



## **The major fishery constraints and marketing system of fish in Lake Ziway**

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### **Abstract**

Lake Ziway is an economically important lake for fish production in the country. Currently the majority of fishermen have been organized into fishermen cooperatives, in line with the policy of the Government. During the study period, the members of the cooperatives were 517, and were organized in 14 cooperatives. Also the study showed that the fishery sector has been of critical importance to the economy and to the social well-being of the fishermen in the study area. However, current harvest trends and fishery conditions put these attributes of the production at risk. It is threatened with problems of open access to the resources, pollutions, marketing, and lack of technology. There were variations in price between districts due to species difference, fish size and distance to access to market. The price of fish was relatively higher in A. T. J. Kombolcha and Dugda where the landing sites are closer to the market at Ziway and Meki; and lower in the remote landing sites. The key actors along the chains include cooperative and private fishermen at landing and their assistants. Hence, appropriate management is an urgent requirement that could assist in sustainable exploitation of the resources, so that the resource could contribute to food security in the study area in particular and in the country in general.

**Keywords:** Lake Ziway, fish production, resources, pollutions, marketing, and lack of technology.

### **1. Introduction**

Fishery resource from Lake Ziway and the lake fisheries have benefited from Phase I (1981-84) and Phase II (1991-98) fishery development projects assisted by the European Development Fund (EDF). Due to lack of appropriate management of the fishery of the lake, fish catch per unit effort and the average size of the fish caught have continued to show a declining trend, implying the fish stocks are getting depleted [13,8]. The consequence may have direct impact on the livelihood of the fishermen of Lake Ziway.

Although there are considerable numbers of studies that have been done on fisheries in Lake Ziway, it seems the majority of them tend to focus on the biological aspects of the resource. Based on these facts, very recently [15]. updated some information on fisheries baseline of Lake Ziway that has been conducted some 20 years back in 1993 during Lake Fisheries Development Program [13]. In addition, a few studies have been carried out on the determinants of gross margin income generated through fishing activity to rural households, the impact of fishery cooperatives on fishing activity of rural households [6], fishermen's willingness to pay for fisheries management [3] and the role of fishery in livelihood security of fishing communities.

Hence, there is lack of studies that are specifically identifying the fishery constraints and marketing system that directly linked to the fishery management. Therefore, this study was initiated with the purpose of identifying the major constraints on the fisheries and marketing system.

## 2. Methodologies

### 2.1 Selection of landing site and fishery cooperatives

Landing sites were selected on the shores that are used by fishermen to land their catches. However, there were several small landing sites through which a few fishermen bring out their catches. Totally 15 major landing sites were purposively selected during the survey with equal proportion from each district (Table 1).

Table 1. The selected landing sites with location for each district

Districts								
A. T. J. Kombolcha			Dugda			Z. Dugda		
Location			Location			Location		
Kontola	07058.8	038043.3	Ido	08004.1	038044.7	Burkitu	08021.3	038093.
	N	E	Kalo	N	E		N	1E
Koroko	07055.5	038042.7	Koli	08004.8	038045.5	C.	08054.1	039001.
nch	N	E		N	E	Minchi	N	4E
Menafe	07056.2	038042.9	M.	08005.8	038046.3	D. Chifa	08052.2	039074.
sha	N	E	Dalana	N	E		N	1E
Shallo	07058.2	038043.5	M. Kofe	08007.9	038048.5	Tsedach	08055.4	038093.
	N	E		N	E	a	N	4E
Worant	07056.6	038042.8	M.	08007.8	038049.2	T.	08057.3	03903.7
o	N	E	Takiti	N	E	Guddo	N	E

### 2.2. Sample size determination

[1] mathematical formula, as indicated below, was used for sample size determination.

$$N = 0.25/SE^2;$$

Where N = Sample size

SE = Standard error; which was calculated by using confidence interval of 10% and confidence level of 95%,

$$SE = 0.1/1.95 = 0.05, \text{ where } 1.95 \text{ is constant}$$

Totally 100 households were randomly selected from Batu town and data were collected in the study area between July 2013 and June 2014 through semi-structured questionnaire interview, visits to the landing

sites and focus group discussion. In order to conduct the survey, a total of three enumerators (one for each district) were recruited. The enumerators were also trained by the investigator before launching the survey to make them clear of the purpose of the survey and to familiarize them with the questionnaire. Then the questionnaire was pre-tested on a small number of respondents randomly selected from the study areas prior to its administration and the interviews were then conducted with a close supervision of the investigator.

The content of the questionnaire includes general questions related to household structure, age distribution, main livelihood sources of the fishermen, role of fishing, utilization patterns of fish products, household participation towards different livelihood activities, main constraints of the fishery and the marketing system.

### 2.2.1. Focus group discussion and key informants

Focus group discussions were held in each study district after filling out the questionnaires by way of interview. Members of the focus group were purposively selected to make a total of four to six members for each district. The members included committee members of fishery cooperative, peasant association executive committee members, development agents, and the districts livestock development desk officers and individuals who were believed to be knowledgeable about the past history and the present status of the fishery of the lake.

The leading check list of issues to be discussed at the group discussions were prepared to guide the discussion with the focus group with special emphasis on policy issues, external support for the schemes, institutional and managerial issues, major problems and future plans to further the development of the fishery of Lake Ziway.

In addition, secondary data were collected from published and unpublished sources. Z. Dugda, Dugda

and A. T. J. Kombolcha districts Agricultural Development Offices, Cooperative Promotion Offices, Livestock Development Agency Desks and Ziway Fishery Research Center were the important sources of data.

## 3. Results

### 3.1. Fishery cooperatives around Lake Ziway

Currently the majority of fishermen have been organized into fishermen cooperatives, in line with the policy of the Government. The Ministry of Agriculture has granted commercial fishing rights only to fishermen cooperatives, each of which has to pay in return for the privilege of exploiting the lake resource. During the study period, the members of the cooperatives were 517, and were organized in 14 cooperatives (Table .2), of which 100 from each district were randomly selected from all cooperative members of A. T. J. Kombolcha, Dugda and Z. Dugda in the selected cooperatives (Table .2).

Table 2. Fishermen cooperative members of in the selected cooperative in each district

<b>Zone</b>	<b>District</b>	<b>Name of cooperative</b>	<b>Current No. of members</b>
E. Shoa	A.T.J. Kombolcha	Ziway Batu	60
		Kontola	32
		Bochessa	31
		Abeyi Burkitu	18
		Abosa	26
		<b>Sub Total</b>	167
E. Shoa	Dugda	Melka Koffe	28
		Abono Gabriel	12
		Melka Fesasa	63
		Warabo	15
		Gotu Derara	10
		<b>Sub Total</b>	128
Arsi	Z. Dugda	Dibayu Chaffa	33
		Tsedecha	69
		Katar	32
		Tullu Guddo	88
		<b>Sub Total</b>	222
		<b>Grand Total</b>	517

### 3.2. Household structure

For the purpose of this study, the term household members, comprised all those who, at the time of survey, were physically residing in the same house

with one person serving as the household head. Hence, Table 5.3 gives details on family size, age distribution and male to female ratio in the study areas. Average family size per household in A.

T. J. Kombolcha, Dugda and Z. Dugda was 5.4, 4.9 and 3.3 persons, respectively. The average family size

of Z. Dugda was relatively lower than A. T. J. Kombolcha and Dugda by two persons (Table 3).

Table 3. Household size and age distribution in the study area

Districts									
	A.T.J.Kombolcha			Dugda			Z. Dugda		
Household characteristics									
	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean
Household size	3	14	5.4	2	13	4.9	2	10	3.3
Male	1	9	3.1	1	7	2.7	1	6	1.8
Female	1	6	2.4	1	6	2.2	1	4	1.5
Household age distribution (%)									
Age < 12 years	21			17			14		
Age 12 -17	28			30			32		
Age 18 – 60	45			46			42		
Age > 60	6			7			12		

In general, males were in higher proportions as compared to females in all the study areas (Table 3). The research population of 42 % to 46 % of them were aged between 18 to 60 years, representing the highest proportion of the fishermen households. Almost 30 % of the households were aged between 12-17 years, while the rest are less likely to provide productive labor (less than 12 years of age and more than 60 years of age) and ranged from 6 to 21 % in all the study areas (Table 3).

### 3.3. Major constraints of the fishery sector

Open access to the resource and pollution were the most common problems on the landing sites of the two

districts (A. T. J. Kombolcha and Dugda) (Fig. 1). Marketing constraints were faced by the fishermen mainly in Z. Dugda (42 %). Lack of regulations for the fishery was almost common understanding in all districts (Fig. 1). In the area, the market issues depend on physical access to landing points, numbers of retailers in the area and the amount of catch (personal observation). Low prices was paying to fishes, particularly due to the high cost of transportation and loss of quality because of limited options for conservation and time/distance to trading point's, were also major contributors for marketing problems.

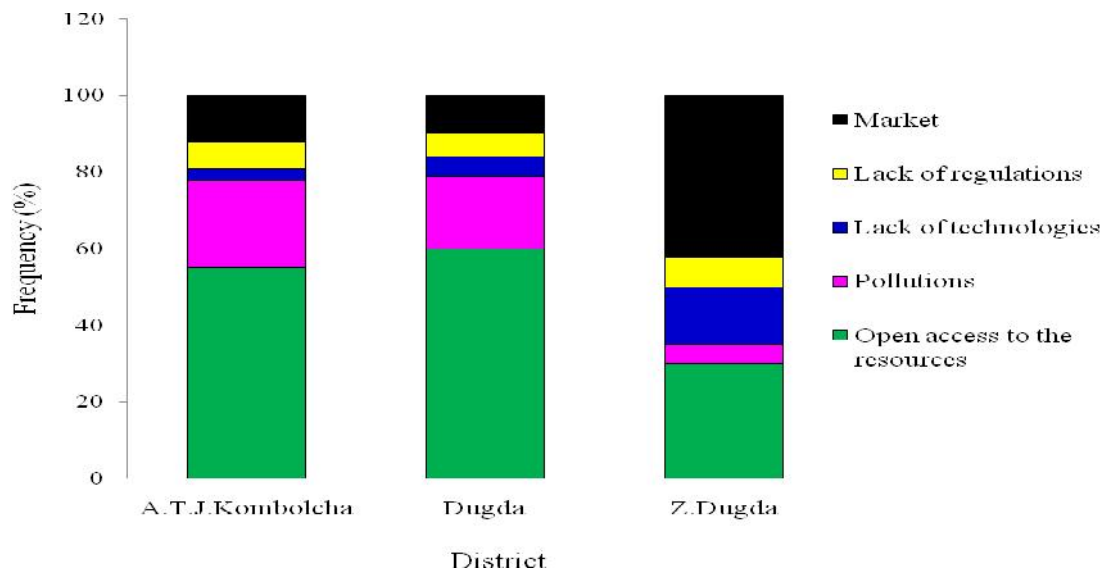


Fig.1. Major constraints of Lake Ziway fishery according to responses of fishermen.

Pollution of the lake is taking place due to improper farming methods and poor tillage systems, which contribute towards the erosion of top soils of the steep cultivated land around the catchment of eastern part of the lake. Urbanization and human settlement are amongst the most serious problems around the lake; associated industrial development was also problematic in Lake Ziway that intensifies pollution, especially in A. T. J. Kombolcha and Dugda districts (Fig.1).

In Ziway Dugda, lack of technology was common as compared to other districts (Fig.1). In general, fishes from the lake were caught and transported by reed boats. These boats are old, inefficient (personal observation). Motors for boats are not easily available and it is one of the major technological problems. Floats and lead rope used with nets were also difficult to obtain for appropriate fishing practices.

In all the study areas, there was also critical shortage of cooling and processing facilities. There was no ice making plant in the area and because of this, fishes are easily spoiled at all stages of the process. This problem was more pronounced in Z. Dugda, due to the landing being far from some infrastructures as compared to the remaining districts (Fig. 1).

Based on the responses of key informants lack of institutional arrangement, like poor linkage and coordination between the large departments and the apparent absence of an effective line of communication with the field level, are among the serious problems to be faced by the sector in general.

### 3.4. Marketing system

#### 3.4.1. Marketing of fish

Prices of whole fresh and filleted fishes of *O. niloticus*, *C. gariepinus*, *C. carpio* and *C. carassius* in the three districts of the study areas are presented in Table 4. There were variations in price between districts due to species difference, fish size and distance to access to market (Table 4). The price of fish is relatively higher in A. T. J. Kombolcha and Dugda where the landing sites are closer to the market at Ziway and Meki; and lower in the remote landing sites (Z. Dugda) (Table 4). *Oreochromis niloticus* obtained higher price than other fish species because of the higher demand from the customers. Again the price varies between seasons; the fish price was high during the Orthodox Christian Lent seasons and reduced in the non-fasting seasons. The price of both whole fish and filleted were relatively high in A. T. J. Kombolcha and Dugda district landing sites than Z. Dugda in all fish species as described in Table 4.

Quality of the product was also an important factor determining the price. Even though there was lack of processing technology at landing sites, fishermen indicated that cleaning the processing area at landing helped them to obtain the quality of products preferred by buyers. The price range for whole fish also varies according to their size of the fishes.

In general, currently the prices of fishes have increased in the study area due to less catch the fishes. All interviewees and the observations made have clearly indicated that there is an extreme shortage of supplies of fishery products in the market.

Table 4. Variation in price of whole and filleted fish at the landing sites of the three districts (July 2013 - June 2014) around Lake Ziway

Variables	Districts		
	A. T. J. Kombolcha	Dugda	Z. Dugda
<b><i>Oreochromis niloticus</i></b>			
Whole fish price (Birr/fish)	4 – 12	3 - 12	3 -10
Filleted (Birr/kg.)	30 – 70	28 - 70	26 - 65
<b><i>Clarias gariepinus</i></b>			
Whole fish price (Birr/fish)	5 – 24	4 - 22	3 - 20
Filleted (Birr/kg.)	15 – 40	13 - 35	10 -30
<b><i>Cyprinus carpio</i></b>			
Whole fish price (Birr/fish)	6 – 35	5 - 30	4 -28
Filleted (Birr/kg.)	26 – 48	26 - 45	24 - 42
<b><i>Carassius carassius</i></b>			
Whole fish price (Birr/fish)	3 -10	3 - 8	2 - 7
Filleted (Birr/kg.)	15 -28	15 - 26	15 -24

### 3.4.2. Market chain of fishes

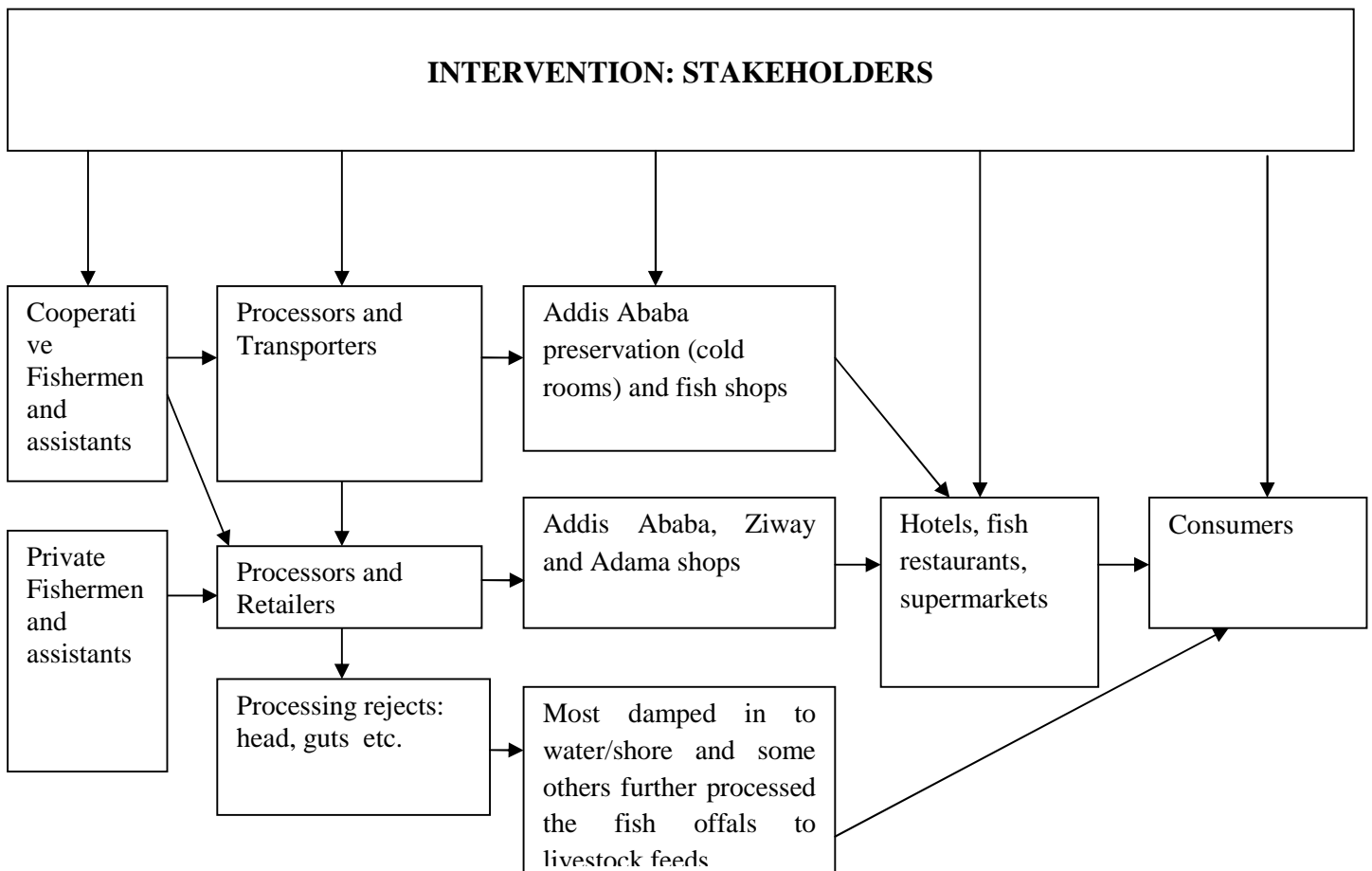
A generic schematic fish market chain at the study site is presented in Fig. 2. Based on information gathered in the course of the field study there were no variation with the report of Brook Lemma (2012). The key actors along the chains include cooperative and private fishermen at landing and their assistants (Fig.2).

In the study area fish consumption and marketing starts at landing sites. The result of this study showed three basic routes of fish delivery to consumers (Fig. 2). The primary route is towards Addis Ababa preservation and fish shop. This is the major route of delivery *O.niloticus* is sold as fillet and gutted whole fish, while *C. gariepinus*, *C. carpio* and *C. carassius* as fillets only. In this route fishes are transported first to a temporary store present in Ziway and Meki towns and

then distributed to hotels and supermarkets in Addis Ababa (Fig. 2). According to the information obtained from the fishermen and retailers there is high market demand for fillets of fish especially *O. niloticus*, and the price also at landing site is higher for this fish being 26 to 70 Birr/kg and the remaining commercially important fish species also receive considerable demand (Table 4). offal's are damped in to shore and some others further processed to livestock feed.

The second route involves delivery of fish to markets in Addis Ababa, Ziway and Adama shops by processors and retailers (Fig. 2). In the area demand of fish is high towards fasting days (Wednesdays and Fridays as fasting days of the week) and fasting periods (55 days in March/April, 15 days in August).

Fig. 2. Value Chains of the fishery products of Lake Ziway (adapted from [4]).





## 4. Discussion

### 4.1. Major landing sites and fishery cooperatives around Lake Ziway

Lake Ziway has landing sites that are already scattered along the whole length of the shoreline, making the implementation of area closure difficult [14]. Totally, 43 landing sites were found in the three districts surrounding the lake [15]. However, for this survey only 15 landing sites were purposefully selected (Table 5.1). Practically around the lake A. T. J. Kombolcha District has more landing sites than the other two (Dugda and Z. Dugda), because of its accessibility to market along the main road at Ziway and also other related infrastructures that assisted fishermen get quality fishes. There were some fishermen who were irregularly changing their landing sites as there is no restriction on fishermen movements.

During the study period the members of the fishermen in the cooperative were a total of 167, 128 and 222 for A. T. J. Kombolcha, Dugda and Z. Dugda, respectively. Currently, the number of members has increased as compared to the previous studies [14];[10];[15] due to the initiative taken by the government through organization of micro-enterprises and promoting fishing as job creation. Members of the cooperatives were complaining about the importance of being a member because there is no advantage from it. This was due to the depletion of the fish stock in the lake and such micro-enterprise organizations have not considered the maximum sustainable yield of the lake rather they focused on job creation.

In Lake Ziway, there were also illegal fishermen [13, 14 and 10]. According to [15], more than 50 % of the fishermen are not members of the cooperatives and are non-licensed fishermen, in which the number has increased from previous reports [13].

### 4.2. Household structure

Average family size per household in A. T. J. Kombolcha, Dugda and Z. Dugda were 5.4, 4.9, and 3.3 persons, respectively (Table 3). Hence, the average family size of A.T. J. Kombolcha and Dugda were almost comparable to Z.Dugda (Table 3). The family size of the first two districts was comparable to the current national household size of the rural area of the country (5.0 persons) [5]. On the other hand, the family size in this study was lower than that of [12]

who reported the average family size of 6.67 and 6.43 in Eastern Wolega of Ethiopia at Doni Kumbi and Bato Degaga District. [11] also reported average household size in East Shoa Zone of the three districts to be 6.14, 6.3 and 6.65 persons for Ada, Gimbichu and Boset, respectively, that shows higher than this finding.

In general, males were representing higher proportions in all the study areas (Table 3). This was found to be in agreement with the findings of [6] in the same district; and contradicted with the general rural area of the country [5]. The difference in sex ratio among the fishing communities and other agricultural systems is difficult to explain and needs further study to see if the same factors could be responsible for sex ratio results.

### 4.3. Constraints

According to the survey and personal observations, fishing on Lake Ziway was predominantly artisanal and the fishermen use non-motorized traditional boats and gears. The lake is also governed by open access to the resources. In addition, key informants revealed that some fishermen were using destructive fishing gears of small mesh sized beach seines. Personal observations also corroborated this. The small mesh size indiscriminately catches both the immature and mature fishes. This indiscriminate immature fish catch endangers the reproductive capacity of the stock that directly affects the resources of the lake as noted in the earlier chapters.

There was lack of regular fishery development plan at both federal and regional levels. These situations do not promote appropriate fishery practices and research activities. Another serious issue is the problem of pollutions that were directly related to different agricultural farms, especially flower farms, in which fishermen in A. T J. Kombolcha District complained about, due to the mass fish kill that occurred in 2011.

Lack of fishing gear technology is another constraint in which fishes from the water bodies are caught and transported by reed boats. These boats are old and inefficient. Floaters and lead rope used with nets are also difficult to obtain in the area as well as in the country in general.

There is critical shortage of landing, cooling and processing facilities that intensify the spoilage process. There are limited buyers at the area with limited capacity, which have impact on the price of fish and fishermen are forced to sell the product with cheap

price before loss of the quality, because of limited options for preservation and improve the shelf life of fish products, especially in Z. Dugda District.

Access to adequate and sustainable infrastructure and facilities is one of the most essential factors affecting livelihood security of fishermen (Z. Dugda). In the study area, lack of electricity and inadequate transport system were identified by both key informants and focus group discussants as major challenges faced by fishermen. Except in some areas, which are near to Ziway and Mekitowns, there is no electricity facility in many rural areas around the lake. Inadequate transportation is also particularly a serious challenge to the fishermen on the Island, who sometimes use their manual boats to market their product in Ziway and Meki towns. The majority of the fish caught were sold to traders usually at landing sites of the lake. Fish marketing is a critical stage as it tends to be greatly affected by preservation technology. Survey results revealed that the majority (92.9%) of the fish catch was sold whole fresh partly due to lack of fish preservation equipment. Focus group discussions indicated that the lack of refrigeration facilities has been a great obstacle as fishermen were forced to sell their catch at landing sites.

#### 4.4. Marketing system

Regarding the existing fish marketing information system for fisheries/agriculture, the Ethiopian media, particularly, the national radio regularly announces market trends of various agricultural crops and coffee. People in the business and in many cases ordinary consumers also listen to this information, as most of these crops are part of the traditional foods daily consumed and habits of the public. In this respect, much attention is not given to the fishery business and in general terms fishery products do not make part of the traditional foods of Ethiopians. As a result, information on marketing system of the fish is not available in Ethiopia. Whatever people know about fish markets and prices is what they know through personal contacts using mobile phones. Because of this gap, there is no consistency in the value of fishery products in the study area in particular and the country in general.

The price of fish in the study area varies by fish species, type of product and market site (Table 4) like other agricultural commodities. Seasonal pattern of fish consumption affects fish marketing around Lake Ziway. Another aspect, which tends to impinge on the

activity highlighted during focus group discussions, was the seasonality of the activity as dictated by demand. According to [9], consumption is heavily biased towards quite limited geographical areas (production areas and Addis Ababa) and also heavily weighted towards fasting days (Wednesdays and Fridays) and fasting periods (55 days in March/April, 15 days in August, as well as other periods which may be less widely observed). In addition, according to [16], increasing scarcity (apparently reflecting both rising demand and supply constraints) has resulted in rising the prices for fish, so there is an increasing tendency for fish to be a luxury product consumed by higher income groups.

Tilapia is the dominant species caught and consumed in Ethiopia, although this does not hold true for all fishing areas in the country. According to [2], fish consumption patterns reflect the local availability of fish type. Although fish consumption patterns vary from place to place in the study area, much of the landed fish is prepared into gutted and filleted forms at landing sites based on the market demand. According to [7], in Ethiopia most (about 73 percent) of the total fish landed is marketed fresh in nearby markets. The rest reaches distant consumers chilled or frozen (26 percent), or as dried, smoked and canned (1 percent) forms. Currently canning has ceased due to poor product quality and low demand.

The Ethiopian market has been growing steadily, and the volume of catch handled by FPME has declined, and the market share has fallen considerably to roughly 8 % of fish entering the marketing system nationally in 2007 [9]. Despite its superior facilities, the FPME has lost market share to smaller-scale more flexible operators, although unable to operate a cold chain and now the volume of catch handled by FPME is almost nil, due to the collapse of the enterprise. Hence, fish traded from Lake Ziway to Addis Ababa is a much more *ad hoc* trade, though cumulatively the volumes are quite significant [4].

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