


Market Linkages and Distribution Channels of Cultured, Captured and Imported Fish in Kenya

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Abstract

This study examined the market linkages and distribution channels of cultured, captured and imported fish in Kenya. A total of 113 fish traders' questionnaires and 10 key informant interviews were administered. Secondary data from published and unpublished records were used to complement primary data. Fish traders were literate enough to express themselves and were well equipped to assess market trends and channel. Fish trade was predominantly in the hands of women (66%). Consumers and middlemen (agents) were able to buy fish directly from producers. There was no significant association ($p > 0.05$) between age, gender and the level of education with regards to the main business. There was correlation between gender and the main business function ($\chi^2 = 3.921$; $df = 2$; $p = 0.141$); the level of education and main business function ($\chi^2 = 12.842$; $df = 10$; $p = 0.233$) and the age distribution against the main business function ($\chi^2 = 11.044$; $df = 10$; $p = 0.354$). Recommendations include improvement of transport networks, promoting a political free environment for trade, regulating trade of imported Chinese fish, promoting a comprehensive fish marketing system including fish auction through strengthening linkages along the market value chain and traders should form strong cooperative societies to ease on the challenge of credit issuance from finance institutions.

Introduction

Fisheries and aquaculture supply 17% of the global animal protein in people's diets and support the livelihoods of some 12% of the world's population (FAO, 2017). Fish provide a rich source of high-quality proteins containing all essential amino acids, minerals and micronutrients such as iron, zinc, omega-3 fatty acids and vitamins, often in highly bioavailable forms (Golden et al. 2016). Fish utilized for human consumption is obtained from a continuum of sources ranging from capture fisheries—the harvest of naturally re-producing fish populations; to aquaculture—breeding and farming under controlled conditions. These two production systems have important complimentary roles in meeting rising demand for fish and other products and enhancing

the incomes and nutrition among smallholder producers, fishers and consumers. World capture fisheries production has plateaued since the 1990s and is expected to remain that way because of depleted resources and regulations constraints (Cai and Leung, 2017). On the other hand, aquaculture has boomed, growing at an average rate of 8.2% per annum over the past three decades and is now providing more than half of the fish destined for direct human consumption (FAO, 2017).

Inter-regional flows in Africa continue to be significant, although often this trade is not adequately reflected in official statistics (FAO, 2017). Currently, Africa is a net importer of fish and fish products that supplies the rising populations, many of which are becoming increasingly urbanized. Improved logistics and

market distribution systems, coupled with expanding aquaculture production and technological innovations and globalization, have enabled increasing regional fish trade (Anderson et al. 2017). In addition, improved control in the harvesting process in capture fisheries and throughout the production process in aquaculture has enabled producers to understand the needs of consumers to further innovate the market and supply chains.

In Kenya, Lake Victoria is the largest fishery, contributing to over 82.5% of the total annual national fish production (KNBS, 2017). However, unsustainable anthropogenic activities have led to the reduction of the natural fish stocks and catches. Demand for fish continues to rise owing to the rapidly growing population, increase in real incomes and ongoing changes in dietary trends (Golden et al. 2017). Given these circumstances, aquaculture is the most suitable alternative, complimenting capture fisheries to gradually satisfy the growing consumer demand which is expected to increase substantially in the future (Obiero et al. 2014).

Future fish production must be able to supply quality product to the market in a timely manner, whether locally, regionally or internationally. Marketing and distribution channels, on the other hand, are important characteristics in the process of getting produce from the source to consumers. In marketing and distribution of fish, fish passes through various market players and trade point before they reach the final consumer. The market players who encompass, but are not limited to wholesalers and retailers play a significant responsibility at all stages of the marketing and distribution system to ensure consumers' demands are met. An efficient market is certain to stimulate economic development goals alongside increasing real incomes and redistributing wealth. Advancement in the distribution channels widens the market for producers and makes production volumes to rise without having an immediate effect on the local process.

Kenya has experienced an extremely high population growth over the last fifty years, experiencing an almost five-fold increase in its population (Dietz et al. 2014). Currently, over 10 million people in Kenya suffer from chronic food insecurity and poor nutrition, and between two and four million people require emergency food assistance at any given time. The country is currently faced with low levels of food sufficiency. Among the food producing sectors in Kenya, only the fishery sector has grown faster than the country's population mainly from freshwater capture fisheries, but the booming growth in the 1980s–1990s has not been sustained, so the current availability per capita has been declining since 2000 (Dietz et al. 2014). With the rapidly growing population in rural and urban areas and increasing domestic consumption of high-value protein foods derived from fish, the fish supply deficit is bound to increase unless the production from aquaculture or imports are equally increased to offset

the deficit. As a strategy for bridging the supply-demand gap, aquaculture has been prioritized in policy documents as a source of sustainable fish supply in the country (Obiero et al. 2014). However, Kenya has not yet fully utilized the massive potential for fish farming to produce critical volumes of fish to fill the growing gaps in national fish demand. This shortfall, therefore, presents a host of new development opportunities for the small- and medium-scale farmers in the suitable areas to invest in the aquaculture production to significantly contribute to fish consumption, reducing rural poverty and unemployment. Still, there is little up-to-date information regarding domestic capture, cultured and imported fish trade, their markets, market structure and distribution channels. Aquaculture producers can only take advantage of existing and emerging markets when they know how they operate and seek ways to profitably meet consumer demands. Since fish is highly perishable, maintaining quality and safety standards are both particularly significant as it requires specific handling and preservation techniques. The overall objective of this study was therefore to analyze the market linkages and distribution channels of cultured, captured and imported fish in Kenya.

Materials and Methods

Study Area

The market survey was conducted in Kenya's three major counties namely Nairobi, Kisumu and Mombasa. The study areas were purposively selected as they are among those that possess the vibrant fish market and fit the requirement of being close direct entry points of imported fish in Kenya. A total of 12 (City market, Gikomba, Majengo, Kongoweya, Kisauni, Likoni, Old town, Municipal, Jubilee, Fresh Fish market, Ahero and Dunga) markets were visited in all the three counties. This study focused on market segments (fish species, source of fish, size, quality and pricing), type of traders and consumers, production to consumer costs, ideal market(s), market channel, mode of transport, customer preferences and challenges encountered in the trade of fish. The idea was to explore options for market linkages and distribution channels related to fish markets in Nairobi, Kisumu and Mombasa counties to develop optimal fish product-market combination. The study covered understanding the consumer preferences (volumes, sizes, prices), demand for fish and fish products, comparing current market channels and exploring other variables involved in different stages of the chain e.g. processing, storage, transport and distribution.

Research Design

The study adopted a quantitative approach which involved the application of a survey method as elaborated by Mugenda & Mugenda (2003). The survey

was in the form of cross-section research design with questions being asked once in the entire period of the research. This made it possible to collect data in short duration of time. The survey offered the most effective means of social description and allowed the inclusion of wide-ranging topics in the questions.

Sampling Framework

A multistage purposive sampling procedure was used in the selection of the survey population with the main sampling units being fish markets, importers and fisheries officers to complete the overall picture of the fish market value chain. Subsequently, random sampling was employed in the identified markets to select fish traders to participate in the survey as respondents. Random sampling provided an efficient system of capturing the heterogeneity that existed in the target population. Key informant interviews were also applied to obtain insights from opinion leaders in the fish market.

Data Collection Instruments

The study used personal face-to-face interviews where the interviewer asked respondents questions to elicit responses that address the research questions and control for non-verbal behaviour as elaborated by Nachmias and Nachmias (2004). A questionnaire was used as the main research instrument. A total of 113 traders' questionnaires and 10 key informant interviews were duly filed during the survey. Secondary data from published and unpublished records were used to complement primary data.

Data Analysis

Data collected from the field was entered and analyzed statistically using the Statistical Package for the Social Sciences (SPSS Inc. version 18.0). Descriptive analysis was done by use of means, standard deviation, percentages and frequency distribution of responses. Inferential statistics were done using the Chi-square test of goodness of fit. All data analyzed were considered significant at 95% significance level.

Results

The Socio-Economic Characteristics of Fish Traders

The socio-economic characteristics of fish traders which include age, gender, level of education and the main business function are presented in Table 1. A total of 113 traders were interviewed in the survey, 47 males and 66 females. 29% of the respondents were of the age 46-55, 27% were of the age 26-35, 25% were of the age 36-45, 8% were of the ages 18-25, 7 % were of the age 56-65 and 4% were of above 65 years representing just 5 traders. The study revealed that traders had a wide range of experience in the enterprise. The traders' years of experience ranged from 1 to 52 years. Data showed that majority of the fish traders had some formal education: 47% of the traders had secondary education, 35% had primary education, 9% attained Certificate/Diploma, 2% had Bachelor's degrees and 1% had postgraduate degrees. Only 6% of the respondents did not have any formal education. This implies that fish traders' literacy level in Nairobi, Kisumu and Mombasa counties is high.

Table 1. Socioeconomic characteristics of fish traders in Nairobi, Mombasa and Kisumu counties

Socio-economic variables		N	Proportion (%)
Gender	♀	47	42
	♂	66	58
	N	113	100
Age	18-25	9	8
	26-35	30	27
	36-45	28	25
	46-55	33	29
	56-65	8	7
	>65	5	4
Education	N/A	7	6
	Primary	40	35
	Secondary	53	47
	Diploma	10	9
	Degree	2	2
	Masters	1	1
Business function	Processor	1	1
	Trader / Retailer	76	67
	Wholesaler	36	32
	Stall	52	46
Establishment type	Store	22	19
	Table	37	33
	Hotel/ Butchery	2	2

The study revealed that 90% of the fish traders had dependents that ranged between 1 to 10 individuals per household. The implication of this is that the lower the number of dependents on a fish trader the greater the performance of the market since less time is spent on family matters and more time is channelled towards marketing.

Rating the Main Business Function

Majority (67%) of the fish traders were retailers. Age, gender, and level of education did not influence the main business function in all the three counties ($p > 0.05$). More specifically, there was no statistically significant association between gender and the main business function ($\chi^2 = 3.921$; $df = 2$; $p = 0.141$); the level of education and main business function ($\chi^2 = 12.842$; $df = 10$; $p = 0.233$) and the age distribution against the main business function ($\chi^2 = 11.044$; $df = 10$; $p = 0.354$).

Reason for Joining Fish Trade

Source of income was ranked as the main reason for joining the trade of fish at 58% followed by referrals at 11%. Moreover, 9% engaged in fish trade due to the fact that they inherited the enterprise, 7% wanted to be self-employed, 7% joined fish trade as they sought it was a profitable enterprise. Engaging in the trade of fish as a hobby and lack of jobs respectively was 4%. Finally, 1% engaged in the enterprise due to the fact that it was a family business as shown in (Figure 1).

Source of Capital

Traders acquired capital from various sources including personal savings (62%), family/Relative (19%), loan (16%) and grants (3%) (Figure 2).

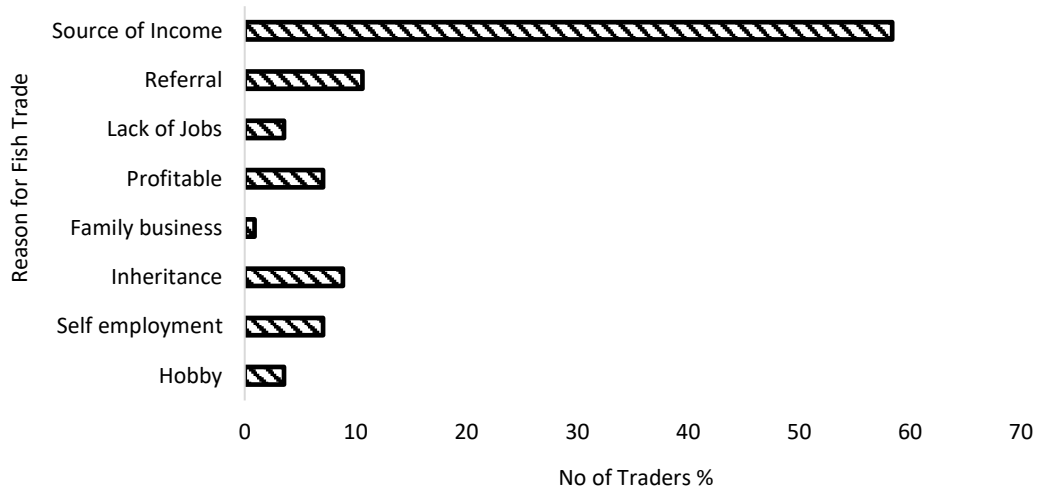


Figure 1. Reasons for joining fish trade.

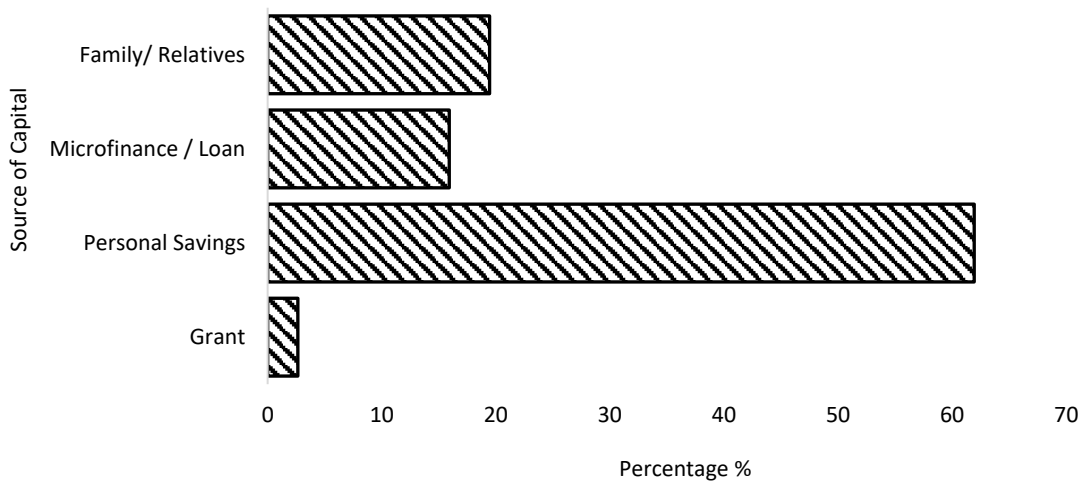


Figure 2. Source of capital.

Fish Species Traded in Markets

Tilapia, Nile perch, catfish and Omena are the most traded freshwater fish species with Tilapia and Nile perch topping the list (Figure 3). Trout was not traded in either Kisumu, Mombasa or Nairobi. Marine species were observed to be dominant and highly traded in Mombasa county with Mackerel as the most traded species. Other species traded in Kisumu, Mombasa and Nairobi included Lungfish, *Synodontis* spp., Haplochromines spp, squids, and African barbs species.

Prices of Fish

Prices of fish varied across the three major cities. In Kisumu, the lowest fish price was 120 Kenya shillings [KSH] per kg, in Mombasa it was 130 Kenya shillings [KSH] per kg and in Nairobi, it was 160 Kenya shillings [KSH] per kg. The highest fish price in Kisumu and Nairobi

was 500 Kenya shillings [KSH] per kg respectively while in Mombasa it was 350 Kenya shillings [KSH] per kg depending on the fish species and the form bought (Figure 4).

Price Reduction

During the study, it was determined that between May-November 2017 there was a price reduction of the 10-kilogram box of imported whole tilapia both in Kisumu and Nairobi counties (Table 2). Indeed, the reduction in the price was a motivation to purchase and that explains the influx of the fish in the local markets in the country.

Value Addition Methods

Fish traders add value to fish by deep frying before selling to their customers. Little loss was incurred in all

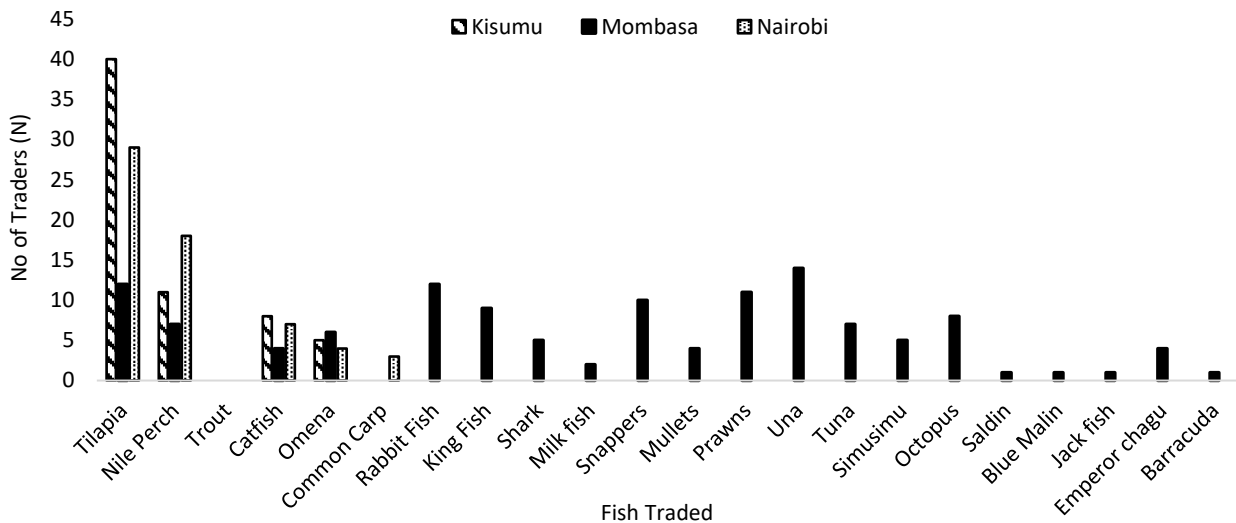


Figure 3. Fish species traded.

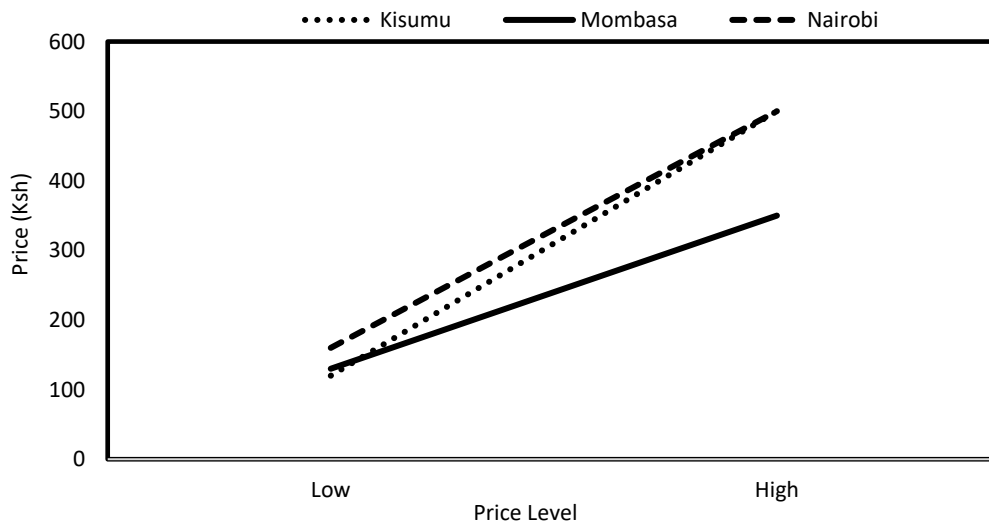


Figure 4. The price level of fish in the three counties.

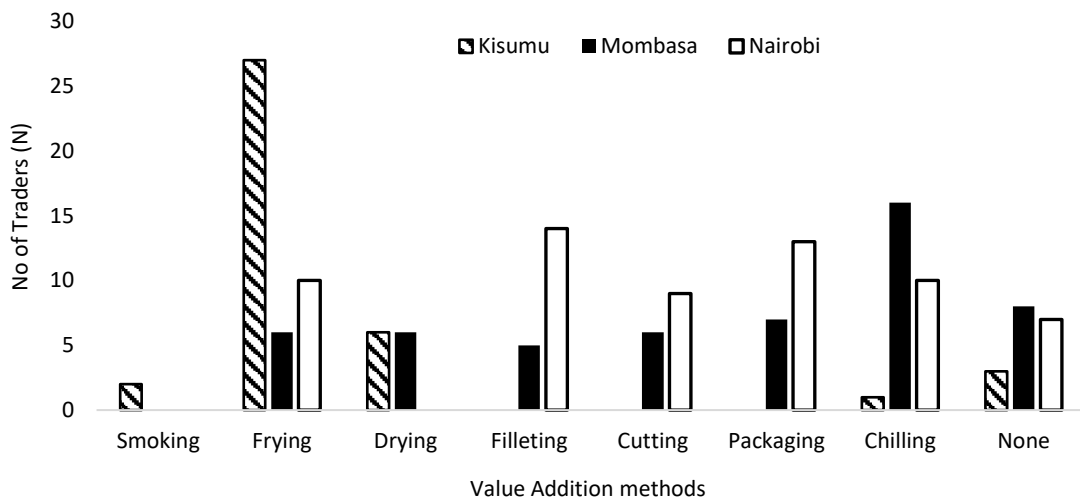
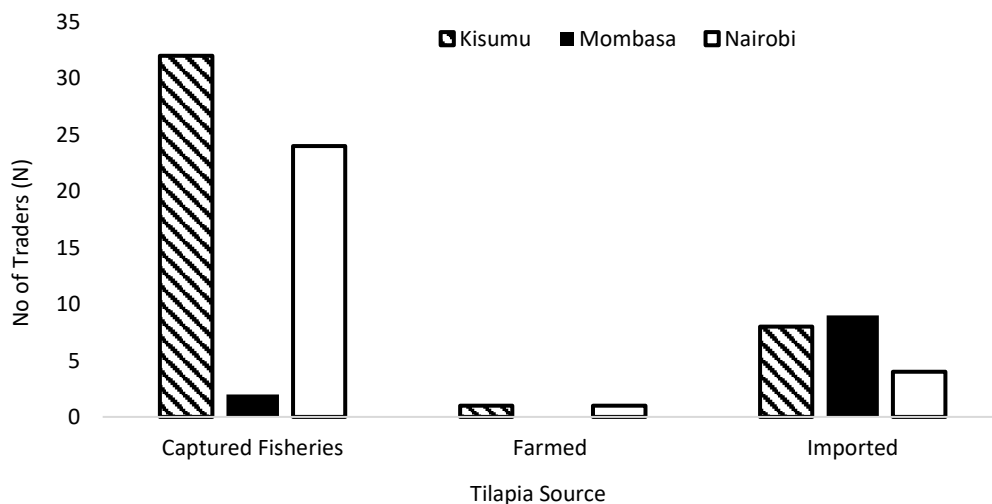
Table 2. Imported China Tilapia Whole Prices in Kisumu and Nairobi showing changes in prices ranges from May 2017 to November 2017 [KSH]

Grade per 10 kg Box	Nairobi City		Kisumu City	
	Price in May [KSH]	Price in November effective on 23/11/2017 [KSH]	Price in May [KSH]	Price in November effective on 23/11/2017 [KSH]
100/200	1,400	1,250	1,450	1,300
200/300	1,700	1,550	1,725	1,600
300/400	1,900	1,650	1,875	1700
400/600	2,050	1,900	2,050	1950
600/800	2,250	2,000	2,250	2050
800/1000	2,400	2,200	2,400	2250
1000/UP	2,500	2,250	-	2300

the markets across the three cities because most of the fish were sold and any leftovers were deep-fried, frozen or sold at reduced prices to the neighbours. Small-scale retail traders ate what was left together with their families. Filleting was the dominant value addition method in Nairobi, frying was the main method in Kisumu while in Mombasa chilling was dominant (Figure 5).

Source of Tilapia

In Kisumu and Nairobi counties, traders sourced their tilapia mainly from captured fisheries, specifically from Lake Victoria. Mombasa mainly dealt in imported China fish and marine species. An insignificant number of traders across the markets traded in farmed fish. No trader in Mombasa City was identified to trade in

**Figure 5.** Value Addition Methods.**Figure 6.** Various sources of tilapia in the three counties.

farmed fish (Figure 6). The traders reported that some consumers were able to differentiate fish sourced from the lake and those sourced from culture systems. As a result, captured fish attracted better market prices compared to frozen imported and farmed fish.

Targeted Consumers

Households were the most targeted consumers of the fish and fish products in all the three cities. Other categories of targeted consumers included other traders, hotels, supermarkets and cold storage (Figure 7).

Consumer Preference

Price is very critical in any marketing system since it ascertains the success or failure of all marketing agents. The price of fish was determined as the main factor that influenced the consumer preference for fish. Indeed, the price of fish is a basis for motivation to sell in addition to determining the marketing channel (Figure 8). Similarly, distinct features of captured,

cultured and imported Nile Tilapia were identified during the study as depicted in (Table 3).

Mode of Transportation of the Frozen Chinese Fish to the Market

The study gathered that the traders made use of different modes of transportation of the frozen Chinese fish to markets. Some traders transported their fish by human carriage while some by road transport using motorcycles. Other traders, especially the ones who trade in captured fish preordered their consignments which were delivered by vehicles. Ultimately, a truck owned by the importing agents transported the fish to the various markets where wholesalers, retailers and consumers purchased directly.

Marketing Channel

Fish flows from various players in the market at different stages and forms thereby yielding various marketing channels. In the various markets visited

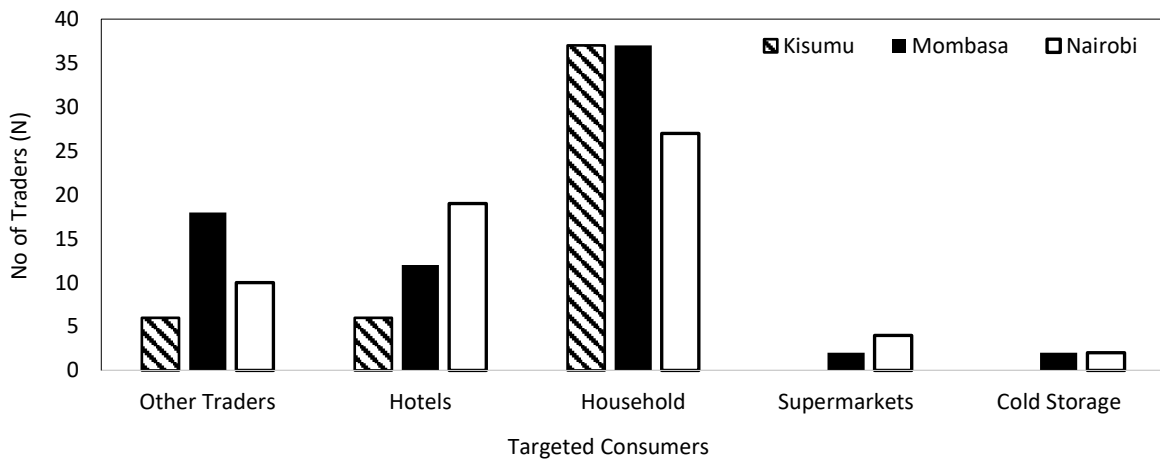


Figure 7. Targeted Consumers.

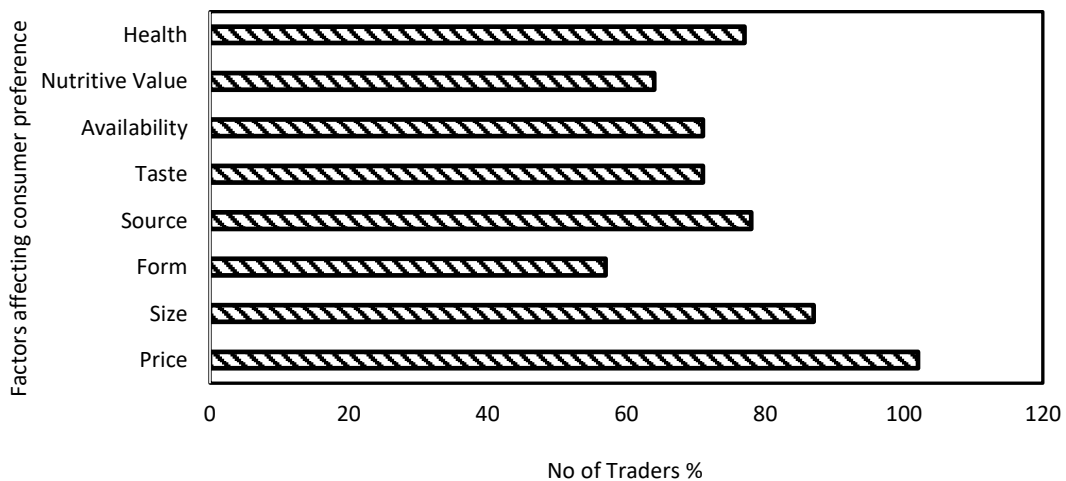


Figure 8. Consumer preference.

Table 3. Distinct features of captured, cultured and imported Nile Tilapia

Fish Origin	Odour	Colour	Texture	Size	Price	Shelf life	Preference	Flavour/ Taste	Availability
Wild caught fish e.g. Lake Victoria	A strong fishy smell that persists even after the fish is processed or cooked	Darker in hue	The flesh surface is rough and the skin is firm when pressed	Relative bigger in size, but comes in various sizes; more fleshy and weighty for similar sizes	More expensive	When properly handled, the fish takes relatively longer before spoilage	More preferred by buyers Preferred among traditional fish consumers	Sweeter/ Delicious	Dwindling in supply Unreliable supply
Imported Fish (Nile Tilapia)	None or minimal fishy smell Sometimes emits a bad odour	Whitish in colour	Light skin Disintegrates upon rubbing or cooking The slimy texture when rubbed	Graded sizes ranging from 100g to 1kg packed in 10kg boxes	Relatively cheap	More durable due to ice preservation	Convincing customer is a challenge	Less tasty	Easily available
Cultured Fish	Mild fishy odour	Reddish colour on fins and banding patterns on the caudal fin	Slightly firm and flaky	Size varies between 150g to 1 kg depending on consumer preference	Price is fair	When properly handled, the fish takes relatively longer before spoilage	Moderately preferred	Mild and sweet	Supply varies

during the study, consumer's needs and preferences dictated the organization of the market linkages and delivery ability to consumers. A marketing channel was determined by the use of the participants in the chain and the route that fish was transferred from producers to consumers. Traders in the various markets across Nairobi, Mombasa and Kisumu counties were sought with regards to the amount of fish sold. The findings showed that retailers were 67.3%, wholesalers 31.9% and processors were 0.9%. Captured, cultured and imported fish in Kenya was sold directly to consumers or through wholesalers and retailers. Some of the captured and cultured fish underwent processing and was sold to wholesalers and retailers and finally to consumers. In some cases, agents purchased fish from producers. Both wholesale traders and consumers were able to buy directly from the agents. Retailers bought from wholesalers and or agents and sold to consumers. While some fish was consumed locally in the domestic market, some was exported to the international market. Kenya imports china fish which was sold directly to consumer or through retailers and then to consumers as shown in Figure 9.

Challenges That the Fish Traders Encounter in The Study Area

The key challenges affecting the fish traders in the study areas were competition from the cheap imported frozen China fish which was ranked first. Political instability in the year 2017 that led to a reduction in

customer turnout and a reduction in sales was ranked second. Poor transport network for the wild fish catches was ranked third and inadequate access to credit due to insufficient income sources and the issues of collateral was ranked fourth. Power outage was ranked fifth.

Discussion

The importance of fish cannot be over emphasized because of its role as a rich protein source and income generation for rural households. Demand for fish is increasing daily. This is primarily because of increase in purchasing power, dietary changes towards healthier diets and preference for fish as low-cost protein (compared to meat). Overall, the fresh water fish market is operating at a competitive level and present opportunities for niche products. While the demand for fish is throughout the year, the supplies from aquaculture sources are fluctuating in nature. Supply pattern do not match with demand pattern. The market is distorted by irregular harvesting and thereby irregular bulk supply. This results in dependency on supply of imported frozen tilapia fish and bulk sale of imported fish in distant market at a lower price. In this scenario, most of the actors in the aquaculture value chain including farmers and suppliers do not benefit. There is huge unmet demand for local fresh fish, which is currently being met by imported frozen Tilapia from China. Imported fish (as a second preference to wild caught fish) gets sold at a lower price compared to local fresh Tilapia due to price lower margins. Cultured fish

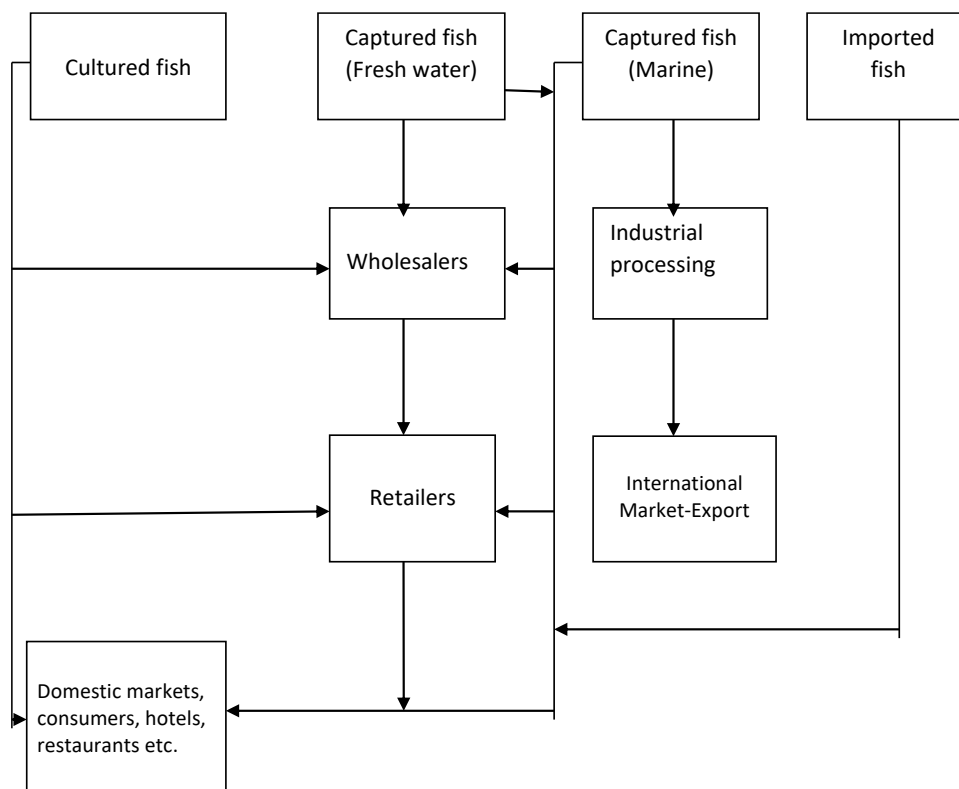


Figure 9. Market linkages and distribution channels of captured, cultured and imported fish in Kenya

traders need to separate themselves from the existing wild fish domestic market chain and establish a more efficient system that sells fish closer to the 'consumer' end of the market chain thereby generating higher 'farm-gate' prices. These traders also need to actively seek out and exploit higher value markets, both domestically and regionally.

Data indicated that majority of the fish traders had some formal education: 47% of the traders had secondary education, 35% had primary education, 9% attained certificate/Diploma, 2% had undergraduate level of education and 1% had postgraduate education. Only 6% of the respondents did not have any formal education. This implies that the literacy level of fish traders in the study areas was fairly high. This follows that the traders were literate enough to express themselves and were well equipped to assess market trends and channel. Lawal and Idega (2004) posits that the education level attained by marketers to a greater extent dictate the approach that the trader may utilize to address marketing challenges and to embrace new innovations with ease. This ameliorates the trader's profits as soon as the innovations are availed to the user.

Fish trade was predominantly in the hands of women (66%), most of who have a high literacy level. Ikiara (1999) posits that women have been described to dominate fish marketing in the Lake Victoria regions of Kenya and in various urban areas. Williams and Awoyemi (1998) observed that women in small-scale riverine fishing villages did various income generating activities to boost their household income. Income sources were acquired through sale of fishery products and social services in fish marketing and distribution.

Marketing and distribution of fish is a profitable business with the ability to put the traders above the poverty level if it is well managed and distributed. Most traders preferred to trade in captured fish because of its perceived sweetness, high-profit margins and high consumer preference. Frozen imported fish from China was ranked second on account of its cheapness and ease of accessibility and availability. Locally cultured fish was ranked third on account of its perceived "muddy taste", small size and lack of accessibility. Bolwig et al. (2010) opine that the structure of the value chain can vary in intricacies depending on the uniqueness of players and the particular activities they undertake to add value to fish and fishery products as they move from the producer. The present study revealed that the distribution channel in the area is decentralized. This means consumers, traders and agents could buy directly from the producers. Freedom of distribution to each participant with little involvement of agents in the distribution channel was enhanced thereby lowering exploitation. A lower number of dependents on a fish trader improved the performance of the market due to the fact that less time is spent on family matters and more time is channelled towards marketing.

A market study on the Kenyan aquaculture market by Farm Africa (2016) revealed that most of the fish traders were in their economic active years. This signifies the sustainability of the enterprise in future. Bello (2000) also asserts that age has a positive correlation with acceptance of innovations. Farm Africa (2016) highlights that the fish trade value chain in Kenya has well-established linkages with respect to the actors and works as a closed system and that trade in cultured fish is delimited due to lack of popularity with customers. With regards to fish species traded in the market, tilapia and Nile perch were regarded as the most traded in terms of value and popularity with targeted consumers (Farm Africa, 2016). Demand for tilapia still supersedes the supply and this offers an ideal opportunity for venturing into aquaculture and the trade of cultured fish as long as the risks and threats are mitigated.

Concerns about the taste of cultured fish are similar to findings from other researchers. A market study by Githukia et al. (2014) on consumer preferences of different fish species posits that consumers felt that cultured tilapia had a "mud taste". Literature on fish farming affirms that the perceived mud taste can be solved by purging harvested fish in clean water for 48 hours.

Ali et al. (2008) findings demonstrate that marketing experience is crucial in finding the traders' levels of profit. As the years of experience increases, traders comprehend the trends, marketing systems, prices and market conditions. Dongondaji and Baba (2010) substantiates these findings by positing that high literacy level could have positive effects on the adoption of agricultural technologies without difficulties.

Fish traders, marketers and distributors face several challenges including competition from cheap imported frozen fish, political instability in 2017 that led to a reduction in customer turnout and a reduction in sales, poor transport network for the wild fish catches that leads to delayed supplies and fish spoilage, inadequate access to credit due inadequate collateral and power outages. The present study proposes that to make fish trade, marketing and distribution a more profitable venture as well as offering a cheap and affordable source of proteins to consumers, there's need for an improvement of road networks, regulating the trade of imported Chinese fish, providing a stable supply of power and undertaking more awareness campaigns on the nutritional and health benefits of fish consumption. Improved road networks have great potentials for enhancing the marketability of traded fish. More importantly, a comprehensive fish marketing system including fish auction can be promoted through strengthening linkages along the market value chain. Fish traders should form strong cooperative societies to ease on the challenge of credit issuance from finance institutions.

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