Research Article

Participatory Demonstration of Improved Fishery Technologies on Belbela Reservoir East Showa Zone, Oromia Region, Ethiopia.

Alemayehu Abebe Wake
Batu Fish and Other Aquatic Life Research Center
Author email: *aleabebe93@gmail.com*

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Processing Table

Abstract

Participatory demonstration of improved fishery technologies were implemented on Belbela reservoir to demonstrate improved fishery technologies, to enhance farmers, DAs and agricultural experts' knowledge and to collect feedback information for further technology improvement/development. Belbela reservoir is located at 8°50'1"N and 39°2'49"E with the catchment area of 105 hectors and 12m maximum depth. Nile tilapia is the only species used as production by Beach Sine and Gill-net fishing gears. Participatory approach such as FRG was used for technology demonstration and data were collected through observation, interview and group discussion. Quantitative data were analyzed through descriptive statistics and qualitative data were used through narration. In capacity building a total of 116 participants attended training at different time on demonstrated technology utilization package, resource monitoring and on sustainable fishing. Technology demonstration was done through establishing two FRGs from active fishermen. One Beach sine, two retaining cage and six fish processing table was prepared and demonstrated on selected site. On organized Mini field day a total of 45 participants were participated and provided feedback reaction for further technology demonstration or improvement. From demonstrated technologies and exchange information, 500gm of standard table size fish was collected and generate a total of 30,000.00 birr in two month with improved handling system. Overall, all participants provide a positive feedback and confirmed as technology help in fishermen income improvement, minimize loss of production and insuring resource sustainability.

Introduction

Fish is an aquatic animal that serves as the source of food, nutrition, income, and livelihood for millions of people in the world (FAO, 2018). Fishery is animal-based food production that has quickly grown sector since the ancient civilization of Egypt and China (Amare *et al*., 2018). The world fisheries are dominated by marine production which has been a vital to the support of human well-being and economic development.Inland fisheries also deliver substantial contributions to nutritional security and income to hundreds of millions of rural households and support livelihood for many families, particularly in developing countries where other option are limited.

Fishery sector is mainly important for locally important sources of food, trade, income and employment opportunitiesfor considerable numbers of people in many developed and developing coastal nations. In developing countries, the livelihood of more than 500 million people is directly or indirectly tied to fisheries (FAO, 2020). Historically, Africa's fisheries are increasingly contributing to food and nutrition security, foreign exchange, employment, and livelihood support services (De Graaf & Garibaldi, 2019).The New Partnership for Africa's Development (NEPAD) estimates that total fishery production in the region stands at 10.4 million tons (NEPAD, 2014) comprising of 6.0 million tons from marine capture fisheries, 2.8 million tons from inland water fisheries, and about 1.6 million tons from aquaculture.

Ethiopia is endowed with several water bodies that contain a high diversity of aquatic fauna. The country fishery production ismostly practiced and collected from Lake, reservoirs, rivers and other small water bodies. Illegal fishing activities, lack of awareness of the community in sustainable fisheries management, and lack of post-harvest technology like fish processing techniques are the major challenge in Ethiopian fishery. Additionally, in newly established fishing site, fishermen suffered with lack of improved fishing gears (Temesgen and Getahun, 2016).

Belbela reservoir is established in Ada'a district in East Showa zone of the Oromia region by damming along the course of Belbela River. It is one of the two storage dams constructed in 1980 by a Cuban Civil Mission in collaboration with Ethiopian Water Resources Authority (EWRDA). The protection works, canals, and on-farm structures for the dam were later constructed by the Ethiopian Water Works Construction Authority (EWWCA) with an objective of irrigating land area to be used by State Farms.

As information gained from district livestock office, the reservoir is used for watering livestock, sanitation and as the primary source of drinking water supply for local people. The same report confirmed that, it also supports commercial fishery, which is based on introduced fish species primarily Nile Tilapia (*Oreochromis niloticus).* However, on the water body fishermen were performing fishing with inefficient fishing material and inadequate knowledge on overall fishing activities from collecting to processing. But, there are technologies that are release by the Batu Fish and other Aquatic Life Research Center which contributes to the fishermen income improvement, minimize loss of production and insuring resource sustainability. Thus, this activity was initiated with the following objectives.

Objectives of the Study

✓ To demonstrate improved fishery technologies at selected site
✓ To enhance fishermen, DAs and agricultural experts' knowledge on improved fishery technologies
✓ To collect feedback information for further technology improvement/development

Materials and Methods

Description of the study area

Belbela reservoir is found in East Showa zone, Ada'a district Koftu Kebele. In the district fishing activities are performed in both human made reservoirs and ponds in addition to a few river.

The area have good demand of fish in the market at different production site. Belbela reservoir is primary established for irrigation purpose and local utilization for human and animal. On the current situation, the reservoir provide as watering for animals, home consumption and fishing in addition to irrigation activities.
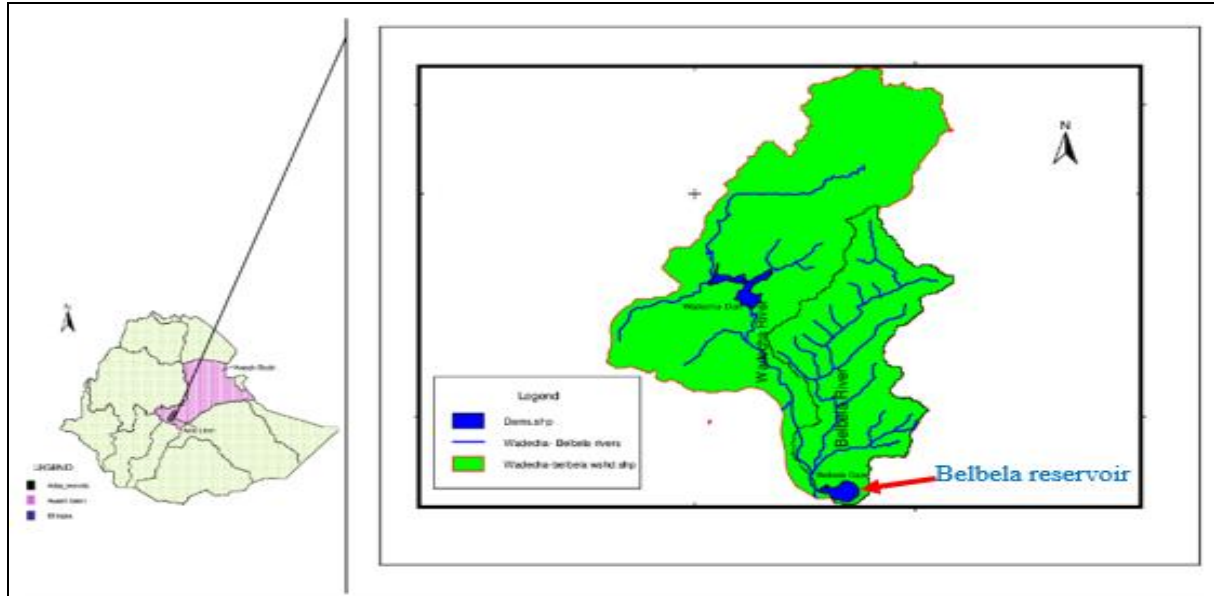

Figure 1. Google map of Belbela Reservoir

It is located at 8°50'1"N and 39°2'49"E with the catchment area of 105 hectors and 12m maximum depth. From our observation Nile tilapia is the only species used as production by Beach Sine and Gill-net fishing gears. Fishing activities were performed through cooperative form that managed by District Agriculture Office. Again, fishing Households were participating in agricultural production trough rain feed and irrigation system.

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 criterial Belebela reservoir was selected with DAs and District Experts for technology demonstration.

Technology demonstration techniques

Participatory approach such as FRG was used for technology demonstration at Belebela reservoir. Two FRGs having a total of 24 members were established in the study area for technology transfer. Additionally, Training, mini filed day, joint monitoring and evaluation were used as mechanism for information exchange among fishermen's.

Data collected and Methods of data collection

Type of Technology demonstrated, Total number of fishermen and local farmers participated in training and Mini field day, Role of farmers and other stake-holders in technology demonstration, Feedback and Secondary data were collected using different appropriate data collection methods such as filed observation, participant interview and focus group discussion.

Roles and responsibilities of participants

In this study three Research Team, Fishermen and Extension worker/experts are the main active participants and have their own responsibility. Research Team from center was performed many tasks like Site selection, provide awareness creation at different stage, prepare and deliver 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 (table 1).

Table 1: Role of stakeholders in technology demonstration

Actors	Roles and Responsibility
Fishermen	Land provision, facilitation, Involving in technology installation, participating on training and field day, field monitoring, evaluation technologies and providing feedback.
Research Team	Provision of training, Preparing extension materials, delivering all necessary materials, facilitating activities and different stakeholder participation, output and data collection and analysis
Extension worker	Facilitating and organizing, information transfer, provide technical support as local condition, continuous follow up and monitoring

Land provision, participation, evaluation technologies, utilize from technology and providing feedback were the main role and responsibility of farmers/fishermen on the study area (table 1). Extension experts also contributed through providing continues communication with research team, facilitation and mobilizing fishermen, monitor and feedback.

Data Analysis

Quantitative data were analyzed using the statistical analysis system of SPSS Ver. 21 software. Descriptive statistics such as mean and frequencies were used in analysis and describe in table.

Results and Discussion

Training of fishermen and other stakeholders

Capacity building was the primary and first section in technology demonstration. It help 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 heartily participated on awareness creation to promoteutilization of recommended fishing technology for sustainable production.

Continues awareness creation was given for 116 participants on demonstrated technologies, fish collection, handling and processing methods that mainly help to reduce post-harvest mislay (table 2).

Table 2: Training provided for stakeholders on demonstrated technology

Participants	Male	Female	Total
Fishermen	90	11	101
DAs	6	-	6
SMS	9	-	9
Total	105	11	116

Source: Own data, 2022

From the participants, about 95% were male category due the nature of activity that mainly performed by male. This data is similar with many finding which confirmed as fishing activity done at night time and early morning. This finding is in line with Shetimma *et al.* (2014) and Salau *et al. (*2014) who indicated that fishing is mainly undertaken by male group.

Figure 2: Picture taken during field training

Demonstration and Technology transfer

Technology demonstration was performed in Ada'a district on Belebela reservoir. Before demonstration necessary training and technologies were prepared by participatory approach with all main stakeholders. Firstly, processing shade was constructed by locally available materials with fishermen near to reservoir at main landing site. It has a total area of $20m^2$ (5mx4m)that used to fix processing table technology. Totally, six processing tables were prepared and fixed in processing shade at landing site.

On this reservoirs research recommend to use 6 to 10cm mesh size of net based on fish species available in the water bodies. Such amount of net mesh size is mainly recommended for closed and small water bodies that mostly controlled by a few fishery cooperative. As fishery technology two Beach sine (8cm mesh size), two retaining cage and six processing table were used as improved technology and demonstrated at selected site with fishermen and districts experts. On demonstration fishermen (FRG), experts from district, Kebele leader and other local community were attend the demonstration.

Table 3: Number of Participants attend Technology Demonstration on Belbela reservoir, 2022

Participants	Male	Female	Total
Fishermen	22	8	30
DAs	3	-	3
Researchers	3	-	3
Local farmers (Non-FRG)	5	4	9
Total	33	12	45

During technology demonstration about 30, 3, 3 and 9 fishermen, DAs, researchers and other Non-FRG were participate on demonstration respectively. Accordingly, a total of 45 participate were participated on demonstration at selected research site.

Figure3: Picture Taken during Technology Demonstration

Fishermen feedback and reaction

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

On the other hand, from all farmers about 38 (84.44%) participants had responded as the technology mainly contribute in household income improvement as to minimizing lose during processing time. This result of the study is in line with Alemayehu and Adisu, (2022), which confirmed that fish processing tables help to produce top quality of fillet than traditional methods that minimize loss of production from 2.5kg to 5%kg/boat/day at landing site. Again, the majority of fishermen responded that, fish processing on processing table minimize time by 10-15 minute that processing on the ground that in line with the previous study result.

Table 4: Farmer's feedback and reaction to wards technology (n=45)

Name of technology	Criteria	Attribute	No of respondent	Percentage (%)
Processing table	Simple to prepare and installed	Yes	45	100
		No	-	-
	Improve hygienic status of fish	Yes	45	100
		No	-	-
	Increase household income	Yes	38	84.44
		No	7	15.56
	Minimize time for processing	Yes	36	80
		No	9	20
Beach Sine	Improve income	Yes	40	88.88
		No	5	11.12
	Help to catch table size fish	Yes	45	100
		No	-	-
	Insure sustainability	Yes	45	100
		No	-	-
Retaining cage	Minimize loss at landing site	Yes	45	100
		No	-	-
	Improving income	Yes	35	77.77
		No	10	22.23

From Focus Group Discussion result, Gill-Net, Beach seine with local wood boat were the main fishing materials used on the study area. As they confirmed that, the majority of them used with 6cm and sometimes use 4cm mesh size for both net type which is out of research recommendation. This directly have a negative impact on resource management and sustainability. At the end the majority used fishing material Beach sine with 8cm mesh size was demonstrated and transfer for fishing households. Finally, demonstrated Net was evaluated and provide feedback on its contribution on improving income, improving productionand insure resource monitoring.

As different literature confirmed that, fish is the most nutritious but highly perishable product. With this fact, at Belbela reservoir fish activities is not managed with appropriate preservation methods which expose to spoilage. For this gap, the research recommended Retaining Cage that used to design to prolog fish from spoilage. It is simply installed in water that help to stay fish alive until presented to market. So, in the study area Retaining cage was demonstrated and evaluated by fishermen at selected research site. About 45 (100%) and 35 (77.77%) respondents responded that retaining cage help to Minimize loss and improve income respectively. From demonstrated technologies 500gm of standard table size fish was collected from the reservoir and possessed on fish processing tables. In consecutive two months of fishery activities fishermen generated a total of 30,000.00 birrwith improving handling system.

Challenge encountered

➢ Poor coordination among fishery cooperative members in the study area
➢ Weak linkage between District Agricultural Office and fishermen

Conclusion and Recommendations

Participatory Demonstration of Improved fishery technologies Processing Table, Beach Sine and Retaining Cage were conducted in East Showa Zone, Ada'a district on Belebela reservoir. Beach sine, Retaining cage and fish processing table technologies were demonstrated through participatory approaches with fishermen and other stakeholders. Awareness creation was given for fisherman and experts on technology utilization and resource monitoring at the study area.

From the fishermen feedback, demonstrated Beach sine, Retaining cage, and Processing table had positive response as they contribute to improve income and insure resource management and sustainability. So, these demonstrated technologies were preferred by stakeholders and recommended for pre-scaling up on fish production potential site of Oromia Region.

Acknowledgments

References

Alemayehu, A. and Addisu, H. (2022). Pre-extension Demonstration of Fishing gear, Retaining cage and Processing Table at Koka Reservoir, East Showa Zone, Oromia Region, Ethiopia unpublished paper.

Amare, D., Endalew, M., Debas, T., Demissew, A., Temesgen, K., Meresa, A., & Getnet, A. (2018). Fishing Condition and Fishers Income: The case of Lake Tana, Ethiopia. *International Journal of Fishery and Aquatic Science*, *4*(1), 006–009.

De Graaf, G. J., & Garibaldi, L. (2019). *The Value of African Fisheries*. FAO. Pp67.

FAO (2018). The state of world fisheries and aquaculture, meeting the sustainable development goals, food and agriculture organization of the United Nations.

FAO (2020). The State of World Fisheries and Aquaculture 2020. Food and agriculture organization of the United Nations.

NEPAD (2014). The Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa; NEPAD: Johannesburg, South Africa. Pp48.

Salau, E., Lawee, A., Luka, G. and Bello, D. (2014). Adoption of improved fisheries technologies by fish farmers in Southern Agricultural Zone of Nasarawa State, Nigeria. *Journal of Agricultural Extension and Rural Development,* **6(11)**: 339-346.

Shettima, B. G., Mohammed, S.T., Ghide, A. A. and Zindam, P.L. (2014). Analysis of Socio-economic Factors Affecting Artisanal Fishermen around Lake Alau, Jere Local Government Area of Borno State, Nigeria. *Nigerian Journal of Fisheries and Aquaculture*, **2(1)**: 48 – 53.

Temesgen M, Getahun A. (2016). Fishery Management Problems in Ethiopia: Natural and Human Induced Impacts and the Conservation Challenges. Reviews in Fisheries Science and Aquaculture; 24(4):305-313.