Ethiopian Institute of Agricultural Research (EIAR)

National Fishery & Other Aquatic Life Research Center (NFALRC)

October, 2010

Contents

1. Background on fisheries and aquaculture research

Ethiopia is endowed with enormous water bodies including lakes, reservoirs and ponds covering over 8800 km^2as wells as river systems that stretch over 7100 km long. There are over 30 major lakes in the country; Lakes Tana and Shalla are the largest (3150 km^2) and the deepest (266 m deep) lakes respectively. These lakes are located in different agro-ecologies ranging from below sea level (-150m, Lake Asai) to over 4200 m as crater lakes on the Bale Mountains. These water bodies are known to harbor a diverse flora and fauna of economic importance to the country. About 200 fish species have been described so far, of which 30-40 fish species are reported endemic to Ethiopia. Potentially it is roughly estimated that some 40,000-51,000 tons of fish can be harvested from lakes, reservoirs & rivers annually.

The history of research on fisheries and limnology dates back to the 1930, with the Italian invasion. Later on some foreign scholars from the AAU also made short term limnological studies on Ethiopian lakes in 1960s & 70s. More systematic research involving Ethiopian scholars was launched with the opening of Graduate programs at the AAU and collaborative doctoral research with Canada and Sweden in the 1980s and 1990s. Lake Fisheries Development project (LFDP) which was initiated by the Ministry of Agriculture contributed in training and capacity building of the lake fishery in the country. The joint Ethio-Russian Biological Expedition (JERBE) has been involved in describing the bio-diversity of fish and other flora and fauna of major river systems and lakes since the 1980s.

For the first time in the history of research, fisheries and aquaculture has been recognized as one of the research commodities in the Ethiopian agricultural research system in 1997 with the establishment of the Ethiopian Agricultural Research Organization, (EARO) through the Proc. No. 79/1997. As indicated in article 6 of this code Sebeta Fish culture station was formally transferred to the agricultural research. The fish culture station was then renamed as National Fisheries & Other Aquatic Life Research Center (NFALRC) and the center was nationally mandated to conduct support & coordinate research on fisheries and other living aquatic resources in the country. Over the past twelve years, the center has undertaken enormous changes in terms of research coverage and out puts, development on human resources and research capacity, local and international collaboration, deliver and up scale of fishery and aquaculture technologies to the end users.

2. Overview of the center

2.1. History

The former, Sebeta Fish Culture Station was officially established in January 1977 by the then ministry of Agriculture. The cost of construction for the center was supported by the Japanese Government, Japan International Cooperation Agency (JICA). The center has been administered by the teams and divisions of the Department of Livestock and Fisheries of the Ministry of Agriculture for over two decades until it was transferred to the EIAR. The center was engaged in different activities including rearing and stocking of fish into natural and artificial water bodies; provide training to stakeholders and undertake some experiments on fish culture. The center has had a long vision "fish for all" aiming at enhancing the fish production in the country. With the establishment of the then Ethiopian Agricultural Research Organization (EARO), the center was legally incorporated under EARO (now Ethiopian

Institute of Agricultural Research, EIAR) by Proc. No.79/1997. The center was then renamed as "National Fisheries, and Aquatic Life Research Center (NFALRC) reflecting the national mandates and responsibilities vested on it. Accordingly, NFALRC was officially mandated as one of the Federal research centers of the EIAR to conduct, coordinate and support research on fisheries and other living aquatic resources nationwide.

2.2 Vision

- To see the center as one of the best fisheries and aquaculture institute in Eastern Africa.

2.3 Mission

- To import, adapt and generate technologies and scientific information that can sustainably utilize the country's fishery resource and improve production and productivity of fish through aquaculture and increase the contribution of the sector towards achieving food security and improve livelihoods of the society.

2.4 Objectives

- Adapt and generate technologies and scientific information on capture fisheries, limnology and aquaculture.
- Coordinate and support research on fish and other aquatic fauna and flora and physico-chemical limnology of Ethiopian water bodies.
- Establish and strengthen collaborative research with international and local stakeholders.
- Provide technical support and training to governmental and non governmental organizations and private sectors in enhancing fishery research and development.
- Rearing of fingerlings to be stocked into natural and artificial water bodies.

3. Center Profile

National Fisheries and Aquatic Life Research Center (NFALRC) is located in the town of Sebeta, Oromiya Regional State at about 25 kms south west of the capital, Addis Ababa. The center is situated at the edge of the Ethiopian Rift Valley (08°, 54'N, 38°, 38°E) at an elevation of 2200m.a.s.l and covers a total area of about 16 ha. By virtue of its location, the center is characterized by a moderately warm climate with annual mean temperature of 21°C and precipitation of 1500 mm.

3.1 Infrastructure and research facilities

The center is equipped with basic infrastructures and research facilities including office blocks, library, laboratory, hatchery, research ponds, borehole water and storage tanks, and broad band communication network. There are 28 ponds in total of which 12 are concrete wall ponds and the remaining 16 ponds are earthen ponds. The sizes of ponds vary from 50 m^2 to over 900 m^2. The water used for ponds originate from a borehole with a capacity of 12 liters per second.

In the past five years three more blocks that included rooms for laboratory, offices and stores were built in the center. Another block which serves as lounge for staff went operational at the beginning of this year. Moreover, the construction of 9 earthen ponds each with 250 m^2 was recently completed through capital budget allocated by the government to upgrade the center research and propagation capacity.

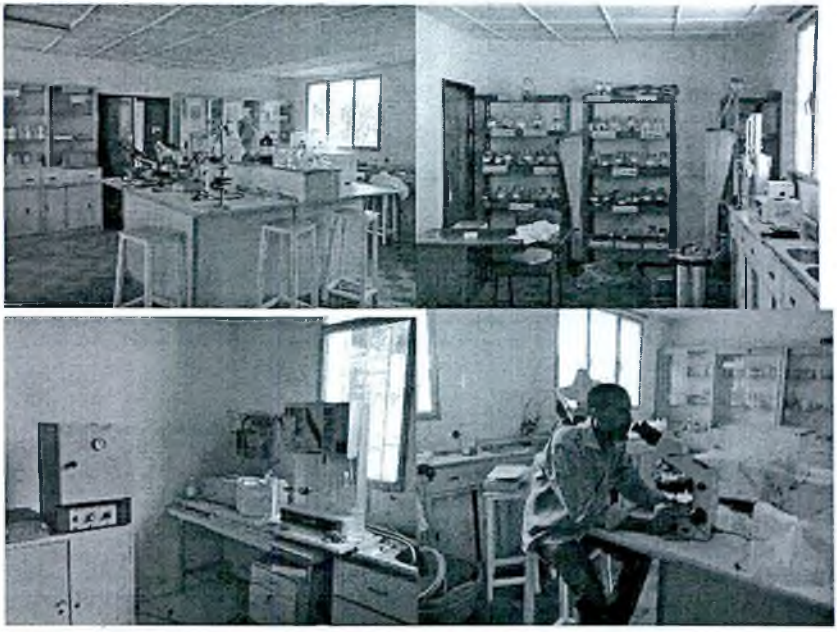

Fig. 1. Laboratory facilities available in center

Currently, the center propagates and maintains five different exotic and indigenous fish in ponds mainly for research and stocking of different water bodies. The ornamental goldfish is propagated for sale to clients. Some of the fish species available in the center are listed below.

2. Nile tilapia (*Oreochromis niloticus*)
3. Tilapia (*Tilapia zilli*)
4. African catfish (*Clarias gariepinus*)
5. Common carp (*Cyprinus carpio*)
6. Crucian carp (*Carassius carassius*)
7. Gold fish (*Carassius auratus*)

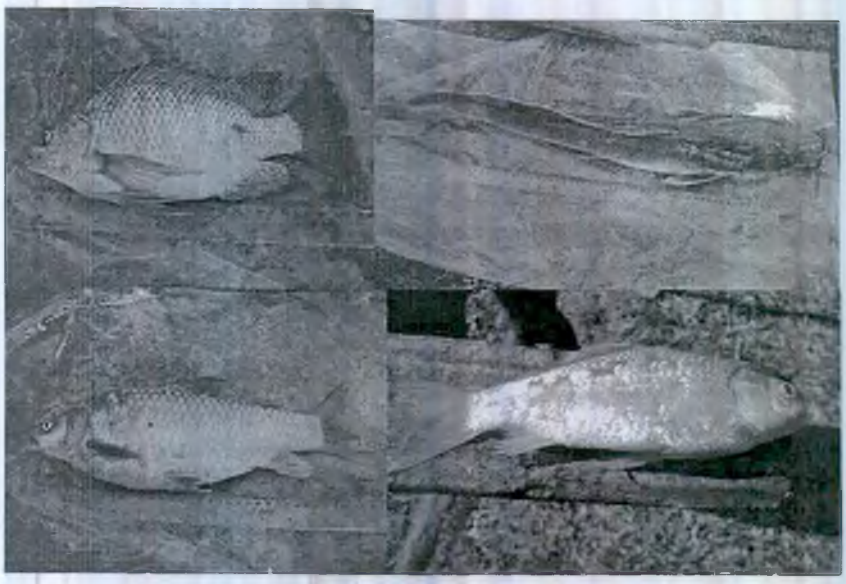

Fig. 2. Some of the fish species available in the center.

So far the center has stocked over 3 million fish fingerlings (mainly *O. niloticus*) and carp into different water bodies. The demand for fish fingerlings has increased considerably and this calls for constructing a higher capacity of ponds and modern hatchery.

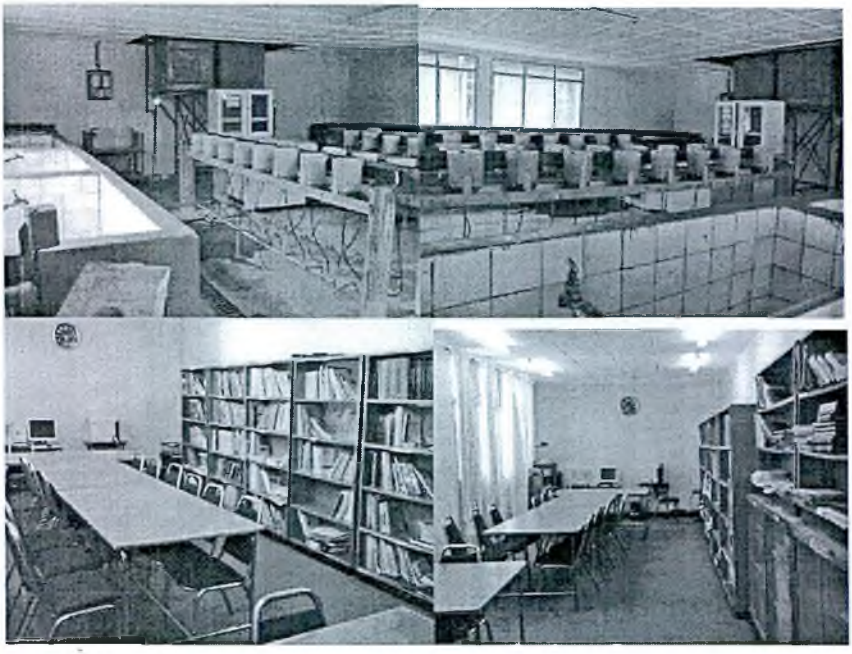

Fig. 3. Hatchery and library facilities of the center.

3.2 Human resource development

The center staff has shown dramatic improvement in terms of both number and education level of the staff. When the center was transferred to the EIAR in 1997, there were only 12 staff including 3 technical staff. Today there are 52 full timer research and support staff engaged on research and management. The research staff are technically qualified having MSc and PhD in fishery, limnology and aquaculture. Most research staff obtained their MSc through the IPGL-IHE program supported by Austria and Netherlands. One senior staff of the center conducted his post-doctoral research at the University of Washington, Seattle, USA through the Fulbright Senior research program.

Table 1. Profile of the center staff.

No.	Staff	PhD	MSc	BSC	Diploma	others	Total
1	Researcher	4 (2)	7(1)	6			17 (3)
2	Technical Assist.			1	2	4	7
3	Support staff				9	19	28
	Total	4(2)	7(1)	7	11	23	52

Numbers in brackets indicate staff on study leave.

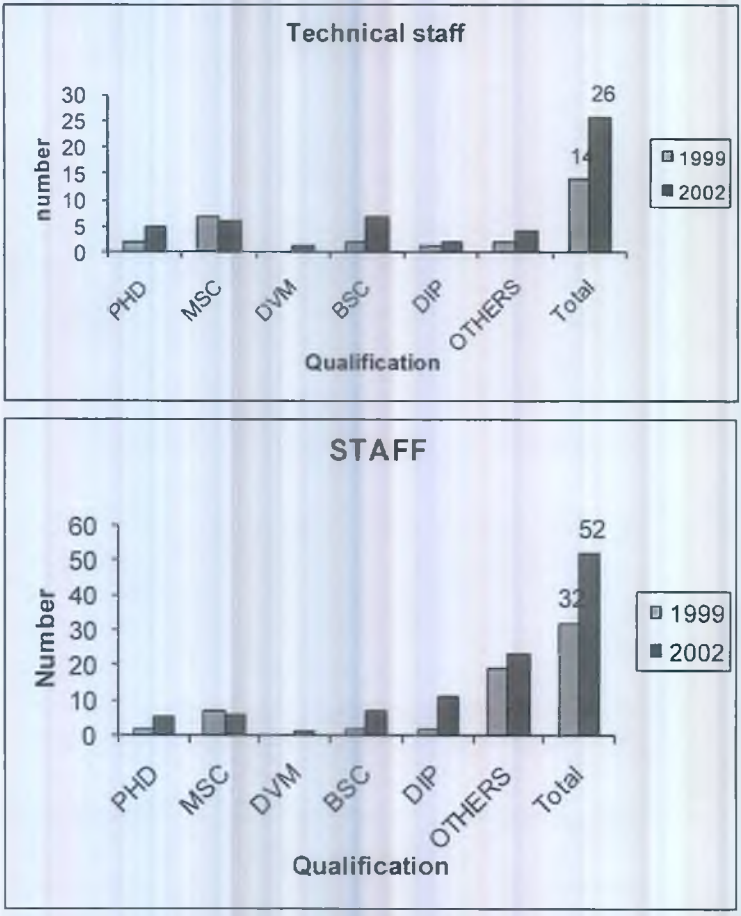

Fig. 1: Comparison of year 1999 &2002 E.C in human resource development

Fig. 4. The newly built staff lounge and small resident quarter.

4. Highlight of Research

In the past twelve or so years, NFALRC has been striving rigorously to implement and achieve the national goal set on fisheries, limnology and aquaculture research. With the view of maximizing, its efficiency on delivery of research technologies, the EIAR has undertaken transformations in its research approach from survey, exponent and trial (SET) to research themes and finally to research project. Following the recent civil service reform and Business Process Reengineering (BPR) program, the fishery research has been categorized as one of the case teams of the Animal Science Research Process. The fishery case team has developed two mega projects, which are then sub-divided into components and research activities.

4.1 National projects

Project 1: Selection and characterization of Tilapia (*Oreochromis niloticus*) strains and propagation of catfish (*Clarias gariepinus*) in hatchery & culture systems.

The main objective of this project is to develop improved strain of tilapia, *Oreochromis niloticus* and adapt seed production technology of catfish, *Clarias gariepinus* including feeding, water management and health packages. This project consists of five components which included 6 activities that are in progress since 2001 E.C.

Research components

Component 1. Fish breeding and genetics.
Component 2. Fish feed and nutrition
Component 3. Pond dynamics
Component 4. Fish Health
Component 5. Technology transfer

Research activities

Activity 1. Selection and characterization of the Nile Tilapia, *Oreochromis niloticus*.
Activity 2. Hatchery seed production of catfish, *Clarias gariepinus*.
Activity 3. Formulation of fish feed from locally available sources.
Activity 4. Water quality assessment of culture systems for Tilapia and catfish
Activity 5. Assessment of fish pathology and parasitology in culture conditions.
Activity 6. Survey and enhancement of small water bodies and demonstration of aquaculture technologies.

Project II. Enhancement and sustainable utilization of fish resources in major inland water bodies.

The main objective of this project is to increase production and utilization of the fishery resource in a sustainable way and reduce food insecurity. This project is divided into six components which include seven on going activities since 2001 E.C.

Research components

Component 1. Fishery resource management

Component 2. Limnology

Component 3. Post harvest and gear technology

Component 4. Fish Health

Component 5. Wet land ecology

Component 6. Socio-economics

Research activities

Activity 1. Stock assessment in Lakes Hashengie, Awassa, Koka, Tana & Ziway

Activity 2. The biology of commercially important fish species in Lakes Koka & Hashenge.

Activity 3. Limnological study in River Awash and Lake Hashengie.

Activity 4. Assessment of post harvest loss and development of intervention measures in Lakes Hashengie & Chamo.

Activity 5. Assessment of fish pathology and parasitology in Lakes Koka and Hashengie.

Activity 6. Ecology and production potential of wet lands around Lake Tana

Activity 7. Assessment on the socioeconomic significance of capture fishery

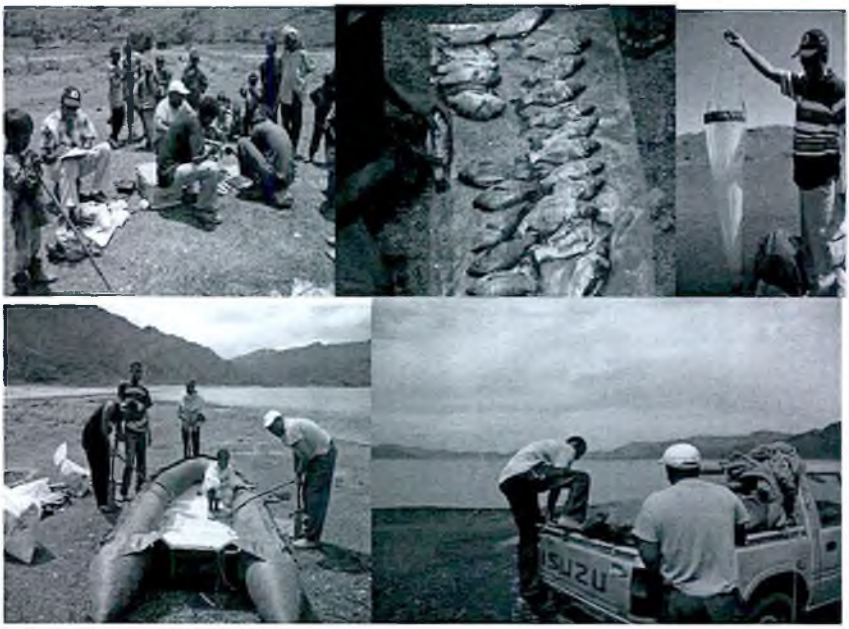

Fig. 5. Field activities on Lake Hashenge.

4.2.Externally funded projects

There are three research projects that have been undertaken by the center in collaboration with local and international stakeholders. Two of the projects are funded by external partners and the third project is financially supported by Oromia RCBP .

Project 1. Integrating BOMOSA cage fish farming system in reservoirs, ponds and small water bodies in Eastern Africa (Project No. E.C. 032103).

The objective of this project was to introduce the BOMOSA cage fish farming technology in Ethiopia, Kenya and Uganda. The project was financially funded by the European Union. About 10 research Institutes and Universities took part in the project from October 2006-September 2009. Major out puts of the project include.

- Transferred the BOMOSA cage technology to Ethiopia.
- Generated scientific information on feed formulation, fish parasites and pathology, GPS, GIS and remote sensing etc.
- User manuals on remote sensing, and BOMOSA cage technology.
- Generated base line information of socio-economic and marketing of BOMOSA.
- Up graded the human resource of the center staff to MSc & PhD.
- Up graded the center with state of the art field and laboratory equipment.

Project II. Joint Ethio-Russian Biological expedition (JERBE project).

The JERBE project has been implemented since the late 1980s in collaboration with Russian scientist and Ethiopian scholars. Over the past two decades, the fresh water research group has been studying the aquatic biodiversity of major lakes and River systems in Ethiopia. This project is still on going and major out puts include:

- Described and documented over 180 different species of fish from Ethiopia of which some 30 fish species are reportedly endemic.
- Produced identification key manual on fish fauna of Baro-Akobo basin.
- Published over 40 scientific articles, chapter of books on Ethiopian freshwater biodiversity.
- Collected & preserved fish specimen for teaching & research.
- Train Ethiopian counter parts on fish taxonomy and artificial breeding of catfish.

Project III. Demonstration & scaling up of aquaculture technology in west and South west Shoa Zone (FRG, ORCBP).

This project aims at up scaling pond aquaculture to farmers in Oromiya region. It is financially funded by the Oromiya Rural Capacity Building Project (ORCBP). The project consists of one component & two activities which are progressing well as planned.

5. Community Services and Training

Along with research, the center also provides different services to the community including stocking of fish fingerling, teaching and supervision for HLI students; training to farmers, development agents and the private sector.

5.1. Fish rearing & stocking

Since its establishment, the center has been involved in rearing fish mainly for research. Fish fingerlings are also stocked to small water bodies to enhance fish production and provide fish for local communities. A number of natural and man made small water bodies have been stocked with fish as indicated in the table below. Through this activity, the stocking of Tilapia fingerlings into Lakes small Abaya (SNNPRS), Haiq and Hashenge as well as many micro dams in Tigray and Oromiya could be mentioned as success stories and achievements of the center in enhancing fish production.

Table 2: Some of the water bodies stocked with fish in different Regional States.

Region	Pond/ Micro/dams	Reservoirs	Lakes
Tigray	>10	-	1
Amhara	>5	-	3
Oromiya	>12	4	-
SNNPRS	>4	1	1
Gambela	1	1	-
Somalia	1	-	-
Direwa	1		

Currently, the center propagates and maintains some six different exotic and indigenous fish species in ponds mainly for research and stocking of different water bodies. However the ornamental, gold fish is propagated for sale.

5.2 Training & consultancy service

The center has been actively engaged in providing training and consultancy services to various stakeholders including farmers, extension workers and the private sector. A series of on station and field trainings have been given to

- Farmers
- Development agents
- Experts
- High school & Elementary school students.
- University students.

Fig. 6. Center staff giving training to farmers and development agents.

5.3. Teaching and supervision

Graduate programs on fisheries and aquatic sciences are given in several Universities including the Addis Ababa University, Hawassa University, Mekele University, Bahir Dar University, Ambo University etc. Senior researchers of the center have been offering courses for students on block. Graduate students regularly visit our center and obtain practical training in the center. In addition, the center researchers are also involved in supervising and examining MSc thesis projects. So far the center staff have been involved.

- In offering courses at Mekele University.
- Co-supervised over 10 MSc theses.
- Served as external examiner for over 15 theses.
- Reviewed Graduate programs of Mekele, Hawassa & Ambo Universities.

6. Collaborations with local & International stakeholders

The center has been cooperating with various local and international stakeholders in various activities such as up scaling and dispatching of research; teaching and extension services to the end users.

6.1. Collaboration with stake holders

Local stakeholders include

- Ministry of agriculture & Rural development
- Ministry of water & Energy
- Regional Agricultural Research Institutes
- Regional Bureau of Agriculture
- Oromiya Livestock, Health & Marketing Agency
- Higher Learning Institutes
- Non governmental organizations

- Farmers
- Private sector

International stakeholders

- Russian Academy of science
- Austrian Academy of science, IPGL
- Boku and Vienna University, Austria.
- Uppsala University, Sweden.
- Moi University, Kenya.
- University of Washington, Seattle, USA.
- Bremen University, Germany
- Food and Agricultural Organization (FAO Regional Office)
- MASHAV, Israel.

6.2 Participation in professional societies

The center staff have been actively participating as regular and Executive committee members in various local and international societies. In addition, they present research results and publish article in scientific journal and proceedings of the societies. Major societies include

- Biological society of Ethiopia (BSE)
- Ethiopian society of Animal production (ESAP)
- Ethiopian Fisheries & Aquatic science Association (EFASA)
- Society of International Limnologists (SIL)
- Eastern Africa water Association (EAWA)

1. The way forward

Over the past twelve years the center has transformed considerably in terms of infrastructure capacity, human resource development, and research scope and coverage. However, the center is faced with big challenge in view of the ever increasing demand for fish in the coming decade. Hence, NFALRC should contribute its role in developing and adopting technologies on fisheries, aquaculture. Hence the center should collaborate and work closely with local and international partners in the coming years. Based on the lessons obtained from the past PASDEP five years development plan. It is highly likely to achieve targets set in the new five year Transformation and development Plan proposed at national level.

Dried fish fillet

Fish from Gambela sun drying

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