 1. Map of study sites by Zone, 1= Jimma, 2=Southwest Shoa, 3= North Shoa, 4= East Shoa, 5= West Harargie, 6 = West Arsi

Selection of the sample ponds

Fish ponds are found in most of the Oromia Zones. The study zones were selected based on the availability of fish ponds, the relative peace and security of the area, and site accessibility. Representative ponds were selected in each zone for this assessment. In Adama district of East Shoa Zone, the assessment was made on reservoirs initially prepared to store water for irrigation of the sugarcane plantation at Wonji sugar factory. These ponds are larger in size, ranging from 1 ha to 5 ha, and are filled with water from the Awash River downstream of the Koka Hydro-electric power station. The Awash water harbors many fish species that can migrate to the Wonji ponds along with the irrigation water. However, the reservoirs selected for this assessment were those stocked with fish fingerlings for aquaculture production.

Data Collection

Histories of the fish stocks were collected through questionnaires from the pond owners. Pond dimensions and water physicochemical parameters were measured on-site (in situ). Fish weight-length data and biomass estimates were obtained by sampling the fish from the ponds using narrow-meshed nets.

Fish growth is influenced by several factors, primarily food (primary productivity), water chemistry (conductivity, TDS, pH), and water temperature. Productivity was estimated by measuring Secchi depth (transparency) on the spot in each of the reservoirs. Water physicochemical parameters, including temperature, conductivity, total dissolved solids (TDS), salinity, and temperature, were measured using a portable multi-meter for conductivity/TDS/salinity.

Fish were sampled from each of the Wonji reservoirs using a 25 m long, 2 m deep seine net with a stretched mesh size of 4 cm (for total biomass estimate) or a standard seine net of 50 m length, 2 m depth, and 8 cm stretched mesh size, hauled over 20% to 100% of the pond area depending on the reservoir/pond size. In other subsistence ponds, fish were sampled using a fingerling seine net, and the range of fish sizes was measured to estimate potential fish growth in the ponds.

Fish species were identified, their lengths measured on a measuring board, and their individual weights measured on a sensitive balance accurate to 0.01g.

Data analysis

The data were summarized and presented in tables and figures descriptively.

RESULTS AND DISCUSSION

Quantity of fish ponds and their distribution

According to secondary data from the Oromia Agricultural Office (2023), there were 1,119 fish ponds in the Oromia Region. The reports on fish production and the number of fish ponds were not well organized, leading experts at the regional level to estimate that the actual number of ponds exceeds the reported figure.

Although the distribution of ponds in the Oromia region was not well organized and documented, the current survey indicates that Jimma Zone reported the highest number, with over 227 aquaculture ponds, followed by North Shoa with 55 fish ponds, East Shoa with 26, West Arsi with 19, Southwest Shoa with 11, and West Hararghe with 11 (Table 1). Though not accessed during the current survey due to security reasons, East Wollega, West Shoa, Horo Guduru Wollega, West Wollega, and Guji Zones also have significant numbers of fish ponds.

In this survey, a total of 349 fish ponds were identified in the six zones surveyed based on secondary data obtained from their zonal offices (Table 1). Information from secondary data was used to analyze pond types for 272 fish ponds. Moreover, a total of 83 fish ponds were physically visited, of which 67 had fish and 16 were dry-out (Table 1). Fish were sampled from 40 representative ponds using seine nets for analysis.

In East Shoa, Adama district, Wonji sugar factory has 18 water reservoirs for sugarcane farm irrigation. Six of the reservoirs were stocked with fish, and local youth were organized as a Common Interest Group (CIG) to manage the ponds and culture fish. All six reservoirs were sampled during the current assessment.

Table 1. Fish pond distribution in Oromia Zones.

SN	Zone	#ponds in surveyed Zones	Number of ponds assessed for:					Remark
			Pond size	Agro ecology	With fish	No fish	Sampled fish	
1	Jimma Zone	227	227	38	32	4	19	half of them were supported by NGO or Jimma University
2	South-west Shoa	11	7	7	4	3	4	
3	North Shoa	55	6	6	4	2	3	
4	East Shoa	26	22	22	19	3	8	Including irrigation reservoirs in Wonji sugarcane farm
5	West Harargie	11	4	4	1	4	1	55% of the ponds were dry and had no water
6	West Arsi	19	6	6	5	0	5	
	Total	**349**	**272**	**83**	**67**	**16**	**40**	

In Jimma Zone, three districts were selected for this study: Kersa, Limu Kosa, and Omo Nadda, known for their organized fish farming in aquaculture. There were eight Common Interest Groups (CIGs) engaged in fish farming in Kersa, of which six were functional during this study. Fish from eleven ponds of four functional groups and one pond owned by a private farmer were sampled in this district during the current assessment. Similarly, three ponds from each of the two CIG groups in Limu Kosa district were assessed.

Each CIG group in Kersa and Limu Kosa had six fish ponds with an area of about 10m x 15m = 150m². However, two out of six ponds were dry in Kersa-Sombo due to water supply limitations in the Biftu CIG site in Ankaso PA.

Representative fish ponds and accessible sites were sampled in Southwest Shoa (Wonchi and Woliso districts), North Shoa (Shara and Wuchale districts), East Shoa (Adama, Ada'a, Dugda, and Fentale districts), West Harargie (Gemechis, Tulo, and Doba districts), and West Arsi (Heban Arsi, Negele Arsi, and Shashamane).

Size of Fish Ponds and Culture Type

A total of 272 ponds were investigated for their sizes during the current assessment (Table 1). Based on the FAO (1995) classification of tilapia fattening ponds under semi-intensive management in Africa, these ponds were grouped into four categories depending on their sizes (FAO, 1995): large-scale commercial ponds with an area above 1000 m² (Plate 1b), small-scale commercial ponds with an area between 400-1000 m² (not recorded in this assessment), subsistence ponds with an area from 100 to 400 m² (Plate 1a), and narrow ponds with an area below 100 m².

Plate 1a. Subsistence fish ponds at Ankaso PA, Kersa district, Jimma Zone.

Plate 1b. Large scale fish ponds at Wonji, Adama district, East Shoa Zone.

According to FAO (1995), of the 272 fish ponds investigated, 73.5% were categorized as subsistence ponds with areas ranging from 100 to 400 m² (Figures 2 and 3a). About 19.9% were classified as narrow ponds with areas less than or equal to 100 m², and 6.6% fell into the large-scale category with areas above 1000 m². No small-scale types (401-1000 m²) were recorded. The large-scale types were those constructed as irrigation reservoirs at the Wonji sugarcane farm (Plate 1b).

Pond area and depth significantly affect the productivity of fish ponds. Wider and deeper ponds are more suitable for fish culture than narrow and shallow ponds. Extension agents from the Oromia Agricultural Development Office advise farmers to construct standard fish (tilapia) ponds with areas larger than 150 m² (typically 300 m² and above) and depths greater than 1 meter (usually 1.2 meters).

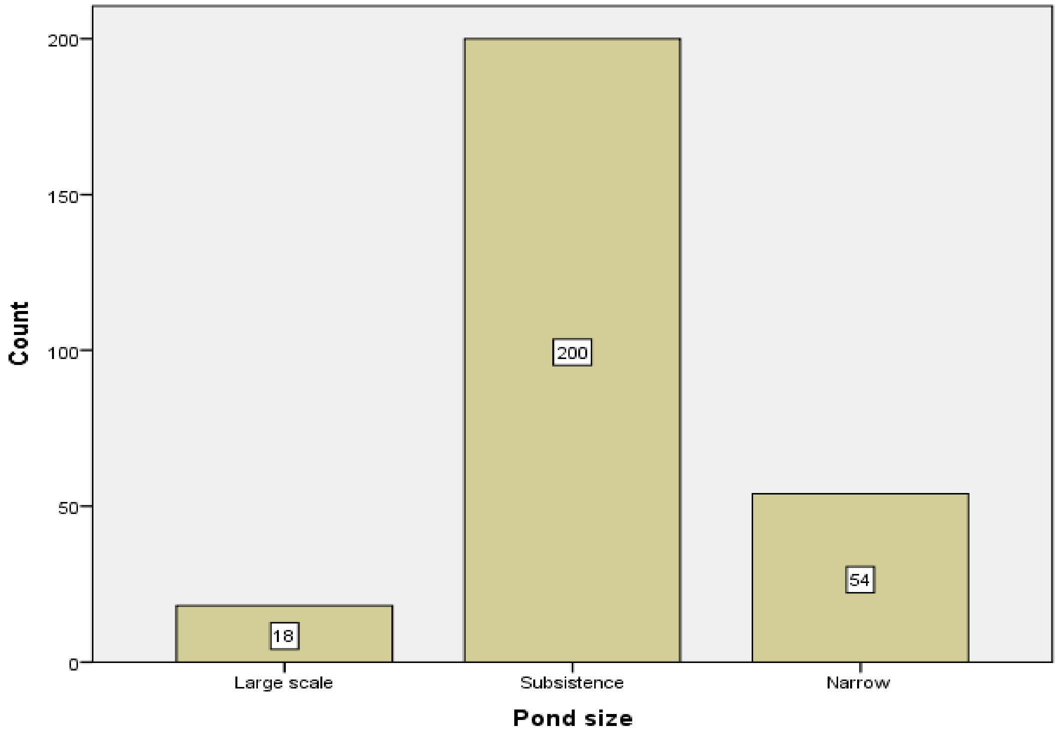

Figure 2. Frequency of pond sizes in the surveyed zones.

Integrated poultry-fish-horticulture production was also reported in this assessment. This farming technique integrates three different components: poultry production, fish culture in ponds, and vegetable production into one system. In the integration process, waste products/by-products from one component are used as inputs for the other. Poultry waste serves as fertilizer for pond water, promoting algae and zooplankton growth for fish food; wastewater from the fish pond is used as fertilized water to irrigate horticulture; and by-products from fish and horticulture can be used as supplementary feed for poultry. Integrated poultry-fish-horticulture technology primarily operates at a small-scale and semi-intensive farming level. Intensive fish farming, requiring specialized management and technological advancement for each species, may not be suitable for this integration.

According to data from the corresponding zones, 30.1% (n=55) in North Shoa, 18.2% (n=22) in East Shoa, 28.5% (n=7) in South-West Shoa, and 33.3% (n=6) in West Arsi were integrated with poultry. However, none of these integrated farms had poultry at the time of this assessment. Farmers reported difficulties managing small-scale poultry due to feed shortages and disease challenges. It was also reported that 20.8% of poultry-fish integrated farms were functionally effective in the Amhara region of Ethiopia (Asmare et al., 2020).

The poultry-fish-horticulture integrated farming technology was evaluated by Batu Fishery Research (Endebu et al., 2016; Abera, 2017), demonstrated to farmers in various zones of the region, and shown to be economically feasible and profitable (Tugie et al., 2017; Getu et al., 2017). This integrated farming system diversifies farmers' products. Tilapia yield from integrated ponds (3,000 kg to 5,000 kg fish per hectare per growing period of 6 months) was twice as high (three times higher for common carp) as the yield typically obtained from extensively managed ponds in the region (1,000 kg to 1,500 kg fish per hectare per 6 months) (Endebu et al., 2016). Moreover, integration solves the problem of fish feed in small-scale aquaculture, reduces production costs such as feed for fish and fertilizer for horticulture, and minimizes space requirements without reducing yield. The extension service for poultry feed supply and health management should be supported by the government.

Altitude and Fish Harvest History of the Ponds

The Ethiopian land topography ranges from the lowland of 125 meters below sea level at the Danakil Depression in Afar to 4,533 meters above sea level at Mount Ras Dashen in Gonder. The ecology is classified into Dega (highland, known as *Baddaa*) with altitudes above 2,300m above mean sea level (m.a.s.l), Woyina-Dega (mid-altitude, known as *Baddadaree*) with altitudes between 1,500 m.a.s.l and 2,300 m.a.s.l., and Kola (lowland, known as *Gammoojjii*) with altitudes below 1,500 m.a.s.l. (Mengesha et al., 2020). The Oromia Region is part of this, with altitudes ranging from 400 meters above sea level at Melka Bafata (in the Shebele River basin) to 4,377 meters above sea level at the peak of Mount Tullu Dimtu in Bale.

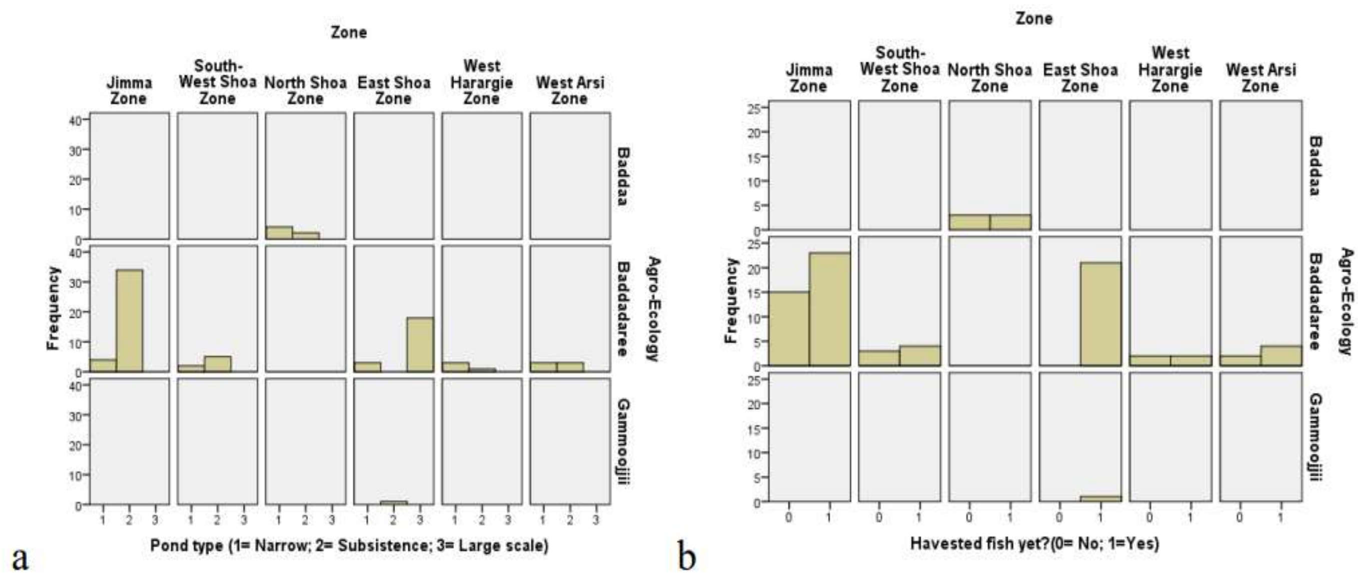

Figure 3. Tilapia pond type (a) and harvest history (b) by Zones and Agro-ecologies.

The fish ponds were distributed across an altitude range from 1,098 meters above sea level at Gidara in Fentale low altitude (*Gammoojjii* agro-ecology) to 2,664 meters above sea level in Chemeri of Yaya Gulele, and 2,640 meters above sea level at Gora Ketema of Wuchale high altitude (*Baddaa* agro-ecology). In these ranges, the survival and final size of the fish were not limited by the existing agro-ecologies. The majority of the ponds (91.6% of the total 83 ponds analyzed) were located in mid-altitude (*Baddadaree*) agro-ecology, while six were in high altitude (Baddaa) agro-ecology.

The altitude of an area affects its ambient temperature: lowlands are warm, while highlands have relatively cold temperatures. Fish growth rates are influenced by temperature; fish grow quickly in lowlands and slowly in highland areas where the lower water temperature, below 18°C, does not favor the growth of tilapia fish (Dereje et al., 2015). Although the growth rate of fish is affected by temperature—causing fish to take longer to reach market size in highland areas—the fish in the three sampled highland ponds were large enough for consumption and marketing. Three of the six (50%) assessed highland ponds were harvested at least once after their establishment (Figure 3b). In the *Baddadaree* agro-ecology, 71.4% of the ponds were harvested at least once, while the one fish pond in the lowland (*Gammoojjii*) agro-ecology was harvested several times before it dried up after the owner's death.

As the altitude of the pond location increases, the success of the aquaculture farm decreases, even to the extent that some farms may not harvest fish at least once after establishment. While farmers expect to harvest their fish in a short time, fish grow slowly in the cold temperatures of highland ponds, leading farmers to abandon the ponds eventually, causing the system to collapse.

Water Suitability Test for Fish

The water quality parameters at the sampling sites were within the range that supports fish growth. Wonji reservoirs and fish ponds in Jimma Zone were clustered, while ponds in other sites were scattered across locations. The measures of water quality parameters in the clustered fish ponds were found to be within the range supporting fish growth (Tables 2a, 2b, and 2c).

Table 2a. Water quality parameter values in fish ponds of East Shoa and West Harargie Zones.

Parameter	Adama district of East Shoa Zone			West Harargie Zone		
	minimum	Maximum	Average	minimum	Maximum	Average
Secchi depth (cm)	6.00	16.00	11.75			19
Conductivity (µS/cm)	345.00	386.00	370.50			435
TDS (mg/L)	99.80	264.00	226.97			285
Salinity (ppt)	0.17	0.19	0.19			0.19
Water temper. (^{0}C)	19.30	24.00	21.82	18	22	19.75

Table 2b. Water quality parameter values in fish ponds of Jimma Zone.

Parameter	Kersa district			Limu Kosa district		
	minimum	Maximum	Average	minimum	Maximum	Average
Secchi depth (cm)	6.00	16.00	11.75	9	18	14.7
Conductivity (µS/cm)	345.00	386.00	370.50	36	52	44
TDS (mg/L)	99.80	264.00	226.97	23	34	28.3
Salinity (ppt)	0.17	0.19	0.19	0.02	0.03	0.02
Water temp. (^{0}C)	19.30	24.00	21.82	24.6	27.0	25.65

Table 2c. Water quality parameter values in fish ponds of North Shoa and South-west Shoa Zones.

Parameter	North Shoa			South-west Shoa		
	minimum	Maximum	Average	minimum	Maximum	Average
Secchi depth (cm)	24	58	38.3	14	40.5	31.7
Water temp. (^{0}C)	18.2	20.5	19.38	21	26	22.25

Water temperature ranged between 19°C in shaded ponds and 24°C in open ponds, which can support the growth and reproduction of the existing fish species. Pond water in Wonji was turbid (11.75 cm), but it can still support fish growth, as fish grow in Lake Koka with similar turbidity levels. Electric conductivity, TDS, and salinity were also not limiting in the ponds surveyed.

Fish species

The stocked fish species in the sampled ponds included *Oreochromis niloticus* alone (40 ponds with Tilapia monoculture = 48.2%), *Clarias gariepinus* alone (Catfish monoculture = 1.2%), or mixed with African catfish and common carp (polyculture = 31.3%). Sixteen ponds (19.3%) were dry out of the 83 visited ponds. Fish can grow to sizes over 300g in well-managed ponds, as evidenced by individual fish reaching larger sizes in such environments.

In Wonji reservoirs, thousands of *O. niloticus* fingerlings were stocked into the six reservoirs assessed in the current survey. However, fish diversity in the reservoirs was similar to the diversity in the feeder river Awash and Koka Reservoir upstream.

Five commercially important fish species (Plate 2a-2d) were found in the Wonji reservoirs during the survey, namely Nile tilapia (O. niloticus), African catfish (Clarias gariepinus), common carp (*Cyprinus carpio*), Barbus (*Labeobarbus intermedius*), and Zilli (*Coptodon zillii*). Most of the catch was Nile tilapia (Qorosoo), which constituted over 75% by weight. African catfish (Tikure or Ambaza) constituted about 12%, while common carp (locally called Samu'el) constituted about 10-15%. Barbus was few in number and smaller in size, which did not exceed 2% of the catch. Coptodon zillii was also rarely found in the reservoirs.

Plate 2a: Nile tilapia (*Oreochromis niloticus*) from aquaculture pond at Kersa district, Jimma Zone.

Plate 2b: African catfish (*Clarias gariepinus*, locally called Tikure or Ambaza) in catch of Wonji reservoirs.

Plate 2c: Common carp (*Cyprinus carpio*, locally called *Samu'el*) in catch of Wonji reservoirs.

Plate 2d: Labeobarbus (*L. intermidus*) in the catch of Wonji reservoirs.

The organized local youth in Wonji were not effectively managing the fish ponds and did not efficiently utilize the fish. The fishing group at Camp-10, R-2 reported frequent fish harvests from the reservoir every 2-3 months since last year, but they did not record harvest data. The other organized groups in Wonji had no history of fish harvesting or fish management practices. Instead, local people reported illegal fish catches from the reservoirs by poacher fishermen.

The smaller proportion of tilapia fish in the catch from Wonji ponds during the current survey, despite the number stocked, was mainly due to the escape of the stocked fish through the open inlet and outlet canals. In Jimma Zone, the fish catch consisted entirely of Nile tilapia; no other fish species were introduced.

Generally, all the fish farms visited during the current assessment were extensive and poorly managed. It is possible to intensify the fish farms by applying fertilizers and monitoring the pond water quality. The level of intensification can improve the productivity of fish in a unit area. For example, China harvests 15 tonnes/ha of tilapia per crop, while the tilapia yield from pond farming in Africa (mainly at a semi-intensive level) is less than 5 tonnes/ha per crop (FAO, 2017).

Socio-economic benefits of the fish farms and good practices

The community living around fish farms and the pond owners were aware of the nutritional value of fish. Farmers in Jimma Zone shared harvested fish among members for home consumption, contributing to the nutritional security goals of the country.

Fingerlings produced in the ponds were sold to other farmers and/or organizations to generate income in Jimma Zone.

Fish have grown to marketable sizes (Plate 3) in many ponds regardless of the ecological category of the pond sites. Tilapia grew to a maximum size of 513 g at a highland pond in Wuchale two years after stocking, 305 g at mid-altitude in Limu Kosa, Jimma, and 465 g at Wonji reservoir (mid-altitude). The harvest history from these ponds was not recorded to estimate the fish growth rates and compare their yield. However, the larger fish found in ponds not yet harvested demonstrate the potential of the ponds to harbor fish, even in high-altitude ponds, though the culture period is long.

The habit of eating fish is expanding among the communities in areas where fish ponds were established.

Plate 3: Big sized fish harvested from the ponds (upper) and Local community competing to buy fish from the cooperatives (lower; photos during the survey).

Weaknesses Observed at the Fish Ponds

Shallow Depth of the Ponds

Out of the 83 physically visited fish ponds, 16 (19.3%) were dry and not functional. These dried ponds were primarily due to a shortage of water supply and improper pond design and construction, which did not consider the availability of a year-round water supply. Of the ponds containing fish, a total of 65 ponds were measured for their water depths, and only nine ponds (13%) had the recommended depth of 80 cm or deeper. Many of the ponds in Kersa district of Jimma Zone were shallow, with an average depth of 40 cm, whereas the minimum pond depth recommended for tilapia growth is 80 cm. None of the ponds investigated met this recommended depth. Shallow ponds do not promote fish growth; instead, the fish are vulnerable to predators, experience stress, and are forced to reproduce excessively to replace themselves, resulting in stunted growth.

Absence of Screens to Prevent Fish Escape

Reservoirs in the Wonji sugarcane plantation lack screens to prevent fish escape at their outlets and/or inlets. Of the six reservoirs examined, only one had a mesh screen (Plate 4) at its outlet. This screen was observed in just one of the twelve required sites (8.3% of the inlets and outlets) needing mesh screens. The irrigation workers at the plantation do not support using mesh screens, as they restrict the flow of irrigation water out of the reservoir. Consequently, the stocked tilapias may have escaped through the inlet and outlet canals. Similarly, many (83.3%) of the observed fish ponds in Kersa district of Jimma Zone lack proper outlets. However, the fish ponds in North Shoa and Limu Kosa of Jimma Zone have better-protected outlets and inlet canals to prevent fish escape.

Water enters the ponds via inlet canals and leaves via outlet canals with overflow systems, which lack mesh screens to prevent fish escape. The fish have the opportunity to escape from the ponds when they are full and excess water overflows, especially during the rainy seasons.

Plate 4: Outlet canal with mesh wire in Wonji reservoir, preventing escape of adult fish only.

Shadow of Trees Surrounding the Reservoirs Restricted Pond Productivity

Most of the reservoirs in Wonji are shaded by surrounding eucalyptus, pines, and other trees on their edges. While trees help stabilize the soil on the dike and bank of the reservoirs and serve as windbreaks in the sugarcane plantation, minimizing cane lodging by wind, they have drawbacks for fisheries. The shade reduces the primary productivity of the water, which is crucial for natural fish feed. Additionally, large trees that fall into the reservoirs obstruct access to fishing. Typically, fish are harvested by hauling a beach seine from corner to corner of the reservoirs.

Lack of Inputs Such as Fishing Nets, Feed Supplements, and Pond Fertilization

Feed is one of the limiting factors for fish growth. Fish in ponds require feed supplements, but none of the surveyed fish ponds in Adama, Kersa, and Limu Kosa districts were supplemented with feed or fertilized with any fertilizer sources. Many fishermen mentioned limited access to fishing nets for harvesting fish from the ponds. Overall, due to these limitations, most (83.1%) of the observed fish ponds were not functioning effectively.

Knowledge and Skill Gaps Among Fish Farmers

The farmers have limited knowledge of fish pond management. They lack skills in water quality monitoring, fish feeding, general pond management, and fish harvesting.

Conclusion and Recommendations

Fish can grow to sizes over 300g in well-managed ponds, as evidenced by individual fish reaching larger sizes in all the surveyed environments. Farmers have started consuming fish and have developed an interest in fish farming. Some fish farmers have begun generating income by selling fish fingerlings and food fish, in addition to home consumption. This interest and initial success give hope for the development of aquaculture in the region to contribute to nutritional security for poor farmers. However, fish pond management among some fish farmers was very poor where fish often escape from ponds through open inlet and outlet canals. Pond water depths were very shallow, stressing the fish and limiting their growth where most (83.1%) of the observed fish ponds were not functioning effectively. These knowledge, skill and input supply gaps challenged development of fish culture in Oromia region. These problems are technical and can be resolved as follows:

1. Farmers need training on pond construction, management, and feed supplementation for their fish farms.
2. Experts should guide fish pond construction from the early site selection stage to fish stocking.
3. Regular monitoring of the ponds by experts is required to help farmers correct any pond management issues that arise.
4. Farmers should also receive assistance from agricultural offices to obtain fish seeds and training to make and mend their own fishing nets

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