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Status of fish supply, marketing and consumption in Nifas silk Lafto and Lideta sub-cities, Addis Ababa, Ethiopia

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Abstract

This study aimed at assessing status of fish supply, marketing and consumption in Nifas silk Lafto and Lideta sub-cities in Addis Ababa, Ethiopia. Both primary and secondary data were used for the assessment. Questionnaires and interviews were employed as a means of primary data collection techniques. Most individual fishers and cooperatives in one of the supply areas (Lake Ziway) are youngsters with low educational level and large family size. They are engaged in fishing for income generation. The commercially important fish species are tilapia, catfish, *Labeobarbus* and carp though there is scarcity of all species. Long lining fishing gears and gill nets were predominantly used. The number of fish catch per day per fisherman mostly ranges 10-20kg whereas those of cooperatives members range from 30 to 40 kg. The market chain begins with a producer (fishermen) and terminates with consumers. The fish supply constraints in this production area are mismanagement of the lake, lack of modern fishing instrument and storage facilities. The majority of fish traders in Nifas Silk Lafto and Lideta sub-cities were involved in fish trading for income generation. They bring fish from production area by using cold storage vehicle as means of transport. About 60.34% Nifas silk Lafto and 68.96%Lideta sub-cities traders choose tilapia fish species and most of them present in fillet form. The market constraints show seasonal fluctuations of fish demand and lack of fish. Restaurant workers mainly buy fish from traders by making tilapia their number one choice. Though fish consumption has high nutritive value and healthy benefits, most of the community members in both sub-cities prefer beef to fish; the consumption trend is relatively high during fasting seasons. Those who consume fish choose fried fish than the other forms. Promotion of fish production and awareness creation on the nutritive value and health benefits of fish consumption are required to scale up fish demand and supply in both sub-cities.

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CHAPTER ONE: INTRODUCTION

Nowadays, there is rapid increase in human population in Ethiopia and the rest of developing countries and it is obvious that the demand for food increases. In addition to increasing food production from land agriculture, it is necessary to sustainably exploit the aquatic ecosystem to contribute towards the effort of food security by virtue of their high productivity. Ethiopia's fish resource and aquaculture could undoubtedly offer one of the solutions to the problem of providing adequate food for a rapidly increasing human population. The production of fish and fisheries worldwide is approximately 154 million tons per year and the consumption is 18.5kg per person per year (FAO, 2013). The total annual fish production of the county's major inland water bodies was estimated to be 51,431 metric tons per annum based on maximum sustainable yield (FAO, 2014). Ethiopia earned about USD 14,000,000 from its capture fishery while 40,000 livelihoods were positively benefited by the fishery sector in the year 2010 (Assefa Mitike,2014). However, fishery in Ethiopia is still infant which means it cannot fulfil the demand. The Ethiopian fishery sector contributes only 0.02% to the country's Gross Domestic Production (GDP) (MOA, 2015). The per capita fish supply is around 400g, significantly below the mean 2.6 kg per capita per year for the East African-sub region. The estimated fish consumption in a small distance around water bodies of Hawassa, Arbaminch and Gambella may be placed at approximately 10 kg per capita per year (FAO, 2014). The fishery sector has various problems, among others climate change, mismanagement of the resource, inappropriate policies and institution, inadequate technical and material backup to the sector, the inappropriate integration of supply, marketing system and consumption trends are the major ones. The potential of aquaculture to reduce poverty and hunger has been recognized in Africa. However, the aquaculture in Ethiopia remains more potential than actual practice or insignificant benefit; despite the fact that the country's physical and socio-economic, condition supports its development. Sustainable fishery management and development of aquaculture are crucial to food security, poverty alleviation and economic growth.

1.1. Statement of the problems

Ethiopia contains many lakes and rivers for fish production, in which Lakes Ziway,Tana, Hashenge, Hayk, Koka, Langeno, Hawassa, Abaya and Chamo are among the potential fish rich lakes found in Ethiopia. In addition to these, there is good environmental condition that can be conducive for fishery development. Therefore, fishery is an alternative means of achieving food security and poverty reduction in Ethiopia. However, the fishing sector for the economy has various problems. Among these climate change, mismanagement of the resource, inappropriate policies and institution inadequate technical and material backup to the sector, market and low fish consumption habit of most people are the major ones. Even though, there are certain opportunities in the country, fish production, marketing and consumption is still at low stage. Until this moment, no research on fish supply, marketing, and consumption was conducted in Nifas silk Lafto and Lideta sub-cities. The finding of this study will help people of the study area to be aware of the problems associated with fish supply, marketing and consumption and give attention for fish supply, marketing and consumption.

1.2. Research questions

1. What are the commercially important fish species in Lake Ziway?
2. What is the trend of fish production in Lake Ziway?
3. What is the trend of fish marketing in Nifas silk Lafto and Lideta sub-cities?
4. What is the trend of fish consumption in Nifas silk Lafto and Lideta sub-cities?

1.3. General objective

The general objective of the study is to investigate the current status of fish supply, marketing and consumption trend in Nifas silk Lafto and Lideta sub-cities and make some recommendations on how fish supply, marketing and consumption could be improved.

1.4. Specific objectives

- To assess the commercially important fish species in Lake Ziway.
- To assess the trends of fish production in Lake Ziway.
- To assess the trends of fish marketing in Nifas silk Lafto and Lideta sub-cities.
- To assess the trends of fish consumption in Nifas silk Lafto and Lideta sub-cities.
- To make some recommendations on how fish supply, marketing system and consumption could be improved.

1.5. Limitation of the study

For the research to be more effective, it was necessary to collect adequate and reliable data from the two selected sub cities hotels, restaurants and the consumers as well. Hence, while discharging the duty the major challenges that the researcher faced include:

- Time constraints
- Office work load of own regular job.
- Not able to get enough members of business owner respondents.
- Missing some open ended questions by respondents
- Fear of some respondents to fill the questionnaire.

1.6. Organization of the study

The thesis has five separate chapters. The first chapter is introduction part that includes background of the study, statement of the problem, objectives, and limitation of the study. The second chapter presents relevant literature review, the third chapter is about materials and methods, the fourth chapter deals with results and discussion and the fifth chapter presents conclusions and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1. Fish production potential of the country

Ethiopia is rich in its fish fauna having a diversified species in the inland water bodies (Redeat Habteselassie, 2012; Abebe Getahun, 2002). For the sake of convenience, the country's water bodies are classified into four systems: lakes, reservoirs, rivers and small water bodies. The lakes and rivers support highly diverse aquatic life, ranging from giant mammals to microscopic fauna and flora. According to Assefa Mitike Janko (2014), there are 180 different species of fish in Ethiopia and 30 of those are native to the country. At this moment, results of various studies indicate that the number of species could increase to 200 and above (Abebe Getahun, 2017), and the country has the potential to produce 94,000 tons of fish per year (Gashaw Tesfaye and Wolff,2014). The country has inland water surface area 7000 to 8000 km^2 and the important river stretch over 7000 km in the country. In 2005, the total capture production in Africa was approximately 4.99 million tons, of these 15.681 tons were from Ethiopia (FAO, 2006). The country has only inland freshwater fisheries. The inland fishery comprises Rift Valley lakes (such as Lakes Chamo, Abaya and Ziway), Lake Tana, Lake Hashenge, Baro and Tekeze Rivers. There is fishing in all these water bodies, but commercial production (that is serving markets other than the local communities) is mainly concentrated at Lakes Tana, Chamo, Ziway, Abaya, koka, Langano, Hawassa and Turkana (Brook Lemma 2012). The main species are Nile tilapia, representing 60% of the catch (Assefa Mitike Janko,2014), Nile perch (favoured but increasingly scarce), *Labeobarbus* (two species) and catfish.

2.2. The principal fish species and abundance

According to Abebe Getahun (2017), there are about 38 species and 2 sub-species endemic to Ethiopia. Lake Tana from Abay drainage basin exclusively has larger number of endemic species in the country (Abebe Getahun, 2017). According to Golubtsov and Mina (2003), the total number of valid fish species known from Ethiopian inland water bodies is about 168 to 183 including 37-57 countrywide endemics. There are also about 10 exotic fish species introduced from abroad into Ethiopian freshwaters (ShibruTedla and Fisseha H/Meskel, 1981). The Rift valley is the region with highest number of introduced fish species. At this moment, results of various studies indicate that the number of species could increase to 200 and above (JERBE, 2007). Therefore, though some stocks show signs of overfishing, the fishery could be expanded so that it can

contribute to food security and the economy. Such an opportunity is provided by Lake Ziway, one of the Ethiopian Rift Valley lakes. Lake Ziway harbors the African catfish, *Clariasgariepinus*, and other commercially important fish species (*Oreochromis niloticus*, *Carassius carassius*, *Cyprinus carpio* and *Labeobarbus intermedius*). *Oreochromis niloticus* is the first dominant species which comprises (31%) of the catch while *Clarias gariepinus*, *Carassisu scarassius* and *Labeobarbus intermedius* comprises 24%, 18%, and 4%, respectively (Lemma Abera *et al*.,2014)

2.3. The constraints of fish production in Ethiopia

Like for most of Africa, Ethiopia is riddled with poverty, economic stagnation and environmentally unsustainable practices, all of which pose serious constraints to fisheries development. However, many opportunities exist for the sector to help reverse national development challenges by making a significant contribution to poverty alleviation, economic growth, better nutrition and ecological improvement. Dual problems of food security and poverty are major and immediate challenges for Ethiopia where about 45% of the people live below the poverty line, with the level of impoverishment being worse in rural areas where 85% of the population live (FAD, 2015). Several studies have shown that the growth of fisheries catches worldwide has slowed down since the 1970`s and indeed reversed since the late 1980`s (FAO, 2002; Pauly*et al*., 2002). The decline is due to several factors; overfishing, ecosystem changes due to destructive fishing practice, discarding of by-catch, and pollution of coastal waters. The reality is, however, quite the opposite. Many nations choose to become competitive in the race for the fish, through expansion and modernization of fishing fleets that go fishing farther, deeper and stay longer at sea. According to FAO (2015) sewage of factories and agriculture are the sources of major pollutants affecting Ethiopian water bodies and fisheries. The extraction of minerals from Lake Abijata could have negative effect on fish stocks, just as the effluents from the tannery at Koka reservoir and the textile industries at Hawassa and Arba Minch can affect the fisheries (Selamu Abraham et al,2018). In addition, the increasing rate of deforestation could result in increased drying up of water bodies. Further dam on river Omo has negatively affected the anadromous fish, which migrate from Lake Turkana to spawn in the river (Selamu Abraham et al). Inadequate legal and policy frameworks have largely given to poor fishery resource exploitation resulting, in some cases, in the overfishing of some important species, such as the Nile perch in Lake Chamo and tilapia in Lakes Hawassa and Ziway. Though there are fishery laws and

regulations currently in place, these legislations are inadequately implemented. Ethiopia`s fishery sector also suffers from limited human resources availability with an acute shortage of trained personnel. These constraints on fishery management, technical and extension support services. Public and private investment in fishery and aquaculture are inadequate (FAO, 2015). Increase in subsistence agricultural growth, deforestation, municipal and industrial effluents and human encroachment on the shoreline has given rise to historically unprecedented nutrient loadings into the lakes (Verschuren *et al*., 2002). The constraints and vulnerability of fisheries communities are mainly due to resource depletion increasing competition on open access resource, inequitable use of resources, natural disasters like storms and over reliance on one type of asset and lack of options. Moreover, lack of government support, remote locations and poor services, low literacy and innumeracy and weak organization capacity are other factors that expose fishing communities to poverty (FAO, 2001). Relevant current and future global climate change include an increase in mean air temperature, shifting precipitation pattern and an increase in extreme weather event. The impact of climate change and variability on inland fisheries and aquaculture production will be deterrent (FAO, 2010). Fish in Ethiopia is also constrained by diseases and poor quality and quantity feeds. The physical attributes of the feed affects water quality and consumption rates by the fish.

2.4. Economic importance of fish production

Fish provides nutrients that are essential to cognitive and physical development especially in children and are important part of a healthy diet. As an affordable animal source of protein in some of the poorest countries, fish is the primary source of nutrition. Globally more than 250 million people depend directly on fisheries and aquaculture for their livelihoods and millions are employed in fisheries and aquaculture value chains, which is vital to reducing hunger and poverty for millions in the world, sustainable productive food and nutrition security, increase income generation and improve livelihoods, promote economic growth and protect our environment and natural resources. Sustainable fisheries management is crucial to food security, poverty alleviation and economic growth. Fisheries are thus acknowledged as an important strategy for poverty reduction. It helps to promote greater economic development in Ethiopia. In 2010, Ethiopia realized about USD 14,000,000 from its capture fishery while 40,000 livelihoods were positively impacted upon by the fishery sector in the year (Assefa Mitike Janko, 2014).

2.4.1. Trade

Fish plays a vital role in domestic trade as well as in import and export market. The Ethiopian cross-border fish trade is currently not properly documented. The country imports significant amounts of fish from neighbouring countries through some of these imports end being exported to Sudan through the border with neighbouring South Sudan. Most fish traders have access to basic cold chains with ice and insulated containers, a few basic fish handling and preservation institutions, which are equipped with electricity and fresh water supplies, are available in the Ethiopian fisheries. In such a way, many people are engaged in this sector as source of income. Because of the general shortage of basic cold chains, fresh fish storage usually lasts only up to two days. Consequently, fish marketers concentrate their trade during religious fasting periods when there is more demand (Ann *et. al*, 2013).

2.4.2. Food security

Consumption of fish has several health, nutritional, environmental, and social advantages over terrestrial animal's meat. Even when consumed in quantities, often fish is nutritionally important part of many people`s diets in developing countries. It is a vital source of protein and micronutrients, and improves the quality of protein in largely vegetable and starch based diets by providing essential amino acids. Fish provides nutrients and micronutrients that are essential to cognitive and physical development, especially in children and are an important part of a healthy diet. As an affordable animal source of protein in some of the poorest countries, fish is the primary source of nutrition, creating growing demand. Therefore, fisheries are regarded as an important sector in the effort to increase animal protein consumption and achieve food security for the growing population (FAO, 2014). National fish demand is somewhat seasonal; as religious observances exert strong influence on fish consumption patterns. During lent for example, Christians, especially of the Coptic Orthodox Church, who are required to refrain from eating meat, milk and eggs, resort to fish as substitute. The domestic fish demand is significantly robust during two short periods of the year when the Orthodox Church encourages fish consumption. These periods are the fasting seasons in February to April and two weeks in August, totalling about 80 days. Large quantities of fish are consumed at periods of religious, fasting in the cities, around major fish production areas such as Great Rift Valley lakes, and major towns, particularly in Ziway, Arba-Minch, Bahir Dar and the capital Addis Ababa.

2.4.3. Creation of employment opportunities

Employment in the fisheries sector has grown, more rapidly than both world population and employment in agriculture. A considerable workforce is employed, both directly and indirectly, by Ethiopian capture fisheries, which also help in sustaining local communities. Whereas 4052 persons were employed directly by the sector in 2010,9148 others benefited from indirect employment offered by the sector. Therefore, the sector is a good means to create job opportunities for under employed people. This is especially so around the Rift Valley and areas surrounding lakes, reservoirs, rivers and other bodies with major fishing activities (Alazer Shifarew, 2016). The rural areas of Ethiopia where substantial fishing takes place benefit from the economic activities of the fisheries and their related operations. In those areas, much more than in the urban and per-urban centres, fisheries are increasingly recognised as an alternative means of addressing the problems of food security and poverty consistently with the rural development objectives of the sector. There is a national awareness that rural areas and the agriculture sector, which support more than 80 percent of the total population, are the basis for bringing about rapid and equitable economic growth and development in the country (FAO, 2014).

2.4.4. Fish meal as animal feed source

Fishmeal is an excellent source of protein for animals. The offal of fish can be processed and used for animal feed. It has high level of essential amino acids such as methionine and lysine, and it has a good balance of unsaturated fatty acids, certain minerals (available phosphorus) and vitamins (A, D and B-complex) in animal feeds (Roos et al). However, use of fishmeal is usually restricted to 5% to 10% of the content of poultry diets. 40-60% of the fish body is being wasted as offal every day and year. Nevertheless, there is a huge amount of animal feed shortage in the country. These days, there is an increased demand of fishmeal from poultry farmers.

2.4.5. 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 (FAO,2014). These fishes have attracted many

tourists and have contributed to get a considerable foreign exchange. To catch trout fish, the tourist gets permission from the nearby agricultural office or from the Ministry of agriculture after paying money in advance before fishing. The fishing licence 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 hooks is limited up to five fish only and not allowed for commercial purpose (FAO, 2014).

2.5. Fish Preservation

Fish is one of the perishable foods, particularly in tropical climates of less developed nations. If proper care is not taken immediately after capture, it can be spoiled in a few hours. Even using traditional methods fish can be still subjected to various forms of spoilages. Fish handling in Ethiopia is at its lowest level and remains at its traditional stage. Starting from the collection of fishes from the net and hooks, fish are thrown on the floors of boats, canoes or rafts. Most of the catches from the lakes reach the market by traditional means of transportation without any preservation facilities. Some fishermen hook some of the fish together with a string and carry them by hand to the market for immediate cash income. Others put the fish in a basket, cover them with fresh leaves and carry them by hand. Still others collect their catch in sacks and carry it to the market by hand or on donkey, taxis or pickup trucks. The most common forms of fish storage are the use of deep freezers of varying sizes and cold rooms in some cases such as the fish production and marketing enterprise (FPME) fish collection centers at Arbaminch, Bahir Dar, Ziway and Addis Ababa. All the shops of the same Enterprise in different towns and cities have mostly deep freezers and in some rare shops cold rooms as well. It should be realized that all these fish storage facilities do not get regular supply of power to keep the freezers and cold rooms running around the clock. Most fish retail shops and fish collection on storage facilities do not have backup diesel generators. Although Ethiopia consumers have preference to completely fresh fish, traditional drying of fish is performed on remote fishing sites. Sun drying of fish is the simplest way of preserving fish and is practiced to some extent in some rift valley lakes. Salting as a preservation tool could be best used in areas where salt is available and cheap. Smoking is not a traditional method and only some trials have been carried out at the Fishery production and marketing Enterprise (FPME) receiving station at Ziway.

2.6. Fish marketing and distribution

2.6.1. Fish demand and supply

The demand for fish is higher than supply especially in Ethiopian fasting season but in non-fasting, season supply is higher. This is because of religious influence on consumption patterns and hence the demand for fish is seasonal. During lent, Christians who abstain from eating meat, milk and egg they consume fish since fish is substitute of meat. Even if the available stocks of this fishery will be fully exploited in the near future, both current and future demand for fish by population cannot be met. For instance, the total demand for fish in 2003 is about 67,000 tones, which is envisaged to grow nearly to 95,000 tons in 2015 and 118,000 tons in 2025. To fill this gap, therefore, new alternative fish supply must be found (Assefa Mitike Janko, 2014).

2.6.2. Fish marketing constraints and price determination

It is found that the important problems of fish marketing are seasonal fluctuation, lack of fish, lack of awareness how to prepare and process, lack of storage facilities and transportation. The problem of fish marketing could be solved easily with the help of cooperative societies and Government.

The prices of fish are not fixed and are determined by different factors such as production cost, transport cost, supply and demand, competition processing technique variety of fish. Traders will take into account their transport and marketing cost as well as price substitute foods when deciding what price to change. Price fluctuation can be explained largely in terms of availability, quality purchasing power of the consumer. Prices are generally lowest during fish harvest and rise as supplies diminish.

2.6.3. Fish consumption trends

The consumption of fish and seafoods in general are having several nutritive, health benefits. Fish meat contains several essential amino acids, high level of unsaturated fatty acids, high level of iron, calcium, iodine and vitamin A (FAO, 2014) Furthermore, fish food has been stated to improve intelligence, treat skin conditions, improve brain development, migraine and diseases, risk of heart disease, asthma, Alzheimer's disease, cancer, obesity, diabetics and others (FAO, 2014). Despite these benefits, many people often preferred red meat to consuming seafoods. People may be averse to consuming fish because of a perceived difficulty in buying, preparing and

cooking it, the belief that it is expensive, or the unpleasant physical properties of some varieties of fish such as bones and the smell besides, fish food consumption patterns, personal health status, attitudinal dimensions, society, age, household income and educational level (Olsen, 2007). In Ethiopia fish consumption patterns are seasonal which implies that both fish demand and fish supply is concentrated within a period of 80 days per year, that is during fasting days (Wednesday and Friday) and fasting periods (55 days in March /April, 15 days in August, as well as other periods which may be less widely observed). Eating habits have been shifting in favour of fish in areas and communities where there is regular and sufficient supply, which would tend to show that fish consumption in the country is also highly influenced by supply factors (FAO, 2003). The fish landed is sold in fresh, chilled, frozen and cured forms. Though varying from place to place, the majority of landed fish is gutted and filleted at the landing sites. Most (about 73%) of the total fish landed is marketed fresh in nearby markets and the rest reaches distant consumers either chilled or frozen (26%) or dried and smoked (1%). Increasing scarcity (apparently reflecting both rising demand and supply constraints) has resulted in rising real prices for fish, so there is an increasing tendency for fish to be a luxury product consumed by higher income groups.

CHPTER THREE: MATERIALS AND METHODS

3.1. Description of the study area

The research was conducted in Nifas silk Lafto and Lideta sub-cities on status of fish supply, marketing and consumption. The two sub-cities are selected purposively due to the availability of fish markets and different restaurants, which present fish. For instance, kera market in Nifas silk Lafto is one of the known markets where fish trading takes place. Nifas silk Lafto is one of the ten sub-cities of Addis Ababa and has 13wereda administrative structures. It borders Bole, Lideta, Kirkos and Akaki-Kality sub-cities. According to Central Statistics Agency's population projection, Nifas silk Lafto sub-city has population estimated to be about 368,883(172,907 males and 195,976 females) (CAS, 2013). Lideta is also one of the sub-cities of Addis Ababa. As of 2011 its population was 214,769, the sub-city is located in the central western area of the city nearby the centre. It is bordered with the districts of Addis ketema, Arada, Kirkos, Nifas silk Lafto and Kolfe Keranio. The major socioeconomic activity of the population in the sub-cities is non-agriculture such as trade, manufacturing and services.

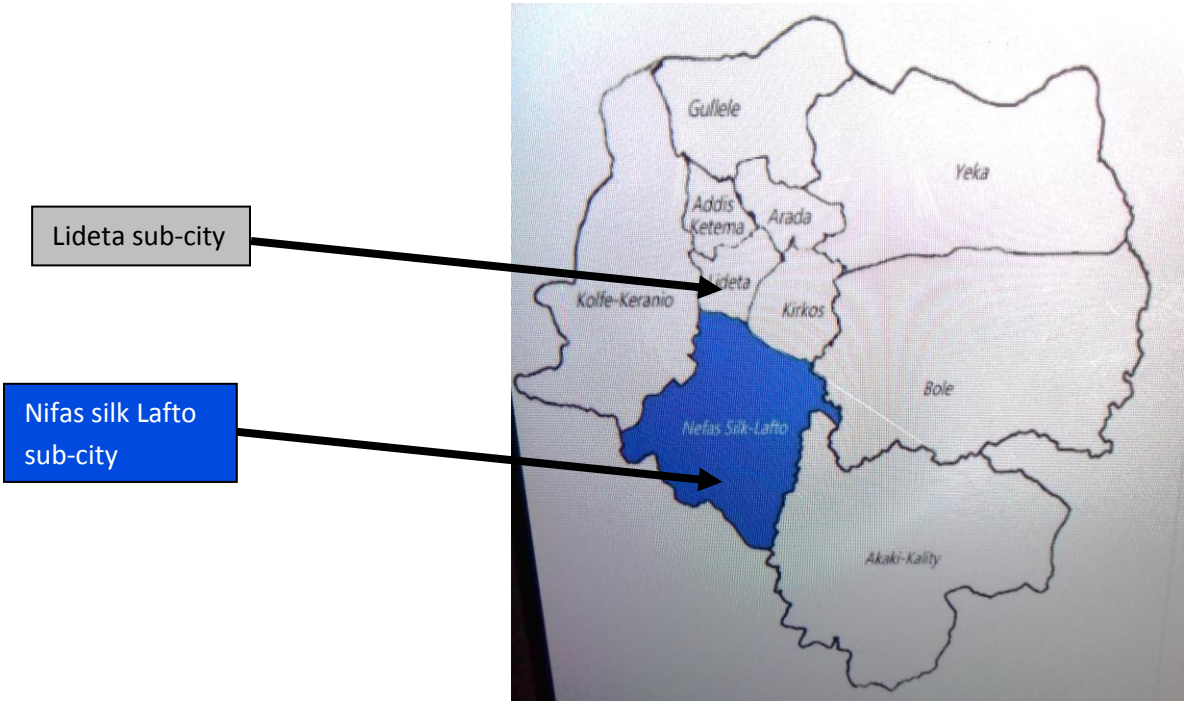

Figure 1: Map of the study areas. Source: Nifas silk Lafto wereda 04 administrative office.

3.2. Methods

The data were collected from both primary and secondary sources, primary data obtained from observation, interview, open and close-ended questionnaire. The secondary data were obtained from different written documents (Journals, books and internets).

The total population size of the respondents was 358 out of which 206 were males and 152 females. 25 fishermen and 17 cooperative men from the production area (Ziway), and58 traders, 48 restaurant/hotel/ workers and 52 consumers were purposefully taken from each sub-city. In order to achieve the purpose of the study, questionnaires were distributed to individual fishermen and cooperative workers, traders, restaurant workers and consumers. The return rate of the questionnaire was 100%.

3.3. Data analysis

Analysis of the data collected through questionnaires from different groups of respondents was made through percentage, tables, figures and pie charts.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1. Commercially important fish species in Lake Ziway

As some interviewed fishermen replied the community members in and around Lake Ziway, utilize fishes from the lake. The fishermen got daily house income by catching fishes from the lake and selling to retailers and local merchants. Some farmers also catch fish in their part-time for additional income. According to fishermen and cooperative members, Lake Ziway harbours commercially important fish species such as *Clarias gariepinus* (catfish), *Cyprinus carpio* (common carp), *Labeobarbus intermedius* (Barbus), and *Oreochromis niloticus (*Nile tilapia*)* and among these species tilapia used to be the most commonly harvested and marketed species. However, currently the number of tilapia catch per day shows a high declining rate. As table 1 shows, 52% of individual fishermen and 58.82% cooperative member respondents reported that currently, catfish is the most abundant species in the lake, while tilapia, common carp and *Labeobarbus* are the second, third and fourth dominant species respectively. However, the demand for tilapia is very high around Lake Ziway, in urban areas and different cities, as it is the most preferred species in Ethiopia because of its good taste and flavour. This indicates that unless urgent saving measure is taken Lake Ziway is going to lose tilapia.

A. Catfish *(Clarias gariepinus)*

B. Common carp (*Cyprinus carpio)*

C. Barbus (*Labeobarbus intermedius).*

D. Tilapia (*Oreochromis niloticus*)

Figure 2: Commercially dominant fish species in Lake Ziway

Table 1: Fishers responses on abundance of commercially important fish species in Lake Ziway in 2019

The commercially important fish species in Lake Ziway	Fishermen respondents		Cooperative members	
	No.	Percentage%	No.	Percentage%
Catfish	13	52%	10	58.82%
Tilapia	6	24%	4	23.53%
Common carp	4	16%	2	11.77%
Labeobarbus	2	8%	1	5.88%
Total	25	100%	17	100%

4.2. Fish Production in Lake Ziway.

According to the data collected from interviewed fishermen and cooperative members, Lake Ziway fishery is one of the popular fishery among the rift valley lakes of the country. In this lake, fish is produced throughout the year, but the rate of production varies based on seasons of the year. Thus, fish production seasons could be classified as maximum production seasons (January to April) confirmed by 96% individual fishers and 76.47% cooperative members, average production seasons (September to December) confirmed by 92% individual fishers and 82.35% cooperative members and minimum production seasons (May to August) confirmed by all individual fishermen and 88.23%cooperative members as listed in table 2. This indicates that there is high fishing effort and maximum numbers of fish are accessible to different market outlets from Lake Ziway from January to April. Therefore, fishermen earn high income and lead their life properly during this time.

Figure 3: Interviewed fishermen of Lake Ziway in 2019

Table 2: Rate of fish production in months of 2019 year.

Months	Rate of fish production											
	Fishermen respondents						Cooperative members					
	Minimum		Average		Maximum		Minimum		Average		Maximum	
	No	%	No	%	No	%	No	%	No	%	No	%
September-December	0	0	23	92%	1	4%	2	11.76 %	14	82.35%	4	23.52%
January-April	0	0	1	4%	24	96%	0	0%	3	17.64%	13	76.47%
May- August	25	100%	1	4%	0	0%	15	88.24 %	0	0%	0	0%
Total	25	100%	25	100%	25	100 %	17	100%	17	100%	17	100%

4.2.1. Demographic presentation of individual fishermen and cooperative members

The demographic presentation of individual fishermen and cooperative who participated in this research work is provided in table 3.

Table 3: Demographic presentation of fishermen and cooperative members

No.	Variable	Category	Fishermen		Cooperative	
			No.	%	No.	%
1.	Sex	Male	25	100%	17	100%
		Female	-	-	-	-
		Total	25	100%	17	100%
2	Age	10-12 years	2	8%	3	17.64%
		21-30 years	16	64%	5	29.41%
		31-40 years	4	16%	9	52.94%
		41-50 years	3	12%	-	100%
		Over 50 years	-		-	-
		Total	25	100%	17	-
3	Educational level	Illiterate	-	-	-	-
		Up to primary school	2	8%	5	29.41%
		Grade 10 complete	19	76%	10	58.82%
		Grade 12 complete	4	16%	2	11.76%
		Diploma	-	-	-	-
		Degree	-	-	-	-
		Masters	-	-	-	-
		Total	25	100%	17	100%
4	Marital status	Single	18	72%	11	64.70%
		Married	7	28%	6	35.29%
		Total	25	100%	17	100%
5	In family	Family head	9	24%	6	35.9%
		Family member	16	64%	11	64.7%
		Total	25	100%	17	100%
6	Family size	1	6	24%	3	17.64%
		2-5	15	60%	10	58.82%
		Above	4	16%	4	23.52%
		Total	25	100%	17	100%

The result on table 3 showed that, there is no female participant in both individual and cooperative fishers and, the majority (81.41%) of fishers in cooperative members were above 20 years of age. Most (64 %) of the individual fisher's age is between 21 to 30 years. This indicates that individual fishers of more than 20 years' age are largely practicing fishing. The educational level of most fishers is grade 10, though some extend to grade 12. Majority of them are single in their marital status, they are members in large family. This low-level education and, supporting large family might have contributed to over utilization of their resources.

4.2.2. Fishing experience of individual fishers and cooperative members.

The fishing experience of participants was determined by responses of individual fishermen and cooperative members and it is given in table 4.

Table 4: Fishing experience of fishermen and cooperative members

Fishing experience in years	Individual fishermen		Cooperatives Members	
	No of respondents	%	No of respondents	%
1-5	11	44%	0	0
6-10	6	24%	4	23.53%
11-20	4	16%	10	58.83%
21-30	3	12%	2	11.76%
Above 30	1	4%	1	5.88%
Total	25	100%	17	100%

Most (68%) individual fishermen have fishing experience less than 10 years, whereas the majority (76.47%) of cooperative fishermen of Lake Ziway have fishing experience above 10 years. As some interviewed young fishermen said, they learned fishing from their elders. First, they began fishing for household consumption, then for earning pocket money and finally engaged as full or part-time fishers. Many of the young fishermen inherited their parents' job. Some practice fishing to support their family`s needs while others began fishing because of lack of alternative job to support their family. According to the data,25 were engaged in fishing individually while 17 were cooperative members. Most (84%) of individual fishermen were engaged in fishing for additional income whereas 16% were engaged for household consumption, but all (100%) of cooperative members were engaged in fishing for income generation.

4.2.3. Fishing gears and fishing boats used in Lake Ziway.

The types of fishing gears currently used in Lake Ziway are gillnet, long lines and beach seines. As given in table 5, beach seine is the dominant gear type used by the respondents. The respondents replied that long lines and gill nets are the second and the third in their preferences for operation. According to individual fishermen gillnets are used mainly to target tilapia, while long lines with holes are targeting carps and catfish. Majority of fishermen used gill net mesh size less than 8cm and catch small sized fishes. Regarding boats, interview result shows that, fishermen in Lake Ziway use two types of traditional boat; bamboo rafts (locally "Yebela") and manual wooden boat.

Bamboo rafts ("Yebela") are small, operated by single person and attributed for small catch while wooden boat is attributed for larger catch. This indicates that the nature and type of boat determines the number of fish caught per day.

Table 5: Fishing gears used by fishermen and cooperatives in Lake Ziway

Types of fishing gears	Individual fishermen		Cooperative members	
	No	**%**	**No**	**%**
Gill nets	5	20%	3	17.65%
Long lines	9	36%	6	35.29%
Beach seines	11	44%	8	47.06%
Total	25	100%	17	100

A. Wooden boat

B. Rafts ("Yebela")

Figure 4: Fish boats in Lake Ziway, A. Wooden boat, B. Raft (" Yebela")

4.2.4. The number of fish caught by fishers per day

As interviewed fishermen said the amount of fish harvested by each individual per day varies based on, individual effort, gear quality, availability of target species in the lake and season.

Table 6: The number of fish caught by fishermen per day.

Number of fish captured by each fishermen per kg per day	Individual fishermen		Cooperatives Members	
	No of respondents	%	No of respondents	%
10 – 20	12	48%	2	11.76%
20 – 30	7	28%	5	29.41%
30 – 40	4	16%	9	52.94%
Above 40	2	8%	1	5.88%
Total	25	100%	17	100%

Near half (48%) of individual fishermen catch 10-20kg fish per day, from these respondents most of them claim that catfish species is high in number. Greater than half of cooperatives (52.94%) catch 30-40kg fish per day. This indicates that cooperative workers relatively catch more and supply more than individual fishermen supply. Fishers said that they do not catch enough fish because of the current situation of the lake. Some participants do not have enough storage facilities that preserve the fish until it reaches to the consumers.

4.2.5. Fish production constraints in Lake Ziway.

Data collected from fishermen and some cooperative members indicate that currently there are several problems that affect fish supply from Lake Ziway. These include mismanagement of the lake, lack of storage facilities, market problem, and lack of modern fishing instrument.

Table 7: Fish production constraints in Lake Ziway.

Types of Constraints	Individual fishers		Cooperatives members	
	No	%	No	%
Mismanagement of the lake	15	60%	11	64.71%
Lack of storage facility	4	16%	1	5.88%
Market problem	5	20%	3	17.65%
Lack of modern fishing instrument	1	4%	2	11.76%
Total	25	100%	17	100%

Generally, the respondents listed several problems that reduce the productivity of the lake such as falling water level, pollution caused by agro chemicals, increasing settlement of population (cause for over fishing and environmental damage), increased salinity etc. According to the respondents,

at this moment mismanagement of the lake is the main problem of the fishing sector, which is confirmed by 60% of the respondents (Table 7). As the participants confirmed fish, supply is decreasing at increasing rate. Therefore, the livelihood dependency is very low and the economic importance is insignificant.

4.3. Marketing in Nifas silk Lafto and Lideta sub-cities

4.3.1. Targets of Nifas silk Lafto and Lideta sub-cities fish traders

Most of the fish traders from Nifas silk Lafto (81.03%) and Lideta (72.41%) sub-cities fish traders were involved in fish trading for the sake of income generation while 18.97 %of Nifas silk Lafto and 27.59 % of Lideta fish trader are to prepare fish food into their hotels and restaurants.

Table 8: Targets of Nifas silk Lafto and Lideta sub-city fish traders

	Nifas silk Lafto		Lideta	
Target of fish traders	No. respondent	% of respondent	No. respondent	% of respondent
Income generation	47	81.03%	42	72.41%
Prepare fish food in their restaurants	11	18.97%	16	27.59 %
Total	58	100 %	58	100 %

4.3.2. Market chain of fish of Lake Ziway to Addis Ababa

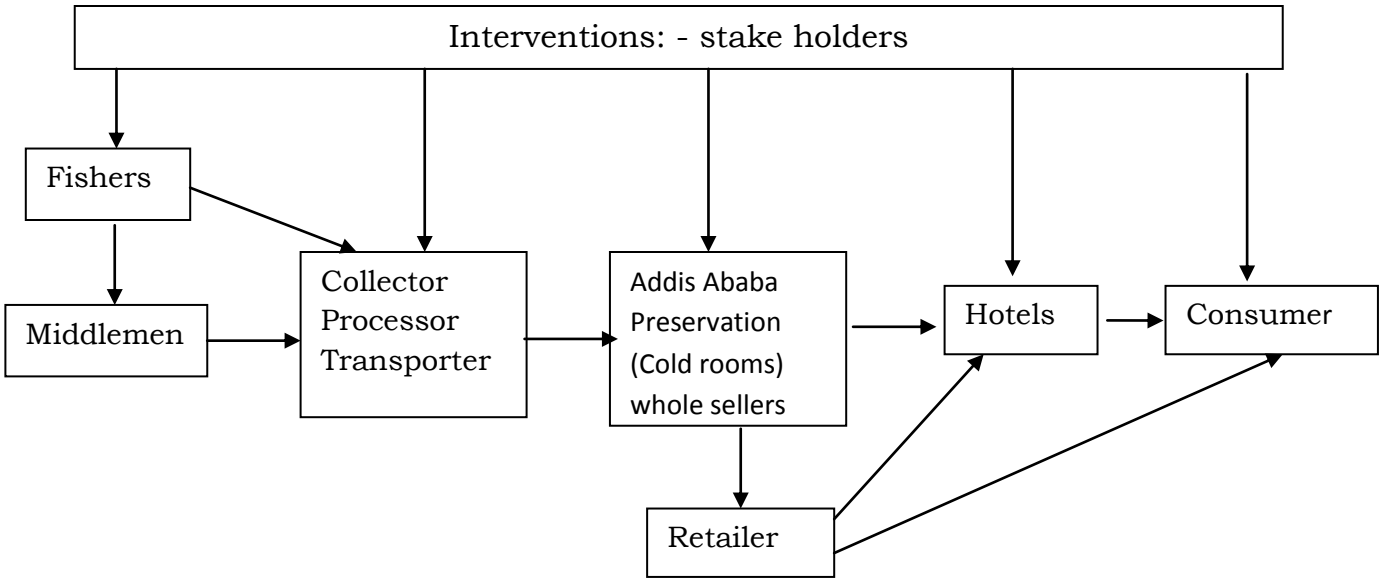

Figure 5: The market chain of fish from Lake Ziway to Addis Ababa.

The results of study area showed three basic routes of fish delivery to consumers (Fig 5). The first route is to Addis Ababa preservation and fish shops (whole sellers) and then fish distributed to hotels and super markets finally to consumers.

The second route with the involvement of middlemen to Addis Ababa preservation and shops then distributed to hotels and supermarkets (retailers) finally consumers (Fig 5). The third route to Addis preservation and shops then retailer, retailers directly sold to consumer (Fig 5). In all routes fish were sold as whole and fillet. According to information obtained from retailers there is high market demand for fillet fish specially Nile tilapia and the price is 125-130 Birr/kg. The other species are also sold for 120 Birr/kg.

Table 9: The source from where fish traders get fish

No	Source	Nifas silk Lafto		Lideta sub-city	
		No.	%	No.	%
1	Ziway	23	39.66%	21	36.21%
2	Arbaminch	18	31.03%	20	34.48%
3	Hawassa	11	18.97%	13	22.41%
4	Bahirdar	6	10.34%	4	6.90%
5	Total	58	100%	58	100%

Fish traders bring fish from different production areas, such as Ziway, Arbaminch, Hawassa and Bahirdar. As indicated in table 9, 39.66% of Nifas silk Lafto and 36.21% of Lideta sub-city respondents get fish from Ziway, 31.03 % Nifas silk Lafto and 34.48% Lideta respondents from Arbaminch, 18.97 % of Nifas silk Lafto and 22.41 % of Lideta from Hawassa and the rest 10.34% and 6.90% Nifas silk Lafto and Lideta respectively from Bahirdar. This indicates that Lake Ziway is the main source of fish for both sub-cities.

4.3.3. Demographic presentation of Nifas silk Lafto and Lideta sub-cities fish traders

As indicated in table 10, more than half of the fish traders in both sub-cities are males, (58.6%) of Nifas silk Lafto and (63.79%) Lideta sub-cities are single in their marital status, and live in large family.

Table 10: Demographic presentation of fish traders in Nifas silk Lafto and Lideta sub -cities

No.	Variable	Category	Fish traders			
			Nifas silk Lafto sub-city		Lideta sub-city	
			No.	%	No.	%
1.	Sex	Male	32	55.17%	30	51.71%
		Female	26	44.84%	28	48.27%
		Total	58	100%	58	100%
2	Age	10-20 years	3	5.17%	4	6.89%
		21-30 years	23	39. %	25	43.10%
		31-40 years	17	29.3%	16	27.58%
		41-50 years	10	17.24%	10	17.24%
		Over 50 years	5	8.62%	3	5.17%
		Total	58	100%	58	100%
3	Educational level	Illiterate	-	-	-	-
		Up to primary school	5	8.62%	14	24.13%
		Grade 10 complete	29	50%	20	34.48%
		Grade 12 complete	21	36.2%	24	41.37%
		Diploma	3	5.17%	-	-
		Degree	-	-	-	-
		Masters	-	-	-	-
		Total	58	100%	58	100%
4	Marital status	Single	34	58.6%	37	63.79%
		Married	24	41.37%	21	36.20%
		Total	58	100%	58	100%
5	In family	Family head	27	46.55%	23	39.65%
		Family member	31	53.44%	35	60.34%
		Total	58	100%	58	100%
6	Family size	1	7	12.6%	13	22.41%
		2-5	38	65.51%	31	53.44%
		Above	13	22.41%	14	24.13%
		Total	58	100%	58	100%

4.3.4. Means of fish transportation in Nifas silk Lafto and Lideta sub-cities

Most (77.59%) of Nifas silk Lafto and 67.24% Lideta sub-city respondents use cold storage vehicle as means of fish transportation whereas 22.41% of Nifas Silk Lafto and 32.76% of Lideta sub- city respondents use taxis. This indicates that cold storage vehicle is the most widely used means of transportation. Concerning fish storage, 81.03% of the Nifas Silk Lafto and 87.93 % of Lideta respondents store their fish in large refrigerator while the rest use small ice room for fish storage.

Table 11: Means of fish transportation in Nifas silk Lafto and Lideta sub-cities

Means of transportation	Nifas silk Lafto Respondents		Lideta sub- city respondents	
	No. of respondents	Percentage of respondents %	No. of respondents	Percentage of respondents %
Taxi	13	22.41%	19	32.76%
Motor cycle	0	0	0	0
Bicycle	0	0	0	0
Cold storage vehicle	45	77.59 %	39	67.24%
Total	58	100 %	58	100 %

4.3.5. The fish species presented by traders to the market

Traders present different fish species to the market depending on the choice of the buyer's (restaurants and individual consumers) and the types of fish available in the production area. According to the data collected from sub-cities, 60.34 % Nifas silk Lafto traders and 68.97% of Lideta sub-city respondent's present tilapia. 22.41% of Nifas silk Lafto and 15.5% of Lideta sub-city respondents present catfish as listed in table 12. This indicates traders of both sub-cities predominantly present tilapia to the market.

Table 12: The fish species presented by traders to the market

Species	Nifas silk Lafto	Lideta		
	No. of Respondents	Percentage Respondents	No. of Respondents	Percentage
Tilapia ("Koroso")	35	60.34 %	40	68.97%
Catfish ("Ambaza")	13	22.41 %	9	15.51%
Common carp	8	13.80 %	8	13.80%
Labeobrbus	2	3.45 %	1	1.72%
Total	58	100 %	58	100 %

4.3.6. Forms of fish presented by traders to the market

Traders presented fish to the market in different forms depending on the choice of customer and availability of fish in production area.

Table 13: Forms of fish presented by traders to the market

Forms	Nifas silk Lafto respondents		Lideta respondents	
	No.	%	No.	%
Whole fish	12	20.69%	7	12.07 %
Processed – fillet	29	50%	41	70.69 %
Presented both as whole fish and fillet forms	17	29.31%	10	17.24 %
Total	58	100 %	58	100 %

According to the respondents, most of the time carps and catfish are presented in whole while tilapia is presented in fillet form. Many of the traders in Nifas silk Lafto sub-city presented their fish in the form of fillets while some of them sell it as whole fish and some other respondents presented both as whole and in the form of fillets. Like Nifas silk Lafto respondents, Lideta sub-city respondents presented fish in the form of fillets, but fillet fish is more frequently sold in Lideta sub-city than in Nifas silk Lafto sub-city. Table 13 indicates that the community of both sub-cities (Figure 5) prefers fishes in fillet form.

A. Fish processing traders B. Fish fillet ready for market C. Fish seller

Figure 6: Interviewed fish processing and fish trader in Lideta sub-city

Traders sold fish to different customers, such as to individual consumers, hotels /restaurants/ and to other fish trading organization (retailers). As the data collected from Nifas silk Lafto, shows 41.38 % of the traders sold their fish to individual consumers, 36.21% sold to hotels / restaurants/, 8.62 % to fish trading organization and 13.79 % sold to both individual consumers and hotels /restaurants/. In Lideta sub-city, respondents sold 46.55 % to hotels / restaurants/, 32.76% to direct consumers, 15.52% to both individual consumer and hotel /restaurants/, and 5.17% to other fish trading organization /retailers/. This indicates that near half (41.38 %) of Nifas silk Lafto respondents sold fish to direct consumers while near half (46.55 %) of Lideta respondents sold to hotels and restaurants. There are many restaurants/ hotels/ in Lideta sub-city than in Nifas silk Lafto, hence traders get easy access to sell their fish to hotels and restaurants in Lideta sub- city.

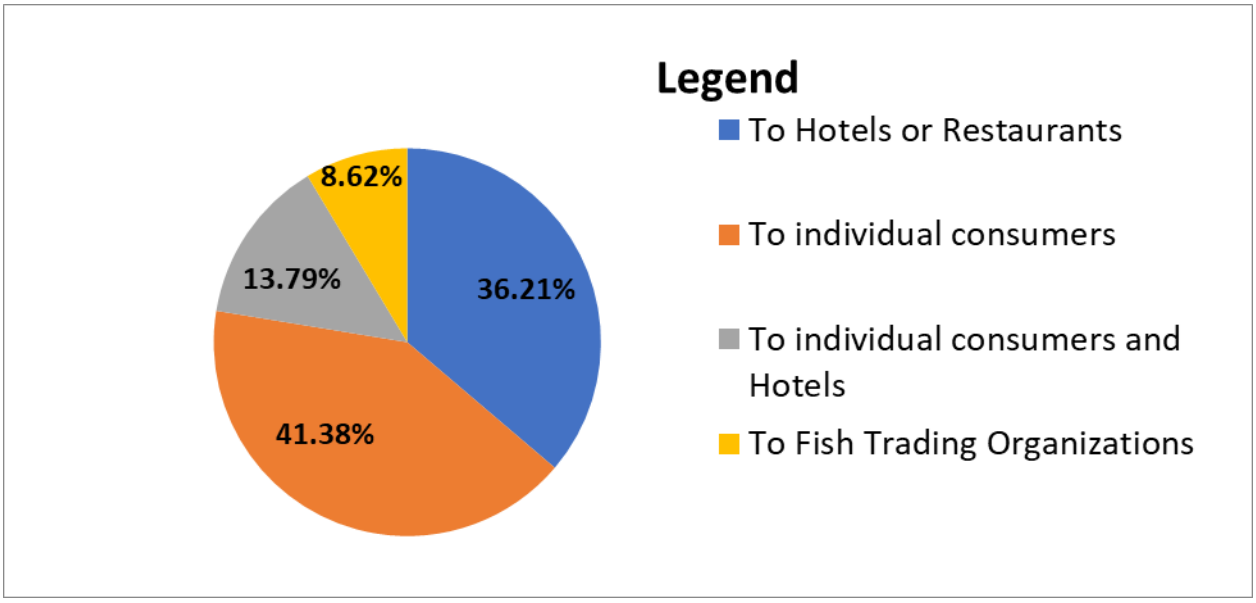

Figure7: Market Outlet for Nifas Silk Lafto Sub City

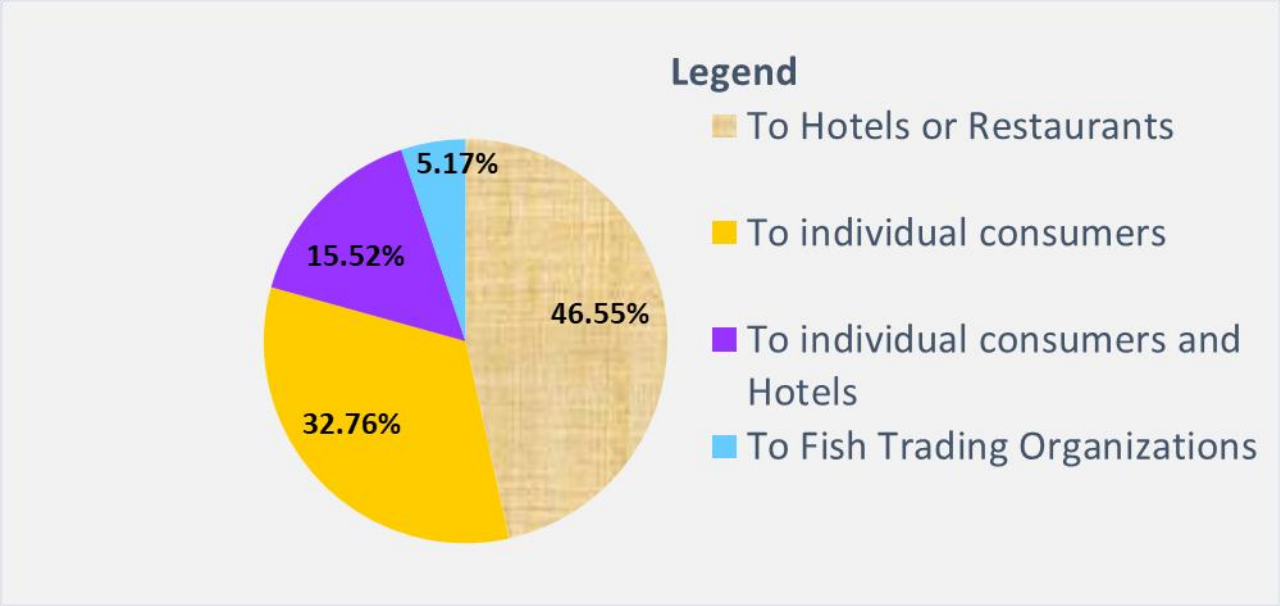

Figure 8: Market outlet for Lideta Sub-city

4.3.7. Marketing constraints of fish in Nifas silk Lafto and Lideta sub-cities

According to this study, the major fish marketing constraints in Nifas silk Lafto and Lideta sub-cities is season which accounts for 48.31% and 55.17%, respectively. The other factors include lack of fish which accounts to 17.24% in Nifas silk Lafto and 20.68% in Lideta sub-cities, lack of transportation accounting to 13.79 % in Nifas silk Lafto and 10.34 % in Lideta sub-cities, Lack of storage facilities accounts to 12.07% in Nifas silk Lafto and 8.62 % in Lideta and lack of permanent market place accounting to 8.62% in Nifas silk Lafto and 5.17% in Lideta sub-cities. This indicates that season is the main market constraint in both sub-cities.

Table 14: Fish marketing constraints in Nifas silk Lafto and Lideta sub-cities

	Nifas silk Lafto			Lideta sub city		
Constraints	No.	%	Rank	No.	%	Rank
Lack of fish	10	17.24%	3	12	20.70%	3
Lack of proper processing and storage facilities (Refrigerator)	7	12.07%	5	5	8.62%	5
Transportation	8	13.79%	4	6	10.34%	4
Season	28	48.27%	1	32	55.17%	1
Lack of permanent market place	5	8.62%	6	3	5.17%	6
Total	58	100%		58	100%	

4.3.8. Ways of fish price determination in Nifas silk Lafto and Lideta sub-cities

Almost all of them responded that fish availability and marketing is adequate during fasting season. 58.62% Nifas Silk Lafto and 53.45 % of Lideta sub-city traders determine market price based on season, that is during fasting season price of fish is higher than regular time because of increase of demand for fish. Type and size of fish are the second and the third price determinant factors. The type of fish confirmed by 25.86% of Nifas silk Lafto and 36.21%Lideta sub-cities respondents whereas the size of fish is confirmed by 15.52% Nifas silk Lafto and 10.34% Lideta sub-city respondents.

Table 15: Ways of fish price determination in Nifas silk Lafto and Lideta sub-cities

	Nifas silk Lafto respondents		Lideta respondents	
Way of price determination	**No.**	**%**	**No.**	**%**
season of selling	34	58.62%	31	53.45%
Type of fish	15	25.86%	21	36.21%
Size of fish	9	15.52%	6	10.34%
Total	58	100 %	58	100 %

4.3.9. Average income of individual fish trader in Nifas silk Lafto and Lideta sub-cities

Average income of individual fish trader in both sub-cities was determined by their responses for the questionnaire. As it is indicated in table 16, individual fish trader gets 12,320 and28, 000 Eth. Birr per month during non-fasting and fasting seasons respectively. This confirms that a trader is more profitable during fasting seasons.

Table 16: Average income of individual fish trader in Nifas silk Lafto and Lideta sub –cities at the market in Addis Ababa.

Seasons	Average fish sold per kg per day	Average price of 1kg fish in Eth. Birr	Income per day in Eth. Birr	Income per week in Eth. Birr	Income per month in Eth. Birr
Non-fasting season	4kg	110	440	3,080	12,320
Fasting season	8kg	125	1000	7000	28,000

4.4. Restaurants /hotels/ that present fish in Nifas silk Lafto and Lideta sub-cities

There are hotels and restaurants in Nifas Silk Lafto and Lideta sub-cities that are known for their fish dish. For instance, Nile hotel, Carshado hotel in Nifas Silk Lafto and Solish international hotel Tariku hotel and Tsehay Hotel in Lideta are some of the hotels in which fish food is regularly presented for customers. Most (68.75 %) Nifas silk Lafto and 85.41 % of Lideta sub city respondents said that hotels/ restaurants/ in which they work are rented where as 68.75 % of Nifas Silk and 18.75 % Lideta sub-city respondents are the owner of the hotels /restaurants/.

4.4.1. Fish species presented by the restaurants/hotels/

As indicated in table 17 tilapia fish species is the most presented species of all, though the rate varies in both sub-cities. More than half (52.08 % of Nifas silk Lafto sub-city and 58.33% Lideta sub-city) respondents revealed that most of their customers more prefer to consume tilapia in different forms because of its flavour and good taste. In general, the restaurant workers can use one to four types of species, but the availability of species varies from season to season as well as from place to place. Majority (77.08 %) of Nifas silk Lafto and 79.16% of Lideta sub-city restaurant workers commonly present two species (tilapia and catfish) for their customers.

Table 17: Types of fish species presented by restaurants

	Nifas Silk Lafto		Lideta	
More presented fish species in their restaurant	No. of respondents	% of respondents	No. of respondents	% of respondents
Tilapia	25	52.08%	28	58.33%
Cat fish	12	25 %	10	20.83%
Common carp	8	16.67%	9	18.76%
Labeobarbus	3	6.25 %	1	2.08%
Total	48	100 %	48	100 %

4.4.2. Demographic presentation of restaurant/ hotel/owners and workers in Nifas silk Lafto and Lideta sub-cities

As indicated in table18, more than half (58.3%) of Nifas silk Lafto and 54.16% of Lideta sub-city restaurant workers are females, and the ages of the majority of the workers ranges from 21 to 30 with educational level of 10^{th} grade complete and 58.6% of them are single living in large family. This indicates that the majority of low educational level youngsters were involved in restaurant works. Therefore, increasing fish production, supply and having more fish presenting restaurants, is one way of creating job opportunities to youngsters.

Table 18: Demographic presentation of restaurant workers in which fish is presented in Nifas silk Lafto and Lideta sub-cities

No.	Variable	Category	Restaurant workers			
			Nifas silk Lafto sub-city		Lideta sub-city	
			No.	%	No.	%
1.	Sex	Male	20	41.66%	22	45.83%
		Female	28	58.3%	26	54.16%
		Total	48	100%	48	100%
2	Age	10-20 years	4	8.3%	8	16.66%
		21-30 years	31	64.52%	27	56.25%
		31-40 years	9	18.75%	11	22.91%
		41-50 years	4	8.33%	2	4.16%
		Over 50 years	-	-	-	-
		Total	48	100%	48	100%
3	Educational level	Illiterate	-	-	-	-
		Up to primary school	12	25%	23	47.91%
		Grade 10 complete	25	52.91%	18	37.5%
		Grade 12 complete	11	22.91%	7	14.58%
		Diploma	-	-	-	-
		Degree	-	-	-	-
		Masters	-	-	-	-
		Total	48	100%	48	100%
4	Marital status	Single	27	56.25%	32	66.66%
		Married	21	43.75%	16	33.33%
		Total	48	100%	48	100%
5	In family	Family head	13	27.9%	24	41.66%
		Family member	35	72.91%	28	58.33%
		Total	48	100%	48	100%
6	Family size	1	2	4.16%	8	16.66%
		2-5	34	70.83%	30	62.5%
		Above	12	25%	10	20.83%
		Total	48	100%	48	100%

4.4.3. The source where restaurant owners get fish

As table 19 shows more than half (56.25%)of Nifas Silk Lafto and 58.33 % of Lideta sub-city restaurants buy fish for the restaurant from retailer, 33.33% of Nifas Silk Lafto and 25 % of Lideta sub-city from cooperative centres while 10.42% of Nifas Silk Lafto and 16.67% of Lideta sub-city respondents get fish from fishermen. This shows that most restaurant owners get fish from retailers, they do not directly bring from production area; that may influence the price of fish prepared by the restaurants.

Table 19: The source where restaurant owners get fish

	Nifas silk Lafto		Lideta	
From whom restaurant owners get fish	No. of respondents	% of respondents	No. of respondents	% of respondents
Fisher men	5	10.42 %	8	16.67%
Traders	27	56.25 %	28	58.33%
Cooperative centers	16	33.33 %	12	25 %
Total	48	100 %	48	100 %

About 75 % of Nifas silk Lafto sub-city and 54.16% of Lideta sub- city respondents get enough fish resources regularly when they want, the rest responded that due to low production and lack of transportation they do not get as much as they want. According to 60.41 % of Nifas Silk Lafto and 93.73 % of Lideta sub-city respondents the size, quality and accessibility of fish supply are decreasing, compared to the current demand of fish by their customers. According to 70.83 % of Nifas Silk Lafto and 62.5 % of Lideta sub city respondents, the current demand of fish is increasing.

4.4.4. Rate of fish supply by restaurants

As the data collected from respondents show, fish food supply is most of the time irregular, that is the demand in these two sub-cities is far higher than the supply specially during fasting period and demand becomes lower than supply in non-fasting seasons. According to data collected, 47.91 % of Nifas silk Lafto and 39. 58 % of Lideta sub-city restaurants supply fish food two days in a week (Wednesday and Friday), 35.42% of Nifas Lafto silk and 33.33 % of Lideta sub-city respondents prepare fish four days in a week (Wednesday, Friday, Saturday and Sunday) the rest 16.67% of Nifas silk Lafto and 27.08% of Lideta sub-city prepare regularly for their customers (Table 20). All of the respondents (100 %) replied that fish foods are more sold during fasting seasons. About

79.16% Nifas Silk Lafto and 60.41 % of Lideta sub-city respondents have permanent fish consumer customers.

Table 20: Rate of fish food presentation by Nifas silk Lafo and Lideta sub city restaurant workers.

	Nifas Silk Lafto		Lideta	
Rate of fish presentation by restaurants	No. of respondents	% of respondents	No. of respondents	% of respondents
Two days in a week	23	47.91%	19	39.58%
Four days in a week	17	35.42%	16	33.33%
Daily	8	16.67%	13	27.08%
Total	48	100 %	48	100 %

4.5. Fish consumption trend of Nifas silk Lafto and Lideta sub-cities.

As respondents in the study area confirmed, fish consumption is higher in production area and closer to fish or fish product markets, because of the stimulation by daily supply of good quality product at more affordable prices. More than half (53.84%) of Nifas silk Lafto and 48.08%Lideta sub-city respondents did not integrate fish to their diet whereas 46.15% of Nifas silk and 51.92% of Lideta sub-city respondents integrate fish to their diet. Of total consumers,79.17% of Nifas silk Lafto and 55.56% of Lideta sub-city respondents prefer beef to fish whereas only 20.83% of Nifas silk Lafto and 44.44% Lideta sub-city prefer fish to beef (Table21). This indicates that the majority of the respondents in both sub-cities are yet to consume fish though there is no religious prohibition for the Christian and Muslim population.

Table 21: Fish consumption trend of Nifas silk Lafto and Lideta sub-cities

Sub-cities	Fish consumption Trend				Preference of those who consume fish			
	consume		Not consume		Prefer beef to fish		Prefer fish to beef	
	No	%	No	%	No	%	No	%
Nifas silk Lafto	24	46.15%	28	53.85%	19	79.17%	5	20.83%
Lideta	27	51.92%	25	48.08%	15	55.56%	12	44.44%

From the total who integrate fish to their diet, 91.66% of Nifas silk Lafto and 76.19% of Lideta sub-cities consume fish occasionally, where as 8.33% of Nifas silk Lafto and 19.04 % of Lideta respondents consume fish once a month. According to the respondents, occasional fish consumption is heavily biased towards fasting periods (55days in March /April,15 days in August) as well as other periods that may be less widely observed). As the data collected shows tilapia fish was mostly consumed and most preferred in both sub-cities, which accounts for 75% of Nifas silk Lafto sub-city and 95.25% Lideta sub-city respondents. In both areas, dry fried form of fish is consumed more than other forms. Most (70.83%)of Nifas silk Lafto and 57.14% of Lideta sub-city purchase fish from the market and prepared the fish in their houses while 29.17% of Nifas silk Lafto and 42.86% of Lideta respondents consume from hotels (restaurants) (Table 22). According respondents in both sub-cities, the consumption trend fluctuates based on Orthodox fasting and non-fasting seasons, showing increase during fasting and decrease in non-fasting seasons, because meat consumption is not allowed during fasting season and fish is used as alternative source of protein.

Table 22: The source where Nifas silk Lafto and Lideta sub-city fish consumers consume fish.

	Nifas silk Lafto		Lideta	
Where consumers get fish food	No. respondent	% of respondent	No. respondent	% of respondent
From hotel/restaurants/	7	29.17%	9	42.86%
Prepare in house	17	70.83%	12	57.14%
Total	24	100 %	21	100 %

4.5.1. Demographic Presentation of fish consumers in Nifas silk Lafto and Lideta sub-cities

As the result in (Table23) indicates, more than half (53.84%) of Nifas silk Lafto and 61.53%Lideta sub-cities are males; most consumers are married, in large family and with high level of education. This indicates those with high level of education and large family size tend to consume more fish.

Table 23: Demographic presentation of fish consumers in Nifas silk Lafto and Lideta sub-cities

No.	Variable	Category	Fish Consumers			
			Nifas silk Lafto sub city		Lideta sub-city	
			No.	%	No.	%
1.	Sex	Male	28	53.84%	32	61.53%
		Female	24	46.15%	20	38.46%
		Total	52	100%	52	100%
2	Age	10-12 years	7	13.46%	10	19.23%
		21-30 years	23	44.23%	17	32.69%
		31-40 years	16	30.76%	20	38.46%
		41-50 years	4	7.69%	4	7.69%
		Over 50 years	2	3.84%	1	1.92%
		Total	52	100%	52	100%
3	Educational level	Illiterate	2	3.84%	-	-
		Up to primary school	5	9.61%	8	15.38%
		Grade 10 complete	7	13.46%	6	11.53%
		Grade 12 complete	9	17.3%	5	9.61%
		Diploma	6	11.5%	10	19.23%
		Degree	10	19.23%	11	21.15%
		Masters	13	25%	12	23.07%
		Total	52	100%	52	100%
4	Marital status	Single	14	26.92%	11	32.69%
		Married	38	73.07%	35	67.30%
		Total	53	100%	52	100%
5	In family	Family head	29	55%	36	69.23%
		Family member	23	44.23%	16	30.76%
		Total	52	100%	52	100%
6	Family size	1	3	5.76%	9	17.30%
		2-5	41	78.8%	32	61.53%
		Above	8	15.38%	11	21.15%
		Total	52	100%	52	100%

4.5.2. Fish dish presented in Nifas silk Lafto and Lideta sub-cities.

There are several fish recipes presented in restaurants of the study area. Some of them are fried fish (“asa tibs”), half-cooked fish (“asa lebleb”), fish goulash (“asa goulash”), fish cutlet (“asa cutlet”), raw fish (tere asa”), fish soup (“asa shorba”) etc. Half-cooked fish (“Asa lebleb”) is lightly cooked

fish in a flavorful sauce. The spice used in the sauce varies among the restaurants. “Asa lebleb” is usually found in fishing towns where the fish is very fresh.

“Asa goulash” is deep fried fish served in a spicy sauce with tomato and onions and eaten with Injera and, it has no resemblance to goulash but the name is used throughout the country. “Tere asa” (raw fish) is served only at a fish market early in the day (when the fresh fish comes in) in a nearby restaurant. It is usually served with lime and a spicy dipping sauce. The most common fish to eat raw is carp. “Asa shorba” (fish soup) is the dish that varies the most throughout Ethiopia.

As listed in table 24 the fish that was more preferred by the majority of consumers in both sub-cities is fried fish (“asa tibs”). “Asa cutlet” and goulash are the second and the third in choices for respondents of Nifas silk Lafto and Lideta sub-cities, respectively. This indicates that fried fish is the most consumed fish recipe in the study area.

Table 24: Fish dish consumed by Nifas silk Lafto and Lideta sub-city respondents.

	Nifas silk Lafto		Lideta	
Types of fish food	No. of respondents	%	No. of respondents	%
Whole fried fish	8	33.33%	9	42.86%
Cutlet	7	29.17%	5	23.81%
Goulash	5	20.83%	4	19.05%
Half cooked fish	3	12.5%	1	9.52%
Fish soup	1	4.17%	2	4.76%
Total	24	100%	21	100%

A. Fish cutlet

B. Whole fried fish ("Koroso”)

Figure 9: Fish dish prepared in Nile hotel in Nifas silk Lafto sub-city

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

The fish supply, marketing and consumption in the study area was particularly low due to low production, market problem and consumers' preference of other meat types. In general, factors like improvement of production and distribution, market access, awareness creation in changing existing feeding cultural and religious influences are among the primary gaps noticed for the low supply, marketing and consumption of fish in the study area. Hence based on the above conclusion the following recommendations are forwarded.

1.To increase fish, supply the government should give due attention to fish production area management, control overfishing and immature fishing that is being practiced by fishermen.

2.The fishermen and traders should facilitate appropriate transport services in order to sell fresh fish in the market in time and use refrigerator to keep them safe from spoilage.

3.To increase fish supply, the development of aquaculture and other related alternative fisheries (integrated- fish-horticulture-poultry farming and aquaponics technology) is important and it also reduces the pressure from the natural system (capture fisheries).

4. Efforts should be made in changing the existing feeding traditions habit and transforming consumer's behavior towards consumption of meat.

5. Encouraging restaurant or hotels regarding fish food presentation in the study area.

6. Responsible governmental sector should plan for awareness creation regarding the importance of fish consumption at schools and institutions.

7. Further refined studies should be done in the study area.

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Appendices

Appendix 1. Questionnaire developed for fishermen and cooperative member respondents in Lake Ziway

ADDISABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

DEPARTMENT OF ZOOLOGICAL SCIENCES SUMMER MSC PROGRAM

Status of fish supply marketing and consumption in the case of Lideta sub-city Addis Ababa Ethiopia

Dear respondents,

These questionnaires are developed to collect data about the status of fish supply, marketing and consumption in Nifas silk Lafto and Lideta sub-city and to suggest measure in order to increase supply rate, make balance of demand and supply in marketing and motivate community to integrate fish in to their diet, as it is one of the source of protein.

The researcher assures that the information gathered is intended for research purpose only.

Thank you in advance for your time and valuable information

General Instruction

For close-ended questions, please, put " √ ‘‘mark and for open ended questions, write the answers on space provided

Part I. Questionnaire developed for fishermen and cooperative member respondents in selected production area (Lake Ziway).

A. personal information of the respondents

1. Sex: male ☐ female ☐

2. Age: a. 10-20 years ☐ b. 21-30 years ☐ c.31-40years ☐

d. 41-50 years ☐ e. over 51 years ☐

3. Educational status: a. illiterate ☐ b. up to primary school ☐ c. grade 10 complete ☐

d. grade 12 complete ☐ e. Degree ☐ f. masters ☐

4. Marital status: a. single ☐ b. married ☐

5. In family: a. family head ☐ b. family member ☐

6. Family size you are heading or supporting: a, one ☐ b. two-five ☐ c, above five ☐

7. How long since have you engaging in fishing? a, 1-5 years ☐ b,6-10 years c, 11-20 years ☐

d, 21-30 ☐ e, above 30 years ☐

8. What is your mode of engagement in fishing?

a. individual ☐ b. cooperative member ☐

9. What main species do you target?

a. Tilapia ☐ b. Catfish ☐

c. *Labeobarbus* ☐ d. carp ☐

e. Other (specify) _____

10. What is your reason for engaging in fishing?
a. House hold consumption ☐ b. Additional income ☐ c. both ☐

11. What fishing method do you use?
a. Gillnetting ☐ b. Longlining ☐

c. seining ☐ d. Other (specify) _____

12. Please give the type and number of fishing gears you possess.

Type_____

13. Please specify the type of fish boat you possess.
a. motorized ☐
b. non-motorized ☐
c. tankua ☐
c. others_____
14. Amount of income you earned from selling fish (Birr per day)
_____

15. What is your average daily fish catch when the catch is low, medium or high?

16. Indicate for each month of the year whether your catch is low, average and high

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

17. How do you preserve the quality of fish you catch?

a. icing ☐ b. cover fish with leaves ☐
c. sell rapidly ☐ d. other (specify) _____
18. What are the major factors affecting fish production in this lake?

a. lack of fishing tradition ☐ b. environmental degradation ☐

c. climate change ☐ d. others_____

19. How many fishing trips do you carry out in a week? _____

20. How many weeks are there in a fishing season? _____

21. Who are your buyers of fish?

a. Direct consumers
b. Traders selling at the same landing site
c. Traders selling away from the landing site.
_____

22.Is fish production in this lake increasing or decreasing? _____

a, increasing ☐ b. decreasing ☐

23. If your answer for question '16' is decreasing, explain why decreasing_____

24. What is the economic importance of fish production?
_____

25. To what extent your livelihood dependent on fishing?

a. very strongly dependent ☐ b. strongly dependent ☐

c. moderately dependent ☐ d. least dependent ☐

26. What is the problem of fishing sector for the economy?

a. Climate change ☐ b. mismanagement of resource ☐

c. inappropriate polices ☐ d. low consumption ☐

Appendix 2. Questionnaire developed for Nifas silk Lafto and Lideta sub-city fish traders

ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

Status of fish supply marketing and consumption in the case of Lafto sub-city Addis Ababa Ethiopia

Dear respondents,

These questionnaires have been developed to collect data about the status of fish supply, marketing and consumption in Nifas silk Lafto and Lideta sub-city and to suggest measure inorder to increase supply rate**,** make balance of demand supply in marketing and motivate community to integrate fish in to their diet as it is one of the source of protein.

The researcher assures that the information gathered is intended for research purpose only.

Thank you in advance for your time and valuable information.

Part II. Questionnaire developed to shops and supermarket (fish sellers/trader

A. personal information of the respondents

1. Sex: male ☐ female ☐

2. Age: a. 10-20 years ☐ b. 21-30 years ☐ c.31-40years ☐

d. 41-50 years ☐ e. Over 51 years ☐

3. Educational status: a. illiterate ☐ b. up to primary school ☐ c. grade 10 complete ☐

d. grade 12 complete ☐ e. Degree ☐ f. masters ☐

4. Marital status: a. single ☐ b. married ☐

5. in family: a. family head ☐ b. family member ☐

6. Family size you are heading or supporting: a, one ☐ b. two-five ☐ c, above five ☐

8. How long since have you engaging in fishing? a, 1-5 years ☐ b,6-10 years ☐

c, 11-20 years ☐ d, 21-30 ☐ e, above 30 years ☐

9. For what target do you trade fish?

_____

10. Where is your trading area?

_____

11**.** From where do you bring fish every day**?**

_____

12. What average amount of fish do you bring every day?

_____

13. What type of species of fish you bring?

_____

14. What is a means of transportation?

A. Cold storage vehicle ☐ B. Taxis ☐ C. Motorcycle ☐ D. Bicycle☐

15. What are ways of preservation mostly used?

a. ice room ☐ b. Large refrigerators ☐ c. others

16. Do you have fish trading license? Yes ☐ No ☐

17. What are your ways of fish distributions?

A. Whole sales☐ B. Retailer ☐ C. Individuals ☐

18. What are the major problems do you face?

A. Lack of fish☐ B. Transportation ☐ C. Marketing ☐ D. Preservation ☐

19. How do you solve the problem?

_____

20. In which season fish is available and marketing is well? _____
Why? _____

21. To whom you sell your fish product?

A. Direct to consumer ☐ B. To local out let (restaurant) ☐ C. To fish trading organization ☐

D. Others (please specify_____

22. How do you determine market price of fish?

A. Fish type ☐ B. Type of product ☐ C. Place of market ☐ D. others? Specify ☐

23. The income you get from fish trade?

Per day_____

Per week_____

Per month_____

24. What is your income for live before join to this job?

A. Family dependent B. Home servant C. other small business ☐ other_____

25. Is your capital increases from time to time? Yes No

26. Does fish demand is the same throughout the year? (yes or no)

Yes ☐ no ☐

27. I f your answer for question ‘’20’’ is no, List the factors which make demand fluctuation?

_____

_____

Appendix 3. Questionnaire developed for Nifas silk Lafto and Lideta sub-city hotels/restaurant/ workers

ADDIS **ABABA UNIVERSITY**

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

Status of fish supply marketing and consumption in the case of Lideta sub-city Addis Ababa Ethiopia

These questionnaires have been developed to collect data about the status of fish supply, marketing and consumption in Lideta sub-city and to suggest measure in order to increase supply rate, make balance of demand and supply in marketing and motivate community to integrate fish in to their diet as it is one of the source of protein.

The researcher assures that the information gathered is intended for research purpose only.

Thank you in advance for your time and valuable information.

Part III. Questionnaire developed for hotels, restaurants and institutions.

1. Sex: male ☐ female ☐

2. Age: a. 10-20 years ☐ b. 21-30 years ☐ c.31-40years ☐

d. 41-50 years e. over 51 years ☐

3. Educational status: a. illiterate ☐ b. up to primary school ☐ c. grade 10 complete ☐

d. grade 12 complete e. Degree ☐ f. masters ☐ ☐

4. Marital status: a. single ☐ b. married ☐

5. in family: a. family head ☐ b. family member ☐

6. Family size you are heading or supporting: a, one ☐ b. two-five ☐ c, above five ☐

7. What restaurant is used by your house hold?

A. Owned ☐ B. Rented ☐ C. Others (specify)

8. Which type of fish is more presented for your restaurant?

A. Tilapia ☐ B.cat fish ☐ C. *Lebeobarbus* ☐ D carp ☐ E. others_____

9. Where did you buy more fish to satisfy your customers in these few years?

A. From fishermen ☐

B. From traders ☐

C. From cooperative centers ☐

10. How many types of fishes you obtained? _____ what are they?
_____,_____,_____,_____

11. Which species are more chosen by your customer? (Please order them 1-4)

A. Tilapia ☐ B. cat fish ☐ C. *Labeobarbus* ☐ D. Carp ☐

12. Have you get enough fish resource regularly from fishermen or other sources?

a. Yes ☐ b. No ☐

If no what is the reason? _____

13. The size (quality) and accessibility of fish supply is increasing or decreasing?

List the reasons

_____

_____

_____

14. The current demand of fish food by your customer is a, increasing ☐ b, decreasing ☐

c, no difference ☐

15. How do you supply fish food to your customer?

a. Regularly ☐ b. Sometimes ☐ C. often ☐ d. none at all ☐

16. What kind of food you are preparing from fish for your customer?

A. Fried fish ☐ B. Soup ☐ C. Fish cutlet ☐ D. Other (specify) ☐

Which one is more preferable by your customers_____?

Which types of fish are required to prepare foods that are preferred in question numbe11?

17. How many times in a week is fish prepared in your restaurant?

a. all the time ☐ b. most of the times ☐ c. sometimes ☐ D. Other (specify)

18. In which season are fish foods more sold in your restaurant? _____

19. Is there a period in which fish consumption is prohibited in your restaurant?

A. Yes ☐ B. No ☐

20. Do you have any permanent fish consumer in your restaurant?

A. Yes ☐ B. No ☐

Appendix 4. Questionnaire developed for Nifas silk Lafto and Lideta fish consumers

ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

Status of fish supply marketing and consumption in the case of Lideta sub-city Addis Ababa Ethiopia

These questionnaires have been developed to collect data about the status of fish supply, marketing and consumption in Nifas silk Lafto and Lideta sub-city and to suggest measure in order to increase supply rate**,** make balance of demand and supply in marketing and motivate community to integrate fish in to their diet as it is one of the source of protein.

The researcher assures that the information gathered is intended for research purpose only.

Thank you in advance for your time and valuable information

Part IV. Questionnaire developed for consumers

1. Sex: male ☐ female ☐

2. Age: a. 10-20 years ☐ b. 21-30 years ☐ c.31-40years ☐

d. 41-50 years ☐ e. Over 51 years ☐

3. Educational status: a. illiterate ☐ b. up to primary school ☐ c. grade 10 complete ☐
d. grade 12 complete ☐ e. Degree ☐

f. masters ☐

4. Marital status: a. single ☐ b. married ☐

5. in family: a. family head ☐ b. family member ☐

6. Family size you are heading or supporting: a, one ☐ b. two-five ☐ c, above five ☐

7. Do you prefer beef or fish? Beef ☐ fish ☐

8. Do you integrate fish in your diet?

A. yes ☐ B. No ☐

9. If your answer for question '2' is no why?

A. No fishing ☐ B. Economic problem ☐ C. Not prefer ☐

10. If your answer for question'2' is yes, how often you include fish in your diet?

A.one a day ☐

B. once a week ☐

C. once a month ☐

D. other ☐

11.Indicate the fish species and forms actually consumed and those most preferred by your household for consumption. (codes)

	Most consumed	Most preferred
Species		
Form		

Codes

Species	Forms
a. Tilapia	a. Fresh (iced)
b.cat fish	b. Sun-dried d. Salted and sun-dried
c. carp	c. Fried e. Other (specify) _____
d. *Labeobarbus*	

12. Where do you get it from?

A. hotels ☐ B. production area ☐ C. market ☐

13. Do you get it whenever you need? A. yes ☐ B. No ☐

14. Do seasons determine your consumption trend? A. Yes☐ B. No ☐

15. If your answer for question '8' is yes, in which season you consume more? _____

Why? _____