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Research Article

Capture fishery technology promotion in West Arsi Zone, Ethiopia

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Abstract
Demonstration of fishery technologies were implemented on Malkawakana reservoir to demonstrate improved fishery technologies, to enhance farmers, DAs and agricultural experts' knowledge and to collect feedback information for further technology improvement/development. The reservoir is located about 336 km South-East of Addis Ababa in the Oromia regional states, Ethiopia. It has an area of 81.6 km^2 and shore line length of 126 km at an elevation of 2376 meter above sea level (masl). It has maximum length and width of 37 km and 18 km respectively. It has a mean depth of 10 m. Nile tilapia, common carp and trout are commercial fish species available and produced by Beach Sine and Gill-net fishing gears. Participatory approach such as FRG was used for technology demonstration and data were collected through personal observation and individual interview. Quantitative data were analyzed through descriptive statistics and qualitative data were analyzed through narration. In capacity building, a total of 120 Participants attended fishery training and technology demonstration at different time on demonstrated technology utilization package, post-harvest handling, and preparation different fish food like fish Lablab, fish Cotolate, fish Soap, fish Tibs, fish fillet, how to gut, harvest and fishery resource monitoring. Technology demonstration was done through establishing one FRGs from active fishers. Two wood boat, One gillnet of 100m size and six fish processing table with its shade was prepared and demonstrated at the Madabatu kebele of Gedab Hasasa district. On the organized field day a total of 70 participants were participated and provided feedback reaction for further technology demonstration. From demonstrated technologies and exchanged information, 900gm of standard table size fish were collected and generate a total of 51,000.00 Birr in two months with improved post-harvest handling. Overall, all participants provide a positive feedback and confirmed as the demonstrated technology support the fishery sector in fishers income improvement, and minimize loss of production on the sustainable bases.

Keywords: Demonstration, Fishery technologies, Malkawakana reservoir and processing table

1. Introduction

Fish and fishery products remain the well-traded food items worldwide [14,10,11,5]. Developing countries play a major role in the global trade of fish and fish products [19,9]. At the same time, demand for fish products are likely to rise as a result of rising populations that are expected to reach 9.3 billion by 2050. Furthermore, developing countries now display a positive trade balance due to their increasing involvement in global fisheries trade [8].

There is ample evidence of the important social and cultural functions that fisheries offer and the contributions that they make to local communities. However, the fishery resources suffered from human impacts, Lack of fishing equipment, lack of awareness on preparing fishing gears like gillnets and beachsiene, illegal fishing, and lack of improved and selective fishing gears [3,20].

Fishing Gears commonly operated in Ethiopian fisheries include gillnets, beach seines, long-lines and hook line are used, particularly in the rivers of Ethiopia. Even though it is a land locked country, Ethiopia is endowed with a number of lakes and rivers, which are believed to be promising potentials of different fish stock [13,4,12].

Providing adequate food for a rapidly increasing human population is one of the greatest challenges in the world. The problem is particularly acute in countries like Ethiopia where, besides population explosion, natural and man-made calamities have aggravated the problem. In Ethiopia the major problems that were identified by the stakeholders (the producers, consumers and hotel owners) involved in the fishing activities face problems such as lack of proper fishing gears; most of them use hook for fishing, Poor post-harvest handling, lack of proper fish processing and storage facilities and lack of enough boat in the area[2,13].

Ethiopia is actively exploiting its water resources by building dams, reservoirs, irrigation and hydropower stations. The benefits of the reservoirs are not only limited to hydropower. Many reservoirs are multi-purpose that are also designed to provide water for irrigation, drinking water, fish farming and flood control. However, hydropower is expected to be the main benefit of it.

Malkwwakana reservoir is established in West Arsi Zone in 1987 G.C to generate hydro-electric power. The reservoir is bordered by three districts of West Arsi Zone namely Gedab Asassa in North, Adaba in South and Dodola in West. There are major 6 in-flowing rivers namely: Burqa Asassa at North Meribo, Nanesha, Leliso, Furona at South and Heraro River which flows to the reservoir in its western part. Fishery technologies such as fish smoking technology, fish retaining cage and fish drying using simple tent dryer were verified and evaluated under Melkawakana reservoir condition [1].

This reservoir has an apple opportunity to exploit fish production in the area. But still now, no one is responsible to use this reservoir for fish production as we expected. As I got information from different source in the area, lack of improved fishery technologies is responsible for underutilization of the fishery resources in the area. In addition to this, in the area there is lack of awareness on fishing gears preparation mechanism, Fish products processing techniques and utilization for local community (fishers), fishery experts and development agent. To exploit and utilize stocked fish, proper fishing technology with awareness creation is a critical for this reservoir

Now a day on this water body even if some fishermen were organized, they are not benefited from it. They don't have necessary and recommended fishery technologies for fish production from this reservoir. Currently, there is huge demand for modern fishing technologies with necessary equipment's. But, there is not as such effort on this reservoir to train fishermen as well as local community on fishing activities to provide knowledge and skill with proper fishery technology that will help for development intervention.

Therefore, this study were proposed to improve fish production and utilization through

improved fishery technology demonstration and training on Malkawakana reservoir

1.1. Objectives of the study

- To demonstrate the improved fishery technologies and fishing gears preparation mechanism
- To improve Fishermen, Fishery Experts and Development Agent capacity (Knowledge, Skill and attitude) through training on fishing gears preparation mechanism and improved fishery technology utilization
- To assess feedback information for further technology improvement/development

2. Materials and Methods

2.1. Description of the study area

The study area was Gedeb Hasasa woreda located in West Arsi zone of Ormoia regional state. The woreda divided in to two major climatic zones known to be Dega (35%) and woinadega (65%) with annual rainfall ranges between 600-700 mm. The topography is predominantly a flat land with an altitude varying from 2300 to 3200 meter above sea level. The mean minimum and maximum temperature of the woreda is 12°c and 27°c respectively. Main economic activities in the woreda are mixed f arming, where crop production and livestock husbandry are practiced side by side.

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using simple tent dryer were verified and evaluated under Melkawakana reservoir condition [1,16].

2.1. Site and fishermen selection

Site were selected based on fish production potential and fishing activities status (active), demand of fishery technologies, accessible to market and road for fishing, suitability for technology demonstration and shade construction, and high number of fishermen slips in and out. Finally, with above criteria Malka wekana reservoir was selected with DAs and District Experts for technology demonstration.

2.2. Technology demonstration techniques

Participatory approach such as FRG was used for technology demonstration at Malka wakana reservoir. One FRGs having a total of 18 members (13 male and 5 female) were established in the study area for technology transfer. Training field day, joint monitoring and follow up were used as mechanism for information exchange among fishermen and other stake holders.

2.3. Collected data and methods of data collection

Type of technology demonstrated, total number of fishers and local farmers participated on the training and field day, Role of fishers and other stakeholders in technology demonstration, Feedback and Secondary data were collected using different appropriate data collection methods such as field observation, and participant interview.

2.4. Methods of data analysis

Quantitative data were analyzed using the statistical analysis system of stata Version 16 Software. Descriptive statistics such as mean and frequencies were used in analysis and described in table.

3. Results and Discussion

3.1. Roles and responsibilities of participants

In this study four research team, fishers and extension worker/experts and others are the main active participants and have their own responsibilities. Research team from center was performed many tasks like Site selection, provide awareness creation at different stage,

prepare and deliver training and recommended technologies with package, facilitating and organizing, information transfer, provide technical support as local condition, continuous follow up and monitoring output and data collection and analysis. Land provision, participation, evaluating the technologies, utilizing technology and providing feedback were the main role and responsibilities of fishers on the study area (table 1). Extension experts also contributed through providing continues communication with research team, facilitation and mobilizing fishers, monitoring and feedback.

Table 1: Role of stakeholders in technology demonstration

N o	Participants	their responsibilities
1	Fishers	Facilitation, Involving in technology installation, participating on training and field day, field monitoring, evaluation technologies and providing feedback.
2	Zonal, district and kebele level livestock officials and experts	Facilitating and organizing, information transfer, provide technical support as local condition, continuous follow up and monitoring
3	Research team	Preparing extension materials, delivering all necessary materials, facilitating activities and different stakeholder participation, Provision of training, output and social data collection and analysis
4	District administration and Job creation officials	They give land for fishery cooperative establishment and give recognition for this fishery cooperative, they participate on the training and field day

3.2. Training of fishermen and other stakeholders

Capacity building was the primary and first section in technology demonstration. It helps to create awareness on new method and packages for selected stakeholders to improve the existing system. The training was delivered for fishermen, DAs and expert. Multidisciplinary team including capture fishery, Socio- economics, Agricultural extension researchers and Office of agriculture and natural resource participated on awareness creation to promote utilization of recommended fishing technology for sustainable production. Training was given for 50 participants on demonstrated technologies, fish harvesting, usage of demonstrated technologies, handling and processing methods of fishery products, capture fishery production and sustainable post-harvest handling of fishery resources (table 2).

Table 2: Number of Participants attended the training

Participants	Male	Female	Total
Fishers/Farmers	13	5	18
Local Farmers	12	-	12
Das	8	-	8
Researchers	4	-	4
SMS	8	-	8
Total	45	5	50

Source: Own data, 2025

From the participants, about 90% were male category due the nature of fishing activity that mainly performed by male. This data is similar with many finding which confirmed as fishing activities done at night time and early morning. This finding is the same with Birara et al., 2020[6]; Salau *et al*.[17], *(*2014), Temesgen M and Getahun A, (2016) [18] finding, who indicated that fishing is mainly undertaken by male group.

Figure 1: Pictures taken during the training on the capture fishery production system at Mada batu kebele of Gedab Hasasa district

3.3. Technology demonstration and transfer

Technology demonstration was performed in Gedab Hasasa district on Malkawakana reservoir of West Arsi Zone. Before the technology demonstration necessary training and technologies were prepared by participatory approach with all main stakeholders. Firstly, Two wood boat, one Gillnet of 100m, five processing table and one processing table house was constructed by fishery experts of Batu fish and other aquatic life research center for demonstration purpose. The constructed processing table house has a total area of 24m^2 (8mx3m) that was used to fix processing table technology. Totally, five processing tables were prepared and fixed in processing table house at Madabatu fishery cooperative.

For this reservoirs research recommend to use 8 to 12cm mesh size of net based on fish species available in the water bodies. Such amount of net mesh size is mainly recommended for closed water bodies that mostly controlled by a few fishery cooperative. As fishery technology two wood boat, five processing table and one Gillnet of 100m length (8cm mesh size) were used as improved technology and demonstrated at selected site with fishers and districts experts. On demonstration fishers (FRG), experts from Zone, districts, Kebeles leader and other district officials and administrative and local community were attended the demonstration.

Table 3: Number of participants attended technology demonstration on Malka wakena reservoir, 2025

Participants	Male	Female	Total
Fishers	31	20	51
Das	10	-	10
SMS	9	-	9
Total	50	20	70

Source: own data of 2025

During technology the demonstration about 51, 10 and 9 fishers, DAs and SMS were participated on the technology demonstration respectively. Accordingly, a total of 70 participants were participated on the technology demonstration at selected research site.

Figure 2: Pictures taken during technology demonstration at Mada Batu Kebele fishery cooperative

3.4. Fishers feedback and reaction

After technology demonstration fishers provide feedback based on different criteria's including income contribution, improve fish catch per effort, simple to prepare and install, improve hygienic status of fish and minimize lose at landing site. Based on fishers' reaction, majority of them have a positive response on demonstrated technology. At the study area, fish is processed on the ground and this contribute for physical lose and contamination of the fishery products at the landing site. Related with processing table, all respondents (100%) positively responded that the technology is simple to prepare and has high contribution to improve quality of the fishery products during the processing

stage. The majority of fishers responded that, fish processing on processing table minimize time by 10-15 minute as compared to that processing on the ground.

Table 4: Farmer's feedback and reaction to wards demonstrated technology (n=70)

Name of technology	Criteria	Attribute	Number of respondent	% tage
Processing table	Simple to prepare and install	Yes	70	100
		No	-	-
	Improve quality of harvested fish	Yes	70	100
		No	-	-
	Increase consumer preferences and household income	Yes	70	100
		No	-	-
	Minimize time for processing	Yes	60	86
		No	10	14
Gill-net	Improve income	Yes	70	100
		No	-	-
	Help to catch table size fish	Yes	70	100
		No	-	-
Wooden boat	Minimize loss	Yes	45	100
		No	25	-
	Improving income	Yes	70	100
		No	-	-

Source: own data of 2025

From the key informants interview and focus group discussion result, Gill-Net and Beach seine with local available wood boat were the main fishing materials used on the study area. As they stated that, majority of fishers used with 8cm and sometimes use 6cm mesh size for both net type which is out of research recommendation. This directly have a negative impact on the fishery resource management and sustainability. To overcome this problem gillnet with 10cm mesh size, five processing table with its shade and improved two wood boat were demonstrated and transferred for the fishery cooperative members. Finally, demonstrated fisheries technologies were evaluated and feedback data were collected from the fishers on its` contribution, improving income, improving

production and insure resource monitoring. From the demonstrated technologies 900gm of standard table size fish was collected from the reservoir and possessed on fish processing tables. In two consecutive months of fishery activities fisher generated a total of 51,000 birr with by using the demonstrated technologies. This study is in line with the finding of [7,2,15].

4. Conclusion and Recommendations

Pre-extension demonstration of improved fishery technologies like processing table with it`s shade, wood boat and Gillnet were conducted in West Arsi Zone, Gedab Hasasa district on Malkawakana reservoir. Wood boat, Gillnet and processing table with its` shade were demonstrated through participatory

approaches with fishers and other stakeholders. Awareness creation was given for fishers, local farmers, different level livestock experts and other officials in the district on technology utilization and resource monitoring on the sustainable way at the study area. From the fishers feedback, demonstrated wood boat, Gillnet, and Processing table with it`s shade had positive response as they contribute to improve income and ensure resource management and sustainability. Therefore, demonstrated technologies were preferred by fishers, fishery experts and other stakeholders and recommended for pre-scaling up on fishery production potential areas of the country.

Conflict of interest
The author has not declared any conflict of interest

Authors` contributions
The corresponding author has been participated and implemented all of the activities starting from research proposal development to the final write up of this study. The second author has been given the practical training on the improved fishery technology demonstration in the study area.

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Declaration of Non-Use of AI:
The authors confirm that no artificial intelligence tools were used in this study.

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