

**Norwegian College of Fisheries Science
Management and Livelihood Opportunity of Lake Tana
Fishery, Ethiopia**

**The need for co management
Aytegeb Anteneh Chekol**

**Master thesis in International Fisheries Management
December 2013**



ACKNOWLEDGEMENTS

Thanks to God The Almighty

This thesis was made possible by greater help and moral support of various people and different institution.

My greatest appreciation goes to Almighty God who is source of my life and inspiration. I also thank him for giving me a wonderfully wife Ms. Emebet Gashaw (she is my sun-shine) and two beautifully daughters Bethlehem and Daniel. Their love, care and support have made me stronger.

I am very grateful to my supervisor, Prof. Svein Jentoft, for the confidence you build inside me and support on every aspect of this thesis.

My deepest gratitude goes to Line Vråberg and Annemarie Hektone both of you make my life suitable in Tromsø really God Bless you and your family

I sincerely thank the Norwegian State Educational Loan Fund for their financial support throughout my studies.

Thanks to Amhara Water Resource Development Bureau (AWRDB) offering my study and the former bureau head Mr. Mammuru Tsedku for the recommendation to Tromsø University during my application. My heart-felt thanks goes to Xoel Chamorro for his tremendous help in the data analysis process.

My heart-felt thanks goes to all Lecturer, IFM program Coordinating office, International student counseling office and all friends for making my stay in Norway a memorable

I would like to extend my thanks to Dr. Andarge Yitbarek, providing valuable information and advice, Mr. Chalachew Aragaw senior fishery expert in Amhara Agriculture Bureau for his comment and material, Wonde Zelalem Limnologist in fishery research center and also thanks to all Amara fishery research center and Lake Tana fishermen for their excellence logistical work and good response on my interview during the data collection.

I am highly indebted to my long last friend Daget Ayana; you contribute a lot for this work ,I will never forget you in my life.

Last but not least, I am very grateful to Dr. Alemayehu Mekonen for your support and insightful comments throughout my study.

To God be the glory

DEDICATION

This work is dedicated to my daughters

Betlehem Aytegeb

&

Daniel Aytegeb

ABSTRACT

Agriculture plays vital role in Ethiopian economy. However, despite its importance and potential, the sector has remained at subsistence level. Animal protein is the most deficient nutrient in human diet. One of the traditional sources of animal protein of the developing world is through livestock rearing. Unfortunately, the livestock production is under increasing pressure from the combined effects of human population growth, shortage of grazing land and expanding desertification. Therefore, it is important to look for a better and cheap, alternative source of animal protein that is environmentally friendly. One of the alternative sources of animal protein could be fish farming and effective and sustainable utilization of existing potential fish resource. Ethiopia is endowed with over 7,400 km² of lakes and reservoirs and 7,000 km of rivers with total annual production potential estimated 51,481 metric tone. Of this total potential, Lake Tana could contribute more than half of the estimate. With the aim of utilization of this potential and to increase its contribution to the national economy, fishery extension has been initiated and the modern fishing technology has been introduced in mid 1980's. However, the country's fishery resource is still underdeveloped and its contribution to the economy is negligible. This study has attempted to examine socio-economic and institutional factors influencing fishery resource utilization of Lake Tana. For the study, both primary and secondary data were used. Stratified random sampling method was employed to select 150 sample households. A total of 120 respondents gave adequate information out of 150 questionnaires administered in the community. The required primary data were collected through interviews using structured questionnaire. Of 120 sample respondents 59 and 41 percent's were organized fishermen and non-organized fishermen, respectively. Results indicated education, training and credit access were significantly influenced fish resource utilization. The finding of the study revealed that, improving educational level, training on fishery resource management and utilization, access to credit, establishment of sustainable market, construction of roads and expansion of sea transportation system would promote fish resource utilization.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	i
ABSTRACT	iii
LIST OF FIGURE	vii
LIST OF TABLES	viii
ABBREVIATIONS	ix
1.0. INTRODUCTION	1
1.1. General Introduction	1
1.2. Statement of the problem	3
1.3. Objective of the study	4
1.4. Specific Objectives	4
1.5. Research Questions	4
1.6. Significance of the study	5
1.7. Arrangement of the study	6
2. 0 AGRICULTURE AND FOOD SECURITY	7
2.1. The State of Food Security in The World	7
2.1.1. The Concept of Food Security	7
2.1.2. Definition of food security	7
2.1.3. Food Security Components	10
2.2. Agriculture and Rural Development	12
2.2.1. Crop Production	13
2.2.2. Livestock.....	13
2.3. Food Security Condition in the Country	14
2.4. Contribution of Small-Scale Fishery to Food Security and Poverty Alleviation	15
2.5. Small-Scale Fisheries Contribution to Economic Growth	16
2.6. Small-Scale Fisheries Contribution to Food Security at Household Level	16
3.0 BACKGROUNDS	18
3.1. Global Fish Production and Consumption	18
3.2. An Overview of Ethiopian Geography	19
3.3. Country Economy Overview	20
3.4. Over View of Ethiopian Fishery	20
3.5. Genesis of Fishery Development	21
3.5.1. Fisheries resources and level of exploitation	22
3.5.2. Demand and Supply of Fish in Ethiopia	24
3.5.3. Aquaculture /Fish farming	25
3.5.4. Fishery Policy of the Government of Ethiopia.....	26
4.0. MATERIALS AND METHODS	28

4.1. The Study Area, Sampling and Data Handling.....	28
4.1.1. Location	28
4.2 Methodology.....	30
4.2.1. Years, Months and Hours.....	30
4.2.2. Data Requirements and Source of Data	30
4.2.2.1 Primary Data Source.....	31
4.2.2.2. Secondary Data Source.....	32
4.2.3. Data Analysis.....	33
4.2.4. Scope and Limitation of the Study.....	33
5.0 RESULTS AND DISCUSSION	35
5.1. Interview Results.....	35
5.1.1. Gender and Age of the Respondents	35
5.1.2. Education and Marital Status of the Respondent	36
5.1.3. Household, Type of Livelihood Activity and Monthly Income	37
5.2. Concept of Sustainable Livelihoods.....	38
5.2.1. Sustainable Livelihood Framework	39
5.2.2. Livelihood Assets.....	39
5.2.3. Vulnerability Context.....	40
5.2.4. Policies, Institution and Process.....	40
5.2.5. Livelihood Strategies	41
5.2.6. Livelihood Outcome	41
5.2.7. Contribution of Small Scale Fisheries to Food Security	44
5.2.8. Causes for Household Food Insecurity	44
5.3. Household Characteristics	45
5.3.1. Perception of the Household Heads Fishery as Livelihood and Source of Income.....	45
5.3.2. Distribution of Respondents by Participation in Leaderships of Social Organizations.....	46
5.3.3. Religion and Fish Eating Habit of Respondents	46
5.3.4. Educational Status of Sample Household Heads	47
5.3.5. Distribution of Respondents by Size of Land Holding	47
5.4. Institutional Characteristics.....	48
5.4.1. Government Interventions to Ensure Food Availability.....	48
5.4.2. Respondent’s Access to Training and Extension Service	48
5.4.3. Distribution of Respondents by Access to Credit	49
5.4.4. Distance of the Lake from Household Home in kilo meter.....	50
5.4.5. Marketing Accessibility	51
5.4.6. Transport Facilities to Fish Product	52
5.5. Lake Tana And Its Fisheries	52
5.5.1. The Fishing Boats of Lake Tana	53
5.5.2. Fisher’s Organization.....	55
5.5.3. Current Fish Production Level and Trends of Lake Tana	55
5.5.4. The Benefits of Lake Tana Fishery to the Community	56

5.5.4.2. Socio-Economic Benefit in Terms of Employment and Income Generation	58
5.5.4.3 For Fish Meal.....	59
5.5.4.4. Sport Fishing as a Recreational Value	59
5.5.5. Stakeholders and Gender Analysis in Lake Tana Fisheries	59
5.5.6. Marketing and Distribution	61
5.5.6.1. Domestic Market.....	61
5.5.6.2 Export Trend	64
5.5.7. Challenges and Constraints of the Fishery	64
6.0. SUMMARY AND CONCLUSION.....	66
6.1. Summary	66
6.2. Conclusion and Policy Implications	68
REFERENCE	71
APPENDICES	77

LIST OF FIGURE

FIGURE 1. MAJOR COMPONENT OF FOOD SECURITY	11
FIGURE 2. MAP OF (A) ETHIOPIA AND (B) LAKE TANA, THE STUDY AREA.....	29
FIGURE 3 .SUSTAINABLE LIVELIHOOD FRAMEWORK ..	43
FIGURE 4 .LAKE TANA FISH PRODUCTION FROM 1996-2010 GC	56
FIGURE 5 .VALUE CHAINS OF THE FISHERY PRODUCTS OF LAKE TANA	63

LIST OF TABLES

TABLE 1. FISHERY RESOURCE POTENTIAL AND EXPLOITATION RATE OF ETHIOPIAN LAKES.....	23
TABLE 2. TOTAL FISH PRODUCTION, PRICES AND PER CAPITA CONSUMPTION RATE FROM 1990 TO 2010	24
TABLE 3. GENDER AND AGE OF THE RESPONDENTS	35
TABLE 4. EDUCATION AND MARITAL STATUS OF RESPONDENTS.....	36
TABLE 5. HOUSEHOLD NUMBER, LIVELIHOOD ACTIVITY AND MONTHLY INCOME.....	37
TABLE 6. DISTRIBUTION OF RESPONDENTS BY PARTICIPATION IN THE LEADERSHIPS.....	46
TABLE 7. LANDHOLDING DIFFERENTIALS BETWEEN FISHERMEN AND NON-FISHERMEN.....	47
TABLE 8. HOUSEHOLD RESPONDENT’S GET EXTENSION SERVICE RELATION TO LIVELIHOOD ACTIVITIES FROM THE GOVERNING BODY.....	49
TABLE 9. CREDIT ACCESS FOR HOUSEHOLD RESPONDENTS.....	50
TABLE 10. HOUSEHOLD LIVING HOME DISTANCE FROM THE LAKE.....	50
TABLE 11. HOUSEHOLD ACCESS TO TRANSPORT AND MARKET.....	51
TABLE 12. DISTANCE FROM MARKET CENTER TO THE LAKE.....	51
TABLE 13. NUMBER OF FISHERMEN AND FISH PRODUCTION BY ZONE IN LAKE TANA FISHERY.....	56
TABLE 14. LAKE TANA FISH PRODUCERS PRICE BY SPECIES AND TYPE OF PRODUCT AT BAHIR DAR	62
TABLE 15. DRIED FISH EXPORT FROM LAKE TANA FISHERY BAHIR DAR TO SUDAN	64

ABBREVIATIONS

ACSI	Amhara credit and Saving Institute, Ethiopia
ADLI	Agriculture Development Led Industrialization
ANRS	Amhara National Regional State, Ethiopia
BoARD	Bureau of Agriculture and Rural Development, Ethiopia
BoCT	Bureau of Culture and Tourism, Ethiopia
BoFED	Bureau of Finance and Economic Development, Ethiopia
CSA	Central Statistics Agency, Ethiopia
EPLA	Environmental Protection, Land Administration, Ethiopia
ET	Ethiopia Birr
FAO	Food and Agriculture Organization of the United Nations
FMIN	Fish Market Information Network
FIVIMS	Food Insecurity and Vulnerability Information and Mapping System
FDRE	Federal Democratic Republic of Ethiopia
FPME	Fish Production and Marketing Enterprise, Ethiopia
GDP	Gross Domestic Product
IGAD	Inter Governmental Authority on Development
ISE-URK	Dutch NGO Inter-Church Foundation for Ethiopia
ISO	International Organization for Standardization
LFDP	Lake Fisheries Development Project
LTFDP	Lake Tana Fishery Development Program, Ethiopia
MoFED	Ministry of Finance and Economic Development, Ethiopia
MSY	Maximum Sustainable Yield
NGO	Non Governmental Organizations

CHAPTER ONE

1.0. INTRODUCTION

1.1. General Introduction

Ethiopia has a rich diversity of ichthyo fauna in its lakes, rivers and reservoirs, although they are poorly known (Ameha and Assefa 2004). Fishing is an age-old practice in these waters: and Lake Tana and its tributaries account for about half of the total water area of the country.

Ethiopia with a population of 86 million (The Economist 2007, cited by Beyen 2007)) is predominantly an agrarian country with the vast majority of the population directly or indirectly being involved in the production of crop and livestock. Hence, agriculture plays a vital role in Ethiopian economy. Agriculture in Ethiopia contributes about 47 percent of the GDP and 85 percent of employment and accounts for about 80 percent of the foreign earning and 70 percent of raw material requirement for domestic industries (Zerihun et al. 2004: 212 cited by Beyen 2007). Subsistence farming using traditional methods is dominant and account for over 90 percent of the output however, despite its importance in the livelihood of the people and its potential, the sector has remained at subsistence level. Moreover, the performance of the agricultural sector has been poor and in general, low productivity characterizes the Ethiopian agriculture.

Ethiopia is clearly one of the poorest countries of the world with very poor performance in the Human Development Indicators (HDI). In 2005 the HDI for Ethiopia was 0.406, which gives the country a rank of 169th out of 177 countries and the Human poverty index (HPI-1) value of 54.9 for Ethiopia, ranks 105th among 108 developing countries for which the index has been calculated (Ajala 2008).

The country's economy is the weakest in its performance; poverty, food and livelihood insecurity and famine are the usual phenomena in the country. According to , Shado and Ababa (2006), 45-50% of the populations of the country live below absolute poverty. The poor who depend much on food aid in the country are not an aggregated whole. The sedentary subsistence farmers, the landless, the traditional craftsmen, pastoralists, and the small-scale fisher are among them. In

Ethiopian context, it is too difficult to differentiate who is the most vulnerable group. In spite of this, the small-scale fishermen are relatively one of those groups who are neglected and bypassed from policy and technical support in the rural development endeavours of the country (Shado, 2006).

According to FAO (FAO 2000), Ethiopia faces the most pressing and difficult problems in feeding her population. This is because of chronic instability and conflict, poor governance, erratic weather, endemic poverty, crop failure, population pressure, poor marketing systems and land degradation. As a result, the demand for agricultural products run ahead of its supply and making the need for additional food supplies is the leading problem of the nation.

Moreover, animal protein is the most deficient nutrient in human diet. One of the traditional sources of animal protein of the developing world is through livestock rearing (Aragaw 1998). Unfortunately, the livestock resource is under increasing pressure from the combined effects of human population growth, Shortage of grazing land and expanding desertification (Misikire Tessema, 2001 cited by Beyen, 2007). Currently, the traditional style of cattle ranching is rather becoming a major threat to the environment, causing irreversible damage on ecological structures and bio-diversity. Hence, the question now is to look for a better alternative source of animal protein that is environmentally friendly. The ways in which government or other institutions intervene to the alternative source of animal protein is fish farming and effective sustainable utilization of existing potential fish resource.

In this respect and more importantly in response to increasing population, the exploitation of the food resource existing in the sea, rivers and lakes has received special attention (Girard 1968). Fish currently makes about 19 percent of the world's total animal protein consumption (Thorpe 2005).

Ethiopia is endowed with over 7400 km² of lakes and reservoirs and 7000 km of rivers and the total annual fish potential production of the country's major inland water bodies was estimated to be 51,481 metric tons per year on a maximum sustainable yield (MSY) basis (FAO 2005). Of the total annual fish potential production of lakes, Lake Tana could contribute more than half of the estimate, it is the largest fresh water covering 3,200 km² (Mohr, 1962). The water is also said to have the most varied fishery resource in Ethiopia, and the maximum sustainable yield (MSY)

from the lake has been estimated at 15,000 metric tons per year (LFDP, 1995). However, current contribution of Lake Tana fisheries to the national economy is very low because of its under development (MoARD, 2002).

1.2. Statement of the problem

Fishery sub-sector, in spite of its significant potential to contribute for food self-sufficiency as source of animal protein, generation of employment opportunities, income generation and foreign currency. The present rate of catch all over the country's inland fisheries has been estimated to be 30 percent (FAO 2005) of the maximum sustainable yield.

According to FAO (FAO 2005), national per capita fish consumption of Ethiopia is 240 gram's, whereas per capita fish consumption of neighboring East Africa Countries such as Uganda, Kenya, Sudan Somalia and Djibouti are 35.7, 14.3, 4.4, 1.6 and 3.3-kilo gram's respectively.

With the aim to utilize this potential fishery resource and to increase its contribution to the national economy, fishery extension has initiated and the modern fishing technology has been introduced during 1980's. However, the sub sector is still underdeveloped and its contribution to the economy is negligible. The total landing were estimated in 2001, about 15,389 tons, which is 30 percent of the estimated potential (FAO 2005), and in 2010 12,291 tons which is 26.5 percent of the available potential (MoARD, 2003).

The degrees of fish exploitation of different lakes in the country are differs from one lake to another lake. According to MoARD (2003), the percentage share of fishery resource exploitation of Koga, Ziway, Langano, Awassa, Abaya, Chamo and lake Tana were 89, 83, 63, 140, 69, 97, and 14.5, percent respectively of the maximum sustainable yield. Almost more than 50 percent of the total potential of the country's lake fishery found to be available in Lake Tana. However from the above exploitation data it could be understood that, Lake Tana is still under utilized and its contribution to food self-sufficiency is negligible, compared to other inland water bodies of the country.

Therefore, the main question here is that why most poor fishermen and their family around the lake do not increase their income and change their life standard? Thus, the aim of this study was therefore to assess the current state of the potential socio-economic and institutional factors that influence the utilization of inland fisheries with special reference to Lake Tana fisheries

1.3. Objective of the study

The objective of this study was to examine the important socio-economic and institutional factors that determine potential fish resource utilization of Lake Tana in meeting increasing the livelihood opportunity of the poor household families.

1.4. Specific Objectives

The main emphasis was on gaining knowledge for the state of the lake resource, the specific purpose of this study were;

- To describe the fishery of Lake Tana
- To asses the livelihood opportunity of the poor household families
- To suggest the current management system of the fishery

1.5. Research Questions

The study will also try to answer the following research questions;

1. What are the major livelihood challenges of the fishing communities around Lake Tana
2. Are there policy and institutional gaps to the management of the fish resource from the lake?

3. What are the causes of household food or livelihood insecurity among the fishing communities?

1.6. Significance of the study

The fishery sub-sector plays a significant role in the alleviation of poverty and the achievement of food security in many part of the world. Fish is an important and indispensable item in human diet. The sub-sector provides livelihood opportunity like employment opportunity, raises income level of the people and also it contribute foreign currency to the country. Fisheries could make the best possible use of under utilized resource presently available to the small farmers to raise their income and also to improve their nutritional status particularly the supply of animal protein.

Agriculture is the backbone of the country but it failed for a long time in the past to meet the subsistence food requirement. As a result, the country suffers from poverty and food insecurity. In alleviate these chronic problems for searching for alternative food and income sources and employment opportunities, like fishery sub-sector needs to be given special attention. Thus the study could:

- To describe status of Lake Tana fishery
- Provide information on the current performance of fishery sub-sector
- Identify the opportunity of fisheries that make the most contribution to economic welfare
- To assess options for better utilization of the resource through management approaches
- Also the study could be used as an input for future studies on similar subject matters

1.7. Arrangement of the study

This thesis was organized in six chapters. The first chapter deals with the introduction, statement of the problem and described the objective of the study. The second chapter deals with the country backbone Agriculture and food security literature review including the role of small-scale fisheries for poverty alleviation and food security. The third chapter describes the background, such as country economy overview, the genesis of the fishery development. The fourth chapter presents the research methodology, data required and source of data, sampling techniques, methods of data collection, and analysis. The fifth chapter brings for the results and discussion. The sixth chapter depicts conclusions & recommendation.

CHAPTER TWO

2.0 AGRICULTURE AND FOOD SECURITY

2.1. The State of Food Security in the World

2.1.1. The Concept of Food Security

Different institutions and organization define food security differently without much change in the basic concepts. The roots of concern about food security can be traced back to the Universal Declaration of Human Rights which recognized that “everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food” (UN 1948 cited by Gebrehiwot, 2008).

Food security as a concept originated in 1970’s and since then it has been a topic of considerable attention. However, the concept has become more complex due to a shift in the level of analysis from global and national to household and individual levels. In the mid-1970s food security was conceived as adequacy of food supply at global and national levels. This view focused merely on food production variables and overlooked the multiple forces that in many ways affected food access and the definitions of food security focused on aggregate food supplies at national and global levels, and analysts advocated production self-sufficiency as a strategy for nations to achieve food security (Gebrehiwot, 2008). The 1974 World Food Conference defined food security as: “availability at all times of adequate world supplies of basic food-stuffs” (United Nation, 1975 cited by Gebrehiwot, 2008).

2.1.2. Definition of food security

The world food summit 1996, defines Food security as *“at the individual, household, national, regional and global levels when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active*

and healthy life”(FAO, 1996).

FAO has defined food security not in terms of access too, and availability of food, but also in terms of resource distribution to produce food and purchasing power to buy food, where it is produced. Food security in general is a concept that integrates a number of important issues the magnitude of which ranges from micro to macro-economics.

Food insecurity, when people lack this, is seen as due to unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate utilization at household level. It is a complex phenomenon attributable to a range of temporally and spatially varying factors, such as the socio-economic and political environment, the performance of the food economy and the health and sanitation situation (FIVIMS 2003). Besides, vulnerability is also seen to be key, referring to factors that place people at risk of becoming food insecure or reducing their ability to cope (Hussein 2004).

According to FIVIMS 2003, food insecurity is a complex phenomenon attributable to a range of temporally and spatially varying vulnerability factors such as the socio-economic and political environment, the performance of the food economy, care practice and the health and sanitation situation. These are taken as indicators and key vulnerability factors that cause hunger and that should be monitored in assessing food insecurity (CFS 1999). These are:

- ⇒ **Demographic conditions;** create vulnerability when size of population exceeds the carrying capacity of a particular area, and there is limited opportunity for out-migration or for development of physical, social and economic infrastructure so as to provide more productive alternatives to the dominant livelihood systems in the area. A high proportion of dependent persons within a family, community, locality or nation also increase the risk of under-nourishment for these persons.
- ⇒ **Environmental conditions;** can create chronic vulnerability in several ways. People living in areas where the natural resource base is poor or deteriorating often have limited opportunities for earning their livelihood. Their situation is worsened if acts of man lead to pollution and environmental degradation; variable climatic and geophysical conditions and biological threats create additional risk.
- ⇒ **Economic conditions;** can be monitored and assessed at various levels - national,

sectorial, or zonal. Study shows that the structure and performance of the national economy and its components can affect the food security situation of an entire nation through the performance of food markets. These are in turn affected by factors such as food prices, interest rates, inflation rates, labor market conditions, foreign exchange rates, and trade balances.

- ⇒ **Political conditions:** can affect food security positively or negatively. Political structures that encourage people's participation tend to reduce vulnerability. But, the presence of civil conflict is a vulnerability factor, which can restrict employment and market opportunities, and may lead to loss of assets, destruction of social and physical infrastructure, and even displacement from their homes for affected households. Armed conflict and civil strife were major sources of food insecurity in the 1990s and will continue to be this century (FAO 2000).
- ⇒ **Government Policy:** Whenever food shortage or famine occurred in a given country, the government is responsible for failing to prevent the crises. Some researchers claim that government policy failures or inappropriate development strategies are responsible for the recurrence of food shortage and famine or for underdevelopment in a broader context (Bird, Booth et al. 2003 cited by Gebrehiwot, 2008)). For example on the cause of the 1977-1988 Ethiopian famine, Clay et al. (1998 cited by Gebrehiwot, 2008) note the correlation between famine areas and specific government policies.

Food security and insecurity are terms used to describe whether or not people have access to sufficient quality and quantity of food. They are affected by factors such as poverty, health, food production, political stability, infrastructure, access to markets, and natural hazards (Gebrehiwot, 2008).

Improved food security is important for global reduction of hunger and poverty, and for economic development (Parliament 2006), cited by Gebrehiwot, 2008). In 2000, world leaders committed themselves to the Millennium Development Goals (MDGs) and one aim of the Millennium Development Goals is to eradicate poverty and hunger, including “to reduce by half the proportion of people who suffer from hunger” between 1990 and 2015.

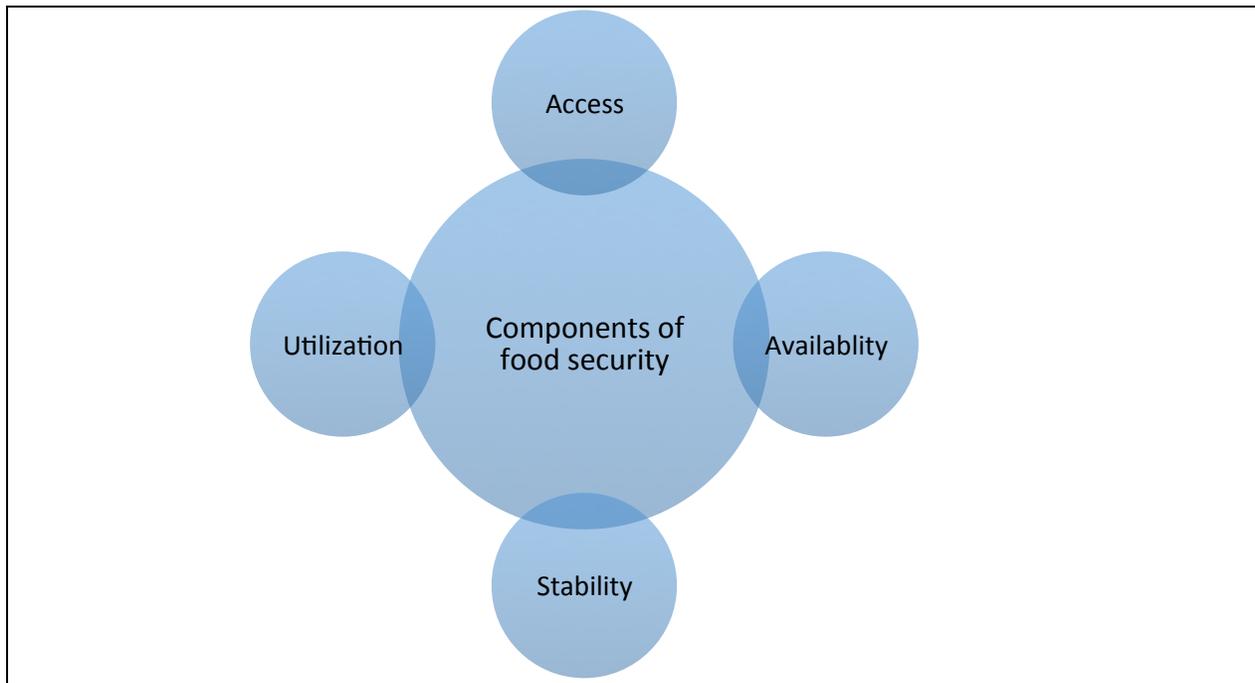
About 850 million people in the world are undernourished; a number that has hardly changed

since the 1990-92 base period for the world food summit and Millennium Development Goal commitments on reducing hunger by half by 2015 (FAO, 2006). According to FAO, 39 countries in the world were experiencing serious food emergencies and required external assistance for dealing with critical food insecurity. FAO's most recent estimates indicate that, globally, 842 million people were unable to meet their dietary energy. Thus, around one in eight people in the world are likely to have suffered from chronic hunger, not having enough food for an active and healthy life, whereas Africa remains the region with the highest prevalence of undernourishment, with more than one in five people estimated to be undernourished (FAO, WFP and IFAD. 2012).

2.1.3. Food Security Components

Food security is multi-dimensional having interrelationships with vulnerability indicators; it cannot be captured by any single or specific indicator. It would therefore be important to understand the essential dimensions of food security – Access to food, Availability of food, and Utilization of food. The interactions and combinations of these dimensions represent food security together. Currently Stability is also considered as the fourth component of Food security (GTZ 2006 cited by Beyene, 2007).

Figure 1. Major component of food security



Source; By the Author

According to FAO Voluntary guideline there are four pillars of food security component for the achievement of Millennium Development Goal 2015.

- ⇒ **Food availability;** the availability of sufficient quantities of food production, supply of protein of animals and others. Food availability may be constrained by inappropriate agricultural knowledge, technology, policies, inadequate agricultural inputs, family size, etc.
- ⇒ **Food access;** access by individual to all economical and physical access to food. It may be constrained by economic growth, lack of job opportunities, lack of credit, inadequate training
- ⇒ **Utilization;** this refers to utilization of food through adequate diet, clean water sanitation and health care, all this are nutritional well-being where all physiological needs are met
- ⇒ **Stability over time;** to be food secure, a population, household or individual must have access to adequate food at all times. They shouldn't lose their access to food as

a consequence of sudden shocks, like economic crises or climate change. The concept of stability can therefore refer to both the availability and access dimensions of food security.

2.2. Agriculture and Rural Development

The Millennium Development Project's hunger task force concluded in 2005 that "the world could meet the MDG of halving hunger by 2015", and development of agriculture is critical to that goal"(World Bank, 2007 cited by Beyene, 2007).

Agriculture is the mainstay of the rural economy of the country in general and that of the regional Lake Tana watershed in particular. It is also the source of livelihood of 92 percent of the total population (BoFED, 2010). According to MoARD, "with the adoption of improved technologies and modern techniques, access to agricultural inputs and investment in infrastructure, rapid growth in agricultural incomes is achievable in Africa". Many countries and international development agencies give their concern to intensification and commercialization of smallholder agriculture as a means of achieving poverty reduction (Leavy & Poulton, 2007:2 cited by Beyene, 2007).

The government of Ethiopia has developed a number of strategies and programs to end poverty and meet the Millennium Development Goals (MDGs), by Industrialization of the agriculture sector it includes; by commercialization of smallholder agriculture through product diversification, a shift to higher-valued crops, support for the development of large-scale commercial agriculture, effective integration of farmers with domestic and external markets and tailoring interventions to address the specific needs of the country's varied agro-ecological zones (MoFED 2010).

This is the latest strategic development plan, covering the period 2010-2015 and intended to lay a platform for transforming the country's economy from an agricultural base towards industrialization. All these programs promote infrastructure, human resource development, rural development, food security and capacity building. The PASDEP increased emphasis on the commercialization of agriculture, enhancing industries and achieving the MDGs.

Under the Productive Safety Net Program (PSNP) launched by the Ethiopian government in 2005, people receive cash and food in exchange for work. Tasks focus on improving public facilities, such as roads, water points, health and education post.

Farming in the area is of mixed type with crop production and livestock rearing, the production system is mainly characterized by the traditional subsistence farming and the level of productivity in the agricultural sector is very low. According to the socio-economic survey result of 106 woredas (district) of the region (BoFED, 2008), farmlands have been cultivated for a long period of time and as a result land fertility has been diminishing from time to time. The practice has been more disastrous in areas where there is high population density like in the watershed.

2.2.1. Crop Production

Crop production is the dominant activity for almost all the rural households in the watershed. The socio-economic survey result of 106 woredas of the region (BoFED, 2004) indicated that teff, maize, wheat, barley and rice, in their order of importance, are the major crops produced in these woredas along with pulses like beans, chickpea, and pea and oil seeds.

However, the production level of smallholder is very low partly due to depleted levels of land fertility. The above referred data source also indicated that, around 32 %of the households in the area are working on non-fertile farmlands. Agricultural production has not been kept pace with the population growth and if the present population growth tends to continue, food shortages are bound to get worse. It is clear that this calls for a continuous developmental effort to reverse the trend.

2.2.2. Livestock

Livestock rearing is very common in all woredas in the watershed as the farming system is predominantly mixed type and cattle rearing; apiculture and fishery are major livestock activities

in the area. According to EPLAUA (1998), about 3.3 million cattle, 1.4 million sheep, 778,630 goats and 486,945 equines were estimated to be found in the watershed.

The livestock sub sector in the watershed is likely to be largely hindered by diminishing size of grazing land. The socio-economic survey result of 106 woredas of the region (BoFED 2004), indicated that, about 96% of the households revealed the fact that grazing lands are decreasing in size from time to time, which mainly attributed to turning of more non-farm lands to crop production and this eventually led to overgrazing. Animal diseases such as anthrax and black leg are also major diseases that affect livestock production in the area.

2.3. Food Security Condition in the Country

According to the study conducted by Minister of Finance and Economic Development (MoFED 2000, cited by Beyene, 2007), the per capita income of the population of the region was Birr 1088 of which household saving accounts only for 4.8 %. As a result, the people's capacity to withstand sudden food shortage is 59.3% against the national average of 66.1percent. Similarly, the food poverty in terms of caloric intake is high (2155 kilocalories) compared to national average, which was 2211 kilocalories in 2000 (Beyene, 2007)).

Food shortage has been the major problem among the rural households of all woredas of the watershed during the last few years. According to the household survey result (BoFED, 2004) about 76% of the household face food shortage, out of which nearly 80% faced the problem for about 2-5 years. Since almost all the rural households depend directly or indirectly on agriculture production, they have experienced the deficit in every harvesting season. Food poverty is more prevalent in rural areas, where the majority of the population lives than the urban centers.

2.4. Contribution of Small-Scale Fishery to Food Security and Poverty Alleviation

Fish has historically played an important role in food security in many countries and contributes globally providing animal protein. The importance of fish products in many coastal, lake and floodplain areas is very much greater than this global average (FAO, 2006).

Small-scale fisheries can be broadly characterized as a dynamic and evolving sector employing labor intensive harvesting, processing and distribution of marine and inland water fishery resources (FAO 2004). The activities of this sub-sector conducted full -time or part-time and seasonally, are often targeted on supplying fish and fishery products to the local and domestic markets, and for subsistence consumption.

An estimated 90 percent for the 38 million people recorded by the FAO globally as fishers and fish-farmers are classified as small-scale (FAO, 2004). In addition more than 100 million people are estimated to be employed in other fisheries associated occupations, particularly in processing and trading, bringing the total estimated to be directly or indirectly employed in small-scale fisheries and aquaculture to be about 138 million in 2002 (Beyene, 2007).

According to Kurien and Willmann (1982), there is often very little precise information about the real contribution of small-scale fisheries to livelihoods and economies in developing countries. Although many small-scale fishing communities are poor and vulnerable, it is now widely acknowledged that small-scale fisheries can generate significant profits, prove resilient to shocks and crises, and make meaningful contributions to poverty alleviation and food security.

According to FAO, the ability of small-scale fisheries to contribute to food security and poverty alleviation can be constrained due to stock depletion, lack of access to capital, limited alternative employment opportunities, and lack of appropriate technology.

2.5. Small-Scale Fisheries Contribution to Economic Growth

Wealth generated by individuals, households or small enterprises can make significant contributions to local economies through income and employment multiplier effects. This is especially the case in fisheries because of the “cash crop” nature of the harvest (FAO, 1997). Fish is one of the few products in some rural economies that can generate cash to encourage and stimulate demand than other food products, because other food products may be more generally consumed within the household.

Small-scale fisheries can make significant contributions to national economies through the generation of foreign exchange derived from international trade. According to Kurien (2005), international trade in fish and fishery products has grown rapidly over the last twenty years. Export values have risen from USD 15 billion in 1980 to USD 56 billion in 2001, in the same period developing countries share of total exports has risen from 40 percent to 50 percent. Fish trade by developing countries increased from less than USD 4 billion to almost USD 18 billion over the same year (Aragaw, 2010). Small-scale fisheries are playing an increasingly important role in the fish exports of many developing countries.

Kurien (2005) further explained that, small-scale fisheries can make national-level contributions to economic growth through the generation of a wide range of taxes. Taxes provide the state with an opportunity to assist both poverty reduction and poverty prevention initiatives. As fish is a very visible product, its trade is easily taxed.

2.6. Small-Scale Fisheries Contribution to Food Security at Household Level

The most direct contribution of fishing activity to food security at the household level is through consumption of the household's catch, i.e. self-consumption. The percentage of total household catch that is consumed by the household varies greatly. It is often assumed that the poor consume a greater proportion of their catch, but, recent field research in the Lake Chad area (Bene et al, 2003), has shown that the poorest households may consume a lower proportion of their catch

than better-off households, and instead sell most of their fish in order to be able to purchase cheaper food stuffs.

If fish (as a subsistence product for fishing households) is potentially an important source of direct food security, its contribution through generation of incomes derived from labor-wages and fish commercialization, can also make it an important indirect source of food security (FAO, 2004). Harvesting, processing and marketing fish generates livelihoods, employment and income for millions of people around the world. Although employment cannot be taken as the firm assurance of food security for these people, it should be emphasized that in a significant number of cases, small-scale fishing activities take place in rural areas where alternative employment opportunities may be scarce or even non-existent. In these circumstances, access to fishery resources for harvest, processing and/or trade may represent the only option available for making a living and maintaining food purchasing power. Fishing as a secondary or complementary activity can thus be essential for rural households both in terms of income and food security.

CHAPTER THREE

3.0 BACKGROUNDS

3.1. Global Fish Production and Consumption

Global production of fish from capture of fisheries and aquaculture and the food fish supply is currently at the highest on record and remains very significant for global food security, providing more than 19 percent of total animal protein supply. According to FAO (2003b), in the year 2003 the world fisheries product has reached 132.5 million tons, of this total fisheries production, developed countries produced 31 million tons and 101.5 million (76.6%) was produced by developing countries.

According to FAO (2002), in year 2001, average apparent per capita consumption of fish was estimated to be about 16.2 kg, 21 percent higher than in 1992 that were 13.1kg. In the mean time FAO (2004b), fish consumption is distributed unevenly around the globe: there are significant differences among countries, with per capita apparent consumption ranging from less than 1 kg person year⁻¹ to more than 100 kg person⁻¹ year⁻¹ in some exceptional ones (FAO, 2009 cited by Beyene, 2007). Over the last few years, the consumption of fish and fishery products has been strongly influenced by improvements in transportation, marketing and food science and technology, which are led to significant improvement in efficiency, lower costs, wider choice and safer and improved products. The extent and range of these changes have varied among regions. In general, globally, there has been a growth of fish and fishery product marketing.

The share of fisheries product by African country is significantly increasing from year to year, inland capture fisheries production in 2001, from Africa Uganda with 356,000 tons and Kenya with 210,000 tons of production stands fourth and tenth respectively, from top ten world inland fishery producers (FAO, 2002). In the same year, Asia with 65.5 %, and Africa with 24 % contribute to about 90 % of global inland capture production.

3.2. An Overview of Ethiopian Geography

Ethiopia is Africa's 10th largest country with a surface area of approximately 1,13 million square kilometers (Anon, 1994 cited by Wudneh, 1998). It is located in the north-eastern part of the continent, or the horn of Africa, lying between 3-18° North and 33-48° East. It is bordered by Kenya in the South, Somalia in the East and South-East, Djibouti in the East, Eritrea in the North and Sudan in the West and North-West.

Geographically, the country consists predominantly of rugged mountains and isolated valleys surrounded by lowlands and deserts in the North and East. Two thirds of the country is occupied by the Ethiopian plateau, the topography ranges between 120 m below m.a.s.l. (Kobar Sink) up to 4620 m above m.a.s.l. Mount Ras-Dashen is the highest point in the simian mountain, it is the 4th highest peak in Africa (Tudorancea & Taylor 2002).

Elevation and geographic location produce three climatic zones:

- **Cool zone** ; above 2,400 meters where temperatures range from near freezing to 16° c,
- **Temperate zone**; at elevations of 1,500 to 2,400 meters with temperature from 16° c to 30° c: and
- **Hot zone** ; below 1,500 meters with both tropical and arid conditions with temperature 27° c to 40° c (Amara Metrology Agency)

Ethiopia has diverse rainfall and temperature patterns, which are largely the result of its location and varied topography. Throughout most of the country there are two seasons: the dry season and the wet season. The dry season prevails, from October through May and the rainy season runs from June to September preceded by intermittent showers from February or March, remainder of year generally dry (Tudorancea & Taylor 2002). Rainfall subject to important variability according to altitude. In general, plateaus over 2500 m receive 1400-1800 mm rainfall per year, mid-altitude regions (600-2500) receive 1000-1400 mm/year, and low lands get less than 200mm/year.

Ethiopia is the oldest independent country in Africa. Ethiopia is the only country in Africa never successfully colonized by any of the European powers during the "Scramble for Africa" in 1870-

1912 (Anon, 1994 cited by De Graaf, M., 2003). Ethiopia was recognized as a sovereign state by these powers at the turn of the century, and it stepped in to the international arena in the 1920s when it joined in the first attempt at a world organization devoted to securing peace, the League of Nations. However in modern times, unfortunately, Ethiopia is still a developing country.

3.3. Country Economy Overview

Agriculture is the backbone of Ethiopia economy. According to Minister of Agriculture, agriculture contributes about 46% of GDP, 85% of export and 85% of total employment but suffering from frequent drought and poor cultivation practices. The principal exports are Coffee is critical to the economy and major export item that accounts about 60 % from the total earning \$ 3.03 billion in year 2012 (Aragaw, 2012) Other important export commodities such as livestock production It contributes about 43.5% of the GDP and 61% of total export. Industry contributes to 13.4% and services 43.1% of GDP (NABC, 2010); are like food and live animals, petroleum, chemicals machines, motor vehicles, cereals and textiles, are some of them. By far the contribution of the fishery sector to the national economy as it stands now is very low.

3.4. Over View of Ethiopian Fishery

Ethiopia is a country with an area of 1 127 127 km² and a population of 82 million, the largest for a land locked country since 1992. Standing water bodies cover approximately 7 400 km² and there are 7 185 km of rivers (Aragaw, 2010). Ethiopia is a federal republic with nine regional state and two charter cities. Ethiopia's fishery is entirely inland and also artisanal, with landings made at many dispersed sites where records are not kept very well. In 2010 total production was 18 058 tons valued at approximately USD 600 000 (CSA 2012 cited by Aragaw, 2012 Unpp data).

According to Central Statistics Agency (CSA) report in 2010, export quantity amounted to 849 tons, while import amounted to 421tons. The fisheries sector provides regular employment for

thousands of poor people and seasonal or part-time employment for many more. The primary sector employs an estimated 13 200 people of which 4 052 are fulltime fishers and the secondary sector believed to employ an estimated another 20 000 people (CSA and MoARD). This work is closely linked to other activities such as farming, livestock rearing, and fuel wood collection.

Ethiopia water bodies support a diverse aquatic life including more than 180 fish species of which about 40 are endemic. Many artificial water bodies are also stocked with fish for fishery. Over all authorities prioritizing other sectors result in uneven efforts regarding management and data collection on fisheries in Ethiopia (Aragaw, 2011).

Empirical model suggests that current total fish production potential is around 50 000 tons annually, though assessments in the mid-1990s, when landing were less than 10 000 tons, suggested that several lakes were already fully or over exploited. The empirical models generally do not take in to account the effect of unsuitable management or fishing practices and have been criticized for consequently grossly overstating the maximum sustainable yield (MSY) (Aragaw, 1998).

Even if many local fish species have been identified, the bulk of the production is made of tilapia, Nile perch, barbus, bagrus, and catfish. Tilapias are the most popular species contributing of the catch but Nile perch used to contribute the largest part of the catches from Lake Chamo and Abaya (FAO 1995). Based on empirical model the overall fish potential yield was estimated at between 40 000-50 000 ton/year for the main water bodies (FAO 1993). Despite this potential, Ethiopian fishery is poorly developed and has marginal contribution to the country's GDP.

3.5. Genesis of Fishery Development

It is common place to say that in the world, fishing is as old as the settlement of people around the lakes and the rivers. However, fishing for the local land based population around the lakes of Ethiopia was an unrecognized opportunity until the 1950's. A study conducted by Drewes 1993, cited by Beyene, 2007), revealed that to the local people around the rift valley lakes, fish was considered as worms and snakes, which should never be touched at all.

Fishing in Lake Tana was started by the Woyto ethnic groups, which did not own land. Thereafter, poor members of the farming communities gradually adapted to fish consumption and subsistence fishery. Commercial fishing in rift valley lakes started during the 1950's responding to the demand for fish from foreigners and upper class Ethiopians in Addis Ababa (Tesfaye, 1998). Due to its isolation from the chain of lakes in the rift valley system, Lake Tana has received minimal attention in fishery development projects. The lake fishery remained almost completely subsistence, until a fishery development project assisted by Dutch non-government organization (NGO) was launched in mid-1980's, which has introduced motorized vessels improved gears, and lately by the European union (EU) assisted Lake Fisheries Development Project (LFDP, 1998).

3.5.1. Fisheries Resources and Level of Exploitation

Concerning production potentials, different resources provide different information. Based on a systematic assessment of the lakes and on length-based empirical models for rivers current annual total fish production potential is estimated to be 51 481 tons (FAO, 2003b).

On the other hand some empirical estimates revealed that country's total fish potential, from the main lakes and reservoirs reach 44 000 – 49 000 tons/year (MoARD, 2003). Regarding country's river fishery potential (Tiffney, 1986) has estimated that, river fishery to produce about 7, 000 ton/year.

Fisheries resource in Ethiopia, in spite of its significant contribution to poverty alleviation and food security is an unexploited natural resource. The total landing estimated in 2001 was at 15 389 tons, which is about 30 % of the estimated potential (FAO, 2003b), and in 2002 was at 12 291 tons which is 26.5 % of the available potential (MoARD, 2003). This landing comes from the major lakes such as Chamo, Ziway, Langano, Awassa, Abaya, Tana and Koka reservoir. The main commercial species contributing to the total landing are *Oreochromis niloticus*, *Labeo hori*, *Clarias gariepinus*, *Barbus* sp, and *Lates niloticus* (Ayalew, 2006).

The degree of exploitation between individual lakes or reservoirs is not uniform. The fish resource exploitation report of MoARD (2003), indicated that, Lake Awassa, Chamo, Ziway, Abaya, Langano, Koga reservoir and Lake Tana has been utilized 140, 97, 83, 69, 63, 89 and 14.54 % respectively.

Convenient road connections and proximity to the capital city had given the rift valley lakes priority in fishery development and research programs. Hence they have been and still are the main fish suppliers to the big towns. Especially the major lakes, with important fish resources are

Lake Ziway, Awassa, Langano, Abaya and Chamo have been the subject of several scientific surveys (Wodajo and Belay, 1984: Getachew, 1987: Dedebo, 1988).

Table 1 Fishery resource potential and exploitation rate of Ethiopian Lakes, taken from Demissie, 2003.

Lakes	Area (sq Km)	Mean depth (m)	Shoreline (Km)	potential	Production (Tons/year
Tana	3500	8	358	24900	1459
Abaya	1070	7	225	9800	390
Langano	230	12	78	600	207
Koka	255	9	0	1300	841
Ziway	434	2.5	102	4500	2163
Awassa	97	11	52	600	521
Abijata	205	7.6		1700	
Finche	170	9		1700	
Chamo	551	6	118	3500	3340
Total	6137	55.5	933	51500	8921

3.5.2. Demand and Supply of Fish in Ethiopia

According to FAO (2003b), current annual per capita fish production is less than 240 g. Despite this, based on only a single factor – population for the year 2008 annual demand for the fish in the country was estimated at 65 344 tons. Future demand at the present population growth rate will reach 83 483 tons in the year 2015. This is the minimum demand, since factors other than population are not considered. These positive factors, which trigger demand, include the relatively current low fish product price compared to the increasing prices of its substitutes: a rise in real income of the society; the growth and expansion of towns, and improvement and expansion in fish distribution or supply networks and improvement in fish product.

Table 2 Total fish production, prices and per capita consumption rate from 1990 to 2010 in Ethiopia, taken from Lemma, 2012.

Year	Production (tons)	Price (USD)	Kg fish person ⁻¹ year ⁻¹
1990	4981		
1991	4262		
1992	4607		
1993	4203		
1994	5318		0.099
1995	6380		0.116
1996	8808		0.156
1997	10394		0.18
1998	15014		0.236
1999	15858		0.261
2000	15681		0.251
2001	15390		0.24
2002	12300		0.187
2003	9213		0.137
2004	10005		0.145
2005	9450		0.133
2006	9890	151.6074	0.136
2007	13252.87	362.9208	0.178
2008	16769.86	522.333	0.219
2009	17047.06	61.10771	0.217
2010	18058	69.68307	0.224

At present, the country 's estimated annual total exploitable, if fully exploited, can meet only 55 % of the projected demand in 2010 and 44 % of the projected demand in 2015, based solely on population size (FAO, 2003b). In view of this, the present water bodies or fish supply sources are unable to meet the demand. This calls for an increasing focus on stocking and enhancement of artificially made water bodies and development of aquaculture to meet future demand for fish.

3.5.3. Aquaculture /Fish farming

Globally, fish farming output, growing at 8-11 % over the past decades is the fastest growing sector of the world economy. Climbing from 13 million tons of fish produced in 1990 to 45.5 million tons in 2004 (Aragaw, 2004). China remains, by far the dominant aquaculture producer in the world, with reported production for 2004 of 30.6 million tons, of the 45.5 million tons of the world production (Aragaw, 2004).

In fact, Ethiopia being a country mostly relying on cattle, small ruminants and chicken for its protein supply did not make significant efforts to develop its fishery resources, let alone going from the wild to farming it in ponds.

Aquaculture in Ethiopia dates back to 1955, when a few extremely small experimental ponds were constructed at Dukem (40 km south of Addis Ababa) for growth observations and introduction of *Tilapia zillii* into Ethiopia (Brook Lemma 1987). According to BoARD recently regional research bureaus and farmers associations that did water harvesting for irrigated agriculture are showing interests to integrate aquaculture into their farms. Given this scenario, aquaculture could be quite feasible in Ethiopia, given the diversity in climate, and the availability of aquatic systems inhabited by over 180 fish species (Eshete Dejene and Zemenu Mintesnot 2012).

Aquaculture is recognized as an alternative means of achieving food security and poverty reduction strategy in the rural area, and is now considered an integral part of rural and agricultural development policies and strategies (MoARD, 2003). However, aquaculture in Ethiopia remains more potential than actual practice, despite the fact that the country's physical and socio-economic conditions support its development. Extensive aquaculture in the form of

stocking and enhancing artificial lakes, reservoirs and small water bodies has been practiced since 1997 (Beyene, 2007). But, due to the absence of systematic monitoring and evaluation, the success or failure is unknown (MoARD, 2003).

Some investors have started to show interest to develop aquaculture in Ethiopia and there are now four private enterprises that are licensed:

1. **Ashraf Industrial Group Cage Culture**, both plans to operate at Lake Tana.
2. **The Ethio-Fisheries** private limited company that built a fish processing plant in Arbaminch, near Lake Abaya.
3. **Vittoria Viezzt Carlo Talaric** PLC which is planning to initiate fish farms along the shores of lake Chamo, and
4. **MIDGE 2000** PL C Cage Culture

It is therefore imperative that a national strategic plan of aquaculture needs to be developed for Ethiopia.

In Amara region, pond fish farming started 8 years ago and the result is very encouraging, every year the bureau of Agriculture distributes 20 thousand fingerlings to farmer's ponds, currently there are about 300 fish farmers (MoARD, 2006).

3.5.4. Fishery Policy of the Government of Ethiopia

Ethiopia is a federal state and the Ethiopian fish production and marketing sector is the responsible of the Federal Minister of Agriculture and the Bureaus of Agriculture of the Regional Government in which the water bodies are found. With other sectors of agriculture well prioritized and their market information linkages better organized, the fishery sector is not given the due attention to any degree of comparable status (Brook Lemma 2012). The national or regional government approaches towards the management and marketing of the fishery products in Ethiopia are not that much different. What is practically happening on the ground, in Ethiopia is that fishery is open access, where anyone at any time can access the water bodies to capture

fishes and as a result, several water bodies have suffered over exploitation due to unwise use of gears and untimely capture of fish (Aragaw, 2010).

The parliament of the Federal Government of Ethiopia ratified a new national fishery proclamation in 2003 giving special emphasis to fishery aquaculture development.

At present the relevancy of the fishery for addressing the problem of food self-sufficiency and rural development is well recognized by the federal as well as regional governments. With a view to improve the poor economic and social performance of the country, Agricultural development led industrialization (ADLI), was considered as the fundamental strategy for meeting a long-term economic development. Consistent with the rural and agricultural sector policy objectives, fishery is increasingly recognized as an alternative means of addressing the problem of food security and poverty in the country, with the following specific objective (FDRE, 2003).

- Increase fish consumption and the nutritional status of the population ,particularly in rural area;
- Improve employment and income opportunities and hence the living conditions of fishery communities;
- Improve post -harvest activities to cut losses and improve fish quality;
- Supply industries and export markets with sufficient quantities of good quality fish;
- Improve complementarity's and efficiency in fish farming systems through integration with other agricultural activities; and
- Ensure sustainable use of fish stock and the aquatic environment

CHAPTER FOUR

4.0. MATERIALS AND METHODS

4.1. The Study Area, Sampling and Data Handling

4.1.1. Location

Amhara National Regional State, with Bahir Dar as the regional capital, is one of the nine regions in Ethiopia; located in the North western part of the country. It has a total land area of 161,828.40 square kilometers, with a population of 19,870,651 of 2007 national census. Amhara region is divided into eleven administrative zones; each is further divided into “Woreda” (administrative community). Amhara region is basically a rural region with 89 % of its population in the rural areas while only 11% are urban dwellers. The region is quite homogeneous in terms of language (Amharic) and culture (Demissie, 2003).

Bahir Dar has a population of 221,991 based on the 2007 census conducted by the central statistical agency of Ethiopia (CSA, 2007). It is declared a special zone in Amhara region being the regional capital. It is the home of the Gojjam tribe of Amhara; it has witnessed rapid urbanization and physical expansion in recent time due to rural-urban migration.

Bahir Dar is located within the central plateau of Ethiopian highlands, sharing the shore of Lake Tana, the source of Blue Nile a major tributary of River Nile, which is the longest river in Africa. It lies at an altitude 1830 meters above sea level, with an average temperature in the range of 12-18^o centigrade and rainfall between 400- 2000mm, usually from June to September.

Lake Tana is one of the largest inland water lakes in Africa with the total area of 3200 km², stretching 75 kilometers North and South, 60 kilometer’s East-West and having average depth 8 m, and a maximum depth of 14 m (Demissie, 2003).

It is the source of the Blue Nile River (Great Abbay), Seven permanent rivers feed the lake as well as ca 40 small seasonal rivers. The main tributaries to the lake are Gilgel Abbay (Little Nile River), Megech River, Gumara River and the Rib River (Fig 4.2b). Together they contribute

more than 95% of the total annual inflow (Aragaw, 2010)), the Blue Nile is the only outflowing river.

The lake is rather circular and has a narrow extension to the South forming the Bahir Dar Gulf. Major cities around the lake are Bahir Dar with 221,991 inhabitants and Gorgora in the North with 20,000 inhabitants, the population scattered in small villages around the lake totals some 100,000 who are engaged in agriculture and related activities (BoARD).

Most of the 37 islands in Lake Tana are small, two larger islands used to be the seat of Ethiopian Emperors in the distant past (Demissie, 2003)

Almost all islands harbour ancient Ethiopian Orthodox Christian Churches and monasteries, generally originating from 12–14th century. Daily ferry services transport goods and link major towns around the lake. Tourist traffic is increasing over the last decade offering boat tours for bird watching and visiting monasteries (Ajala 2008).

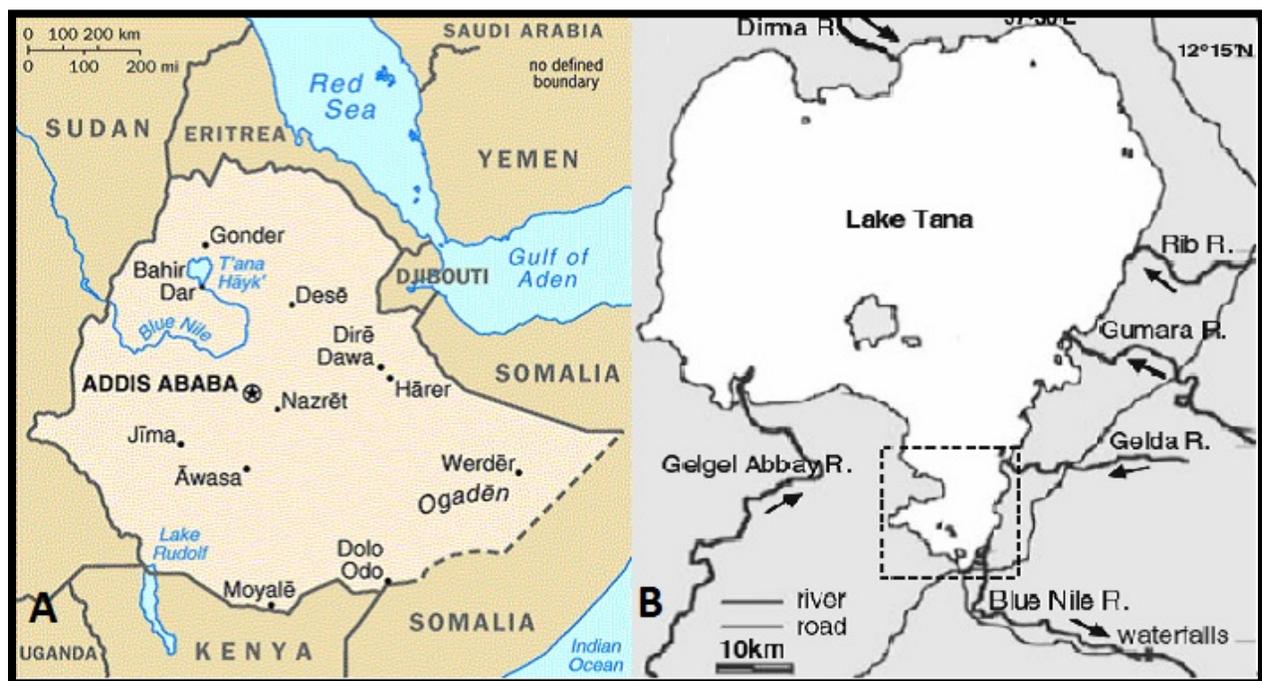


Figure 2; Map of (A) Ethiopia and (B) Lake Tana, the study area, Adapted from Abebe Ameha (2004).

4.2 Methodology

4.2.1. Years, Months And Hours

In 1582 when the Christian world adopted the revised Gregorian calendar, Ethiopia stayed with the Julian calendar. The Ethiopian year is divided into 12 months of 30 days each and a 13th month of five or six days at the end of the year. The first month of the Ethiopian year is September or Meskerem and the New Year starts on 11 September in the Gregorian calendar. The Ethiopian leap year follows the same rules as the Gregorian so that the 13th month has six days in a Gregorian leap year. The Ethiopian calendar is 7 or 8 years behind the Gregorian calendar. In the year we consider to be 2004, it is 1996 in Ethiopia from 1 January to 10 September and 1997 from 11 September to 31 December.

An Ethiopian day is divided into 12 hours of daylight, starting at 6:00 and 12 hours of darkness, starting at 18:00. In other words 9 o'clock in the morning is 3 o'clock in Ethiopian time. Confusingly, urban Ethiopians use both Ethiopian and western time and calendars. When making appointments in Ethiopia it is necessary to confirm which time and /or calendar system is being used.

The two calendars are quite different and any attempt to convert yearly total data available in EC to GC without having monthly data will end up with misleading information. Unfortunately, most fishery data collected for this study were available only in the yearly total basis in EC. Thus, in this thesis both the Gregorian (GC) and Ethiopian calendars (EC) were used, but all references and citations are in GC.

4.2.2. Data Requirements and Source of Data

Data are special type of information generally obtained through observation, surveys or are generated as a result of human activity. This study was conducted at Southern part of Lake Tana Ethiopia, the period of (Jun 10 to August 10, 2011), for a period of two months (Fig 2b). It involved gathering information, both primary and secondary, to find possible information for the

current state of Lake Tana and socio-economic and institutional factors that influence the sustainable use of the resource.

In order to achieve the objectives of the study primary data is generated from household survey, focus group discussion, and key informant interview.

4.2.2.1 Primary Data Source

Primary data are collected a fresh and for the first time by the researcher himself, while secondary data have already been collected and compiled by some once else.

4.2.2.1.1 Survey

Survey employing pre-tested structured questionnaire on the samples selected households is the main method to generate primary data on household demography, source of livelihood, food security /insecurity situation, household assets, their socialites and networks, the level of communities' participation in resource use and management, and their perception towards the common pool resource use.

4.2.2.1.2. Key Informant Interview

Key informant interview is another method employed to collect first hand data; development of semi-structured questionnaires and informal discussion with the fishermen who have life experience in the topic, the processor and trader, and the local government officials were interviewed in depth. The interview covered from the general personal information to the overall fishery activities.

Local language “Amharic” was used to collect information. At the beginning the respondents

were collectively informed the purpose of the research and then the interview or/informal discussions were conducted at different landing sites. Accordingly, a total of 120 respondents gave adequate information out of 150 questionnaires from fishermen, processor and trader.

4.2.2.1.3 Focus Group Discussion

Focus group discussions were conducted with major stakeholders, which use the lake resource for different purpose, such as full-time and part-time fishermen, fishery expert from research institutions, officials from the district administrators and agriculture office. The focus group was composed of thirty participants.

4.2.2.1.4 Field Observation

On site observations and diary keeping capturing ideas and events that could not be or were not covered in the questionnaires events happening in the field and understand the fishing community. It enabled to experience the remoteness, the scale and the boundary of the shore where they conduct fishing, and also it enabled to feel some of the challenges the fishermen face working on water bodies and realize the absence of basic social service.

4.2.2.2. Secondary Data Source

The secondary data collected from the community administrative, Zone Agricultural and Rural Development Office, Regional Agriculture Bureau (BoARD) and from the Federal Ministry of Agriculture and Rural Development (MoARD), and other related offices and institution. Secondary data on the trend of fish catch, the marketing information, and the fishing effort, the number of fishing firms, and the number of fishermen engaged in full time and part time fishing,

the urban population and, the technologies employed for fishing and transporting the products which directly or indirectly contribute to the resource depletion is collected.

Efforts were also made to review the existing literature and documents, Books, Journals, are assessed. Internet websites is explored so as to collect up-date information about the subject area of the study.

4.2.3. Data Analysis

The data collected were stored in a database created in MS Excel, a variety of subjects were analyzed by combining quantitative and qualitative social scientific methods. Descriptive statistics was used to summarize and analyze the primary data collected through questionnaires to achieve the specific objectives of the study.

4.2.4. Scope and Limitation of the Study

The study was intended to examine determinants of livelihood opportunity and fish resource utilization in LakeTana. The problem of the availability and accuracy of data had effects to the study. Lake Tana is a wide lake bounded by three administrative zones and ten woredas with 54 landing sites surrounding the lake. The study covers only seven landing sites from the southern part of the lake (Fig 2.b) were chosen of the ten woreda surrounding the lake. Moreover, the study has dealt with a limited number of households and focused on the attitude and perception of users with regard to the benefit of different activities in the fishery sector for those who are involved in a primary or secondary source of livelihood, and institutional factors determining potential fish resource utilization and management of the lake to get a better sustainable benefit and improved fishing community livelihood. No attempts were made to determine the fishing production efficiency, marketing aspects of fish products and income generated by fishermen from their fish harvest. The study was mainly focus on the respondents' attitude; therefore the data or/the information obtained is depending on personal opinion, which may result a poor

conclusion. Time, accessibility, financial resources and other resource limitations determined the scope of the study. Even if the study is restricted in terms of sample size and area coverage, the findings can be used as a springboard for other more detailed studies.

CHAPTER FIVE

5.0 RESULTS AND DISCUSSION

This section discussed the finding of the study in different aspect of the livelihood pattern; the household characteristics, Assets of livelihood, livelihood activities and livelihood opportunity observed in the community. The descriptive statistics was run to obtain the distribution of the independent variables. The socio-economic and institutional characteristics of the respondents such as family size, age, level of education, marital status, perception of fishery resource as livelihood of fishermen and non-users were analyzed. Of the total 120 sample respondents interviewed 90 (75%) were male and 30 (25%) were female.

5.1. Interview Results

5.1.1. Gender and Age of the Respondents

The study reveals that most of the respondents were male with 75% and 25% of females. Even if male is predominantly headed households there are sizable female-headed households in the community. The age range was from the highest 55 to the lower 15 years

Table 3: Gender and age of the respondents

Demographic Variables	Frequency	Percentage
Sex		
Male	90	75
Female	30	25
Total	120	100.0
Age		
<19 Years	3	2.5
20 -30 years	45	37.5
31 - 40 years	48	40
41 - 50 years	14	11.6
>51 years	10	8.3
Total	120	100.0

As shown in the above (table 5.3) both female and males are contributing the fishing industry, fishing is observed totally for men's duties, while the post-harvest activity was left for women.

5.1.2. Education and Marital Status of the Respondent

The educational status revealed that 50% have no education at all, 25% are attended from grade 1-4, 5.8% from grade 5-8, 8.3% from grade 9-10, 6.6% from grade 11-12 and 4.2% are diploma holder, while the marital status shows that married 58%, single 16.6% and the remaining 25.4% are the member of divorced, widow/widowers and separated (table 5.4).

Table 4 Education and marital status of respondents

Demographic Variables	Frequency	Percentage
Marital Status		
Married	70	58.3
Single	20	16.6
Divorced	8	6.6
Separated	10	8.33
Widowed/widower	12	10
Total	120	100.0
Educational Status		
None	60	50
Grade 1-4	30	25
Grade 5-8	7	5.8
Grade 9-10	10	8.3
Grade 11-12	8	6.6
Diploma	5	4.2
Total	120	100.0

As shown in the table above the educational status of the respondents involved in this industry except 50% illiterate respondents all the remaining respondents can at least writing and reading.

5.1.3. Household, Type of Livelihood Activity and Monthly Income

The number of family in each household varies from null for those that are single with no dependents to more than 6 children in average. Households with the three children is the highest with 30.8%, (see table 5) bellow.

Table 5 Household number, livelihood activity and monthly income

Demographic Variable	Frequency	Percentage
Number of Children		
None	8	6.6
One child	20	16.6
Two children	14	11.6
Three children	37	30.8
Four children	14	11.6
Five children	8	6.6
> Five children	19	15.8
Total	120	100.0
Type of Livelihoods Activity		
Fishing	30	25
Farming	7	5.8
Fishing and farming	42	35
Fishing and trading	5	4.2
Farming and trading	7	5.8
Petty trading	29	24.2
Total	120	100.0
Monthly income from all economic activities		
<500 birr	60	50
500-1000 birr	28	23.3
1000-2000 birr	17	14.2
2500-3000 birr	11	9.2
>3000 birr	4	3.3
Total	120	100.0

*Note \$1 U.S Dollar currency exchange rate was 18.40 Ethiopian birr during the fieldwork from June -August 2011. **Source: Author's data survey 2011**

All the respondents in this study were 80% Christian's Orthodox, 18.1% Muslim, and the remaining 0.1 % are protestant. There is no religion influence between them. The main ethnic groups on Lake Tana fishery were Amhara (91.2%), Negede woyeto, 3.2 %, Agew, 2.7% and Oromo, 3% (Demissie, 2003).

5.2. Concept of Sustainable Livelihoods

The concept of sustainable livelihood is relatively recent in the discourse of poverty, food security, natural resource management and development mainly associated with rural development. As analysts point out, there are two broad approaches to defining livelihoods. One has a narrower economic focus on production, employment and household income. The other takes a more holistic view, which unites concepts of economic development, reduced vulnerability and environmental sustainability while building on the strengths of the rural poor (Shackleton et al, 2000 cited by Ajala, 2008).

Chambers and Conway (1992) developed a definition of livelihoods and the factors that make them sustainable which underpin all of the livelihoods frameworks currently being used (cited in Ajala 2008: 20)

A livelihood comprises of the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain and enhance its capabilities and assets, and provide sustainable opportunities for the next generation; and which contributes net benefit to other livelihoods at the local and global levels in the long and short term.

Again the Chambers and Conway definition was modified by DFID in 1999, as:

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from shocks and stresses and maintain and enhance its capabilities and assets both now and in the future whilst not undermining the natural resource base (Carney, 1999 cited by Ajala 2008:21).

Similarly, Frank Ellis adopted the concept and modified the definition given by Chamber and

Conway. According to him:

A livelihood comprises the assets (natural, physical, human, financial, and social capital), the activities, and the access to these (modified by institutions and social relations) that together determine the living gained by the individual or household. (Ellis, 2000:9 cited by Shado, 2008:13).

5.2.1. Sustainable Livelihood Framework

As a measure to reduce the number of poor people living in extreme poverty by half by 2015, Department for International Development (DFID) of UK consulted widely in order to increase its understanding of the nature of poverty and how it might be addressed. One of the outcomes of this consultation was the sustainable livelihoods (SL) framework (Shado 2008). It is one way of organizing the complex issues surrounding poverty.

5.2.2. Livelihood Assets

According to DFID livelihoods framework identifies five livelihood assets through which livelihoods activities are carried out for means of living.

Human Capital: Human capital refers to the labor available to the household: its education, skills, and health (Carney cited in Ellis 2000:33). Investment in education and training and the skills acquired through pursuing one or more occupations improve the human capital of a household. Similarly, better health condition of a household improves the efficiency and effectiveness of labor as an asset (Ellis 2000, cited by Shado 2008:19).

Natural Capital The natural resources which people use to generate means of survival includes; land, water and aquatic resources, tree and forest products, wildlife, biodiversity and environmental service. In fishing livelihoods the most important natural capital is the fisheries resource with its ecosystem.

Social Capital The social resources (network and connection; includes neighborhood and kinship, relation of trust and mutual support, formal and informal groups, common rules and sanction, collective representative, mechanism for participation in decision making and leadership all this are social capital according to IFAD.

Financial Capital Refers to stock of money to which the household has access it comprises savings, access to credit in the form of loans. According to Frank Ellis, the absence of financial markets or distrust of such financial institutions in many societies, result in savings being held in other forms. In rural Sub-Saharan Africa, the keeping of livestock often plays an important role as store of wealth and as security to bad times (Ellis 2000, cited by Shado 2008:19).

Physical Capital is physical assets that are created by economic production process: the basic infrastructure (transport, shelter, water, communication,) and tools and equipment that enable people to pursue of livelihoods, seeds, fertilizers and etc.

5.2.3. Vulnerability Context

The contexts or the settings are the most important aspects of the sustainable livelihood framework components in the analysis of rural poverty. According to Ellis, cited by (Shado, 2008), livelihood is constructed in a context of trends and shocks. In his adopted SL Framework, the trends include population migration, technological change, relative price, macro-policy, national economic trends, and world economic trends. The shocks include natural and manmade catastrophes like drought, floods, pests, diseases, and civil wars.

5.2.4. Policies, Institution and Process.

Different scholars in analyzing SL used the concept of mediating processes with slightly different term and scales. For example, in DFID's SL Framework it is termed as transforming structures (levels of government, private sector) and processes (laws, policies, culture,

institutions) (Farrington et al, 1999:3). Swift and Hamilton, on their part, consider mediating processes as institutions and organization (Swift and Hamilton 2001:83, cited by Shado, 2008). According to IFAD Policies, institutions and processes at all levels shape livelihoods from the household to the international.

Policies; - of government, different levels of government, NGOs and international bodies

Institution; - political, legislative & representative bodies, executive agencies, judicial bodies, civil society & membership organizations, law, political parties and money.

Processes; - the” rules of the game”, decision- making processes, social norms & customs, gender, caste, class, and language.

5.2.5. Livelihood Strategies

According to IFAD the terms "strategies" seems to imply that the poor have choices regarding what they do to realize their aspirations, take advantage of opportunities and cope with vulnerability. Livelihood strategies are composed of activities that generate the means of household survival. Therefore livelihood strategies function by combining the assets they can access by considering the vulnerability context, supported or obstructed by police, institution and processes.

5.2.6. Livelihood Outcome

The outcome could be negative or positive depending on the implementation,

Positive outcome;

- More income
- Increase wellbeing

- Reduce vulnerability
- Improved food security
- More sustainable use of natural resource
- Resilient

Negative outcome;

- Poverty - a “poor” livelihood outcome
- Fragile or unbalanced set of livelihood assets,
- Unable to sustain to shocks,
- Food insecurity
- Unsustainable livelihood

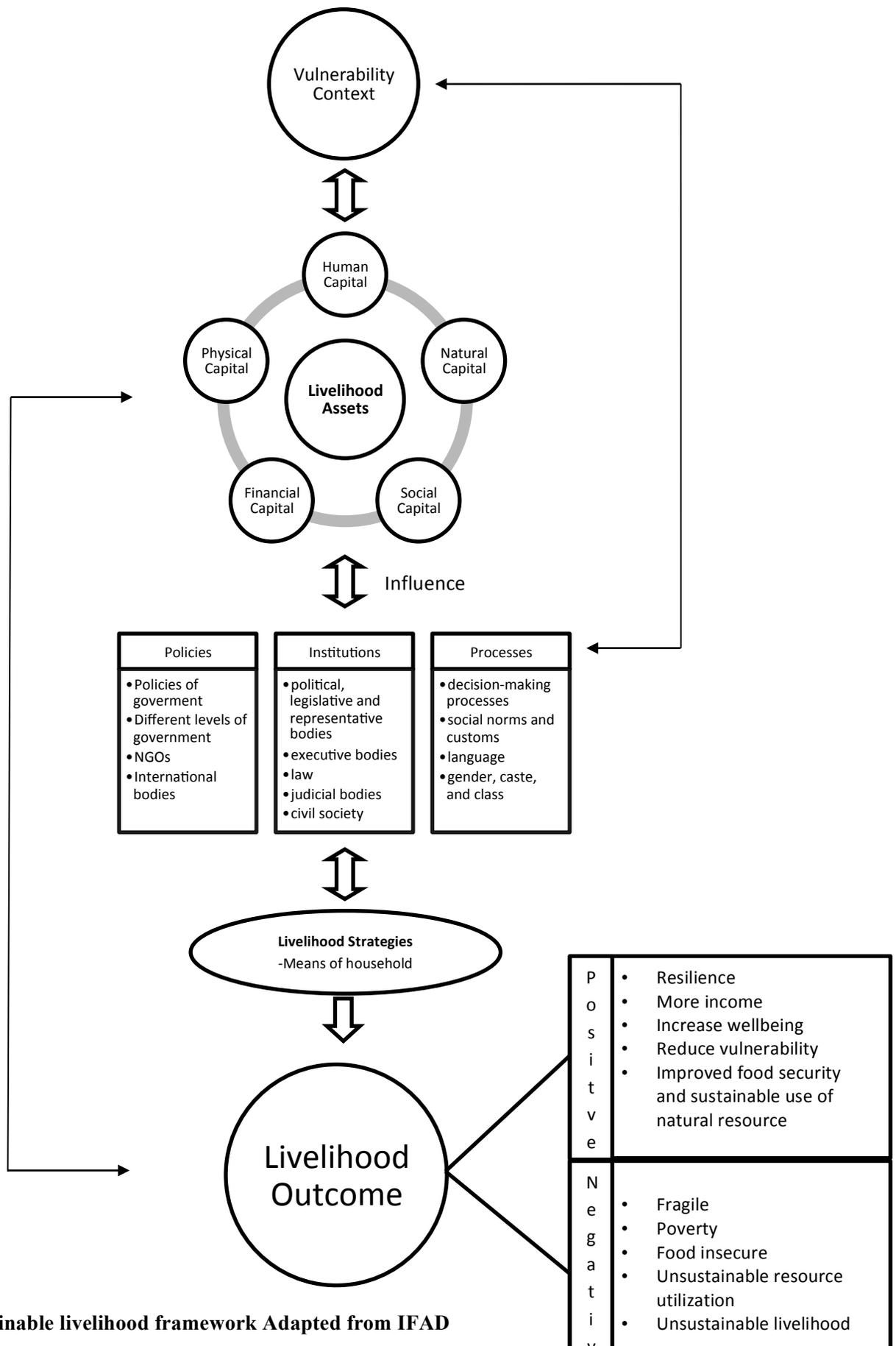


Figure 3 Sustainable livelihood framework Adapted from IFAD

5.2.7. Contribution of Small Scale Fisheries to Food Security

Fish has historically played an important role in food security in many countries and contributes to do so in globally, providing 15-16 % of animal protein intake (Shado, 2008). The importance of fish products in many coastal, Lake and flood plain areas is very much greater than this global average (FAO 2006:5, cited by Shado, 2008). Small-scale marine and inland fisheries play great role in food security through the preservation and processing of fish for trade to inland markets. Inland fisheries may contribute more to national and local food security because of the subsistence nature of much of the fishing activity. Moreover, small scale fishing, marketing and processing provide an important means of income generation for many of the poor and food insecure and who are not officially categorized as small scale fisheries .In Ethiopian context, this is especially true to those who are engaged in fish filleting at landing beach, fish transporting by human labor, fish retailing and those who are preparing fish food for local consumption

According to FAO, the ability of small-scale fisheries to contribute to food security and poverty alleviation can be constrained due to stock depletion, lack of access to capital, limited alternative employment opportunities, and lack of appropriate technology. Another similar study conducted by FAO on strategies for sustainable contribution of small scale fisheries to food security and poverty alleviation states that many small scale fishing communities are isolated from land based society, not only geographically, but also socio- economically, culturally and politically (Shado 2008).

5.2.8. Causes for Household Food Insecurity

Many study shows that the main causes for food insecurity at the regional and household level is a combination of both natural factors and manmade processes.

The major causes for household food insecurity are;

==> **Natural Causes;** Drought and environmental degradation are the common natural factors

that make households vulnerable to food shortage. The pattern of rainfall in the drought zone is inadequate for rain fed agriculture. Rain starts late after the normal planting season has already gone and stops early when the cultivated crops are at their vegetative stages of growth. Mostly the lowland area of the region exposed for drought and crop pests as well as natural resource degradation is a serious problem as a result the ecology around the area becomes more fragile than ever and resulting the decline of agricultural production and productivity, frequent food shortage, drought and famine (Gebrehiwot 2008).

==> **Socio-economic Factors;** Social factors such as population pressure, traditional farming system and practices, and economic limitations like poor infrastructural services, shortage of farm land and other productive assets are also factors responsible for the households' food insecurity in the region. The main socio-economic problems in the region are population pressure and poor infrastructural services are the main constraint to food security in the region. Infrastructural services such as marketing, rural transport communications are essential to achieve household food security in particular or for poverty alleviation in general. However, there are marketing problems for the fishermen, shortage of modern fishing and processing materials and lack of transport communication around the landing place

⇒ **Government Policy Failures;** Inappropriate governmental policies and institutional weakness are main responsible factors for the recurrence of food shortage or poverty and underdevelopment in general. Whenever food shortage or famine occurs in a given country, the government is responsible for either causing the crisis or failing to prevent it. In Ethiopian circumstances lack of appropriate development polices and strategies is one of the main factors which results vulnerability to disaster.

5.3. Household Characteristics

5.3.1. Perception of the Household Heads Fishery as Livelihood and Source of Income

From the total sample households 85.8 % perceived fishery as alternative means of livelihood, source of income and source of protein. Of the fishermen 100 % and non- fishermen 76% have

perceived fishery as means of livelihood and as income source. The study revealed that fishermen have no alternative means of livelihood than non-fishermen.

5.3.2. Distribution of Respondents Participation in Leaderships

Out of the total respondent households, 33% households were participated in leadership of administrative and social organizations. From the sample households who participated in leadership of administrative and social organizations, fishermen were 15.7 % and those of non-fishermen were 44%. The study revealed that the difference in level of participation in leadership of administrative and social organizations between fishermen and non-fishermen was significant, this indicate that participation of fishermen in social leadership is less than that of non-fishermen.

Table 6: Distribution of respondents by participation in the leaderships

Participant	Frequency	Participate	Not participate	Percentage
Fishermen	70	11	59	15.7
Non-fishermen	50	22	28	44

5.3.3. Religion and Fish Eating Habit of Respondents

Among the various social characteristics of a population, religion plays an important role in influencing various types of behavior. Orthodox Christians were the dominant community around the lake. The study shows that among the total respondents, 93.3 percent were Christians and only 6.7 percent were Muslim. From among fishermen and non-fishermen about 85 and 95 percent were Christians. Comparing the fish eating habit of the two religion follower communities, the Muslim community consumes always while Orthodox Christians do not eat during fasting period including Wednesday and Friday in the week.

5.3.4. Educational status of sample household heads

The total sample respondents in terms of literacy level have shown that 50 % were illiterate and the rest 50 percent were literate. Among the literate, 50 percent could read and write, 25 percent had attended formal education from grade 1-4, 5.8 % were attended from grade 5 - 8, 8.3 % attending from grade 9-10, 6.6 % attended from grade 11-12, and the remaining 4.2 % had attended university (Table 5.4). The study revealed percentage difference in education between fishermen and non-fishermen was that fishermen are likely more literate than non-fishermen.

5.3.5. Distribution of respondents by size of land holding

The land size of sample respondents varied from landless to 4 hectare with an average holding of 1.09 hectares. The average size of land for fishermen was 0.91 hectare while that of non-fishermen was 1.22 hectare. The survey result showed that from the total respondents, 20 % were owned land up to 0.5 hectare, 25% were owned the land size between 0.51 to 1.0 hectares, 42.5 % were owned the land size between 1.01 to 2.0 hectares, only 5.83 % respondents were owned land above 2.0 hectares and the remaining 6.67 % of respondents were the landless. The study result revealed that non-fishermen had higher landholder than fishermen.

Table 7: Landholding differentials between fishermen and non-fishermen

Land holding in hectare	Fishermen	Percentage	Non fishermen	Percentage
None	25	35.7	6	12
0.5	5	7.14	10	20
0.51-1.0	10	14.3	15	30
1.01-2.0	23	33	16	32
>2.0	7	10	3	6

5.4. Institutional Characteristics

5.4.1. Government Interventions to Ensure Food Availability

Food availability is one of the components of food security (2.1.3) as defined in the World Food Summit. Food security at the regional level is determined by the availability of enough resources for the whole population. The most widely used indicators are quantities of available food compared with needs. Availability is a function of domestic production, imports, food aids and security stock.

Increasing agricultural production is the first and main source of food entitlement for most of the farming community in the region in terms of direct consumption of food. Increasing food production contributes to food security within communities and nations by making more food available and by generating employment and income (Gebrehiwot 2008). To increase agricultural production and productivity, government's interventions are mainly focused on expansion of extension services such as crop extension, livestock extension and natural resource conservation and protection.

5.4.2. Respondent's Access to Training and Extension Service

To create awareness and acquaint the skill on fishery resource utilization and management thereby, to encourage farmers to engage in fishing activity, training plays an important role. Among the total number of respondents 35 % farmers have been trained in fishery resource management and utilization. Among fishermen 71% and from non- fishermen 3 % had received training. The percentage difference in training on fishery resource management and utilization between fishermen and non-fishermen indicates that fishermen have access to training on fishery resource management and utilization than non-fishermen.

The study result has also revealed that from the total respondents 85.8% were receiving general

agricultural extension services. Among fishermen 88 % and among non- fishermen 84.5 % had relation with the extension institution on general agricultural extension service. Concerning extension on fishery, of the total sample household farmers 39.2 %, 75.5 % fishermen and 14.1% non-fishermen responded that they had received extension service on fishery resource management and utilization. The percentage difference in extension service between fishermen and non-fishermen was found to be significant. This means that fishermen have more access to extension service on fishery resource utilization and management.

Among the various types of extension services received by the total sample respondents, 97.1 % responded that they got service on crop production and protection, 86.4 percent on livestock production, and 52.4% on soil and water conservation measures, and 45.6 % on fishery resource management and utilization.

Table 8 Household respondent’s get extension service relation to livelihood activities from the governing body

Type of training	Fishermen	Percent	Non-fisher	Percent
General agriculture extension	58	82	50	100
Crop production	45	64	46	92
Livestock production	31	44.3	39	78
Soil and water conservation	52	74.3	41	82
Fishery resource management and utilization	41	58.6	10	20

5.4.3. Distribution of Respondents by Access to Credit

Credit is very much required to purchase and fulfill fishing equipment’s such as motorboat and modern fishing net. The survey result indicated that 83.7% of fishermen, 36.6% of non-fishermen and 55.8 % of the total sample respondents had access to credit in the previous years. The percentage difference in access to credit between fishermen and non-fishermen shows that fishermen had better access to credit compared to non-fishermen. The source of credit mainly

from Amhara Credit and Saving Institute (ACSI), and farmer's cooperative association.

Table 9 Credit access for household respondents

Purpose of credit used for	Fishermen	Percentage	Non fishermen	Percentage
For fishing activity	21	38	0	0
Chemical fertilizer	5	9.3	11	23
Improved seed	3	6	8	17.4
Livestock production	15	28	13	28.3
Commercial fattening	10	19	14	30.4

5.4.4. Distance of the Lake from Household Home in kilo meter

The survey result indicated that the average distance of the respondents' home from the lake was 2.55 km; on an average the fishermen were located at 2.19 km away from the lake, whereas the non- fishermen were 3.02 km away from the lake. The result revealed that the mean difference in the distance from residence to lake between fishermen and non- fishermen was significant (Table 5.10). This means fishermen are residing relatively near the lake than non-fishermen. This shows that, as the distance between farmers' residence and the lake increases, the farmer is likely to spend more time on travel and incur lose on other on-farm activities, thus discouraged to be fish user.

Table 10 Household living home distance from the Lake

Distance in Km	Fishermen	Percentage	Non fishermen	Percentage
≤2.85	40	57	10	20
2.91-4 00	21	30	9	18
4.01-7.00	5	7.1	8	16
>7 00	4	6	23	46

5.4.5. Marketing Accessibility

Market accessibility such as demand and faire price payment for fish products is of the paramount, which help in enhancing fish producers. For fish producer’s high access to market (demand) to fish product is prerequisite as fishes cannot be stored like other farm products. Of the total respondents 47%, 54.3% fishermen and 40 % non-fishermen had access to market. The percentage difference in market accessibility between fishermen and non-fishermen was significant (Table 5.11), most fishermen did sell their fish products at the landing site (seashore) or else in the sea for fish collectors with very low price compare to the city price.

Table 11 Household access to transport and market

Access to market & Fishermen transport	Percentage	Non fishermen	Percentage	
Transport access	28	40	15	30
“ None	42	60	35	70
Market access	38	54.3	20	40
“ None	32	46	30	60

Among the total respondents 63 %, among fishermen 64 % and among non- fishermen 62 % live at a distance range of 11 to 23 km, away from the nearest market, and the rest 37 % of them live at a distance greater than 23. Kilo meter away the nearest market, of which 21 and 38 of fishermen and non-fishermen, respectively (Table 5.12).

Table 12: Distance from market center to the Lake

Distance from market center in Km	Fishermen	Percentage	Non fishermen	Percentage
≤13	25	36	21	42
13.01- 23	20	28	10	20
23.01 – 30	10	14.3	8	16
>30.01	5	7.14	11	22

5.4.6. Transport Facilities to Fish Product

Transport facilities such as cool storage and vehicles or boat are a crucial service for fish producers as it helps them to transport their products to markets. For fishermen it is more decisive in that fish is perishable product and hence it needs to be transported to the market place as soon as possible. Among the total respondents, 23.3 % among the fishermen 32.7 % and among non-fishermen 17 % responded to have access to transport. The percentage difference in transport accessibility between fishermen and non-fishermen shows that fishermen have better access to transport facility than non fishermen since they use boat, where as the survey result shows that distance from respondent's home to the nearest local market have no more difference between fishermen and non fishermen.

Most fishermen including non-fishermen were artisans and subsistence. Their fishery utilization was very insignificant compared to the potential of the lake. They were asked why not scale up and be market oriented commercial fishers? The major reasons given by the respondent fishermen were, the price of fish is not attractive, lack of transportation lack of credit/capital for fishery activities and there is no sustainable market for fish product these were the major concern for the fishery development.

5.5. Lake Tana and Its Fisheries

Lake Tana is one of the few African lakes, which have not yet been damaged by human activities (Nagelkerke 1997), and the fish resource is less exploited than Rift Valley lakes (Wudneh, 1998).

Fishing in Lake Tana had started earlier than rift valley lakes 5 to 6 decades ago by Weyto ethnic group who were feeding them selves only from hunting hippopotamus, and fishing due to lack of access to get farm land (Wudneh 1998). Poor members of the community around the lake and on the islands have later adopted fishing as main activity and source of livelihood. And finally in 1983, motorized boat fishing with an improved fishing technology has introduced by Dutch NGO project. And then in 1986, LTFRDP was started with the cooperation of MoARD and EOC

supported by ISE from URK, Netherlands to promote new entry in to the fishery and expand it through off shore exploitation. Thus, to make fishing more profitable than the only existed reed boat subsistence fishing (LFDP 1995) and (Nagelkerke 1997).

According to Tesfaye Wudneh (1998), the fishery in Lake Tana is confined to the southern part of the lake around Bahir Dar gulf. This is because of the rapid development of urbanization, which contributed to increase demand in fish consumption by visitors and household consumers. The other means was due to the better accessibility of market outlet for the motorized boats catch through FPMC, and the high demand by the hotels and small fish restaurants in the town for local consumption.

5.5.1. The Fishing Boats of Lake Tana

Traditionally, fisheries in Lake Tana consisted of papyrus reed boats, which are produced locally available papyrus, which grows around the south-western part of Lake Tana at a low cost and with a two-year life span. Their carrying capacity, lower durability and smaller size made the reed boats inefficient as seen and compared to the physical condition of the lake. Based on the above fact, the number of crew per trip in the reed boat is limited to be one and all reed boat fishermen do not go for fishing far from the shore of the lake (Aragaw, 2011). The fishermen used traps and small gill nets. In 1986, the Lake Tana Fisheries Development Program (LTFDP) between the Dutch NGO Inter-Church Foundation for Ethiopia (ISE-Urk) in collaboration with the Ethiopian Orthodox Church, the Ministry of Agriculture and Amhara fishermen resulted in the introduction of motorized fishing boats using gillnets, targeted at tilapia, large catfish and migrating large barbs during their spawning migration (LFDP 1997). While the catch size of all species has fallen, recruitment of tilapia and catfish seems unaffected. However, recruitment of the large barbs has fallen by 75 percent in 10 years' time (MoARD 2004). The major cause appears to be the destructive fishing in the river mouths while the fish are in route to there spawning grounds upstream (Ameha 2004). The boats currently number 400 reed boats and 25 motorized boats (Brook Lemma, 2012) The reed boat fisheries account for about 40 percent, whereas the motorized fishery comprises about 60 percent of the catch. There is also a seasonal

riverine fishery, numbering between 100 to 400 fishermen, but with minimal contribution to the catch.

The fishery on Lake Tana is characterized by a specific combination of gears and fishing crafts. Presently the most frequently used fishing gears are gill nets, cast nets, scoop nets, traps, and hooks. Cast nets, scoop nets are mainly used on the inflowing rivers of LT during the rainy season. Trap, hooks and scoop nets contribute little to the total catch (Aragaw, 2011).

Starting from 1940's and 50's, the rapid population growth which resulted in shortage of cultivable land and depletion of land resources forced the people to look for other occupation and source of food from water resource in subsistence level (Demissie, 2003). Rapid growing demand for fish in the capital city by foreigners and modern town dwellers had also contributed to start commercial fishing as a new practice (LFDP 1998, cited by Demissie, 2003). Commercial fishing is a recent activity in the lakes; up to 1985 the activity was linked to subsistence fishing in rivers and swampy areas mainly with hooks, cast nets, and gill nets. The activity has been gradually increasing from 500 tones in 1988 to 1454 tones in 2001 as mentioned before from a subsistence activity it has become a commercial one (MoARD 2004).

The three major types of fisheries are:

- The motorized boat gill net fishery;
- The reed raft gill net fishery and
- The chase and trap gill net fishery.

The gill nets used are either nylon monofilament gill nets (7 to 9 cm stretched mesh size, 20 m long) also made locally by the fishermen themselves or multifilament nets (8 to 12 cm stretched mesh sizes, 100 m long) made by most fishers (Demissie, 2003). The motorized boat fishery uses essentially the bigger multifilament gill nets. The reed raft fishery uses both types of gill nets, depending mostly on supply. The chase and trap fishery is confined to the Southern part of the lake. It is practiced during the dry season at low water levels.

5.5.2. Fisher's Organization

Currently the majority of fishermen have organized into fishermen's association (Service Cooperative), in line with the policy of the Government. The Ministry of Agriculture (MoA) has granted commercial fishing rights only to fishermen's associations, each of which has to pay a royalty in return for the privilege of exploiting a given water body since 2003. According to BoARD, there are three fishermen organization/Association

- Lake Tana Number One Fish Supply Association
- Lake Tana Saint Georges Fishermen Association
- Fishery processing and marketing enterprise (FPME)

There is no exact recorded information about the private or unorganized fishermen. According to BoA, among 5 000 fishers, more than 50 percent are organized fishermen, where as those individually licensed and non-licensed fishermen fall under the group non-organized fishermen. The non-licensed fishermen are considered as "illegal" by the licensed fishermen and the government. Fishermen are not treated on equal basis by government institutions, while cooperatives fishermen are given priority and protection such as free from taxes, free extension and training opportunities, subsidies for the materials they purchase, and others, where as private fishermen are subject to various taxes and denied access to landing sites.

5.5.3. Current Fish Production Level and Trends of Lake Tana

The fishing effort and catch have been increasing steadily the last few years (Table 5.13 and Fig 5.4). Recorded fish production increased from 1109 tons in 1996 to 6561 tons in 2010. Currently the data collection system covers most of the landing sites of the lake.

Table 13 Number of fishermen and fish production by zone in Lake Tana fishery taken from Aragaw, 2011.

	West Gojjam		North Gondar		South Gondar		Total		Change
Year	1996	2010	1996	2010	1996	2010	1996	2010	%
Number of fishermen	259	425	185	913	70	350	514	1700	+230
Fish Production (In tons)	822.6		260		20.8		1109	6561	+491

As it is shown in (Table 5.6) the fishing effort and catch have been increasing. For example the fishers number and fish production increased by 230 and 491 percent respectively in the past 15 years, this may due to the increasing demand of the customer and price of fish in the main towns.

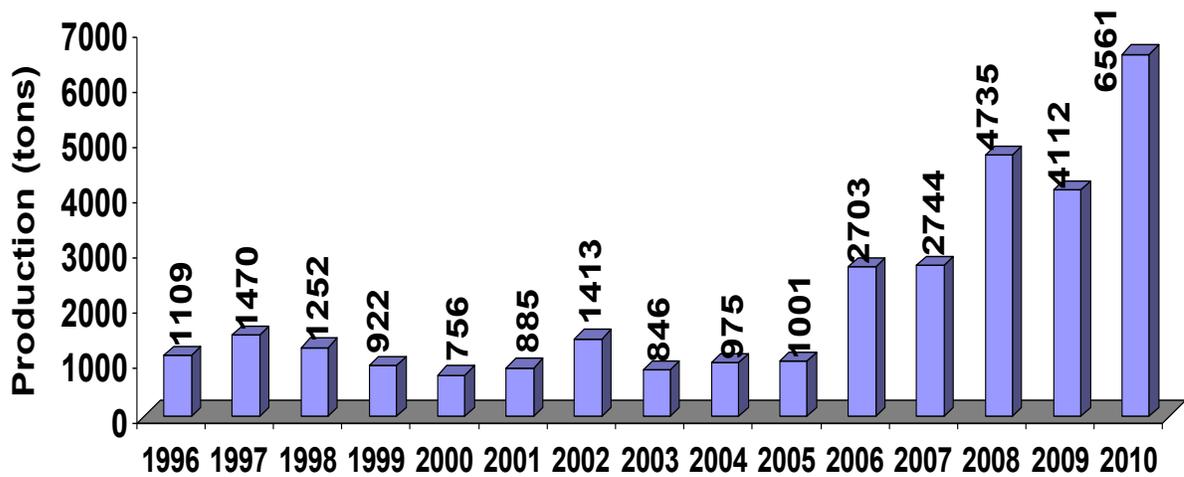


Figure 4 Lake Tana fish production from 1996-2010 GC taken from Aragaw, 2011

5.5.4. The Benefits of Lake Tana Fishery to the Community

The water resource from Lake Tana and all other small Lakes and rivers found in the region provide immense potential, and playing various roles in the main economic activity

The potential benefits of the lake include fisheries, tourism, transportation, drinking for human and domestic animals, irrigation, electric power generation, recreation etc. A growing number of national and international tourists visit the monasteries in the Islands of Lake Tana. Therefore, Lake Tana and its wetlands are the sole remaining natural resources for the region that should be managed carefully for the sustainable development and in order to transfer the benefits of the resources to the future generation.

According to MoARD (2001), the current low level of exploitation of the fisheries, leaves considerable room for further expansion, with an estimated additional 36,000 ton's of fish available for further exploitation. However, important constraints remain to be addressed in order to be able to realize the opportunity.

5.5.4.1. Nutritional benefits / food source

Fish is the main food source for the Neged weyto people or /minor ethnic group living around lake Tana and other poor people living on the islands and surrounding of the Lake. According to Abebe Z, .20001,cited by Demissie 2003:33), fish is the only food source for this group of people who have long tradition in eating fish and hippopotamus meat by hunting and subsistence fishing activity because of lack of access to farmland and then they can't afford to use other food source.

Fish is a reserve of food against drought and hunger, in areas around the lake and rivers, fish is the only and an important source of animal protein especially for the poor who cannot afford buying other animal protein sources. Animal protein is the most deficient or undersupplied nutrient in most rural communities diet (Aragaw 1998).

5.5.4.2. Socio-Economic Benefit in Terms of Employment and Income Generation.

The lake fisheries support large segments of fishers and fish traders in three zones and 10 administrative woredas. Currently, there are about 5,000 family heads (average 6 dependents) in total 30,000 beneficiaries directly dependent on the fishery activities. Other employment opportunities include fish processing, fish trading and net making. During my field work the information found from respondents, the fishermen working with papyrus reed boat can catch 37 kg of fish per trip in average. The catch will be up and down depending on the season variation and consumption by the local people related to religion, have effect on their income level affecting the price and the demand of fish. According to the fishermen the catch in rainy season decline because of: the migration of the fish species to the upstream of the lake and the river for spawning. And when increasing the water level and turbidity the water temperature will decrease, which may influence the growth of the fish, as a result the fish production will decline.

Fish consumption varies between fasting and non-fasting time of Christian Orthodox followers. Consumption will increase during fasting time due to religious feeding taboo by the Orthodox Christian followers that doesn't allow to eat any animal product (Demissie, 2003). Most researcher gives their own perspective about the relationship between fish and Orthodox Christian feeding taboo, as far as I know during fasting times the Christian Orthodox church refrain from eating any animal product during fasting periods as mention by different researcher that is true no doubt about that, but who said fish is not an animal? I know that according to the prevailing categorization, they are part of the animal kingdom except class chondrichthyes (they have skeletons of cartilages rather than bone) and obviously not vegetal or mineral, so where does this idea of fish is not being animals come from? Meanwhile during Christian Orthodox fasting period the consumption of fish is high because, from my point of view, at this time the supply of all meat product is not available in the market, we can say that the butchers and the restaurant no longer function for supplying of meat., therefore the people who are not the Orthodox Christian believers will find another means to satisfy their meat interest. The only alternative means available on the market is fish and fish due to this fish demand highly increase with the price. But who know it that all Orthodox Christian believers obey the rule of the game.

5.5.4.3 For Fish Meal

The offal of fish can be processed and used for animal feed. 40-60 percent of the fish body is being wasted as offal every day and year. But there is a huge amount of animal feed shortage in the region. These days, there is an increased demand of fishmeal from poultry farmers. Mr. Abawengelle at Bahir Dar has already established a fishmeal-processing unit collecting fish offal from the fishers in a very sustainable way; these have bilateral benefit, one by keeping our ecosystem from pollution, previously the fish offal threw in to the lake and highly affecting the ecosystem and the people living around the lake, and the second one is creating another income opportunity and give credential for the fishermen.

5.5.4.4. Sport Fishing as a Recreational Value

Recreational fishing (sport fishing) is particularly becoming common in southern part of Lake Tana. This activity has been started in the country since 1970s. In the early 1970s, one foreigner working in Bale National Park introduced two species of fish, Brown trout and Rainbow trout from Kenya to the rivers of the Bale National Park. This fish have attracted many tourists and has contributed to get a considerable foreign exchange. To catch trout fish, the tourist get permission from the near-by Agricultural office or from the Ministry of Agriculture after paying money in advance before fishing. The fishing license given to the tourist may be on daily basis, weekly, monthly or annually depending on their request. The number of fish to catch per day per hook is limited up to five fish only and not allowed for commercial purpose.

5.5.5. Stakeholders and Gender Analysis in Lake Tana Fisheries

The involvement of females in the fishery industry is very low following the poor development

of the sector in Ethiopia (Lemma, 2012). Meanwhile the majority of females are found in the processing, whole sellers, retailer and net making in Lake Tana Fishery (Fig5.5). The fish processing mainly gutting, filleting and sun drying are the common processing method This opportunity is mainly seen in Lake Tana fishery sector participating the female, whereas the majority fishery sector in Ethiopia were not participating females. Beyond this, there are a

Young women involved in fishery related business like preparing food for the fishermen around the fish landing sites, cooking (roasting, making soup), selling bread and drinks are starting currently around the landing site with in a lake, this service is not only for the fishermen but also for the consumer and even tourists.



Fig 5.5: (A) Female members of Lake Tana Number One Fish Supply Association active at fish processing. (B) She is making fish soup. (C) Tourist visiting the active landing site. (D) Roasting gutted fish. (E) Female selling bread and drinks. Source: Taken from (Lemma, 2012).

5.5.6. Marketing and Distribution

5.5.6.1. Domestic Market

The Ethiopian domestic fish consumption pattern at and around water bodies is no different from what is observed globally people with frequent contact with water bodies understand the value of fish as food (Lemma, 2012). In Bahir Dar there are three main suppliers of the Lake Tana fish product.

- ⇒ **FPME** roughly 15% of its supplies go to the local market and nearby town. FPME is the main supplier of fish from Lake Tana to Addis Ababa, the capital city of Ethiopia at a distance of 500 km from Bahir Dar Lake Tana. An estimated 40% of the fish handled by FPME nationally is sourced in Lake Tana. The common commercial fish are barbus, tilapia and catfish comes from Lake Tana. This represents about 600–700 t (MoA). Study’s show that the main source of FPME supplier is Tana Haik number one Fishing Cooperative supply on Lake Tana.
- ⇒ **Tana Haik number one Fishing Cooperative** estimated 45% of its catch is sold on the local market, and
- ⇒ **Saint Georgis, a local trader organization**, with a collector boat, and current purchaser power estimated 40%

This catch is sold principally to local restaurants and hotels including those in the small towns north of Bahir Dar and Gonder. The urban fish market is highly grown and recently seen the opening of new retail outlets.

Table 14 Lake Tana Fish producers price by species and type of product at Bahirdar

No	Type of fish species & product	Price in Birr per Kg
1	Nile Tilapia; - whole fish	10 00
	- Filet	32 00
2	African catfish;- Whole fish	5.75
	-Filet	18 00
3	Barbus species ;- Whole fish	5.50
	-Filet	13 00

The price of fish varies by fish species, type of product and place of market. Seasonal pattern of fish consumption affects fish marketing at Lake Tana consumption of fish varies in intensity both in a year, month and a week. Influenced by various factors (tradition, habits, religious customs). Consumption varies during some months of the year, as well as some days of the week. For

example, most of the Orthodox Christians in Amhara Region do not eat any animal protein including fish during the major fasting days including Wednesdays and Fridays.

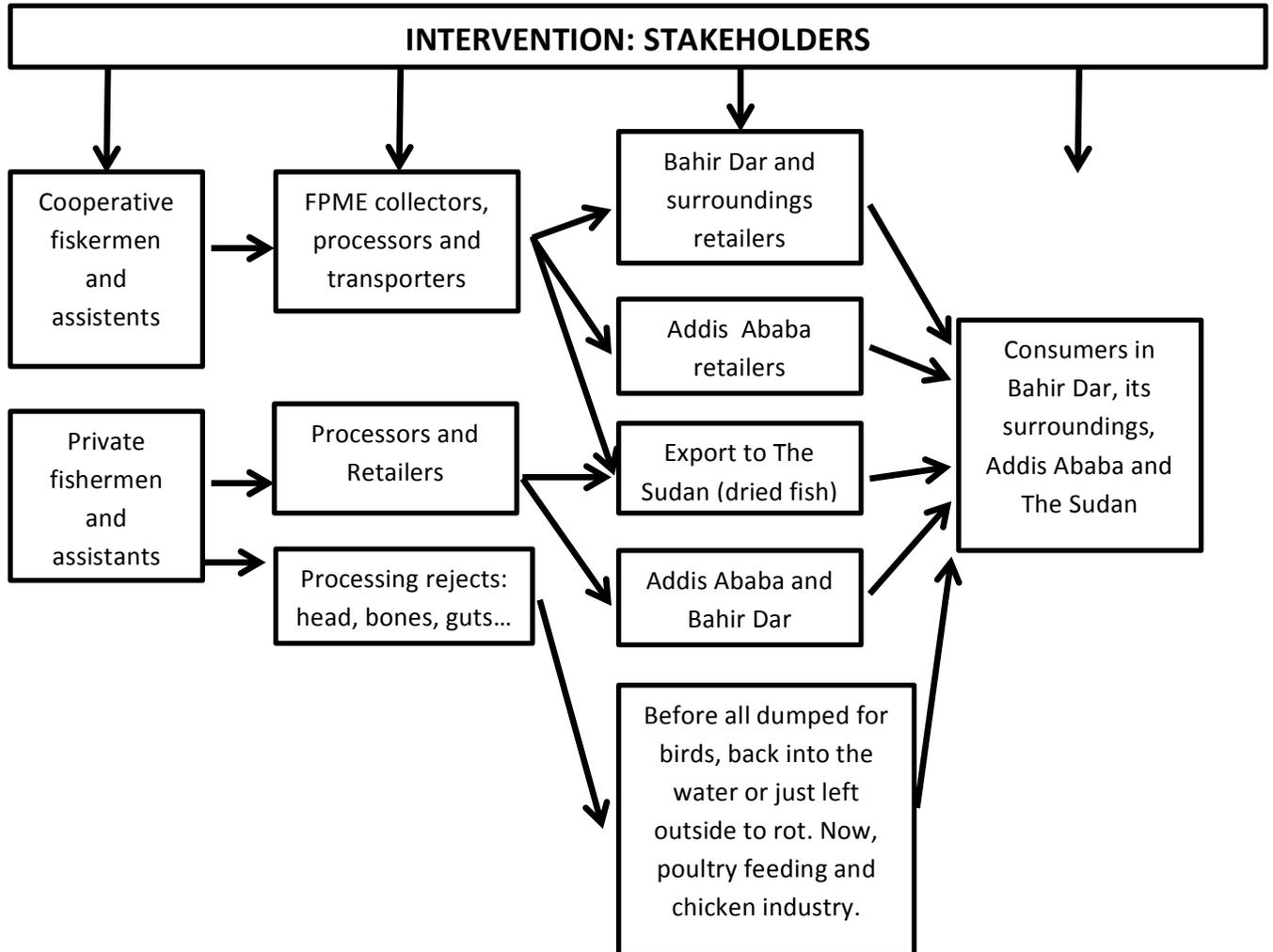


Figure 5 Value Chains of the fishery products of Lake Tana Adapted from Brook Lemma, 2012

Lake Tana has more than eight fish landing sites, all of them are not officially recognized and hence illegal fishing takes place at this site.

5.5.6.2 Export Trend

According to Brook Lemma (2012), export of fish products from Ethiopia to the international market of Europe and other Asia country were difficult since 2005 because none of Ethiopian fish processors and exporter could meet the international fish trade requirements. However the onset of new world trade regulations and stringent quality control measure, like EU regulation fish export to this country died out. But without any stringent and quality control Ethiopia export dried fish from Lake Tana fishery to Sudan incredibly. This is not a profitable way for Ethiopian government, rather the Ethiopian government must improve the quality and export to other neighboring countries must initiate with mandatory conditions of export quality in place (BrookLemma, 2012).

During my field work survey what i observed with the respondent comment Ethiopian fishery is still traditional, for example, fish landing site, transportation, preservation, processing, fish handling and consumption is still at its traditional level, on the meantime there is no traceability as stated in the ISO 65 guidelines or any form of Eco labeling.

Table 15 Dried fish export from Lake Tana Fishery Bahir Dar to Sudan, taken from (Brook Lemma 2012)

Year	Quantity in tons	Price in USD
2006/07	327	256 420
2007/08	304	342 600
2008/09	369	277 400
2009/10	349	277 809

5.5.7. Challenges and Constraints of the Fishery

Some of the major challenge and constraints are;

- ❖ There is high deficiency of recorded data
- ❖ There is no market information exchange system; the Ethiopian market chain is not based on market information exchange, as a result of which the various stakeholders act independently
- ❖ Fishermen are not treated on equal basis by government institutions, while cooperatives fishermen are given priority and protection such as free from taxes, free extension and training opportunities, subsidies for the materials they purchase, and others, whereas private fishermen are

subject to various taxes and denied access to landing sites.

- ❖ There is no quality assurance mechanisms at all levels of the chain, for example, filleting on the ground, transportation in sacs, and others, as a result fishery products will not be competitive with other products such as beef and chicken.
- ❖ There are problems of accessibility to landing sites especially for the private producers as a result landing sites compete with other agricultural and other livelihoods to access the water.
- ❖ There are conflicts between members of different cooperatives and private producers. As a result, there are thefts of gears and physical confrontations among fishermen, which are particularly taking place at night offshore.
- ❖ Shortage of raw material on the market such as twins, floats, sinkers, storage spaces, freezers and cold rooms etc. Now it is more dangerous to fishermen to operate very old boat who do not have any insurance coverage

CHAPTER SIX

6.0. SUMMARY AND CONCLUSION

6.1. Summary

Ethiopia is endowed with over 7,400 km² of major Lakes, reservoirs and small water bodies with 7000 km of rivers rich in fish resources. Empirical estimates revealed that country's total fish potential from the main lakes, reservoirs and rivers reach 51, 481 metric tonne per year.

In developing economy, the fisheries like other industries provide employment opportunities and raise income of the people. It plays an important role in the alleviation of poverty and the achievement of food security. Also it is main source of animal protein.

Fisheries sub sector, in spite of its significant potential to contribution for food self- sufficiency, source of animal protein, generation of employment opportunities and income, is a least exploited natural resource in Ethiopia in general and Lake Tana fishery in particular. Lake Tana accounts for over 50 percent of the country's fish resource. However, its current exploitation is estimated to be only 20 percent.

This study has attempted to identify the contextual factors that influence fish resource utilization of Lake Tana and has tried to quantify the relative importance of various factors. To address the objective of the study, relevant and related studies were reviewed, general and secondary information about the study area and the lake were collected from various publications, reports, and personal contacts with concerned offices were also made. But, the major source of data on which the study mainly depended, was collected from 120 sample household heads drawn from West Gojjam zone bordering the lake. A structured survey questionnaire was used to interview the selected sample respondents.

The study was conducted in Amhara region Bahir Dar city on fishing communities of Lake Tana. The fishing communities are varied in terms of organization and residence place, that means the majorities are living in the town and the remaining are living in rural area. While in terms of

organization, study shows that more than 50% are organized under fishers' co-operative and others are non-member of co-operative.

The study was undertaken with the main objective of identifying the major livelihood challenges of the fishing communities and reviewed the small-scale fisheries contribution to food security and poverty alleviation in Amhara region in general and Lake Tana fishery in particular.

SLAs were applied as a framework for analyzing the livelihood trends, processes, and outcome of the fishing communities of Lake Tana in holistic way. In sustainable livelihood framework the context, the assets, the mediating (policies, institutions and processes) and strategies are the most important component of the framework, which influence ones livelihood.

The study shows that there are multiple factors behind the fishery resource degradation other than poverty, like population pressure, policy and institutional failures.

Among the most important development challenges facing Ethiopia today is food security. To achieve sustainable food security needs absolute consensus between the private and the public sector, because know a day the main engine for the development is the private sector including the small scale farmer to accelerate the development goals of the country by creation of job opportunity for the poor household, by increasing their income generation contribute reduction of poverty and improving nutrition at the household level.

The main component of Food security policy level indicators such as availability of adequate food, access to food, utilization of food supplies and stability over time were considered to assess the change in food security situation

The main causes for household food insecurity are; natural, socio-economic factors and policy failures.

Natural factors such as resource degradation, recurrent drought and environmental degradation are important factors that make households vulnerable to food shortages.

Social factors such as population pressure, traditional farming system and practices, and economic limitations like poor infrastructural services; shortage of farmland and other productive assets are also factors responsible for household's food insecurity in the region. And

the government policy failer, the misguided economic policies were the main factors for accelerating food insecurity in rural area of the region.

As a result, the selected fishermen were categorized into two groups; organized and non-organized fishermen. It was found that organized fishermen had relatively better access to credit, fish market (at shore) and live nearer (relatively in shorter distance) to the lake than non-organized fishermen. Moreover, organized fishermen had trained in fishery resource management and utilization, where as non- organized fishermen are not utilizing the resource properly because lack of training on fishery resource management and utilization, shortage of capital, distance of the lake from village, inaccessibility to market for fish product, and lack of transportation to the lake as well as to the nearest market center.

The study reveals that training on fishery resource management and utilization, educational status of the respondent, family labor and credit access influenced the fishery resource utilization positively and significantly. On the other hand, ages of the respondent, distance of lake from home and social responsibility were found to influence fishery resource utilization negatively and significantly.

6.2. Conclusion and Recommendation

This study figured out that access to credit was positively and significantly related to the fish resource utilization. However, the existing credit system focuses on short-term credit given mainly for fertilizer, seed and fattening programs. The provision of medium and long-term credit especially from formal sources directed to the promotion of fishery resource development would, therefore, be a vital step to encourage fishery resource utilization.

Training of farmers in fishery resource management, utilization and fishing technologies and acquaintance with the techniques of their application was appreciated and important for managing the resource sustainably. Hence, promoting and expanding training would result in more rational decision, accurate implementation and sustainable utilization of the resource.

The finding of this study suggests the provision of due attention to household characteristics such as education. Education is one of the demographic characteristics of households, which have an important role to increase the farmers' ability to obtain and use information relevant to fishing techniques. The study revealed that the status of education was found to be positively and significantly related to the utilization of fishery resource. Thus, there is a need to educate farmers at least up to the level of primary education via adult education system.

The study also revealed that distance of farmers' home from the lake was negatively and significantly associated with fishery resource utilization. This was related with the problem of lack of access to transport and transport facilities around the lake. Therefore, construction of roads with transport facilities all round the lake is primary issue in order to improve the existing resource utilization.

The survey revealed that transport access and market access were their critical problems of fish resource utilization. As fishing is done in remote areas, the transportation of fish to the market center is rather difficult. Normally the fresh unprocessed fish is to be transported to the market as soon as possible because it is highly perishable. However, due to lack of road and sea transportation, they were obliged to sell their harvest at the landing site (seashore) to the collectors who travel by boat and collect the fish with low price and sell at higher prices at national market.

Fish producers also feel extremely dissatisfied and always frustrated in marketing their catch. They are aware of the fact that the middlemen were exploiting them. One of the main causes that prohibit farmers to invest in fishery was the lack of market access (demand) for fish. Fishermen did not receive fair price for their harvest. Even some times if fish collectors are absent, they are obligated to dump their products since they do not own cold storage facilities for preservation. Fish is aquatic inhabitant and it should be preserved properly as soon as it is caught. Adequate storage facilities play a vital role in marketing fish products. But in the study area, it was hardly possible to find preservation facilities such as icebox, which puts the fish producers in hardship. A lot of wastage takes place that is primarily due to absence of preservation facilities. Therefore, in order to enhance the participation of farmers in fish resource utilization thereby to augment contribution of fishery resource to economic welfare, development and expansion of facilities

such as transportation system, cool preservation, and sustainable market for fish product is fundamental issue.

Additionally I will recommend the following points:

1. The policy and institutional gap of the Federal and Regional Fisheries Development and utilization Proclamations should be consider the participation of fishing communities.
2. Up to know the government alone management of the common pool fishery resource is seen to be ineffective and thus co-management of both government and fishing communities seem to be more important.
3. The fishermen in their remote working place should be provided with necessary social services, like road access, health care and security.
4. The local government bodies should promote credit and saving both co-operative and non- cooperative fisher's.

REFERENCE

Ajala, O. (2008). Livelihoods Pattern of “Negede Weyto” Community in Lake Tana Shore, Bahir Dar Ethiopia. *Ethiopian Journal of Environmental Studies and Management* 1(1): 19-30.

Ameha, A. and A. Assefa (2004). The fate of the barbs of Gumara River, Ethiopia. *SINET: Ethiopian Journal of Science* 25(1): 1-18.

Aragaw, C., (1998). Development and Management Approaches for inland Fisheries with Special references to Lake Tana. Portsmouth, England, A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Fisheries. University of Portsmouth, England.

Aragaw, C., (2010): Pond fish farming in practice: Challenges and opportunities in Amhara Region. In: “Management of shallow water bodies for improved productivity and peoples’ livelihoods in Ethiopia”, the Proceedings of the Ethiopian Fisheries and Aquatic Sciences Association (EFASA),. Editors: Seyoum Mengistu and Brook Lemma, Addis Ababa University Press, Addis Ababa, Ethiopia. pp. 61-68.

Ayalew, W., (2006). Current status and future challenges of fisheries in Lake Tana. Proceeding of the National Consultation and Promotional Workshop on Lake Tana and its Environs: Conservation, Utilization, Development and Threats. November 6-7 2006, Bahirdar. pp130-143.

Bene, C.; Neiland, A.; Jolley, T.; Ladu, B.; Ovie, S.; Sule, O.; Baba, O.; Belal, E.; Mindjimba, K.; Tiotsop, F.; Dara, L.; Zakara, A.; Quensiere, J., (2003). Inland fisheries, poverty and rurallivelihoods in the Lake Chad Basin. *Journal of Asian and African Studies*, 38(1): pp17–51.

Beyen, T., (2007). Analysis Of Factors Determining Potential Fish Resource Utilization In Lake Tana, Ethiopia. Alemeya, Ethiopia, A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Masters of science in Agricultural Economics, University of Alemeya, Ethiopia.

BoFED (2004). Bureau of Finance and Economic Development, Annual Report.

BoFED (2010). Bureau of Finance and Economic Development, Annual Report.

CFS (1999) Assessment of the World Food Security Situation.

Dedebo, E., (1988). Biology and commercial catch of *clarias mossambicus peters* (pisces clariidea), in lake Awassa. An M.Sc. Thesis presented to the school of graduate studies of Addis Ababa University, Ethiopia, 73p.

Drewes, S., (1993). Socio - economic study of Lake Fisheries in the Rift Valley and Lake Tana. Addis Ababa, Ethiopia, pp 9-11.

Eshete Dejen and Zemenu Mintesnot (2012): A generic GIS based site suitability analysis for pond production of Nile Tilapia (*Oreochromis niloticus*) in Ethiopia. In: The role of aquatic resources for food security in Ethiopia, Proceedings of the 4th Annual Conference of the Ethiopian Fisheries and Aquatic Sciences Association (EFASA), Addis Ababa, Ethiopia (now n print)

Ellis, F., (2000). Rural Livelihoods and Diversity in Developing Countries. Oxford University Press,UK

EPLAUA (1998). Amhara National Regional State Environmental Protection, Land Administration and Use Authority Abbay Basin Integrated Master Plan Study (1998): Phase III, water resources study, EPLAUA, BahirDar. 385p.

FAO (1993). Food and Agriculture Organization of United Nations, Fisheries Development Planning and resources Management in Ethiopia; Proceeding of National Seminar of Fisheries Policy and strategy 22-25 June 1993 Rome, Italy, pp6 –13.

FAO (1996). Rome Declaration on World Food Security and World Summit Plan of Action. World Food Summit. Rome, Italy.

FAO (1997). Food and Agriculture Organization of United Nations, Fishery Resources Division and Fishery Policy and Planning Division. Fisheries management. FAO Technical Guidelines for Responsible Fisheries. No.4. Rome, Italy, 82p.

FAO (2000). Use of property Rights in Fisheries Management. Food and Agriculture Organization of United Nations Fisheries Department. Rome, Italy, 2000.

FAO (2002). World Review of Fisheries and aquaculture. Food and Agriculture Organization of United Nations. Rome, Italy, 355p.

FAO (2003b). Fishery Statistics. Food and Agriculture Organization of United Nations. Volume 96/1 year book. Rome Italy. 251p

FAO (2004). Report on the second session of Working Party on Small- Scale Fisheries. A. C. o. F. Research. Bangkok, Thailand. FAO Fisheries Report No. 735: 21.

FAO (2004b). Report of the second session of the Working Party on Small-scale Fisheries. Food and Agriculture Organization of United Nations. Advisory Committee on Fisheries Research. 2004. Bangkok, Thailand, 18 – 21November 2003. FAO, Fisheries Report. No. 735, Rome, Italy. 21p.

FAO (2005). Capture Production 2003. FAO Yearbook of Fishery Statistics - Vol.96/1. Rome, Italy, 2005.

FAO (2006). Document Repository.

Farrington, J. et al., (1999). Sustainable livelihoods in practice: Early Application of Concepts in rural areas, Natural Resource Perspective, Number 42, Overseas Development Institute Portland House, London. [http:// www.odi.org.uk/NRP/42.html](http://www.odi.org.uk/NRP/42.html) - 45k

FDRE (2003). The Federal Democratic Republic of Ethiopia, Fishery Development and Utilization Proclamation No. 315/2003. Federal Negarit Gazetta 9th Year No. 32.

FIVIMS (2003). Food Insecurity and Vulnerability Information and Mapping System, Food and Agriculture Organization of United Nations. Rome, Italy.

Gebrehiwot, T., (2008). Rural Food Security Policy Impact Evaluation in Tigray, Ethiopia. A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Masters of science in: Governance and Spatial Information Management, University of Enschede, The Netherlands. http://www.itc.nl/library/papers_2008/msc/gsim/gidey.pdf

Getachew T., (1987). An herbivorous fish, (*Oreochromis Niloticus* L.), diet and its quality in two Ethiopian Rift valley lakes, Awassa and Ziwai. *Journal of fish biology*, 30:439-449.

Girard, M. J., (1968). The Role and Possibilities of International Assistance in the Task of Fisheries Development in Developing countries. Proceedings of the international seminar on Possibilities and Problems of fisheries development in south east Asia, September 5-6, Berlin, pp. 128-140.

Husein, K., (2004) The Relevance of Livelihood Approaches to Food Insecurity Measurement. http://www.eldis.org/vfile/upload/1/document/0901/FIVIMS_Hussein.pdf

Kurien, J., (2005). Responsible fish trade and food security. FAO Fisheries Technical Paper. No. 456. Rome, Italy. 102 p.

Kurien, J.; and Willmans, R., (1982). Economics of artisanal and mechanized fisheries in Kerala. A study of costs and earnings of fishing units. Madras, FAO/UNDP Small-Scale Fisheries Promotion in South Asia Project RAS/77/044, Working Paper (34):112p.

Lemma, B., (1987): The present status and potentials for future development of inland fisheries in Ethiopia. In: S. OUATTAR and J. FEYEN (eds), Proceedings for the Management of Water and Natural Resources to Increase Food Production in Africa. Acco Press, Leuven, Belgium. pp. 18.1-18.16.

Lemma, B., (2012). Report on the value Chain Assessment of the Fishery Sector in Ethiopia. Food and Agriculture Organization Sub- Regional Office for Eastern Africa. Addis Ababa, 2012. 131p.

Lemma, T., (2003). Livelihood Strategies in the Context of Population Pressure: A Case Study of the Hararghe Highlands, Eastern Ethiopia, University of Pretoria, South Africa.

LFDP (1995). Fisheries Statistics bulletin number two. Working Paper No 19 Addis Ababa, Ethiopia. 31p.

LFDP (1998). Lake Fisheries Development Project phase II, Ministry of Agriculture and EEC, Final Report of fisheries biologist, GOPA-Consultants, July 1998. 198p.

MoA (2001). Ministry of Agriculture and Rural Development Annual Performance Report, Addis Ababa, Ethiopia. 38p.

MoA (2003). Ministry of Agriculture Fishery Development and Marketing plan, Addis Ababa (in Amharic). 78p.

MoARD (2003). Ministry of Agriculture and Rural Development, Annual Performance Report, Addis Ababa, Ethiopia. Unpublished data.

MoARD (2004). Fisheries Development and Marketing Plan. Addis Ababa, Ethiopia. Unpublished Document.

MoARD (2006). Ministry of Agriculture and Rural Development, Annual Performance Report, Addis Ababa, Ethiopia. Unpublished data.

MoFED (2010). Ministry of Finance and Economic Development, Poverty and Food Security situation report, 2010, Addis Ababa, Ethiopia.

Moher, P. A., (1962). The geography of Ethiopia. University college of Addis Ababa press. Addis Ababa, Ethiopia. 128p.

Nagelkerke, L.A.J., (1997). The barbs of Lake Tana, Ethiopia. Morphological diversity and its implications for taxonomy, tropic resource partitioning and fisheries. Experimental Animal Morphology and Cell Biology. Ph.D. Dissertation Wageningen. Agricultural University Wageningen, the Netherlands. 296p.

Shado, T. and A. Ababa., (2006). Challenges of Sustainable Livelihood: the Case of Fishing Communities Around Lake Chamo. Unpublished paper.

Thorpe, A., (2005). Mainstreaming fisheries into national development and poverty reduction strategies: current situation and opportunities.

Tudorance, C., and W.D. Taylor (2002) Ethiopian rift valley lakes. In C.Tudorancea & W.D Taylor (eds). Biology of inland water series. Backhuys publishers Leiden, The Netherlands.

Wodajo, K., and Belay, A., (1984). Species composition and seasonal abundance of Zooplankton in two Ethiopian rift valley lakes, lakes Abiata and Langa. *Journal of Hydrologia*. 113:129-136.

Wudneh, T., (1998). *Biology and Management of Fish Stocks in Bahir Dar Gulf, Lake Tana, Ethiopia*. Ph.D. Dissertation, Wageningen, the Netherlands, Agricultural University institute of Animal Science. 143p.

APPENDICES

Field Survey Questionnaire

1. General Information

1.1. Name of the respondent _____

1.2. Administrative zone _____

1.3. Woreda _____

1.4. Name of the rural Keble administration _____

1.5. Name of the Village _____

1.7. Date of interview _____

2. Characteristics of Household head

2.1. Sex 1. Male ----- 2. Female -----

2.2. Marital status of the respondent

Single -----

Married -----

Divorced -----

Widowed -----

2.3. Educational level of respondent

Read and write -----

Primary school, (1 - 6)-----

J. Secondary school, (7 - 8)-----

High school (9 - 12)-----

College graduate -----

Illiterate -----

2.4. Household member's information

Name

Sex

Age

Educational

level

Relationship

in the HH

3. Religion of the respondent

3.1. What is your religion?

Orthodox Christian-----

Catholic Christian-----

Protestant -----

Muslim-----

Other's specify _____

3.2. According to your religion do you eat fish?

1. Yes ----- 2. No -----

3.3. If the answer is yes, what is your fish eating habit?

only during fasting time -----

always -----

always but not during fasting time -----

4. Awareness and perception of fishery

4.1. How far is your home from the Lake? _____ km.

4.2. Do you ever think that fishing is alternative means of income and livelihood?

1. Yes----- 2. No-----

4.2.1. If your answer is yes, have you used to fish?

1. Yes----- 2. No-----

4.2.2. If the answer is yes, how long is your fishing experience? _____ Years

4.2.3. If your answer for question number 4.2. is no, what are the reasons?

Lack of extension service on fishery resource -----

Lack of interest to know about fish-----

Other's, specify

4.2.4. Type of Boat and Gillnet used for fishing purpose

Type of Boat

1. Modern (motorized)

Made up of steel -----

Made up of wood -----

2. Traditional made up of papyrus (reed boat) -----

Type of Gillnet used

1. Modern-----

Specify (size) in meter _____

2. Traditional -----

Specify (size) in meter _____

4.2.5. At what time you used to fish?

always (the whole time) -----

always out of farming time -----

only during the holydays -----

only during fasting period-----

4.2.6. Is there activities related to fishing? 1. Yes ----- 2. No -----

4.2.7. What are these activities related to fishing if your answer is yes?

Making local boat and gillnet -----

Washing , drying of fish product-----

Specify if other

4.2.8. Who perform the activities related to fishing?

I and my family-----

Laborers especially women -----

Laborers especially men -----

4.2.9. Is there all weather roads to your fish landing site (harbor)?

1. Yes ----- 2. No -----

4.2.10. If your answer is no, how far is the road from the landing site? _____ Km.

4.2.11. Is your product spoil before you sale or consume?

1. Yes ----- 2. No -----

4.2.12. If your answer is yes, what is average percent that is spoiled per trip? ____%.

4.2.13. What are the reasons for the spoilage?

the market is far -----

no means of transport (no road)---

no ice-box (refrigerator)-----

4.2.14. If you are not used to fish, what are the reasons?

lack of awareness about fish and fishing-----

lack of capital to fulfil fishing materials -----

the lake is far from my village -----

there is no market for fish product-----

shortage of labor for agricultural activities-----

fear of the sea-----

Others, specify

4.2.15. Do have interest to fish? 1. Yes----- 2. No -----

4.2.16. If your answer is yes, what you need to be fulfilled?

Credit to fulfill fishing equipment's

Sustainable market -----

Extension and training in fishery

License of fishing -----

Specify if any other _____

5. Land holding

5.1. Do you have your own farm land?

1. Yes ----- 2. No -----

5.2. If the answer is yes, how large is your land size? _____ ha.

5.3. If the answer for question 5.1. Is no, what is your source of land?

Rented -----

My Parents-----

Other, specify _____

6. Have you another means of income other than Farming & fishing

1. Yes ----- 2. No -----

6.1. If the answer is yes, describe your source of income

Labor sale-----

Petty-trade-----

Help of relatives from urban/abroad-----

Other,

Specify_____

8. Institutional support

8.1. Extension service

8.1.1. Do you get extension service?

1. Yes 2. No

8.1.2. If the answer is yes, who provide the extension service?

1. BoARD development -----

2. NGO's-----

3. Other's specify_____

8.1.3. What are main components of extension service you get?

Crop production and protection -----

Livestock keeping and management-----

Soil and water conservation-----

Natural resource management and utilization-----

Fishery resource management and utilization-----

Other's, specify _____

8.2. Have you received training on fishery resource and fishing before?

1. Yes ----- 2. No -----

8.2.1. If yes, for how many day's? _____ days

8.2.2. On what areas you have got trained?

Fishing methodology-----

Fish preparation and consumption-----

How to make fishing materials-----

Fish product management and preservation -----

Manipulating fishing technology-----

Fish product preservation and marketing-----

Other's, specify _____

8.2.3. If your answer for question 9 is no, do you need training

1. Yes ----- 2. No -----

8.2.4. If your answer is yes, on what areas?

Fishing methodology-----

Fish preparation and consumption-----

How to make fishing materials-----

Fish product management and preservation -----

Manipulating fishing technology-----

Fish product preservation and marketing-----

Other's, specify _____

8.3. Credit availability

8.3.1. Did you get credit over last years?

1. Yes ----- 2. No -----

8.3.2. If your answer is yes, what was the purpose of credit?

For fertilizer -----

For improved seed -----

For livestock -----

Fishing credit-----

Other's specify _____

8.3.3. What are your sources of credit?

Government -----

NGO's -----

Relatives and friends -----

Other's specify _____

8.3.4. Have you used credit for fishing activities for last years?

1. Yes ----- 2. No -----

8.3.5. If your answer is yes, for what purpose

to purchase fishing materials-----

to purchase preserving material -----

to hire labor -----

other's specify _____

8.3.6. Was credit you received enough to fulfil your objective?

1. Yes ----- 2. No -----

8.3.7. If your answer for question number 8.3.4. is no, do you want credit for fishing activity?

1. Yes ----- 2. No -----

8.3.8. If your answer is yes, for what fishing activities?

to purchase fishing materials-----

to purchase preserving material -----

to hire labor-----

other's specify _____

8.4. Market and Marketing

8.4.1. Is market accessible for your fish product?

1. Yes ----- 2. No -----

8.4.2. If you have market access, what is the name of market place?

8.4.3. What is the distance of the market from landing place? _____ Km.

8.4.4. What is the distance of the market from your home? _____ km.

8.4.5. Who does buy your fish?

retailers -----

Wholesalers ----- Fish producers and cooperative-----

Consumers -----

8.4.6. The Current price of wet fish per kilo gram paid by

Retailers (Birr)_____

Wholesalers (Birr)_____

fish cooperative (Birr)_____

consumers (Birr)_____

others' specify _____

9. Describe problems generally facing you in your fishing activity?

9.1. _____

9.2. _____

9.3. _____

9.4. _____

9.5. _____

Thank you!!