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Research Application Summary

Socio-economic and profitability of fisheries enterprises: The case of Fincha Amarti Nashe reservoir of Oromia state, Horo Guduru Wollega zone, Ethiopia

Keno, B. & Zewdie, A
Department of Agricultural Economics, Wollega University, Oromia State, Ethiopia
Corresponding author: bikefuwa@gmail.com

Abstract

This study focused on the analysis of a value chain: the case of Fincha Amarti Nashe reservoir of Oromia State, Horo Guduru Wollega zone, Ethiopia. The socio-economic characteristics of the stake holders along the fisheries enterprises and analyses of market performance were employed to analyze marketing profit and profit margin of the chain actors. The data were collected from both primary and secondary sources. The primary data were collected from 122 respondents selected by multi-stage random sampled fisher men, six traders and 30 consumers through structured questionnaires and checklist. Descriptive statistics and econometric analysis were used to analyze the qualitative data collected from fish producers, traders and consumers by using multinomial logit model. The data collected from the sample fisher men, consumers and traders were analyzed using descriptive statistics which included mean, standard deviation, chi-square, t-test, frequency table, and percentiles. Fishing was found to be male dominated (75.25 %), while processing was found to be female dominated (10.75 %) in the three selected kebeles of the district. The key constraints experienced by fishermen were lack of market, low price of product, lack of transport, lack of market information, distance to the market and perishability. Consumers also face high cost of fish, deterioration of fish and poor sanitary condition problems. Overall, fisher men are forced to capture a lower share of profit margin. Thus, action is needed to train local fishermen with management skills and assembly of marketing teams. Other issues to be addressed include women's empowerment and gender equity, improving credit access, and introducing improved fishing inputs.

Keywords: Actors, constraints, fish, fishermen, fish consumers, marketing margin, market outlet, multinomial logit model, socio-economics, value chain analysis

Résumé

Cette étude a porté sur l'analyse d'une chaîne de valeur: le cas du réservoir Fincha Amarti Nashe d'Oromia, zone d'Horo Guduru Wollega en Ethiopie. Les caractéristiques socio-économiques des acteurs des entreprises piscicoles et les analyses de la performance du marché ont été utilisées pour analyser le bénéfice de la commercialisation et la marge bénéficiaire des acteurs le long de la chaîne. Les données ont été recueillies à partir de sources primaires et secondaires. Les données primaires ont été recueillies au moyen de questionnaires structurés et de liste de contrôle auprès de 122 pêcheurs, 6 commerçants et 30 consommateurs choisis grâce à un échantillonnage au hasard à plusieurs étapes. La statistique descriptive et l'analyse économétrique ont été utilisées pour analyser les données

qualitatives recueillies auprès des pêcheurs, commerçants et consommateurs de poissons en utilisant le modèle logit multinomial. Les données recueillies auprès des pêcheurs, des consommateurs et des commerçants ont été analysées à l'aide de statistiques descriptives incluant moyenne, écart type, test chi carré, t-test, table des fréquences et quartiles. Il ressort de l'étude que la pêche est surtout pratiquée par les hommes (75,25%), tandis que la transformation est dominée par les femmes (10,75%) dans les trois kebeles sélectionnés du district. Les principales contraintes rencontrées par les pêcheurs sont le manque de marché, le faible prix du produit, le manque de transport, le manque d'informations sur le marché, la distance au marché et la périssabilité. Les consommateurs sont également confrontés à des coûts élevés de poisson, à la détérioration du poisson et à des problèmes d'hygiène. Dans l'ensemble, les pêcheurs sont obligés d'enregistrer une part de marge de bénéfice plus faible. Ainsi, des actions sont nécessaires pour former les pêcheurs locaux en compétences de gestion et à l'assemblage d'équipes pour la commercialisation. Les autres problèmes à résoudre comprennent l'autonomisation des femmes et l'égalité entre les sexes, l'amélioration de l'accès au crédit et l'introduction d'intrants de pêche améliorés.

Mots-clés: Acteurs, contraintes, poissons, pêcheurs, consommateurs de poissons, marge de commercialisation, marché, modèle logit multinomial, socio-économique, analyse de la chaîne de valeur

Introduction

Fish is an important source of protein to the teeming population in Ethiopia, where fishing is carried out in almost all water bodies, with commercial production concentrated in the Rift Valley Lakes of Chamo, Ziway and Tana. According to FAO (2008), the total number of fishermen is estimated at 15,000 of which about 5,000 are active and the remaining being part-time or occasional fishermen.

There are 180 different species of fish in Ethiopia and 30 of these are native to the country (Ethiopian Embassy London, 2012). The total area of the lakes and reservoirs stands at about 7000 to 8000 km^2 and the important rivers stretch over 7000 km in the country (Mebrat, 1993). Fishing contribution to the country's GDP is relatively low but the fish production potential of the country is estimated as 51,000 tones. Fresh fish are consumed in the vicinity of the Great Rift Valley lakes. Outside these areas, the domestic market for fish is small (FAO, 1993).

With regards to employment creation, the number of people directly employed in fisheries and aquaculture is estimated at 38 million, of which over 90 percent are small-scale fishers (FAO, 2005). In addition to those directly employed in fishing, there are "forward linkages" to other economic activities generated by the supply of fish (trade, processing, transport, retail, etc.) and "backward linkages" to supporting activities (boat building, net making, engine manufacture and repair, supply of services to fishermen and fuel to fishing boats, etc.). Taking into account these other activities, over 200 million people are thought to be dependent on small-scale fishing in developing countries (FAO, 2006).

Fisheries are often available in remote and rural areas where other economic activities are limited and can thus be important engines for economic growth and livelihoods in these areas (FAO, 2005). Hussein (2010) noted that in Ethiopia the total annual fish production from rivers, small and large reservoirs was estimated to be 13,000 tons, however the total annual production potential from different water bodies was predicted in the range of 41,000 to 49,000 tones and in some lakes, the production is rapidly declining, while the demand for fish is increasing, especially in the big cities.

Different fish species were introduced to Fincha reservoir for different purposes, along which Nile Tilapia (*Oreochromis niloticus*), Common carp (*Cyprinuscarpio*) and grass carp (*Ctenopharyn godonidellus*) were introduced into the reservoir in the 1980`s.The former two species and *Tilapia zillii* were reported to be well established in the reservoir in 1998 (Fasil and Gashaw, 2012).

Nile tilapia is currently the most demanded species by the local consumers and traders. The local people are using different methods to catch the fish in the reservoir. Some fishermen use gill net, beach seine and others use spears for fishing. There are traders (legal and illegal) who collect the fish from the local people with lower prices and take it to central markets since 1998. Some of the fish catch is also being consumed by the local people.

In Fincha Amarti Nashe reservoir there is enough fish resources. The reservoir has out flow called river Fincha and Nashe which generates the electric power and is also used for irrigation (Fincha Sugar Factory). Amarti-Nashe reservoir is not efficiently utilized, meaning that commercial fishing is not widely practiced over there. The current fish utilization is not monitored by the government concerned office, and there are no rules and regulations to guide the utilization of the fish resources. This may cause over exploitation of the fish stock. There is also no information on the registered fish stock and utilization of the fish in the reservoir. Yet there are many challenges the fish value chain actors confront.

Artisanal freshwater fishery is one of the most important economic activities in Ethiopia (FAO, 2012). Improvements in fishery sector would contribute to poverty alleviation and environmental sustainability in Ethiopia (Global Fish Alliance, 2010). Value chain analysis is essential to understand relationships and linkages among buyers and suppliers and a range of market actors in between (Wenz and Bokelmann, 2011). Value chain analysis is essential to explain the connection between all the actors in a particular chain of production and distribution and it shows who adds value and where, along the chain. It helps to identify pressure points and aid in making improvements in weaker links where returns are low (Schmitz, 2005). In spite of the fact that markets are crucial in the process of agricultural commercialization, transaction costs and other causes of market imperfections could limit the participation of farm households in different markets (Sadoulet and de Janvry, 1995 as cited in Moti, 2007). This implies that markets could be physically available but not accessible to some of the farm households. The ultimate consumers have to depend on an effective marketing system to be able to purchase fish at reasonable prices.

With regard to the fish population at the global level, of the stocks with a known status, 77% are at a level where there is no room for further expansion. These stocks fall into the following categories: 52% are fully exploited, at or close to the maximum sustainable production limit, 17% are over-exploited, 7% are depleted, and 1% is recovering. Only 3% of the known stocks are underexploited. An additional 20% are moderately exploited with some potential for further expansion (Freitas *et al.,* 2008). Similarly, from the 600 marine fish stocks monitored by FAO (2006) 3% are underexploited, 20% are moderately exploited, 52% are fully exploited, 17% are overexploited, 7% are depleted and 1% are recovering from depletion.

Fish marketing is a critical stage as it tends to be greatly affected by preservation technology. A study in Lake Ziway revealed that the majority (92.9%) of the fish catch was sold whole fresh mainly due to lack of fish preservation equipment like refrigerated facilities. Access to adequate infrastructure facilities like transportation and electricity facility in many rural areas around the Lake are some of the key factors affecting livelihood security of fishers. Another aspect which tends to impinge on the activity of the fisher men is the seasonality of the fish market. On Lake Ziway, the largest amount of fish landing occurs between January and March while the minimum is during the summer season (June to September). The highest fish harvest season coincides with the highest demand period which happens to be the fasting season of Ethiopian Orthodox religion followers who consume mostly fish meals. Indeed some of the fisher men go for fishing only during these fasting months. This seasonality of harvest and demand creates challenges for fishermen to secure their livelihoods from the resource (Ignatius Mberengwa1 and Zelalem Bacha, 2011).

In Ethiopia the major problems that were identified by the stakeholders (the producers, consumers and hotel owners) involved in the fishing activities have been lack of proper fishing gears, poor post-harvest handling as a result of lack of proper fish processing and storage facilities, low price of fish as a result of low bargaining power of producers, lack of transportation facilities, poor culture of eating fish in the community, lack of enough boats in the area, and lack of permanent fish market places or shops (EFASA, 2011). With increased marketing efforts and increase in supply, the demand for the fish product could be increased significantly from the current level.

The aim of this study was to analyze the socio economic factors affecting the profitability of fisheries within the study areas and specifically, i) describe the socio-economic characteristics of the stakeholders, ii) estimate the profit level of stakeholders along the fisheries value chain, iii) determine the consumer preferences for fish in the study area, and iv) identify the major constraints faced by the stakeholders in the study area.

Methodology

This study was based on the analysis of fish value chain among the fisheries around Fincha Amarti Nashe reservoir rural household area of Horro district. Horro district is one of the

10 districts of Horro Guduru Wollega Zone, and is located 314 km North West of Addis Ababa. It is bordered by Abay Commen district in the south east, by Jardega Jarte in the North West and Jima Ganati district in the south west. It is located between 9°34′00″ N and 37°06′00″ E and at an elevation of 2576 m above sea level. The total land area of the district is 87,111.485 hectares and out of these 34,696.85 hectares was under cultivation (HWARDO, 2015).

Based on the National Regional Government of Oromia Statistical Abstract 13th edition the total population of the district is estimated at 88,267. The total number of the rural population is 83,551 and out of the total rural population 43,907 are male and 44,359 are female. The majority of the inhabitants observe Ethiopian Orthodox Christianity, with 50.32% reporting that as their religion, while 38.24% were Protestants, and 9% were Moslem (BOFED, 2014). The total number of people at Shambu town is 14,996, of whom 7,757 were male and 7,239 were female (CSA, 2010).

Cultivable and grazing land covers 61.6% and 8.0% of the district, respectively. About 11.1% of the land area of the district is covered by forests and shrubs, while the remaining 19.3% is covered by swampy, mountainous or otherwise unusable land. Horro district has 27 fisher men associations with 21,138 member fisher men (9.3% females). About 13,974 fishermen (7.8% females) were also members of the 15 Service Cooperatives in the district. The district is divided into three agro ecology zones, that is, dega 49.8%, wainadega 48.96 % and kola 1.24 %. The district has the potential for both crop and livestock production, which is mainly undertaken by small holder fisher men. The agro ecology of the district is suited for diverse agricultural production.

There are a number of rivers being used for irrigated agriculture, particularly for horticultural crop production. The important crops grown in the district are teff, wheat, barley, maize, millet, oats and sorghum from cereals, horse beans and peas from pulses, and Niger seed, falx and rape seed from oil crops. Livestock is an integral part of the production system. The largest forest available in Horro Guduru Wollega is called Chato ('Bosona Caatoo' in Afan Oromo). Rivers include the Geber, Gembo, Deneba, and Abjar Rivers.

The district is endowed with all-weather roads, potable water supply, not well organized and equipped markets, communication (telecommunication, postal services, hospital electricity, banks and credit facility, extension advice, school and health center. About 11.7% of the district's population had access to potable water supply. At the time of the study, the district had three banks and micro finance services were provided by banks like Oromia Credit and Saving Share Company, Wasasa Micro Finance Institution (HWARDO, 2015).

Population, sampling techniques, procedure and sample size. Before deciding on the survey areas, discussions were held with the district fish experts of the Livestock Resource and Health Protection office as well as with fishermen about the value chain analysis of

fish and also about the current value chain systems of fish in Horro District. Primarily, reconnaissance survey was undertaken to prepare sample frame of the households in kebeles around the reservoir who participate on fishing. Multi-stage random and purposive sampling procedures were employed to select the district, kebeles, fisher men households and chain actors, respectively (Table 1).

Table .1. Sample size distribution in the sample rural kebeles

Name of District	Name of selected kebeles	Total number of households in kebeles	No of fishermen	Number of sample households
Horro	Didibe Kistana	452	65	41
	Doyo Bariso	482	61	39
	Ashaya Igu	178	50	42
Total		1112	176	122

Source: Own computation from OoARD and kebele administration data

Types and Source of data. Both secondary and primary data were used in this study. Secondary data were collected from various sources such as government reports, research publications, technical and working papers, scientific and consultancy reports for various sources including Central Statistical Authority (CSA). Primary data were obtained from two sources: fish producers and market participants.

The field survey was conducted with: - a) Key Informant Persons (KIP): Heads of villages and communities, provincial fisheries administration officers and other experienced stakeholders in the selected study areas were individually interviewed through a semi-structured questionnaire; b) Focus Group Discussion (FGD) involved local authorities and other related stakeholders in the appointed study areas where groups were asked to share information relevant to fish value chain using semi-structured questionnaires; and c) Fish traders (including Wholesalers, / Retailers).

The study used information on different variables such as data on fish production, fish marketed, prices of fish supplied, and distance to weather road, age of the household head, extension service, educational status of the household head, access to market information, credit facility, and type of sellers and buyers. The data were analyzed using descriptive statistics which include mean, standard deviation, chi-square, t-test, frequency table, and percentiles.

Analysis of fish value chain performance. Estimates of the marketing margins are often used to analyze performance of markets. Marketing margin was calculated by taking the difference between fisher men and retail prices. Analyses of fish value chain performance were done using market share and gross margin analysis. The producers' share is the commonly employed ratio calculated mathematically as, the ratio of producers' price to consumers' price.

Mathematically, producers' share was generated as:

$$Ps=\frac{Pp}{Pc} =1-\frac{MM}{Cp} \quad (1)$$

Where: PS= Producer's share
Pp= Producer's price
Cp = Consumer price
MM = marketing margin

Marketing Margin (MM) was calculated at each marketing node along the fish value chain. The following mathematical relationship was employed.

$$MM = \frac{Gross\ Marketing\ Margin\text{-}Marketing\ Cost}{Consumer\ Price} \times 100 \quad (2)$$

The Total Gross Marketing Margin (TGMM) was related to the final price paid by the end buyer and is expressed as a percentage as described by Mendoza (1995).

$$TGMM - \frac{Consumer\ price\text{-}Producer\ price}{Consumer\ Price} X\ 10 \quad (3)$$

Where, TGMM=Total gross marketing margin.

Net Marketing Margin (NMM) is the percentage over the final price earned by the intermediary as net income once marketing costs are deducted. A higher marketing margin diminishes the producer's share and vice-versa. However it provides an indication of welfare distribution among production and marketing agents.

$$NMM = \frac{Gross\ marketing\ margin\text{-}Marketing\ Cost}{Consumer\ Price} X\ 100 \quad (4)$$

From this measure, it is possible to see the allocative efficiency of markets. Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution, which depresses market participation of smallholders. An efficient marketing system is where the net margin is near to reasonable profit.

To find the benefit share of each actor the same concept was applied with some adjustments. In analyzing margins, first the Total Gross Marketing Margin (TGMM) was calculated. This is the difference between producer's (fisher men) price and consumer's price (price paid by final consumer), i.e.,

TGMM = Consumer's price – Fisher men's price
Then, marketing margin at a given stage 'i' (GMMi) was computed as:

$$GMMi = \frac{SPi\text{-}PPI}{TGMM} X\ 10$$

Where, SPi is selling price at ith link and PPi is purchase price at ith link.
Total gross profit margin was computed as:

$$TGPM = TGMM\text{-}TOE \quad (6)$$

Where, TGPM is total gross profit margin, TGMM is total gross marketing margin and TOE is total operating expense. From this concept, the profit margin at stage "i" is given as:

$$GPMi = \frac{GMMi\text{-}OEi}{TGPM} \quad X\ 100 \quad (7)$$

Where, GPMi =Gross profit margin at i^{th} link
GMMi =Gross marketing margin at i^{th} link
OEi =Operating expense at i^{th} link
TGPM=Total gross profit margin

Market outlet choice model. A multinomial logit (MNL) model was applied to explain inter cooperatives variation in the choice of a specific marketing outlet. The concept of utility as applied to farm households suggests that if a household is faced with different alternatives j it tries to maximize utility given constraints. The decision that a household makes to either increase the volume of sales or to make outlet choice, depends on marginal utility. The analytical model is constructed based on the concept of utility maximization which is built on the condition that if a given household has different set of alternatives (market outlets) j to choose from, where j = 0, 1, 2, 3… from the decision maker's perspective, the best alternative is simply the one that maximizes net private benefit at the margin. In other words, household i is choose marketing outlet j if and only if Uij>Uik.

Based on McFadden (1978), a household's utility function from using alternative j can then be expressed as follows:

$$U\ (\text{Choice of j for household i}) = Uij = Vij + \varepsilon ij \quad (4)$$

Where, Uij is the overall utility,
Vij is an indirect utility function and εij is a random error term.
The probability that household i select alternative j can be specified as:

$$Pij = \Pr\ (V\ ij + \sum ij > V\ ik + \sum ik) \quad (5)$$

$$Pij = \Pr\ (\sum ik < \sum ij + V\ ij - V\ ik, \forall k \neq j) \quad (6)$$

Assuming that the error terms are identically and independently distributed with type i extreme value distribution, the probability that a household chooses alternative j can be explained by a multinomial logit model (Greene, 2000) as follow:

$$Pij = \frac{\exp(\beta jXij}{\sum_{j=0}^{j} \exp(\beta j \, X \, ij)} \quad (7)$$

Where, Xij is a vector of household of the i^{th} respondent facing alternative j
βj is a vector of regression parameter estimates associated with alternative j.
Following equation above, we can adapt the MNL model fitting to this study as follow:

$$P(CHOICE \; ij = j) = \frac{Exp(\beta jxi)}{\sum_{j=}^{j} 1 \; Exp(\beta jxi)} \quad (8)$$

Where, i represents i^{th} farm household, and i =1, 2, 3… 122., j represents different marketing outlets, j=0 for sale to wholesalers, j=1 for sale to retailers and j=2 for sale to consumers. The P represents the probability of fishes marketing outlet j to be chosen by fishery household i; Choice = j means that fishes marketing outlet j is chosen by farm household i; Xi is independent variables.

It is a common practice in econometric specification of the MNL model to normalize equation (11) by one of the response categories such that βj = 0. In this regard, the MNL model can alternatively be specified as follow:
The market outlet choice of households is modeled by a multinomial logit model. The underlying assumption is that a household selects its outlet according to a latent utility function y* defined as:

$$Pij = \frac{exp(\beta jXij)}{(\sum_{j-1}^{j-1} exp(\beta jXij)} \quad (9)$$

The coefficients of explanatory variables on the omitted or base category are assumed to be zero. The probability that a base category be chosen can be calculated as follows:

$$Pij = \frac{1}{1+ (\sum_{j-1}^{j-1} exp(\beta jXij)} \quad (10)$$

The marginal effects of the attributes on probability of choice are determined by differentiating equation (11):

$$\delta J = \frac{\partial PJ}{\partial Xi} = \frac{P}{J} = PJ \, [\, \beta j - \sum^{j} 0 \, (PJ)], \; for \; j \; 1,2 \ldots J \quad (11)$$

Where,
Pj is the probability that fisher men choose market outlet j
βj is a vector of regression parameter estimates associated with alternative *j*.

In the case of this study, fisher men have three market outlets to sell most of their Fish produce, *J* = 3, and the alternatives *j* = 1, 2, 3, represent sale outlets to wholesalers, to

retailers and to consumers respectively. The dependent variables (the marketing outlet (CHOICE) chosen) in the analysis are measured by the probability of selling fish to either of these markets. According to the survey result, three main different marketing outlets were identified. These include sales to wholesalers (0=Wholesaler); sales to Retailers (1= Retailers) and sales to Consumers (2= Consumers).

The model predicts the relative probability that a producer would choose one of the three categories based on the nature of the explanatory variables. For this analysis, the market outlet Wholesaler was used as comparison base because this outlet was chosen by the majority of fish selling fisher men in trading their fish. Econometric analysis of the data was done with Stata 12 software.

Result

Socio-economic characteristic of fisheries stakeholders in Fincha Amarti Nashe reservoir. The study examined the socio – economic characteristics of the respondents such as age, sex, marital status, educational status, livelihood activities, year of experience, and trend of fish production, family size and benefits derived from association. Demographic and socioeconomic characteristics of the sample respondents are presented in Tables 2 and 3. The total sample size of farm respondents handled during the survey was 122. Of the total sample respondents, 75.25 % were male-headed households and only 10.75 % were female-headed in the three selected kebeles of the district of whom 86 % were married and 14 % not married. Religion distribution of the district in the study area indicated that 91 % of respondents were protestant, orthodox 10 %, wakefata 18 % and Muslim 3 %. Religion influences tradition for fish in some communities.

Average household heads age was 38.2 years in Horro district, while 32.7 % of the respondents were illiterate. The average family size sampled respondents was 2.16 persons. From the total respondents of 122 fishermen, total production was 7439 kg consisting of 5584 kg tilapia and 1190 kg common carp with average of 45.7 kg tilapia and 9.7 kg common carp per household. The respondents depend on different means for income generation, 98.5 % fishing, 79.2 % livestock rearing and 53.4 % were also engaged in other income sources.

Value chain map of fisher men around the reservoir. According to McCormick and Schmitz (2002), value chain mapping enables to visualize the flow of the product from conception to end consumer through various actors. It also helps to identify the different actors involved in the value chain, and to understand their roles and linkages. The current map of fish value chain in Horro district is depicted in Figure 1.

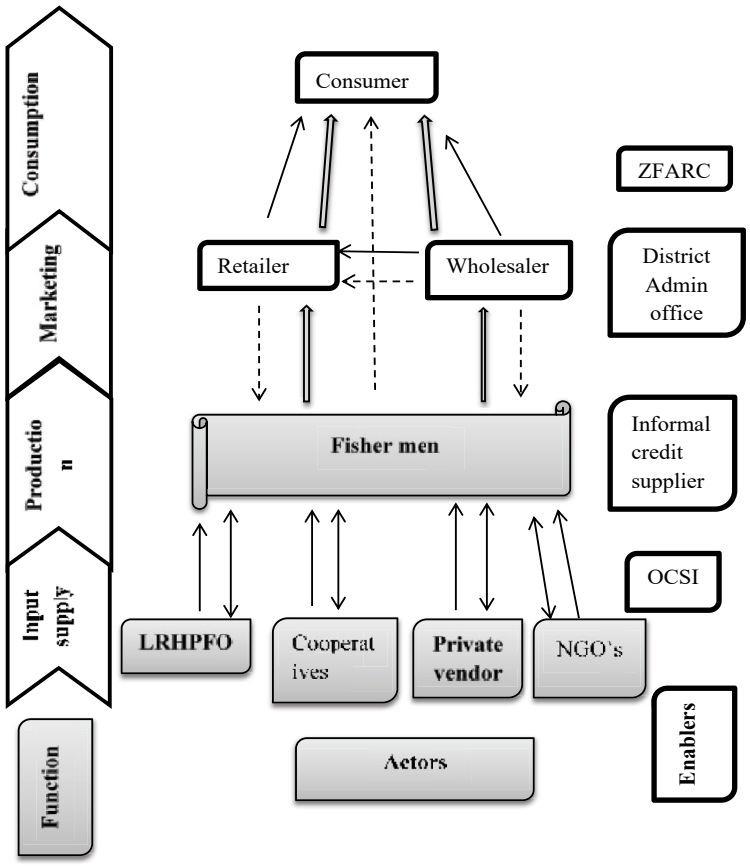

Figure 1. Value chain map of fish

Source: Own sketch from survey result, 2015

Represents physical flow of inputs and products

Represents two-way flow of information and technologies

Represents one-way flow of information

Represents the flow of much of products

The value chain map highlighted the involvement of diverse actors who were participating directly or indirectly in the value chain. According to KIT *et al.* (2006), the direct actors are those involved in commercial activities in the chain (input suppliers, producers, traders, consumers) and indirect actors are those that provide financial or non-financial support services, such as credit agencies, business service providers, government, NGOs, cooperatives, researchers and extension agents.

The primary actors in fish value chain in Horro district were the fisher men, fish input suppliers, traders and consumers. Each of these actors adds value in the process of changing

product type. Some functions or roles are performed by more than one actor, and some actors perform more than one role.

Input suppliers. At this stage of the value chain, there were many actors who were involved directly or indirectly in agricultural input supply in the study area. However, NGOs, primary cooperatives/ union and private input suppliers were the main source of input supply. Fish for All (FFA), and Ethiopia local NGOs also participated in providing fish farming inputs in Horro district. The actors provided agricultural inputs like fishing boats, fishing gears (nets), and refrigerators which are essential inputs at the production stage. Private vendors also supply some are fishing materials.

Producers. Fisher men were the major actors who perform most of this value chain function right from reservoir inputs preparing of their fishing activities or procurement of the inputs from other sources to facilitate the fishing activities and marketing. The major value chain functions that fishermen performed were harvesting, cleaning, washing, scaling, filleting, packing and post-harvest handling of the fish caught.

In the selected three kebeles of Horro district, 33% of the sample fisher men got inputs for fishing and post-harvest loss protection or management inputs from NGOs while other fishermen (65.9 %) rented from traders. The rented items included refrigerators, gillnets, long line /hooks, and fishing boats/wooden.

Wholesalers. Wholesalers were mainly involved in buying fish from the fishermen directly in larger volumes than any other actors and supplying them to retailers and consumers. They possessed refrigerated vehicles and transported the fish to central market in Addis Ababa. Survey result indicates that wholesale markets were the main assembly centres for fish in their respective surrounding areas. They had better storage, transport and communication access than other traders and were located in Addis Ababa, Fincha and Guduru.

Retailers. Retailer involvement in the chain included buying of fishes, transport to retail shops, grading, displaying and selling to consumers. Retailers were the key actors in fish value chain. They are the last link between producers and consumers. They mostly bought from wholesalers and sold to urban consumers.

Fish consumers. Consumers were those purchasing the products for consumption. Two types of fish consumers were identified: households and restaurants. Average income of 30 consumer respondents was 29,712 birr per annum. The private consumers were employees, urban and rural residents who purchased and consumed fish with an average of 1.8 % of their income per annum and purchased fish by 7.6 % of their incomes per month in Fincha town of Abay chomen district and Shambu town of Horro district, respectively. Private consumers purchased fish directly from producers, retailers and wholesalers though most of the consumers purchased from retailers. Fishermen made an important segment of the rural consumers since they consumed part of their products. The survey results also showed

that 6773 kg of fish was harvested. From this 5584 kg Tilapia and 1190 kg Common carp were sold in 2014/15. Consumers preferred a well sanitized, washed and well fileted fresh fish. In general consumers had their own quality criteria for purchasing fish and those criteria including preference of the fish type and its quality on fileting.

Supporting actors. There were actors who provided supportive services including training and extension, information, financial and research services. According to Martin *et al.* (2007), access to information or knowledge, technology and finance determines the state of success of value chain actors. NGOs, OoARD livestock division, primary cooperatives, and micro finance banks were the main supporting actors who played a central role in the provision of such services.

Training and Extension Services. NGOs and OoARD were the main sources of fish harvesting training in Horro district. The survey result revealed that 42.6 % of the respondents got training from Fish For All local NGO and Government Livestock resource and health protection offices while 57.3 % of sample respondents had no training. Additionally 42.6 % fishermen who accessed the training were trained on fish processing, fish stock management, fish marketing, fish harvesting techniques and fish record keeping.

Financial services. In the study area, cooperatives support supervision and cooperation. Fishermen got fishing equipment from traders as rent. In addition Oromia Credit and Saving Institution (OCSI) supported them in providing saving services. The survey result showed that 26.2 % of the sample respondents from Horro district had access to credit but were not taking credit from the Bank of Credit and Saving Banks nearby. Most of the respondents did not participate in credit market beacause of processing bureaucracy and distance to get credit service. Sources of credit for traders were also the same as for producers.

Source of credit for fishermen were the local micro finance called Wasasa microfinance bank and Oromia credit and save Share Company. In addition 41 fishermen of Didibe kistana kebele obtained fishing equipment from a local NGO called Fish For All as gift for their support. They also got credit from OCSI.

Marketing channels and performance analysis. A marketing channel is a business structure of interdependent organizations that reach from the point of product origin to the consumer with the purpose of moving products to their final consumption destination (Kotler and Armstrong, 2003). The analysis of marketing channels is intended to provide a systematic knowledge of the flow of the goods and services from their origin (producer) to the final destination (consumer). Since the channels to different fish species were different the analysis was done on common carp and tilapia the solitary fish species in the available reservoirs in the study area.

Tilapia marketing channel. Four main alternative channels were identified for tilapia marketing. It was estimated that 5584 kg of tilapia were marketed in Addis Ababa and Shambu markets in 2014/15. The main marketing channels identified from the point of

production until the product reached the final consumer through different intermediaries are depicted in Figure 2 and include wholesalers, retailers and consumers with an estimated percentage share of 51.6 %, 17.2 % and 31.1 %, respectively.

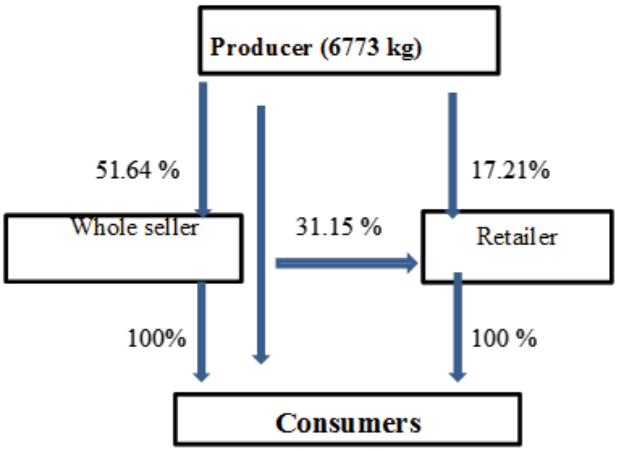

Figure 2. Tilapia market channel

Common carp marketing channel. Two main alternative channels were identified for common carp marketing. It was estimated that 1190 kg of common carp were marketed at Shambu markets in 2014/15. The main marketing channels identified from the point of production until the product reached the final consumer through different intermediaries are depicted in Figure 3.

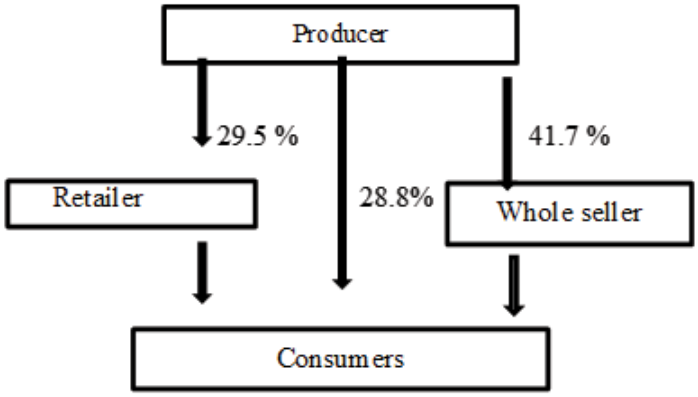

Figure 3. Common carp market channel

Performance of fish market. The performance of fish market was evaluated by considering associated costs, returns and marketing margins. The methods employed for analysis of performance were marketing margin. The analysis of marketing channels was intended to provide a systematic knowledge of the flow of goods and services from its origin of production to final destination (ultimate consumers). The estimated volume of production

of both fish tilapia and common carp was about 7439 kg.

Marketing margin can be used to measure the share of the final selling price that is captured by a particular agent in the value chain. The relative size of various market participants' gross margins can indicate where in the marketing chain value loss or profits are made. In order to calculate the marketing margin of an agent, the average price of fish for that particular agent was considered. For instance, the buying price of consumers was obtained by taking the average purchasing price of consumers. In order to measure the market share of each agent, the marketing channel where all agents participated was selected. Marketing margins, associated costs and benefit share of value chain actors and marketing margins through different main channels is presented below.

The arrangement of marketing cost for tilapia revealed that perishability loss was the highest cost for each marketing agents. This is due to the perishable nature of fish. The other significant cost was packing material cost. Profitability of tilapia for 2007 E.C production year in the study area was low. The average market price of tilapia was 26.68 Birr at landing site and this generated profit margin of ETB 24.64 /kg. Regarding the cost items, packing had the highest share (29.90 %) followed by loss cost (22.29 %).

Whole sellers obtained profit of 42.4 birr per kg of fish, which was a good profit compared with that of fish retailers. Marketing labor cost incurred the highest cost of 1.09 % for keeping quality of the fish and perishability followed by cost incurred due to post-harvest loss (0.90 %).

In terms of profitability of tilapia fish, it was profitable for retailers. A retailer obtained a profit of ETB 10.44 per kg of fish at retail level which was however lower when compared to whole sellers who obtained 42.4 birr per kg of fish. The main cost for retailers was rent for retail shop (7.89 %) followed by transportation cost (0.67%).

Marketing margins. Marketing margins are the difference between prices at two market levels. The term market margin is most commonly used to refer to the difference between producer prices of an equivalent quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example, between producer and wholesale, or wholesale and retail prices (Spencer, 1971). Therefore, the study considered the average sales prices for different participants in fish value channel (fisher men, whole seller and retailers).

Overall, 84.21 % of total gross marketing margin was added to fish price when it reached consumer at the Finfine, Shambu and Fincha marketing centers by retailers and whole sellers. Out of the total gross marketing margin 43.32 % was gross margin for whole sellers, and 13.32% for retailers.

Common carp market performance. The analysis of marketing cost showed that perishability was the main cost for producers. This is due to the perishable nature of the

fish. Thus, the cost of loss was the highest amount followed by packing material cost. The cost for perishability of the fish was the highest costs in the marketing chain.

The profitability of common carp for 2007 E.C production year in the study area was low. The fishermen with 9.75 kg average annual productions of common carp fish received average market price of 10 Birr at landing site which generated profit margin of ETB 7.06 /kg. With regarding to the cost items, loss cost (32.43 %) followed by packing cost (23.60 %) were the main costs incurred. In terms of profitability of common carp for whole sellers, the whole sellers achieved a profit 9.18 birr per kg of common carp fish, being less profit when compared with that of fish retailers. The main costs were marketing cost (2.34 %) followed by transportation cost (1.87 %).

The cost and profitability analysis of common carp retailers showed that it was profitable. A retailer obtained a profit of ETB 12.13 per kg at retail level which was higher when compared to whole sellers (9.18 birr). Rent for retail shop had the highest (18.10 %) followed by transportation cost (1.55%).

Marketing margins analysis indicated that 32.06 % of total gross marketing margin was added to fish price when it reached consumer at the Finfine, Shambu and Fincha marketing centers by retailers and whole sellers. Out of the total gross marketing margin 10 % was gross margin of whole sellers, and 15 % for retailers.

The main challenges for fisheries and stakeholders were lack of market, low prices of product, lack of transport, lack of market information, distance to the market and perishability. These were the factors that hindered the production of fish harvests in the study area.The majority of the sample fishermen indicated lack of fishing materials like refrigerator, fishing boat, fishing gear and transporting material to protect post-harvest loss in harvesting fish as the major problems for the fishermen.

Discussion

Of the 122-interviewed fish producing households, 75.25 % were male-headed households and only 10.75 % were female-headed households in the selected three kebeles of Horro district. The average ages of the sampled respondents were 38.2. The average family size was 2.16. Fish value chain analysis of the study area identified the main value chain actors as being fish producing fishermen, wholesalers, retailers and consumers. Fishermen, LRHPO, and Fish For All Ethiopia were the main actors involved in the production and input supply activities. Wholesalers purchased fish from fishermen and sold to consumers. In addition the consumer also bought directly from the fishermen. Retailers purchased fish from producers and sold to consumers. There were also governmental and non governmental supportive actors who supported fish value chain directly or indirectly. Value chain supporters or enablers provide facilitation tasks like creating awareness, facilitating joint strategy building and action and, the coordination of support. The main supporters of

the fish value chain in the study areas were the office of agricultural and rural development (LRHPO), Office of trade and industry (OoTI), District administrations, Oromia saving and credit institution, Wasasa Microfinance banks.

Constraints impeding the development of fish value chain were found at all the stages of the chain. At the fishing, fishermen were faced with lack of modern input supply and on marketing side limited access to market, low price of product, lack of market information, lack of transport, low quality of product and lack of policy framework to control the illegal traders.

Fish harvested in the area passed through several intermediaries, i.e., wholesalers and retailers, with little value being added before reaching the end-users. The intermediate buyers obtained the fish from the fisher men at a lower price and they sold to the consumers at a higher price. The average price that sample respondents received for a kilogram of tilapia was reported to be 30 Br/kg and 10 Br/kg for common carp whereas the price that consumers paid was 70-90 Br/kg. The study findings also indicated the absence of organized institution and system group marketing, and lack of processing activities which put traders in a better position to dominate in pricing. The study indicates that traders' operating expense for tilapia and common carp were 62.51% and 28.89 % of total value chain expense but their profit margin was 77.37 % and 16.09 %, respectively, of the total profit margin. Further, the result of the multiple regression model indicates that marketable supply of fish is significantly affected by gender, access to market, distance to nearest market, and size of gear. Therefore, these variables require special attention if marketable supply is to be increased.

Fishermen in the study areas supply their produce through different market outlets. Fisher men were classified into three categories according to their outlet choice decision: those who have supplied most of their fish to wholesalers (51.64%), 17.21 % supply to retailers and 31.15 % of fishermen supply to consumers. The multinomial logit model was run to identify factors determining fishermen market outlet choice decision. The model results indicated that the probability to choose the retailer outlet was significantly affected by age of the fishermen, educational level of the fishermen, volume of fish sold, and distance to the nearest market determined the selection of retailers as market options. In addition to this sex of the fishermen, harvesting time, type of fish sold and size of gear and distance to the market affect that of retailers. Access to market, harvesting time, type of fish sold and size of gear determinined choice of consumer outlet. In addition to this, distance to the market considered influenced choice of consumer outlet access to extension service, volume, access to market information, size of gear, credit access and type of fish sold compared to wholesale outlet. Similarly, the probability of choosing consumer marketing outlet was affected by age, volume of fish sold, access to extension services and size of gear compared to wholesale outlet. Therefore, these variables require special attention if fisher men's margin from fishing is to be increased.

Recommendations

It is recommended that marketing organizations should solve problems such as bad fish handling through providing transparency in pricing and assistance to fisherman to improve fish handling and processing. In the same way, the marketing organization need to offer facilities to cool and preserve fish better than it was being done. It is therefore important that the marketing organizations address the problems that have been identified in this study including the following issues:

Training of local fisheries staff and assembly of marketing team in aspects such as basic hygiene, fish handling and preservation, processing and packaging innovations, including new equipment and technology, and improved preservation and distribution skills. It would be helpful to introduce appropriate technologies for reducing fish spoilage (especially for small-scale fisheries). Training activities need not only be theoretical sessions but also include practicals, and exchange visits between communities in the business area and other parts of the activities in the country where levels of structures and efficiency of the sector-fishing are higher.

There is need to build a logistic unit equipped to treat freshly caught fish at various marketing points of the reservoir. This would includes places selling fresh fish to supply markets and to the central market. Importantly it should be located at the fishing port and include the following elements: A space for receiving fish; a treatment room for cleaning, sorting and packing fish; a cold room and also freezers to store fish; and establish a system of drainage cleaning. Quarantine conditions need to be established to promote hygienic and eliminate all forms of contamination.

Also, there is need to aquire refrigerated trucks for the transportation of fish to the nearest markets and to central market: It is important to establish a canter isothermal cooling in order to avoid deterioration of the fish becsuse of distance and the heat during transport products to supermarkets and restaurant chains.

Women's empowerment and gender equity: A priority action is to promote the equal participation of men and women in decision-making, in associations and at the completion of activities foreseen in the cooperative including awareness, preservation and marketing of fish. Training and workshops on gender equity need to be organized with associations to develop an organizational policy in gender equity that promotes greater participation and involvement of women in community development and organized spaces.

The other need is to establish credit access for the fisheries sector in order to allow fishermen and distributors to acquire the means of production and marketing more efficiently and sustainably, allowing them to increase their range and gain more money, and also allowing small merchants to increase their capital.

The existing extension services need to be improved so as to provide adequate support to stakeholders in product development, fish handling and preservation of fish, up-grading of existing fishing boats, demonstration of new fishing techniques, exploration of new entrepreneurial skills in fishing, processing, marketing, business management skills, project facilitation (one stop shop) and mentoring. Local leadership and community based management capabilities should be strengthened amongst the local fisher communities to enable voluntary compliance to the fisheries good practices.

A number of policy implications arise from the significant variables from the analysis of the present study. To start with, promoting diffusion of modern input technologies is vital for increasing the production effectiveness of fishing. Given that farmers are small-scale and unorganized in the study area, this needs strong government intervention. Not only does it require providing input facilities, but also promoting the diffusion of best practices to ensure access. Effort should also be made to strengthen farmers' cooperatives and encourage collective action by farmers so as to lower transaction costs for accessing inputs.

Importantly, retailer outlet choice is negatively and significantly affected by sex, type of fish sold, and size of gear relative to wholesale outlet. Therefore, these factors need to be encouraged by developing farmers' awareness to improve quality of the fish post-harvest loss, creating awareness on preferred fish type and providing training on using size of the gear to protect over exploitation of fish.

Finally, consumer outlet choice is significantly and positively affected by sex, access to transport, access to extension service, access to market information and access to credit. Therefore, empowering women in fish value chain, and enhancing their skills for keeping quality, facilitating transportation access, improving access to extension service for the fishermen is essential for promoting fish market efficiency. In addition, government should give special attention to the fishery sector since fish is highly perishable yet critical for nutrition and income.

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