Pre-extension Demonstration of Fishing gear, Retaining cage and Processing Table at Koka Reservoir, East Showa Zone, Oromia Region, Ethiopia

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Abstract

Pre-extension Demonstration of Fishing gear, Retaining cage and Processing Table was conducted in Lume district of East Showa Zone at Koka Reservoir. The main objective of the study was to demonstrate fishery technologies: gill-net, retaining cage and processing table. Demonstration was conducted through organizing two FREG with a total 50 fishermen who participated in fishing activities. In awareness creation, a total of 54 participants were participated on both theoretical and practical training. During technology demonstration, 64 participants were attend the program and provided their feedback. Based on the different attribute, among the farmers interviewed all respondents had been responded that Gill-net with 10cm mesh size is help to improve fish harvesting process through attaining sustainable production. In similar way, almost all fishermen (100%) stress that utilizing processing table Improve hygienic status and Improve customer demand. About 65.22% and 76.1% of fishermen also mentioned as processing table is easy to established and Increase household income by 200 birr/day/boat. The interviewed fishermen also agreed on retaining cage technology that used to minimize loss of production, help to store production during bulk production, help to maintain fresh fish until market hold, easily made and install in the water. Overall, demonstrated fishery technologies are mainly contribute to minimizing loss of production, maintaining trading and marketing chain, Improve income and insuring resource sustainability. Thus, fishery technologies were recommended for father scaling up in different fish production potential site.

Key words: Demonstration, Gill-net, Retaining cage, Processing Table, Training

Introduction

In 2010 global capture fisheries and aquaculture from both marine and inland waters produced 148 million tons of fish, which was valued at US$217.5 billion (FAO, 2012). The context in which this production takes place is one in which an estimated 1.4 billion people are in poverty, 868 million people are estimated to be chronically hungry and an estimated one third of children in the developing world under five years of age are stunted (Conway, 2012). 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. On the other hand, fisheries provide a wide range of benefits, beyond income. Beyond material benefits (food, income and employment), it supports of wider household livelihood strategies such as seasonal contributions and safety nets. Fisheries also have a role in supporting relationships and well-being within communities, often through reciprocal arrangements and collective action.

Gears commonly operated in Ethiopian fisheries include gillnets, beach seines, long-lines, hook-and-line, and cast nets. Various forms of traps, scoop nets and baskets made of plant materials and wires are also used, particularly in the rivers of Ethiopia. Even though it is a land locked country, the country Ethiopia has a number of beautiful lakes, reservoirs and small water bodies that distributed throughout the country and covering a total surface area of about 13, 637km^2 (Tesfaye and Wolff, 2014). It has a number of lakes and rivers with substantial quantity of fish stocks.

The fish production from these water bodies is supporting the livelihood of poor farmers living around water bodies in providing inexpensive, but high-quality protein and diversifying sources of income (Gebrekidan *et al.,* 2012). But, in most case fish catches from lakes and other water bodies were used as customary practice from handling to processing. Especially, the processing (gutting or filleting) is done at shore of the lake with poor quality that leads many contamination and production damage (Ignatius and Zelalem, 2011).

The region of Oromia is endowed with numerous water bodies including lakes, reservoir and rivers. Additionally, the country is actively exploiting its water resources by building dams, reservoirs, irrigation and diversion canals and hydropower stations that used as source of irrigation drinking water, fish farming and flood control. Koka reservoir is one of the major reservoir at which major fish resource are available and a lot of fishermen livelihood are depend on fishing activities. However, fishermen around Koka reservoir are still performing fishing with traditional and customary practice. Due to its nature, fish start to spoil immediately after harvesting and the problem is become series during handling and processing stage.

In the study area around Koka Reservoir fishermen utilize un-recommended mesh size of Gill-net for fish catch. Additionally, throughout all landing site there is no appropriate processing mechanism and utilize on ground for fish gutting and filleting purpose which directly affect the quality of product in the market. On the other hand, if fishing activities supported with research and technologies it bring a positive impact on community's livelihood improvement. Besides, improving fishermen knowledge and skill with proper fishery technology, it need to demonstrate efficiently and proper fishing technology like fishing gears, processing table and Retaining cage with all recommended packages for resource sustainability.

Fishing gears, processing table and Retaining cage are some evaluated technologies and provide a positive result on fishing activity to utilizing the open resource. Fish processing tables is a kind of fish filleting tables that enables fish processors to produce top quality fillet and also help to prevention of physical damage, protecting fish from direct dirty soil and bacterial contamination. Retaining g cage technology designed to prolog the time that the fish stay alive at landing in water during lack of market and high production season. Gil-net with recommended mesh size mainly contributes in resource sustainability in particular water bodies. Therefore, the study was aim to demonstrate important fishery technologies in Lume district adjacent to Lake Koka reservoir of East Showa zone.

The specific objectives of the study were to;

- ✓ Evaluate fishing gear, retaining cage and fish processing table at selected site
- ✓ Create awareness on demonstrated fishery technology utilization
- ✓ Assess stakeholders feedback for further technology development/improvement

Material and methods

Description of the study area

Koka reservoir is one of the main lakes that used for different economic and ecological purposes for local community. Administratively it is found in Oromia Regional State, between East Shoa Zone (between Lume and Bora district), and Arsi Zone (bordered with Dodota district) (Lume District Livestock Development and Fishery Office, 2020). It is situated at around 90 kilometers southeast of Addis Ababa. It has a surface area of about 255 km^2 with a maximum depth of 14 m. The mean depth of the reservoir is around 9m with shore line of 195-205km distance. The reservoir is supported with the major two inlet rivers namely Awash and Mojo that flow toward to the Lake.

Its water in- and outflow is mainly provided by the Awash River. However, the Mojo River is mainly generating inflow during the rainy season. It is among the most important lakes for Ethiopian small scale fisheries in general and riparian societies in particular (Tesfaye and Wolff, 2014). The reservoir is serving for different purposes, such as hydroelectric power generation and from small to large irrigation. It is also important for fishing activities (Ann Gorfon *et al.,* 2007) that mainly used people living in the vicinity of the water body.

Site and fishermen selection

Development agent and experts were participated on specific landing site selection. The landing site was selected based on accessible to market and road, suitability for technology demonstration and shade construction, and high number of fishermen slips in and out from Lume district adjacent to Koka Reservoir. Fishermen also selected based on their readiness to work as group, willingness in taking any provide information to share any information for others farmers and good history with local community

Technology demonstration techniques

Participatory approach such as FREG was used to enhance technology demonstration efficiency and effectiveness. One FRG was established that organized along Koka reservoir at Dungugii Bekele Keble. Training, joint monitoring and evaluation were used as mechanism for technology demonstration and information exchange among fishermen's. Filed day was also organized to facilitate technology and information transfer at selected site with Zone and Districts Livestock and fishers offices.

Methods of data collection

To obtain the relevant information, quantitative and qualitative data were collected through filed observation, FGD, interview and measurement though preparing sheet/checklist.

Data collected

Quantitative data such as technologies demonstrated, total number of fishermen and farmers participated in training and field days were collected using checklist. In addition, qualitative data such as, role of farmers and other stake-holders in technology demonstration and feedback were collected. Regarding on the fishing activities the secondary data were taken from Agricultural office.

Materials used

Cement, Stone, String, plank, floater, sinker, nail, meter, twine, needles, metal and Staffa.

Roles and responsibilities of participants

In technology demonstration stakeholders: fishermen, research team and extension worker had their own responsibility. Especially fishermen were provided land for processing shade construction for processing table installation.

Table 1: Role of fishermen and other stakeholders in technology demonstration

Actors	Roles
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, feedback and all data collection and analysis
Extension worker	Facilitating and organizing, information transfer, provide technical support as local condition, continuous follow up and monitoring

Data Analysis

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

Results and Discussions

Training on capacity building

Training is the main approach that was used to create awareness on demonstrated technology being to capacitate fishermen, DAs and expert knowledge and skill. Fish post-harvest researcher which comprised of socio-economics, researcher from extension was participated to facilitate extension efforts. Theoretical and practical trainings were given to fishermen, DAs and district experts from all technology preparation to utilization process.

Moreover, the capacity building was given mainly focus on the promotion of utilizing recommended fishing gear for sustainable production. Intensive training also was given for participant fishermen and other stakeholder on Retaining cage and fish processing technology that mainly help to reduce post-harvest lose. Additionally, awareness creation was given on fish collection, handling and processing methods on those demonstrated technologies. Overall, a total of 54 participants were participated on training at selected site (table 2).

Due to the nature of activity, male is dominated and mostly manipulated in different fish potential area including Koka reservoir due to the reason that, fishing activity is mainly done during night time and early morning, time that is not suitable for women and the activity need much energy. 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. In addition to FRG members, 4 local farmers were participated in awareness creation program related with those prepared technology utilization.

Table 2: Training to stakeholders on demonstrated technology

Fishermen			DAs			SMS		
Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
46	0	46	2	-	2	6	-	6

Demonstration and Technology transfer

Before technology demonstration, processing shade was constructed with size of 72m^2 (12mx6m) at selected landing site. Six (6) processes tables (1.2mX0.6m size) were made and installed in processing shade based on research recommendation. Gill-net with10cm mesh size and two retaining cage also used as technology demonstration and transfer to fishermen. Technology demonstration was jointly organized in collaboration with fishermen and district livestock and fishery office. Non-FRG member also were participate to create opportunities for stakeholders to see and learn from technology demonstration and promotions. In demonstration a total of 64 participants were attend the program to create demand for the technologies and provide feedback for further technology improvement/development (table 3).

Table 3: Number of Participants on Technology Demonstration

Participants	Male	Female	Total
Fishermen	46	-	46
DAs	2	-	2
SMS	6	-	6
Others	8	2	10
Total	62	2	64

Fishermen feedback and reaction

As fishery technology Gill-net, fish Retaining cage and fish processing table were prepared and demonstrated with fishermen and other stakeholders. Based on those participant reactions, the demonstrated fishery technologies had preferred for its intended purpose. Especially, those all participants were responded as Gill-net and fish processing table extremely good in fishing sector due its more contribution in minimizing loss of production and improve income gain from the sector. On fish retaining cage, according to absolute category rating test, about 78.26% and 21.74% had responded it is extremely good and good technology that mainly contributes in prolog the time trough staying fish alive at landing in water.

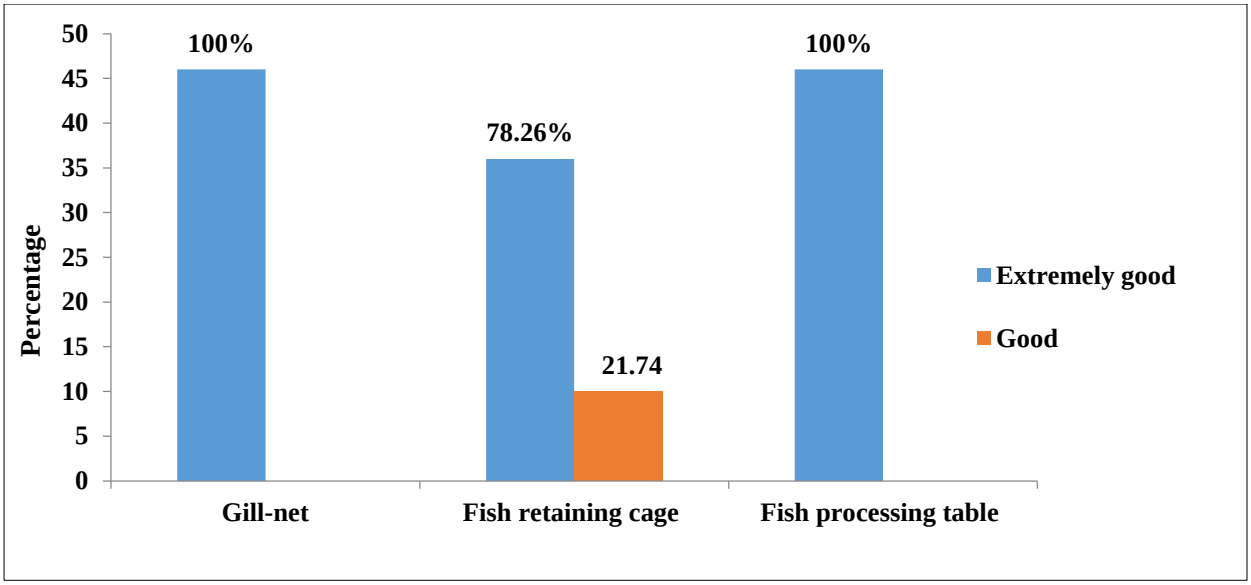

Figure 4: Stakeholder evaluation level with absolute category rating test

Again, participant fishermen were seen the three technologies based on some attributes like improve fish harvesting process, insure sustainability, easy to established and used/process, improve hygienic status, improve customer demand, increase household income, minimize loss of production and need low cost to establish. Among fishermen interviewed, all respondent had been responded that Gill-net with recommended mesh size was highly help to improve and sustain fish harvesting process.

Currently in the study area fishermen were use Gill-Net, Beach seine and Hooke with different size for fish collection. But, the mesh size of Gill-net or Beach seine was 6cm which is below with the current Research recommendation for Lake Fishery production 10 to 12cm. As male age of 32 key informants Mr. Goshu Teka confirmed that, around the reservoir almost all fishermen were utilize Gill-net with mesh size of 6cm due to fish size that available in the water bodies. As literature confirmed that, the size of the fish targeted determines the type and the size of the gear we have to use (Getachew, 2015). But, it has a negative implication on resource management and sustainable production. .

Table 4: Stakeholders feedback on demonstrated technologies (n=46)

Name of technology	Attribute	SA		A	
		Freq.	%	Freq.	%
Gill-net	Improve fish harvesting process	46	100	-	-
	Insure sustainability	46	100	-	-
Processing table	Easy to established and used/process	30	65.22	16	34.78
	Improve hygienic status	46	100	-	-
	Improve customer demand	46	100	-	-
	Increase household income	35	76.1	11	23.9
Retaining cage	Minimize loss of production	34	100	-	-
	Contribute in improving income	34	100	-	-
	Need low cost to establish	34	100	-	-

SA (Strongly agree), (ii) (A) agree

On the other hand, about 65.22% of interviewed fishermen were strongly agreed on processing table in terms of its installation and utilization status in different landing site (table 4). Moreover, all participants were agreed that fish processing technology under shade highly contribute to improve hygienic status and more attract customer for purchasing in marketing situation. In terms of income status about 76.1% of respondents had responded as the technology mainly contribute in income improvement due to minimizing production lose during processing stage.

As fishermen confirmed that, with customary practice on the ground preparing one kilo of filleted fish takes 20-30 min with poor quality status. On the other hand, during technology demonstration under shade on processing table one kilo of filleted fish was completed in10-15 min with good quality status. As Focus Group Discussants told that, due to lack of appropriate processing methods and technology on average about 2.5-5kg of fish is lose on the shoreline /day/boat under normal production. So, with effective utilization this improved technology can rapidly minimize such lose and improved income of fishermen by 200 birr/day/boat. Making fish processing on specific site can minimize pollution of the fishing source water body as well as the surrounding environment with effective utilization of collected fish. This also open other income source through selling by product of fish for further processing stage that mainly used as commercial fish and other animal feed.

The interviewed fishermen also, agreed on retaining cage technology that used to minimize loss of production, help to store production during bulk production, help to maintain fresh fish until market hold, easily made and install in the water. But, they strictly mentioned on its application with the current fishery production status. They emphasis that, the currently demand in market for commercials fish is rapidly increasing with declining of the production. However, they confirmed as the technology mainly used during low demand season of fish product

As fishermen had long history in fishing sector, they well know about Gill-net with all recommendation packages. But, through gradual the harvested fish sizes come to decline and fishermen also minimize Gill-net mesh size which is out of research recommendation. According to the majority of group discussants fish processing table under shade is better technology that utilized under any level of fish production and more recommended technology than the other.

Conclusion and Recommendation

The activity was conducted at Koka reservoir on representative landing site from Dungugi Bekele Kebele specific site was selected purposively selected based on its accessibility for technology demonstration. FRG was organized and used to demonstrate Gill-net, retaining cage and fish processing table technology with fishermen and other stakeholders. Capacity building was given related with demonstrated technology utilization as well as on the overall fish production and postharvest techniques. Fishermen were benefited from improved fishery technologies, which enable them to produce better quality fish products with sustainable manner.

Based on participant reactions, from demonstrated fishery technologies fish processing table under shade were highly preferred that contribute in minimizing loss of production and improve income gain from the sector. Again, participant stakeholders were evaluate the technologies and agreed on its contribution toward improving hygienic status, improve market interest and easy to established and used/process. Overall, Gill-net with appropriate mesh size (10cm), retaining cage, and processing table have highly contribution on fishing sector with improving method of collection, processing and handling. Therefore, those fishery technologies were preferred by stakeholders and recommended for pre-scaling up on unaddressed fish production potential site of Oromia Region.

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