



LATTICE CONSULTING

REPORT ON

MARKET STUDY OF THE
AQUACULTURE MARKET IN KENYA
KENYA MARKET-LED AQUACULTURE
PROGRAMME (KMAP)

END HUNGER >>> GROW FARMING
FARM AFRICA

JUNE 2016



“

Identify traders who are willing to take the risk especially the shops. They can put a notice that they are selling farmed fish, have fish tasting...” – Market superintendent, City market on how to overcome resistance to farmed fish.

”

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If a woman comes from Kitengela to buy fish and misses the lake one won't she buy the China one? And the price is low? And if she is going to say, Ruiru, most people there cannot differentiate lake fish and Chinese fish" - Fisheries assistant, Gikomba market on the appeal of tilapia imported from China.





Executive Summary

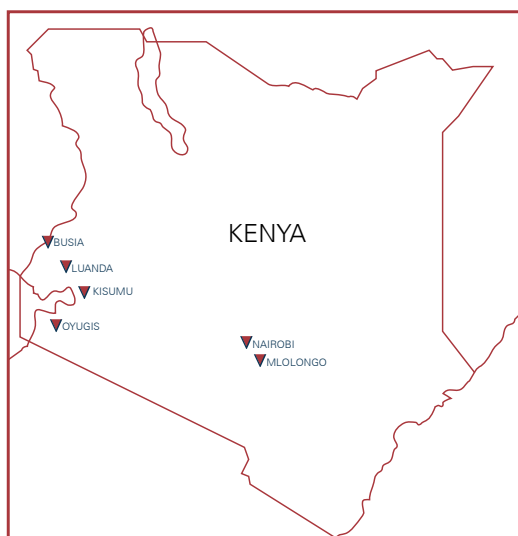
The Kenya Market-led Aquaculture Programme (KMAP) ultimately aims to increase the availability of farmed fish in Kenya by 4000 MT per year. One of the ways to achieve this will be to work with fish farmers with the potential to commercialize their enterprises. The project's hypothesis is that 'developing the aquaculture value chain will make a significant contribution to rural development and food and nutrition security while generating incomes and employment'. KMAP is working under two assumptions:

- That socio-economic and climatic conditions remain favourable
- That Kenyans will increase their consumption of fish

One of the results aimed for is to increase access to markets for medium -scale fish farmers and input suppliers. Lattice Consulting was commissioned to carry out a market study and provide recommendations that will guide the strategic interventions by KMAP to achieve this. This study of the aquaculture market in Kenya looked at the existing fish

markets in Kenya, specifically in Busia, Oyugis and Nairobi including village based markets near Kisumu and Nairobi. In total six markets namely Busia, Oyugis, City, Gikomba, Mlolongo and Luanda were visited. Busia, Oyugis, City and Gikomba markets were identified by Farm Africa. These are located in the targeted project areas.

Lattice Consulting chose Mlolongo and Luanda because they were likely to have a vibrant fish market and fit the requirement of being close to Nairobi and Kisumu respectively. Apart from interviewing the fish traders, fisheries officers and market officers were also included in order to complete the overall picture of the market. A sample of customers was also interviewed in order to look at their awareness of farmed fish and their fish preferences. The fish types of interest in this study were Nile perch, Tilapia, catfish and trout as these are both wild and farmed. However there was no presence of trout in any of the markets. The study was conducted over a two week period in May. Various data both quantitative and qualitative have been collected and analyzed. We have endeavored to answer all the research questions presented in the terms of reference and to be accurate in our analyses and projections. However we cannot account for the accuracy of all the information given to us by the respondents. As such the reports' tables should be used as a general guide. This survey offers rich insight into the attitudes and behaviour of the fish traders and consumers that have informed the recommendations made at the end of this report.



Key Highlights of the Study

Fish traders

The value chain of the fish trade in Kenya has well-established linkages between the actors and operates as a closed system.

The gate keepers to the fish markets that we studied are the traders' associations that are made up of familial relationships. Entry into the trade is controlled by them and hence is limited.

The top fish traders seem to be considered as credit-worthy by banks and micro-finance institutions as many have taken loans.

Trading in farmed fish is considered a 'risky venture' by most of the traders due to its continued lack of popularity with their customers.

36 of the traders surveyed (40%) are willing to trade in farmed fish as long as the risks and threats are addressed.

Fish

Tilapia and Nile perch are the top most traded fish in terms of value and are the most popular with customers. Catfish remains limited

There was a negligible presence of farmed fish in all the markets except Oyugis

The demand for Tilapia and Nile perch is more than the current supply. This provides a good opportunity for investment in aquaculture.

The price of Nile perch and Tilapia is relatively high and most of the consumers are from medium to high incomes.

Majority of customers in all the markets invariably believe that farmed fish is not as tasty as wild fish. Of the 59 customers interviewed, 42 (71.2%) prefer wild fish while the rest do not differentiate between the two.





Background

1.1 Fish production in Kenya

In Kenya, over 70% of fish and fish products consumed locally are from wild capture fisheries, principally Lake Victoria. However due to factors such as overfishing, pollution, use of illegal fishing gears, freshwater fisheries production are on a decline. This is despite government efforts to regulate the sector. As the status quo continues, the Kenyan population is on an upward trend creating more demand for freshwater fish, which is increasingly recognized as a source of safe, healthy 'white' protein. This has exacerbated the causal factors of fresh water fish decline, creating a demand – supply deficit.

To meet this deficit the government started promoting aquaculture. Before 2009, the government's efforts to promote fish farming were hampered by slow uptake due to factors such as cultural practices and lack of knowledge of aquaculture. The government of Kenya through the Fish Farming and Enterprise Productivity Programme (FFEPP) initiated a fish farming programme popularly dubbed as "Fish Economic Stimulus Programme" from the year 2009. The programme provided fish inputs free of charge (labour for pond construction, fingerlings and feeds), capacity enhancement programmes and extension services to interested farmers. These farmers on their part provided land for the fish ponds. The main species provided for culture during this programme were Nile tilapia (*Oreochromis niloticus*) and catfish (*Clarias gariepinus*). The result of this was an immediate increase in number of farmers engaged in fish farming, land

under aquaculture increased from 722 Ha (2008) to 2,076 Ha in 2013 and production levels increased from 4,452 MT (in 2008) to 23,500 MT by 2013¹.

However, the FFEPP focused more on the production end of the value chain, on assumption that farmed fish would be readily assimilated into existing marketing channels. This was not the case as both traders and consumers remained hesitant to accept farmed fish as an equal product to its wild fish counterpart despite campaigns such as the 'Eat more fish'. This was one of the factors that led to majority of the farmers not being able to break even and achieve profitability. This situation acted as a disincentive towards fish farming.

1.2 Farm Africa and KMAP

Farm Africa is an international Non-Governmental Organisation (INGO) with a track record of implementing successful grassroots development projects and improving relevant policies on agricultural development. It works with smallholder farmers, pastoralists and forest-based communities to develop innovative approaches to make sustainable improvements to their livelihood activities through more effective and productive natural resource management. In addition, Farm Africa supports its beneficiaries in value addition for their products and harvests and links them to markets in order to establish viable income-generating enterprises.

Farm Africa has received funding from the Embassy of the Kingdom of Netherlands in Kenya (EKN) to implement the Kenya

Market-led Aquaculture Programme (KMAP). KMAP is designed to address three major challenges: feed production, nutrition and agriculture incomes in Kenya. The project's main hypothesis is that developing the aquaculture value chain will make a significant contribution to rural development and food and nutrition security, while generating incomes and employment opportunities. It will achieve this goal through the implementation of strategic interventions in the production, marketing and enabling environment for aquaculture. KMAP aims, inter alia, to increase farmed fish production to 4,000 MT per year by working with large and medium fish farmers and input suppliers in Kenya.

KMAP will support farmers and traders with technical and business training, link them to markets and input providers to ensure sustainable growth of their business. Input providers such as fingerling producers and feed producers will receive technical support and support in marketing. Through networking events on existing agricultural shows the different players in the value chain will be linked to each other and potential investors can be attracted with fact based economic models and linking them to expertise. KMAP will also promote the consumption of farmed fish and identify (new) market segments for farmed fish and fish products.

KMAP's objective is to develop a vibrant aquaculture industry that generates

sustainable incomes, food and nutrition security, and employment through the following objectives:

- 1) Sustainably increase production and productivity of medium to large scale fish farmers, hatcheries and fish feed producers
- 2) Increase access to markets for medium to large scale fish farmers and input suppliers
- 3) Enhance the provision of an enabling environment to support aquaculture development

1.3 The Purpose of the Study

In order to support the design of the project implementation, Farm Africa engaged Lattice Consulting to carry out a market study and provide recommendations for medium-scale fish farmers to commercialize their operations through increased market engagement.

The study covers the following specific matters:

- a) A quantitative analysis of the current market for fish in Kenya, and future growth forecasts;
- b) A quantitative and qualitative analysis of five specific markets within Kenya (Oyugis, Busia, Nairobi) of particular interest to the KMAP project;
- c) A value chain analysis of the fish trade in Kenya, including analysis of the main actors at market level of the value chain.



Methodology

The Terms of Reference had three defining focus areas as shown below

1. A quantitative analysis of the current and future market for fresh water fish in Kenya
2. A quantitative and qualitative analysis of three specific markets in Kenya (Busia, Gikomba and City Markets) and two village based markets near Kisumu and Nairobi
3. A value chain of the fresh fish trade, including an analysis of the main fish traders in the chain.

(a) A quantitative analysis of the current market for freshwater fish in Kenya and future growth forecasts.

Research Questions:

1. What is the current volume of production and consumption of fresh water fish in Kenya?
2. What is the future trend in volume of production for the next 10 years?

Research Method

1. A literature review of existing data from the State Department of Fisheries on production, imports and exports and any other supporting government records. This covered the years 2009-2014. Raw data was also collected from various county offices and sources as was made available. Record keeping has stalled since the inception of the devolved county governments in 2014.
2. Trend Analysis for forecasting to the year 2024. A linear approach

was taken on the assumption that the scenario would have no drastic changes.

3. The current consumption of freshwater fish was determined by using available data and a percentage approximation for the post-harvest loss as shown below.

(b) A detailed survey of the selected markets.

Research Questions

A quantitative and qualitative analysis of three specific markets within Kenya (Oyugis, Busia, Nairobi (City market and Gikomba)) and two village based markets near Kisumu and Nairobi – all of the questions in this section to be addressed for each of these markets separately:

- i. What is the current volume of fresh fish traded at this market, analyzed by type of fish, by size of fish, and by wild catch versus farmed fish?
- ii. What is the average price, and typical highest / lowest price for



- fresh fish at this market, analyzed by species of fish, by size of fish, and by wild catch versus farmed fish?
- iii. Who are the largest sellers of fresh fish at this market? For each of the ten largest sellers by overall volume, what volume of fish does each seller trade in a month, analyzed by species of fish, by size of fish, and by wild catch versus farmed fish?
 - iv. Who are the buyers of fish at this market? For each of these categories of buyer (traders / processors / retailers / hotels and restaurants / individual consumers) what volume of fish is bought in a month, analyzed by species of fish, by size of fish, and by wild catch versus farmed fish?
 - v. Specifically with regard to fish bought by individual consumers, show the percentage of purchases analyzed by the following segments: (a) gender; (b) age (c) income.
 - vi. What percentage of traders is male and female (both in terms of numbers of traders and share of the market)? For traders who are active in farmed fish, what volume of farmed fish is sold in a month, analyzed by species and size of fish? What is their preferred fish in terms of species and size, and why? How many suppliers do they have, and who are their main suppliers? What payment terms and conditions are typically in place with their suppliers? How many customers do they have and who are their most significant customers? What payments terms and conditions are typically used for their customers? What infrastructure and assets do the traders have?
 - vii. Do traders currently trade in farmed as well as wild catch fish? Do traders generally have a positive or negative perspective on farmed fish, and why? What do they perceive as the main barriers for entering in to trading farmed fish? What do traders see as the main opportunities and threats for trading in farmed fish?

- viii. What level of post-harvest losses are traders experiencing? What processes are traders adopting with regard to fish handling and preservation techniques? Are these consistent with the policies, rules and regulations in fish trade at national and county/market level and are traders fully compliant with them?

Research Method

1. A survey was administered to the major/ wholesale traders in all the markets. This was a semi-structured questionnaire (see Appendix) with quantitative and open-ended questions.
2. Key Informant interviews were administered to market superintendents and county fisheries officers.
3. A customer questionnaire was also administered in order to enrich the findings.
4. For each of the top 10 traders in each market daily data on the volume of fish purchased and sold, purchase and sale price was recorded for the 6 days.
5. Use of available market records on sales to validate and understand the seasonality trends correctly.

Sampling

In addition to the pre-selected markets i.e. Busia, City and Gikomba, we selected Luanda and Mlolongo markets because:

- Both are within easy reach of Kisumu (Luanda) and Nairobi (Mlolongo)
- Both have a large enough population to be vibrant
- These markets could have farmed fish

We deployed 2 research assistants in each market for 6 days to ensure that the survey time covered at least two market days. This was in order to capture all active 6 days of the week and note any variations in sales volume.

Fish Traders:

In each market, a purposive selection of respondents based on their historical volume of sales was done. We interviewed the top 20 traders in City Market, Gikomba and Busia markets; and 10 each in Mlolongo, Luanda and

Oyugis. A total sample size of 90 fish trader was achieved.

This sample size was based on the perceived number of wholesale traders in the said markets hence deemed as more representative. In each market we recorded the daily fish purchase and sales of the top 10 traders for 6 days in order to gain a deeper understanding on volumes, prices, size, source, and fish type.

Market superintendents & Fisheries Officers;

Key Informant Interviews were administered to both markets superintendent and county fisheries officers based in all selected markets. In Gikomba market the superintendent did not agree to be interviewed. In total 6 Fisheries officers and 4 market superintendents were interviewed.

Customers:

In every market a short survey was administered to at least 6 individual customers. These customers were chosen simply based on their willingness to respond to the questionnaire although attempts were

made at having respondents of both genders. In total 59 respondents were questioned. The detailed research instruments are presented in Appendix 1.

(c) Value chain analysis of the fish trade in Kenya, including the linkages and structures between the actors.

Research Questions

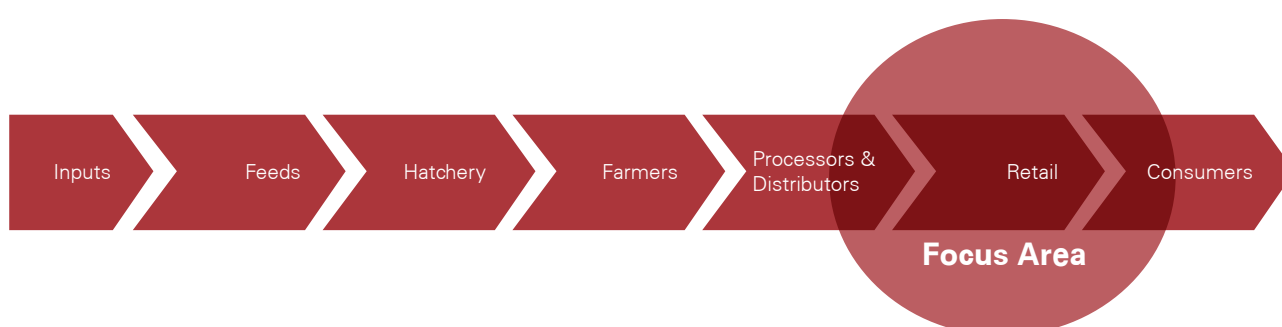
1. What does the fish trade value chain look like, and what are the linkages and structures between the actors?
2. Who are the actors and what are their strengths and weaknesses?
3. What are the recommendations on how to engage the fish traders within the KMAP project?

Research Method

We used data collected from the survey to:

- Structure the value chain of fish traders
- Outline their weaknesses and strengths. Also the opportunities and threats in the fish trade.

The diagram below gives a visual indication of our focus in the value chain.



The next chapter discusses the results and findings of the survey. The survey was done on 18th May to 30th May 2016. (Different markets began at different dates due to logistics.)





Results

3.1 The current and future market for fish in Kenya

Introduction

The total amount of fish produced in Kenya in 2014 is estimated at 206,647 tonnes. Freshwater capture fisheries accounts for 182,792 tonnes and farmed fish 23,855 tonnes. Lake Victoria contributed about 90 percent to capture fisheries. Freshwater fish consumption in 2014 is estimated at 195,206 tonnes, taking into account post-harvest food losses and a negative trade balance. The average per capita consumption is estimated at 4.5 kg in 2014².

3.1.1 Fish production volumes

Freshwater wild catch fish production: current volumes

Kenya's inland water covers 13,400 square kilometers. It has many seasonal and perennial rivers, most of which empty into the western Indian Ocean. From a fisheries point of view, the two major lakes are Lake Turkana (6,405Km²) and Lake Victoria (4,128Km²)³. The main

types of fish being produced from Kenya's inland waters are Omena (*Rastrineobola argentea*), Nile perch (*Lates nilotica*), Tilapia (*Oreochromis niloticus*) and to a lesser extent Catfish (*Clarias gariepinus*) and Common Carp (*Cyprinus carpio*).

The current fish production volumes are challenging to estimate given the limited availability of reliable data. This report includes data sets from the State Department of Fisheries (Ministry of Agriculture, Livestock and Fisheries) and FAO, both using their own statistical methodologies and offering different estimates. The State Department of Fisheries estimates the total production of freshwater wild catch fish in 2014 at 154,983 tonnes, whereas the FAO estimates it to be 182,792 tonnes. In Table 1 a comparison of FAO and the State department of fisheries data is provided. The most significant difference between the data sets is the volume of tilapia produced; 28,890 tonnes according to the State Department versus 47,555 tonnes according to the FAO.

Table 1: Volume of fresh water capture in Kenya (2008-2014)

Species	2008	2009	2010	2011	2012	2013	2014
Tilapia (FAO stat)	26,360	26,561	37,334	58,290	44,998	46,182	47,555
Tilapia (Min. stat)	17,035	22,242	28,402	25,150	24,131	27,466	28,890
Nile perch (FAO stat)	45,026	43,650	39,045	46,612	53,023	44,319	43,399
Nile perch (Min. stat)	45,039	43,650	38,704	47,116	53,023	44,319	43,399
Omena (FAO stat)	46,966	49,326	47,716	72,314	52,948	66,717	69,561
Omena (Min. stat)	46,966	49,326	46,985	72,314	52,948	66,717	69,561
Common carp (FAO stat)	947	1,611	1,875	2,656	2,490	3,330	3,522
Common carp (Min. stat)	355	551	1,146	1,695	1,727	1,920	2,083
Catfish (FAO stat)	3,283	5,019	9,341	8,974	11,423	11,394	11,738
Catfish (Min. stat)	1,276	2,024	6,969	6,426	6,596	6,918	7,174
Other (FAO stat)	14,273	7,468	8,543	7,712	7,016	6,487	7,946

² FAO country analysis: <http://www.fao.org/fishery/facp/KEN/en>

³ State department of fisheries Bulletin 2014

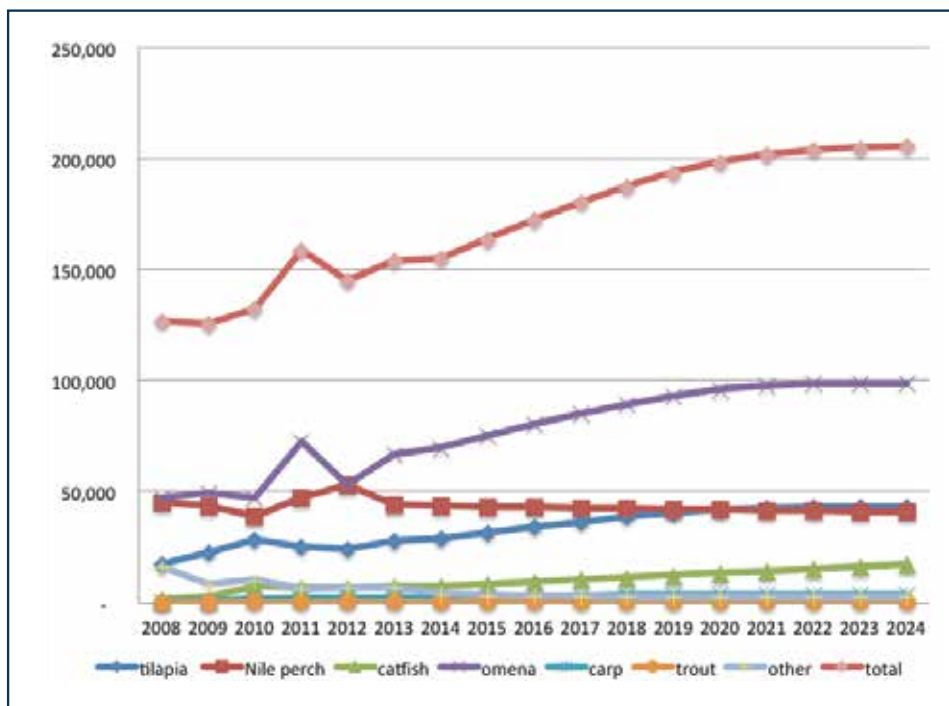
Species	2008	2009	2010	2011	2012	2013	2014
Other (Min. stat)	16,001	7,881	10,140	6,115	6,725	6,819	3,876
Total Freshwater fishes (FAO stat)	131,432	132,813	143,833	196,031	171,183	177,303	182,792
Total Freshwater fishes (Min. stat)	126,672	125,674	132,346	158,816	145,150	154,159	154,983

Source: FAO Fishery & Aquaculture Statistics & State Dept. of Fisheries Kenya Bulletins

Freshwater wild catch fish production: projections

Extrapolating the trends between 2009 and 2014, the total volume of freshwater wild catch fish produced will be approximately 200,000 tonnes by 2024.

Figure 1: Current & Projected wild catch projection (MT)



While statistics show that wild catch increased from 2008 until 2014, it is expected that the wild catch production increase is leveling off in the coming years. This is due to chronic overfishing of Nile Perch for export in Lake Victoria and other Kenyan lakes and rivers⁴.

Farmed fish: current production

The main types of fish currently farmed are tilapia, catfish, carp and trout. In 2015 an estimated 27,125 tonnes of farmed fish was produced in Kenya. Tilapia represents about

75% of total production, followed by catfish (17%), carp (6%) and trout (<1%).

The table below compares fish farming statistics of the State Department of Fisheries and FAO. Statistics from the two sources are similar or identical for most species. Trout production was not included in FAO data. Per species data was not available from the state department of fisheries bulletins post 2012 due to lack of collection and sharing of this data by some county governments’.

Table 2: Aquaculture production 2008-2015

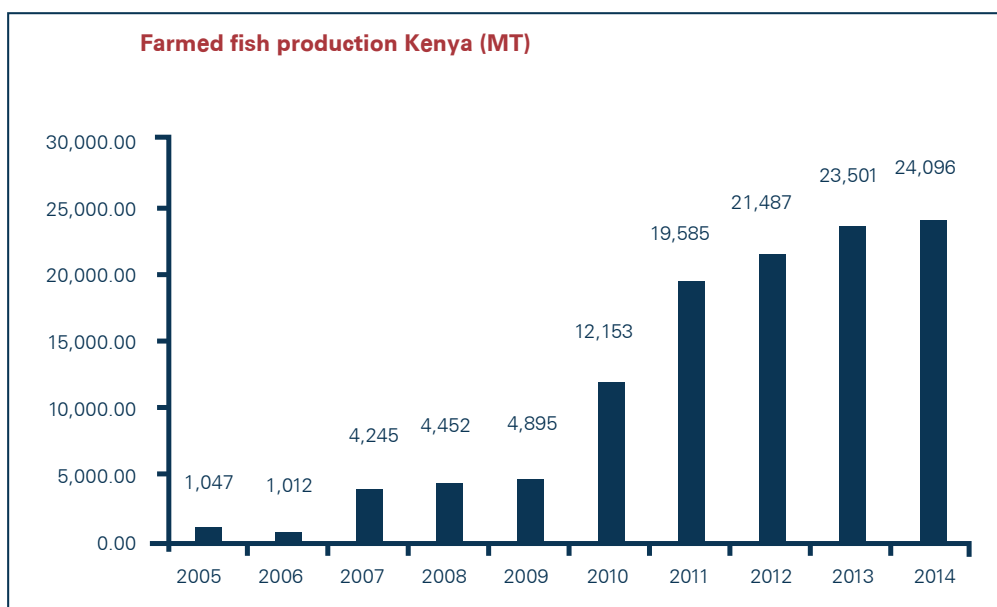
Species	2008	2009	2010	2011	2012	2013	2014	2015
Tilapia (FAO stat)	3,113	3,424	9,115	16,602	16,115	17,626	18,072	nd
Tilapia (Min. stat)	3,113	3,424	9,115	14,689	16,115	nd	nd	nd
Catfish (FAO stat)	935	1,047	2,188	3,984	3,869	4,230	4,337	nd
Catfish (Min. stat)	935	1,047	2,188	3,525	3,868	nd	nd	nd
Common Carp (FAO stat)	355	373	729	1,328	1,289	1,410	1,446	nd
Carp (Min. stat)	355	373	729	1,175	1,289	nd	nd	nd
Trout (Min. stat)	49	51	122	186	214	nd	nd	nd
Total (FAO stat)	4,403	4,844	12,032	21,914	21,273	23,266	23,855	nd
Total (Min. stat)	4,452	4,895	12,154	19,575	21,486	23,501	24,096*	27,125

Source: FAO & State Department of Fisheries, *source: Gap analysis report on aquaculture 2016

In Figure 2 the trend in fish farming in Kenya is provided. The large jump in production in 2010 and 2011 is noticeable and most probably

caused by Kenya’s Economic Stimulus Program (ESP) that was launched in 2009.

Figure 2: Farmed fish production in Kenya (2005-2014) MT



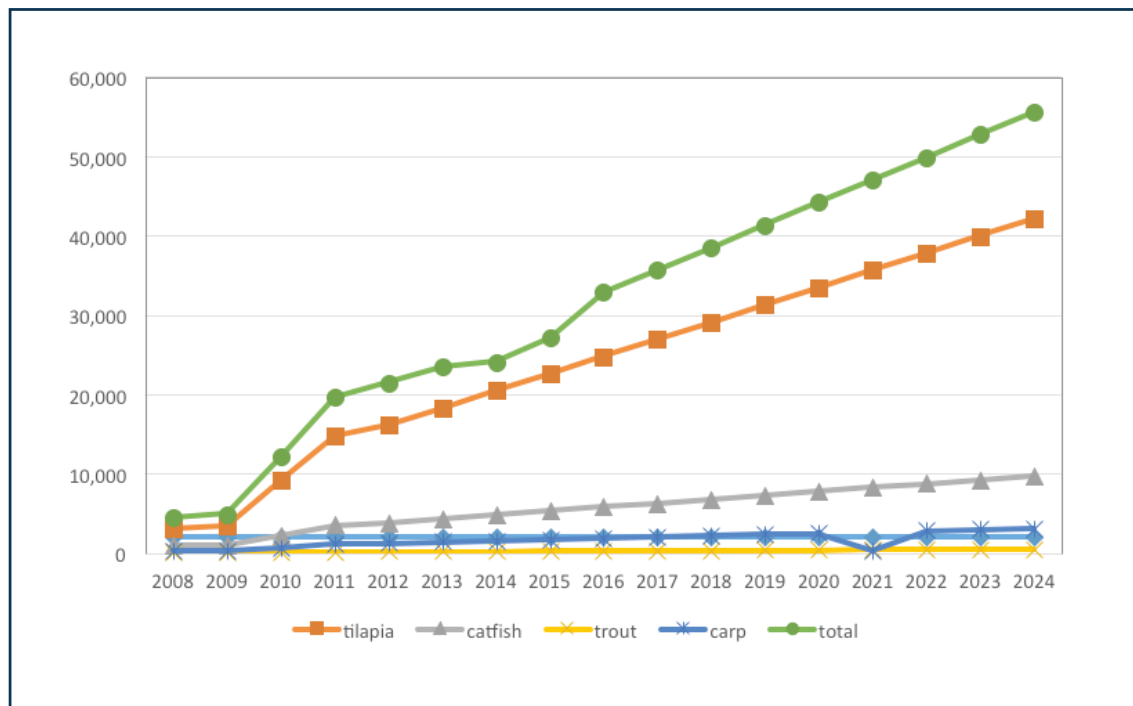
Source: State Department of Fisheries (Bulletin 2014)

Farmed fish: projections

Extrapolating the trends between 2008 and 2014, the total volume of farmed fish produced will be approximately 52,000 tonnes by 2024. Kenya, however, has far greater

capacity for fish farming, with over 1.14million hectares potentially available to enable a production capacity of over 11 million tonnes per year⁵.

⁵ FAO Fishery and Aquaculture Country Profiles 2015, The Republic of Kenya

Figure 3: Current & projected farmed fish production by species (MT)

Source: State Department of Fisheries statistics (2014). Other values (2015 onwards) are projected.

3.1.2 Current Import and Export volumes

Kenya is a net exporter of fish, mainly Nile Perch from Lake Victoria. However, data on imports and exports may be unreliable due to cross-border smuggling of fish. The fish from Uganda is simply regarded as 'Kenyan' and documented as such both in Busia and Gikomba markets. We observed that although a lorry from a Ugandan fish farmer was offloading in Gikomba, the fish was later recorded as wild catch from Lake Victoria. The imported frozen fish from China was also not differentiated when recording of the traders' sales was done in Gikomba.

Imports

According to official statistics, the total amount of fish imported in 2014 was 5,853 tonnes. The majority of Kenyan fish imports

originate from Uganda's portion of Lake Victoria, these may however not be fully represented in official statistics. The balance of imports is from aquaculture and wild catch producers across Africa, Europe and China.

Excluding imports from Uganda, frozen mackerel and frozen herring, respectively, represented the largest quantities of imports prior to 2014. In 2014 frozen tilapia imports, majority of which are from China, surpassed frozen herring imports to represent 30.8% of all imports, trailing mackerel imports which stood at 45.4%.

Tilapia imports

Table 3 shows Kenya's official statistics on fish and fishery products imports from 2008-2014 with a special highlight on frozen tilapia because it is of interest to this study.

Table 3: Kenya's Tilapia imports (2008-2014)

Tilapia Imports (2008-2014)							
Fish	2008	2009	2009	2011	2012	2013	2014
Frozen Tilapia	nd	23	23	131 (4.9%)	202 (7.7%)	739 (14%)	1,805 (30.8%)
Others	2,190	3,355	3,355	2,533	2,420	4,530	4,048
Total (MT)	2,190	3,378	3,378	2,664	2,622	5,269	5,853

Source: State Department of Fisheries Bulletins

Although no figures are available yet for 2015, according to the December 2015 FAO Globefish Report, 'China exports of breaded tilapia increased by 23.8% during the 2015. Exports were significantly higher to Cameroon as well as to other African markets, namely Côte d'Ivoire, The Democratic Republic of the Congo (DRC) and Kenya'⁶. Although the report does not reference frozen tilapia, we could probably surmise that the volume of tilapia from China increased in 2015 from 2014.

Exports

According to the State Department of Fisheries, a total of 6,290 metric tonnes of fish and fishery products were exported in 2014 earning the country KES. 2.5 billion in foreign exchange. Exports mainly consisted of Nile perch and its by-products totaling

4,980 metric tonnes of the total exports⁷. The remaining fish exports consider mainly marine fish and fish products which are excluded from this study.

Nile perch

Wild caught Nile perch makes up about 80% of Kenya's fish and fish products exports. More than 70% of this is in fillet form (chilled & frozen), the rest is headless and gutted (H&G) whole fish, and fish maws. Netherlands, Israel, Portugal, UAE, Australia and China are among the countries exported to. Table 4 shows the export of Nile perch over the years. There is a downward trend as the volume of Nile perch exported has been reducing with each year. This could be a more evidence of the reducing volumes of wild catch especially from Lake Victoria.

Table 4: Exports of Nile perch products & other fish (MT)

Exports of Nile perch products and others (MT)							
	2008	2009	2010	2011	2012	2013	2014
Nile Perch							
frozen fillets		6,358	6,433	4,252	5,314	2,490	1,444
chilled/fresh fillets		2,852	3,047	3,109	2,986	2,666	2,676
frozen H&G		498	811	616	417	310	14
chilled H&G fish		3	3	321	130	118	445
fish maws							
Total quantity	12,422	9,712	10,294	8,297	9,122	5,783	4,980
Tilapia							
Others	2,083	1,402	1,704	1,365	1,043	959	1,310
Total exports	14,505	11,114	11,998	9,662	10,165	6,742	6,290

Source: State department of fisheries Bulletins (2008-2014)

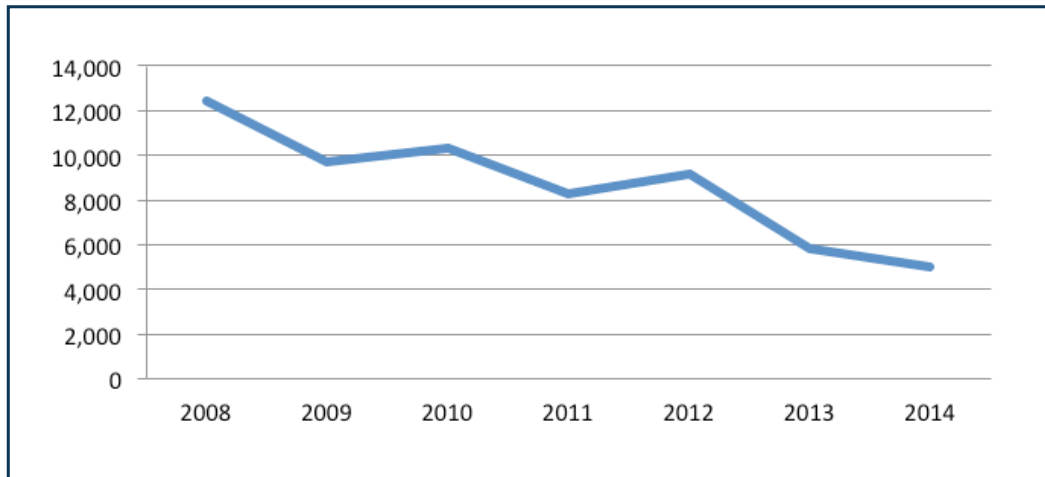
⁶ <http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/358402/>
⁷ State Department of Fisheries statistics

The table above excludes tuna loins. The 'others' mainly refers to marine produce such as octopus, shark skins, fish skins, and crustaceans. Until recently, farmed fish was not permitted for export to the EU countries however with the signing and ratification of the EU-funded Standards and Market Access

Programme (SMAP) farmers will be able to fulfil the requirements for accessing these markets.

The chart below shows the reduction in volume of Nile perch exports.

Figure 4: Volume of Nile perch exports (2008-2014) MT



Source: State department of fisheries bulletin (2014)

3.1.3 Fish consumption

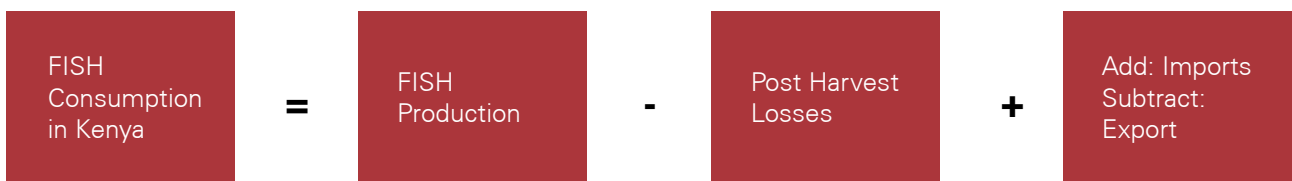
The most widely eaten types of fish in Kenya are omena, Nile perch, tilapia and catfish. According to FAO statistics, fish consumption declined from 6.0 kg per capita in 2000 to 4.5 kg per capita in 2011⁸. One reason for this decrease in per capita consumption is the dwindling supply of fish from Lake Victoria and other aquatic sources.

In this study, the current and projected volumes of fish consumption are calculated in two ways. First by multiplying the average consumption per capita by the size of the Kenyan population. Second, by subtracting post-harvest food losses and the trade balance from fish production.

Current consumption

The population of Kenya was estimated at 46,661,552 people as of 1 January 2016⁹. When taking the average per capita consumption of 4.5 kg of fish per person (FAO estimate) into account, we estimate the total fish consumption in Kenya in 2016 will be 209,977 tonnes. However, taking into account the declining trend in average per capita consumption, the total fish consumption may be lower.

The second method in which fish consumption is calculated in this report is by using available data from 2014 on production and post-harvest losses and the fish trade balance as shown in the figure below.



Major Species

Calculation break-down: fish consumption 2014

- Fish production: Wild catch: 182,792 tonnes (FAO) + Aquaculture: 23,855 tonnes (FAO) = 206,647 tonnes
- Post-harvest losses (4% of production volume): 8,266 tonnes
- Imports (Tilapia only): 1,805 tonnes
- Export (Nile Perch only): 4,980 tonnes
- Total fresh water fish consumption 2014: $206,647 - 8,266 + (1,805 - 4,980) = 195,206$ tonnes.
- Per capita fish consumption 2014: $195,206,000 \text{ kg} / 45,010,056 \text{ inhabitants} = 4.3 \text{ kg}$

Post-harvest food losses estimate

Post-harvest food losses represent food that is lost after harvest and is not consumed. Losses are divided into economic and physical losses.

Physical loss of fish in Kenya is low. Interviews with fish traders and market superintendents revealed that little fish is lost in the value chain. In many cases fish is still consumed although it is spoiled and should have been taken out of the market. Spoiled

fish tends to be smoked or deep fried to disguise its state. It is estimated that physical post-harvest loss is around 4% in Kenya. This number is partially based on FAO estimates on artisanal fisheries losses in Africa which are less than five percent.

Projected consumption 2025

In 2025, the Kenyan population is estimated at 55,892,984 people¹⁰. Assuming that the average consumption per capita remains at 4.3 kg per capita, this implies a total estimated consumption of 242,405 tonnes of fish consumed in 2025. Naturally, this total consumption estimate is constrained by many external factors, such as the future availability and price of fish and fish products.

In Summary

The forecast for aquaculture in Kenya is largely positive. This is in line with global forecasts for the industry that predict that aquaculture will continue to grow at a 'fairly rapid rate' despite its challenges¹¹. However the figures projected for Kenya in this report are meant to serve as a broad guide and should not be used for any analytical calculations.



¹⁰ <http://www.livepopulation.com/>

¹¹ Lem, A., Bjorndal, T. & Lappo, A. 2014. *Economic analysis of supply and demand for food up to 2030 – Special focus on fish and fishery products*. FAO Fisheries and Aquaculture Circular No. 1089. Rome, FAO. 106 pp.

3.2 A Detailed Survey of the Selected Markets

3.2.1 Type, Size, Volume & Price of fish traded

3.2.1.1 City Market:

Located at the town centre, this market is a national heritage site built in 1930s. Since then it has grown in the number of traders selling commodities such as fish, meat, flowers, vegetables and curios. There are about 2000 traders who come into this market daily but those set up are 148 shops, 117 tables outside, 100 flowers sellers, 62 fish traders and 3 main shops. The fish traders are all situated in the outside areas and are charged 50 shillings daily as rent by the county which runs the market. Water and power are provided. However the water is not constant and so fish traders have to buy additional water for cleaning.

Although the market has become congested plans for its expansion stalled due to a court order petitioned by those who want to see it preserved in its state. As such any future plans may mean moving the market to a different location. For now plans are underway to improve the meat section (which includes the fish traders). These include a slanting floor for ease of cleaning, expansion of the drainage system and having glass enclosed tables for the traders so that the fish and poultry is not exposed. The market superintendent hoped to have this in place by June 2016.

Over the last few years the volume of fish has

dropped and fish traders have diversified into selling both fish and poultry.

During the survey week, the top 10 traders in the market sold a combined volume of 11,377 Kilograms of Nile perch and tilapia (all greater than 600 grams in individual weight).

Nile perch accounted for 65.3% and tilapia 34.7% of the total sales (see figure below). The two types of fish were delivered to the market in fresh and whole form. As a general practice, the traders scale and gut the tilapia before selling it. Nile perch on the other hand was sold in fillet form yielding 3256.5 Kg of fillets which the traders sold at KES 500-550 per kilo. The traders purchased the Nile perch in whole form at a price range of KES 240-280 per kilo.

The purchase price for tilapia ranged between KES 340 – 350 per Kg which was sold by the traders to customers at a range of KES 380-400 per Kg. This translates to a mark-up of KES 40-50 per Kg. In 2014 and 2015, the average supply price per Kg was KES 300 (EFMIS¹²) for the same period.

“Fish volumes have reduced over the years. I don’t know where the fish has gone to. They tell us it is the climate or too

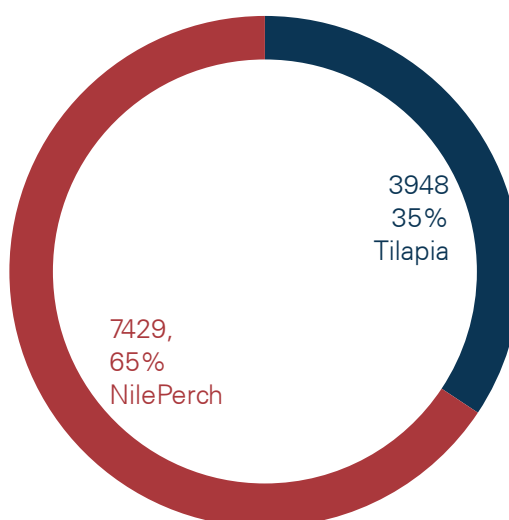
Fish traders at the market pay the following;

50 KES per day Rent
Hawkers license is 700 KES per year e.g. the women who buy by-products.
Processing license is 1000 KES/year (e.g. Filleting)
Trader’s license is 1000 KES/year.
Crustacean license is 1500 KES/year
Dry fish license is 1500 KES/year
200 KES movement permit for everyone and 1000 for a small vehicle. The amount increases for bigger vehicles.

much taxation. Here we charge only 250 (KES) per basket. They (traders) are crying about taxation at every point. The number of traders is more or less the same but many now sell both chicken and fish because chicken sells more therefore it's a more sure thing. Chicken does not come from far and people don't really know much about fish." Market Superintendent, City Market.

The lowest volume of tilapia handled by an individual trader was 10 Kg while highest was 1185 Kg. Nile perch on the other hand was traded on a relatively higher volume with the lowest being 135 Kg and highest 1549 Kg.

Figure 5: Volume of fish sold in City market by top 10 traders. (Kg, %)



The traders managed to sell all the fish they purchased during the period.

Assuming all factors remain constant for the entire month of trade, then it is feasible to predict that the top 10 traders would handle four times the volume dealt with during the survey, an equivalent of 45,508 Kg. Assuming these top traders account for 50% of the total volume traded in the market then approximately 91,016 Kg of fish is handled in City market on a monthly basis. This is less than the EFMIS record during the same period for 2014 and 2015 when the market dealt in 105,666 Kg and 95,619 Kg respectively (see table below).

Table 5: Volume of fish traded in City Market Jan-March 2016

TYPE OF FISH	JAN (Kg)	FEB (Kg)	MARCH (Kg)	TOTAL QUANTITY (Kg)	VALUE Per kg KES	TOTAL VALUE
Nile perch fillet	82,749	63,668	66,652	213,069	300	44,839,400
Tilapia whole	16,991	22,990	23,462	63,443	400	25,377,200
Grand Total	99,740	86,658	90,114	276,512		70,216,600

Source: Nairobi county fisheries data.

Table 6 & 7 show EFMIS data for the volume of sales of tilapia and Nile perch in City market and the prices during the months of January to June 2014 and 2015 respectively.

Table 6: Volume of fish traded in City market January-July 2014 & 2015 (Kg)

Year	Fish Species	January	February	March	April	May	June
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	30730	22094	22296	20455	17548	25433
	Nile perch	63967	73471	77054	87288	88118	113490
	Total	94697	95565	99350	107743	105666	138923
2015	Fresh Tilapia	23184	18811	31084	43977	19144	17692
	Nile perch	43006	39562	99515	78790	76475	72414
	Total	66190	58373	130599	122767	95619	90106

Source: KMFRI EFMIS data 2014 & 2015. See Appendix

Table 7: Sales prices of fish traded in City market January - June 2014 & 2015 (KES)

Year	Fish Species	January	February	March	April	May	June
		Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	300	300	300	300	300	300
	Nile perch	200	200	200	200	200	200-250
2015	Fresh Tilapia	300	300	300	300-350	300	300
	Nile perch	200	200	200	200	200	200

Source: KMFRI EFMIS data 2014 & 2015. See Appendix

3.2.1.2. Gikomba Market

Gikomba market used to be the central aggregation point for fish destined for Nairobi and its environs, however in recent years fish is distributed directly to suburbs such as Ruiru and Eastlands area of Nairobi. The size allocated to the fish traders has remained the same but the population of fish traders has grown, causing congestion. The fisheries officer estimates the number of fish traders at 100 -120. These deal in Nile perch, sundried tilapia from Lodwar; common carp from Lake Naivasha; tilapia and common carp from Masinga Dam; smoked mudfish from Lake

Magadi; omena, Nile perch, catfish and tilapia from Lake Victoria.

The main fish area has been renovated and cemented although the extended fish area consists of wooden stalls and is almost ankle deep in mud (as was the case during the survey period). The dry fish area has also been roofed and cemented. However water is scarce and traders are forced to buy additional water. The traders association used to have a cooling room but this was burnt down during a market fire several years ago and is yet to be replaced.

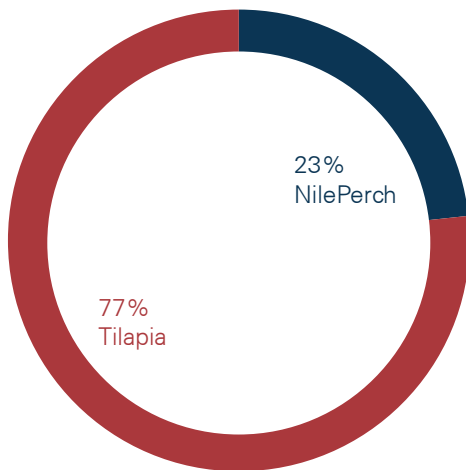
The fish traders pay the following;

Frying fish (Mama Karangas) 700kes/ year
 Selling dried fish 1700 Kes/year
 Selling fresh fish 1200 Kes/year
 A pickup is charged 1000 Kes.
 Lorry permit is 2500 Kes per year.
 Motorcycles are charged 200 Kes per year.

The top 10 traders of Gikomba market mainly deal in tilapia (76.6%) and Nile perch (23.4%) of various individual sizes from the wild.

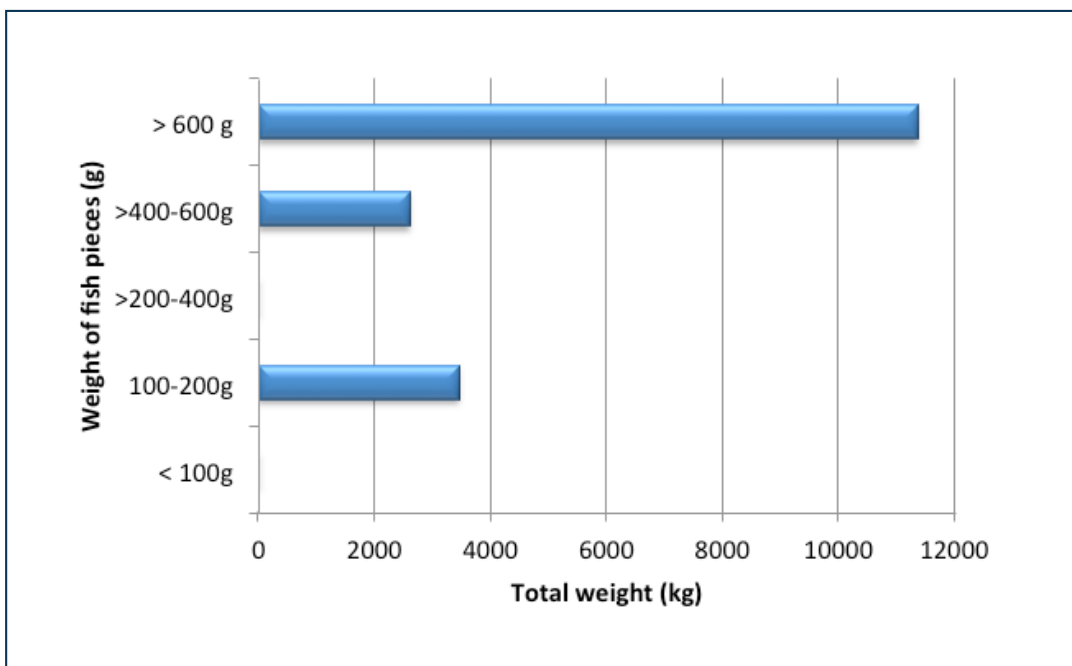
Similarly to City market the fish are delivered to the market in fresh, whole form.

Figure 6: Volume of fish sold in Gikomba market by top 10 traders by type



The traders in Gikomba traded in various sizes of fish ranging from above 100g to more than 600g. The most traded size was however bigger than 600g per piece of fish (see figure below). Like in City market, sizes of tilapia and Nile perch lighter than 500g are considered undersized and can be confiscated by the fisheries officers. However tilapia from Masinga Dam tends to weigh below 500g and is permitted.

Figure 7: Volume of fish traded in Gikomba by size and total weight (Kg)



Nile perch was relatively cheaper, with supply price of whole fish being KES 240-270 during the period. Value addition was minimal amongst the large traders; only 310 Kg of fillets was processed during the survey week.

The highest volume traded by an individual trader was 5497 Kg while the lowest was 570 Kg. The traders were able to sell all of their fish during the survey period.

Table 8: Volume of fish traded in Gikomba Jan- March 2016

Type of Fish	January	February	March	Total (Kg)	Price/Kg	Total Value
Fresh Tilapia	73,005	68,840	94,593	236,438	370	87,482,060
Tilapia Fillet	946	2,100	752	3,798	600	2,278,800
Nile perch Fresh	8,500	9,402	4,800	22,702	260	5,902,520
Nile perch Fillet	10,000	7,450	6,700	24,150	450	1,086,750
Fresh Protopterus	1,500	345	2,000	3,845	400	1,538,000
Common Carp fresh	3,000	2,700	2,900	8,600	200	1,462,000
Grand Total	96,951	90,837	111,745	299,533		109,530,880

(Source: Nairobi County Department of Fisheries)

Below is the data from EFMS 2014 and 2015 showing the total sales of tilapia and Nile perch in Gikomba

Table 9: Volume of fish traded in Gikomba January - June 2014 & 2015 (Kg)

	Fish Species	January	February	March	April	May	June
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
Gikomba 2014	Fresh Tilapia	270970	262150	229844	272630	224600	252700
	Nile perch			1524		12900	
	Total	270970	262150	231368	272630	237500	252700
Gikomba 2015	Fresh Tilapia	230800	192200	203300	149213	137710	165900
	Nile perch			9600	18800		9600
	Total	230800	192200	212900	168013	137710	175500

Source: KMFRI EFMS data 2014 & 2015. See Appendix

Table 10: Prices of fish in Gikomba January - June 2014 & 2015

Gikomba	Fish Species	January	February	March	April	May	June
		Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	350	350	350	350	350	350
	Nile perch			220-350		350	
2015	Fresh Tilapia	350	350	350	350	350	350
	Nile perch			350	350		350

Source: KMFRI EFMS 2014 & 2015. See Appendix

3.2.1.3 Busia Market

The market is located in Busia town at the border of Kenya and Uganda. Thursday and Tuesdays are the market days. However, the market is vibrant throughout the week. It currently houses 400 fish traders (wholesalers and retailers combined). This can be broken down to:-

- Approximately 100 exporters dealing in salted sundried tilapia, barbus, and alestes from Lake Turkana which is exported to Congo. They also export fish maws from lakes Victoria and Turkana to Uganda
- About 150 importers of tilapia (fresh, whole), Nile perch (fresh, whole), smoked and sundried catfish, tilapia and sundried omena.
- A few traders also buy locally from capture fisheries and farmed fish

This is an increase in number of traders although the volume of fish has significantly reduced. Revenue has also decreased, for example previously, market days would generate between 10 -15 thousand shillings but this has reduced to about 5 thousand shillings; a clear indication of the impact of reduced production volumes.

‘The volume of fish the market sends to Nairobi has significantly reduced

from 3 Lorries of 7 to 10 tons Lorries to ½ a lorry per day.” Market Superintendent, Busia market.

The fish traders’ cooperative has an ice making plant unlike the other markets in the survey. The ice is sold at 1000 shillings per sack. The fresh fish section is covered and cemented while the dried fish area is still temporary (wooden stalls). The area allocated for fish is more than half of the entire market. The county government is responsible for cleanliness, repairs and renovations and public works. Three water points have been installed in the section as well as one ablution block. The section however lacks refrigeration and storage space for dried fish hence exposing them to e.g. dust.

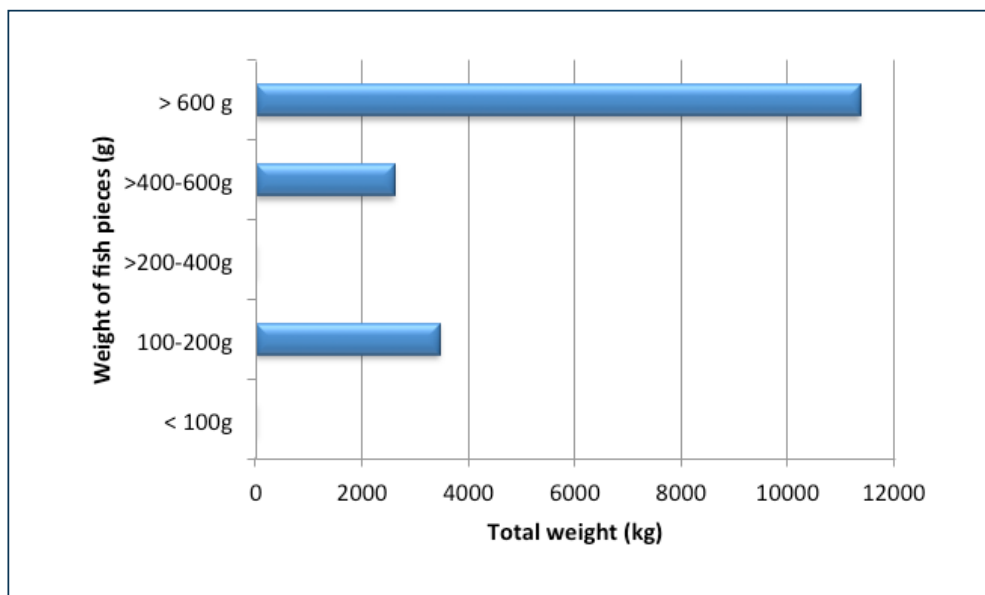
Control of illegal fish imports is difficult, due to the porous Kenya-Uganda border and an understaffed fisheries department. There is only one officer working during the day from eight to five making it easy for those who want to bring in illegal fish. This problem has been exacerbated by devolution of fisheries as the emphasis is largely on revenue collection and not on the enforcement of the Fisheries Act.

The fish traders pay the following;

Traders License 300 kes	
Movement Permit 50 kes	
Fish import fee 1 Kes/kg	
Fish export fee: 0.5% ad valorem (according to the value of the goods)	
County Levies:	
Small basket (100 kg): KES 70/day	Medium basket (200 kg): 100/day
Large basket (300 kg): 150/day	Extra-large basket (350-400kg): 200/day
Permit Small lorry (less 3 tons): 1500 Kes/year	
Permit for above 3 tons lorry: 2000 Kes/year	
Retailers: KES 50/day	
Dried fish bale: KES 70	
Penalties: KES 1000 (trailer)	KES 500 (smaller vehicles)

The top 10 traders only trade in wild tilapia, supplied to them in fresh, whole form. During the survey period, these traders sold 28,135

Kg of fish of various individual sizes (see figure below) purchased at KES 280-320 and sold at KES 330-350 per Kg.

Figure 8: Volume of fish (tilapia) traded by top 10 traders in Busia market (kg)

The highest volume sold by an individual trader was 14, 200 Kg while the lowest was 600 Kg. All fish supplied to the traders during

the period (6 days) was sold. The tables below show the volumes of Nile perch and tilapia sold in January to June in 2014 & 2015.

Table 11: Volume of fish traded in Busia market January - July 2014 & 2015 (Kg)

	Fish Species	January	February	March	April	May	June	July
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
Busia Market 2014	Fresh Tilapia	26920	38580	25678	18810	35216	23100	28710
	Nile perch		200	300				
	Total	26920	38780	25978	18810	35216	23100	28710
Busia 2015	Fresh Tilapia	56600	27930	32620	30210	30050	47250	36120
	Nile perch		130					
	Total	56600	28060	32620	30210	30050	47250	36120

Source: KMFRI EFMIS data2014-2015. See appendix

Table 12: Prices of fish traded in Busia market January -July 2014 & 2015 (KES)

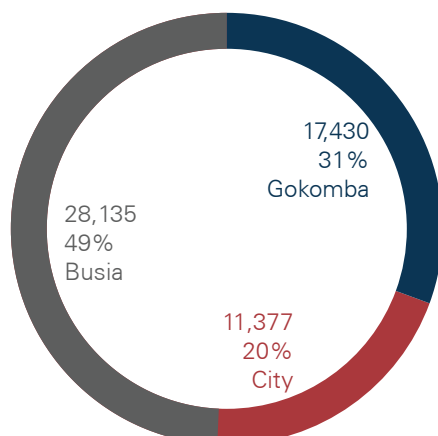
Busia Market	Fish Species	January	February	March	April	May	June	July
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	270	270	270	270	270	270	270
	Nile perch		250	250				
2015	Fresh Tilapia	270-360	280-300	280-300	280-310	300	300-320	300-370
	Nile perch		250					

Source: KMFRI EFMIS data. See Appendix

3.2.1.4 Fish type, Volume and Prices in Busia, City and Gikomba markets compared
Cumulatively the top 10 traders in the 3 big markets (Busia, City and Gikomba) traded 56,942KG of fresh, whole fish during the

survey period (6 days). However, Busia accounted for half the volume followed by Gikomba and City in the following respective proportions: 49.4%; 30.6%; 20%.

Figure 9: Comparative volumes of fish sold in City, Busia and Gikomba market



Supply and sale prices varied across the markets during the period with prices in Busia being the lowest for tilapia followed by Gikomba. City was the most expensive market probably due to its location within Nairobi CBD and mainly serving an upper to middle class population.

Table 13: Comparison of prices in Busia, Gikomba & City market

Fish type	Busia	Gikomba	City	Busia	Gikomba	City
	Purchase price			Selling price		
Nile perch whole		240-270	240-280		270-290	
Nile perch fillet					500	500-550
Tilapia whole	280-320	330-350	340-350	330-350	360-380	380-400

3.2.1.5 Luanda Market

Approximately 300 retailers and wholesalers operate in Luanda market, 10% of who deal in both fresh whole and fried fish. Fried juvenile Nile perch are a delicacy and are in as much demand as omena and haplochromis. Thursdays and Mondays being the main market days are quite vibrant and busy while business slows down on the other days. During the rainy season the number of traders reduces as some go to tend to their farms.

The market has two sheltered market areas dedicated to fish traders who mostly sell fish in dry (sundried) and fried form, such as omena, split tilapia and haplochromis. The traders who deal in fresh fish (tilapia and catfish) sell along the road side in order to attract customers on the highway passing through Luanda town and also due to lack of space in the built area.

The top ten traders in this market buy fish in fresh whole form and then add value by deep

frying. The fish is sold per piece (occasionally per kilogram) making the fish much more expensive compared to Busia or Oyugis.

For example, the traders buy:

Whole fresh tilapia of >100-200g at KES 65-100 and sell at KES 150-200 deep fried

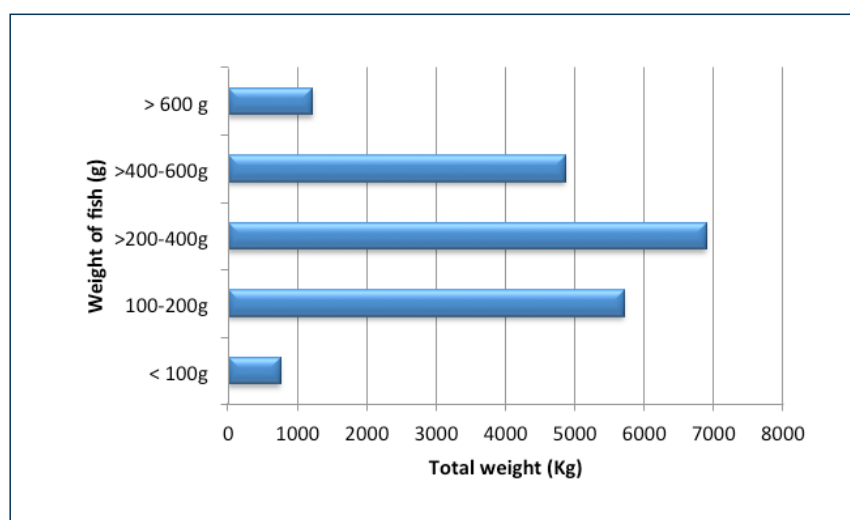
- >200-400g at KES 80-300 and sells at KES 240-270 deep fried

- >600g at KES 300-400 and sold at 800 deep fried

Catfish is equally well priced with >200-400g pieces being supplied to the traders at KES 60-110, which is then deep fried and sold at an average price of KES 300 per piece.

- >600g per piece when deep-fried sells at 600-850 KES.

During the survey week, >200-400g pieces were the most traded followed by >100-200g pieces. Less than 100g was the least traded (See graph below). All the fish dealt with were from the wild.

Figure 10: Volume of fish traded in Luanda- top 10 traders

Three quarters of the total volume of fish that the traders dealt with was tilapia. The volume of catfish sold was negligible (93 kg).

Figure 11: Proportion of fish type traded in Luanda market by top ten traders

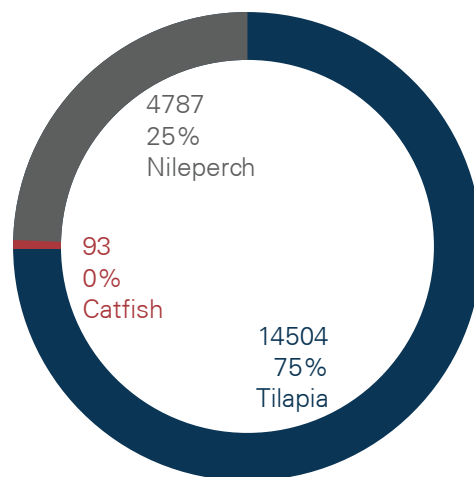


Table 14: Volume of fish traded in Luanda market January-July 2014 & 2015 (Kg)

Market	Fish Species	January	February	March	April	May	June	July
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
Luanda 2014	Fresh Tilapia	3174	2827	2534	2159	2808	1893	1775
	Nile perch		10	8	8			65
	Total	3174	2837	2542	2167	2808	1893	1840
Luanda 2015	Fresh Tilapia	420	1529	1638	1392	2307	2022	3170
	Nile perch				418			
	Total	420	1529	1638	1810	2307	2022	3170

Source: KMFRI EFMIS data. See Appendix

Table 15: Prices of fish traded in Luanda market January- July 2014 & 2015 (KES)

Luanda	Fish Species	January	February	March	April	May	June	July
		Price range	Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	300-340	300	300-340	300-350	300-320	300-330	300-350
	Nile perch		180	200	180			350
2015	Fresh Tilapia	350	350	350	300-320	300-320	300	300-330
	Nile perch				320			

Source: KMFRI EFMIS data. See Appendix

3.2.1.6 Mlolongo

Mlolongo does not have a designated fish trading area; traders set up their stalls along the streets. The traders begin to fry and sell their fish in the evening until late into the night. These are women traders who purchase their fish from Gikomba market in Nairobi.

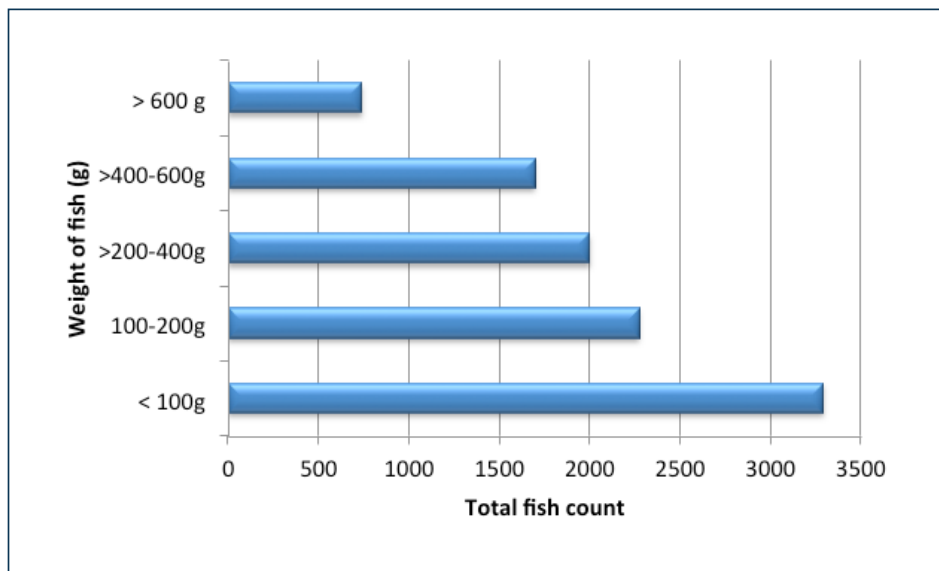
Since devolution, the county fisheries officials have been relegated to doing extension work and no longer supervise the traders. As such there is no enforcement of any regulations and the standards do not meet the requirements. This is not to say that the traders operate in completely unhygienic environments but they have not received any

specific advice or guidance.

The traders pay for their licenses at Gikomba market instead of the Machakos County under whom this town’s jurisdiction falls.

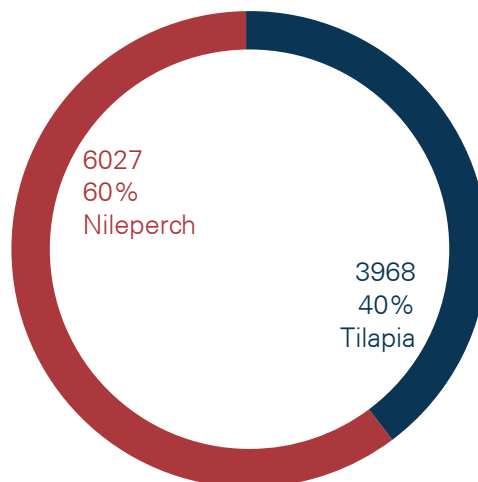
The traders purchase fish in whole, fresh form and add value by deep frying before selling to their customers. Fish price is determined by size. During the survey period, a combined total of 9995 fish of different sizes and types were traded. The highest number of fish sold was in the <100g per piece range. This could be because Mlolongo is generally a low income area and this price range is more affordable.

Figure 12: Volume of fish traded in Mlolongo by 10 traders (whole fish)



The market traded in tilapia and Nile perch with Nile perch accounting for 60% of the volume traded.

Figure 13: Proportion of fish type traded in Mlolongo



3.2.1.7 Oyugis

Oyugis market is an open-air area allocated to traders of various commodities such as grains, tubers, fruits, vegetables and fish. The market has temporary structures (racks) even though some traders sell their wares on the ground. There is no piped water within the market area so traders have to buy water. The pavements are not tarmacked or cemented and there is no drainage, however there is solar lighting which enables trading late into the night. According to the market superintendent, the county government has earmarked the market for modernization.

The only yearly levies paid by the traders are 50 kes movement permit 300 kes trader's license

Approximately 300 fish traders operate in the market. The section allocated to fish traders makes up a quarter of the entire market. The traders also benefit from cleaning (sweeping) and waste collection services by the local authority. The section has 2 waste disposal bins. Half of the ten top fish traders in Oyugis

market trade in both wild and farmed fish. While fish farmers generally sell their fish at their farms, they deep fry any surpluses to avoid spoilage and supply these to the market. Generally, on the advice of the fisheries officers, only 2 or 3 farmers supply on market days so as not to over-flood it with farmed fish.

Traders charged different prices based on fish size and type. For example:

- Whole fresh tilapia of individual size >400-600g was supplied at KES 310-350 per piece and sold at KES 336-400.
- Whole fresh catfish of individual size >400-600g was supplied at KES 300-310 and sold at KES 400 per piece.
- >400-600g catfish in deep fried form was sold to traders at KES 450 per piece.
- Whole catfish weighing above 600g was delivered to the market at an average KES 571 per piece and sold at an average KES 833.
- Nile perch of individual weight of >400-600g per piece was supplied at KES 240-270 and sold at 280-300 KES.

Figure 14: Volume of fish sold in Oyugis by top ten traders

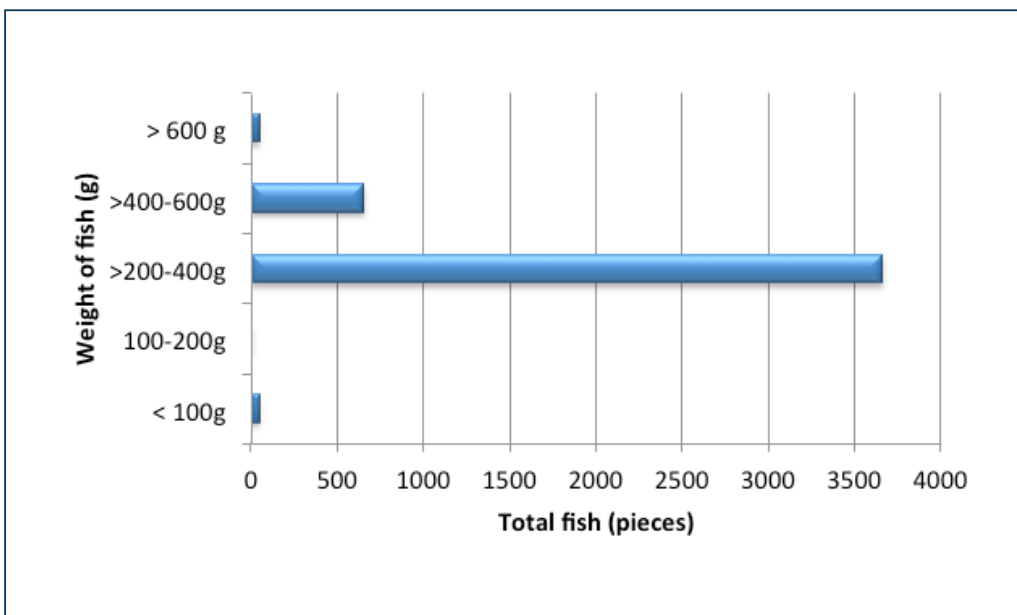


Table 16: Volume of fish traded in Oyugis January-July 2014-2015 (Kg)

Market	Fish Species	January	February	March	April	May	June	July
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
Oyugis 2014	Fresh Tilapia	1900	1630	1380	1750	1770	1120	1480
	Nile perch	2120	2560	1070	1560	1710	1060	1320
Oyugis 2015	Fresh Tilapia	9560	3320	1500	1150	12200	3080	1020
	Nile perch	6720	2020	1490	1250	8500	3350	1110

Source: KMFRI EFMIS data 2014-2015. See Appendix.

Table 17: Prices of fish traded in Oyugis Jan-July 2014-2015 (KES)

Market	Fish Species	January	February	March	April	May	June	July
		Price range	Price range	Price range	Price range	Price range	Price range	Price range
Oyugis 2014	Fresh Tilapia	550-650	600	550-600	600-650	600-650	600-650	600-650
	Nile perch	280-350	280-320	250-300	250-300	250-300	250	250-300
Oyugis 2015	Fresh Tilapia	650	650-700	700	600-700	650-670	650	600-700
	Nile perch	350-460	350-400	350	300-350	350-370	300-350	300-350

Source: KMFRI EFMIS data 2014-2015. See Appendix

3.2.2 Post-harvest Handling & Losses

During the survey period very little wastage and loss was reported in all the markets.

One reason for this is that there was a short supply of fish meaning most of it sold. The other reason is that fish traders in City and Gikomba are able to freeze their fish in whole or fillet form. The general practice is that after washing the fish other traders will eviscerate it and sell immediately and any left-over is either frozen or fried. Fish may even be refried. For those who are trading low volumes like in Mlolongo, they consume the remainder with their families. In Luanda market when there is surplus or the demand is low, traders will take their fish to other nearby village markets or reduce their prices.

“Last month I had one case. It is rare for it to be rotten because the fish is scarce so it is unlikely to stay. So wastage is also small. When one gets fish constantly everyday that’s when wastage is high but right now it is low.” Fisheries Assistant, Gikomba market on fish spoilage.

Fish is also sold in sundried and smoked form to preserve it. These forms of preservation may be used by the traders to hide slightly off fish. The question of whether the traders are in full compliance to the national safety standards and regulations is complicated. As one fisheries expert puts it, the fish if

examined closely will probably not pass inspection. Ideally fish should be transported in cold storage vehicles but to enforce this would probably cause the price of fish to increase. Furthermore it is sometimes packaged in sacks, cartons and baskets making it vulnerable to physical damage and exposure to microorganisms among other elements. According to the fisheries officer, during the rainy season in Oyugis, the roads become impassable and often by the time that the fish arrives from the lake it is spoiled and has to be thrown away.

Nairobi traders in both markets are all well aware of how to handle the fish hygienically and also know how to differentiate between fresh and spoiled fish. Rotten fish is disposed of either by the traders or by the fisheries and county officers. There is strict enforcement by the officers on personal hygiene such as wearing of clean dustcoats and gumboots and covering of hair. Male traders are not permitted to grow beards and all traders are required to have medical certificates. The public health officers do regular checks on this. Additionally one is not permitted to attend to customers if he/she is unwell. Fisheries officials sometimes have challenges in enforcing these rules and are forced to take measures on offenders. This is daunting because although trained to handle such cases, they are not law enforcement officers. In rare cases, traders are charged in court for instance for undersize fish. Some traders will also have dirty dustcoats or other offences. The traders associations also help in enforcing the regulations and often cases will be referred to them to deal with because they have methods of employing punitive measures on their members such as banishment from the market.

“Enforcing is a big challenge because they

are used to us. It would help if there was police. Some run away when they have a dirty coat then come back when you have gone. You cannot start chasing after him.” Fisheries assistant, City market

3.2.2 Farmed fish

All traders interviewed in the 6 markets dealt in wild fish only except for 5 in Oyugis market who sold both farmed and wild fish. In terms of volumes traded, 4 traded greater volumes of wild than farmed fish, while 1 traded both in equal measure.

In previous years there was more presence of farmed fish in the markets but this gradually dwindled due to a negative reception by customers and traders. In Luanda although we did not encounter any farmed fish, the fisheries officer indicated that no levies were charged on farmed fish.

A significant majority of traders, customers and officers interviewed had strong negative perspective on farmed fish. Most traders indicated that they would only resort to selling farmed fish if wild fish was in short supply. Traders who had previously sold farmed fish said that customers rejected the fish claiming its taste was very different from that of wild fish. This claim is validated by the customers we interviewed. Furthermore we noticed that

the farmed fish in Oyugis was sold collectively with the wild to hotels and institutions rather than individuals.

“Yes, the source matters a lot, because fish from the lake is sweeter than that of fish ponds.” Female customer, Luanda market, on whether the source of fish matters.

Some customers however, did not indicate a preference for, or difference in, the taste of farmed or wild fish. This feedback tended to apply to customers not traditionally raised on lake or sea fish.

“We are not particular. Like when fish is filleted it is not always Tilapia it’s the other one, mbuta (Nile perch) and some of us can’t even tell the difference.” Market Superintendent, City Market.

Below is a summary of the sentiments expressed by those interviewed:

- Tasteless –muddy (earthy taste)
- Too small in size
- Is fragile / Breaks apart when being cut and fried
- Spoils quickly even when frozen ,turns green
- Has chemicals, artificial boosters – wild fish considered more ‘natural’
- Farmed fish is fatty (Apparently the same complaint has been made of the Chinese tilapia)
- Farmed fish can sell faster due to its cheaper price

The complaint about the taste of farmed fish is not unheard of and is similar to what other local and global researchers have found. The global perception of farmed fish is that it is ‘unnatural’ as expressed by those who thought that the fish were ‘fed with chemicals’. A comparison study on fish consumers in Kenya found that some consumers thought farmed tilapia had a ‘mud taste’ and that farmed fish were produced with genetically modified feed ingredients or chemicals such as growth hormones (Githukia et al)¹³. Fish farming literature also indicates that the muddy taste is easily rectified by leaving the catch in clean water for a day or two.

Saying that farmed fish is small size begs the question; what is small and for whom? Our survey has shown that there are customers for smaller sizes of fish (100g and more) and in fact some buy pieces of the larger fish. This assertion may need more clarification as most traders who were asked to clarify this said that their particular customers took bigger sized fish for example those in City where sizes are greater than 500 grams.

“Farmed fish has no market. They keep saying it is tasteless, the size is small, that is, table sized 300-400 grams, although they say the price is fair.

Over the years I have not seen any farmed fish [here].” Fisheries assistant, City market.

Given its lower price point, farmed fish sells quickly especially to retailers or price sensitive customers. Conversely it sells slower to customers who value ‘quality’ over price. The lower price of farmed fish may cause it to be perceived as inferior to wild fish.

Chinese frozen farmed fish is available in Gikomba. This is generally bought by women traders who sell fried fish in the estates. One woman trader at Gikomba market said that she usually sells 6-7 cartons of fish on a good day.

A few traders across the different markets claimed that farmed fish spoiled too quickly especially when displayed for an entire day. The change in skin colour to green or black was attributed to spoilage. Spoilage is closely linked to handling and post-harvesting processes that are employed. Microbial action is largely responsible for the breakdown of the tissues and enzymes leading to deterioration. These are factors that have to be carefully managed if quality of the fish is to be preserved. Interestingly we observed that wild catch is not subject to careful post-harvest handling and in fact arrives in Nairobi even up to 2 days after being caught. There are however no complaints about the taste leading us to doubt the credibility of some of

the claims about the 'tastelessness' of farmed fish.

"The imported Chinese fish is tasteless too and same thing when you go to deep fry it. But there is scarcity of fish so there is no otherwise [alternative]. It goes for 210 shillings per kg while tilapia goes for 270-280 per kg. The other fish

traders are complaining about the Chinese fish, that it is spoiling their market."

Fisheries Assistant,
Gikomba

When asked if in future they would consider starting to trade in farmed fish or increasing the volume of farmed fish they were currently trading, only 36 out of 90 traders indicated that they would. They did however indicate changes they would want in place to address the current threats and risks to trading in farmed fish.

Changes that fish traders want to be addressed before they can trade in farmed fish

- Enhance size, taste, colour and quality
- Boost supply from farms and preservation methods
- Proper policy from the government on marketing of farmed fish
- Improve feed quality to improve the taste
- Reduce the prices
- Fish breeds to be changed to one that can grow big quicker
- Standard sale price should be set for farmed fish country wide
- Diversify farmed fish products
- Sensitize customers on their attitude on farmed fish
- Sensitize people on fish eating and the importance of farmed fish.

The above are incorporated into the recommendations that we make at the end of this report.

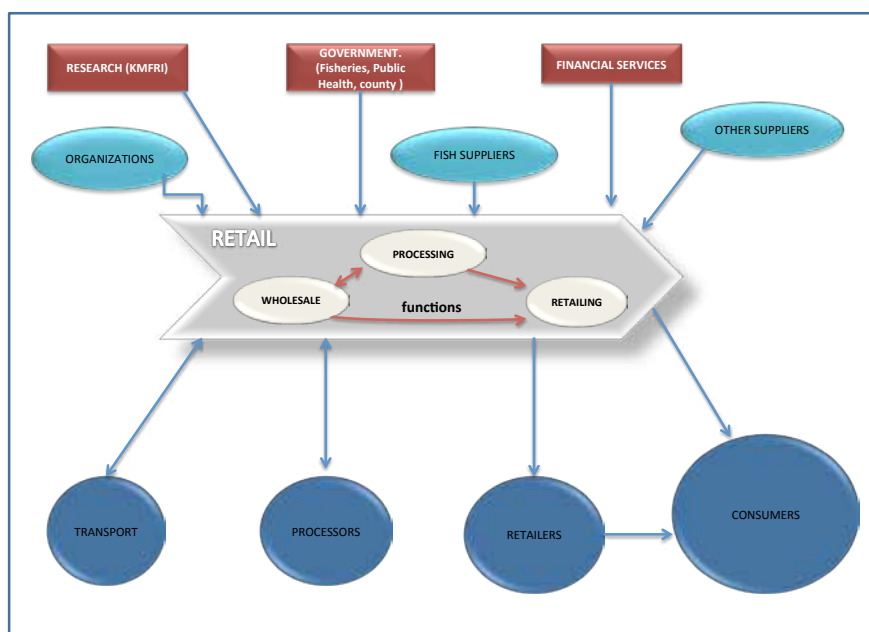
3.3 Value chain of the fish trade

trade value chain and its players who are then discussed in detail including their linkages and structures.

3.3.1 Diagram of the value chain

Below is a diagram representing the fish

Figure 15: Value chain of fish trade diagram



The sections below discuss the players of the fish trade beginning with the traders themselves.

3.3.2 The Fish Traders

Profiles

In total 90 traders were interviewed. In Busia, City and Gikomba markets 20 traders were each selected while 10 each were selected from the three smaller markets. There were 44 men and 46 women in total. However each market was different; for example Gikomba market had more women traders than City which is male-dominated. Busia had more men while Luanda had more women. This could be attributed to the fact that although the trade is open to both genders, women tend to be involved in processes such as drying and frying while the men seem to be more involved in filleting (as is common in City Market). For instance all the traders in Mlolongo were women who sold mainly

fried fish. One fisheries officer was of the opinion that women tended to deal with lower volumes and processes e.g. the 'mama karangas' (women frying fish) selling in the estates while men are seen to handle the bigger volumes e.g. transporting in lorries from the Lake region to Nairobi.

Although this is not always the case as evidenced by the survey, traditional thought has placed women as mostly tertiary users in the fish trade dealing mainly with processing, marketing of fish and fish by-products. However aquaculture offers a better chance for women to be involved at all levels along the chain including as primary users. As one fisheries officer put it, "women can easily take part in aquaculture because they just need to delegate the workers".

None of the officials interviewed thought that one gender necessarily had an advantage over the other. However this survey did not delve

too deeply into gender participation issues in terms of advantages or the disadvantages to women in the industry. About 57% of the traders are aged between 30 and 44 years. The oldest were 2 men over 70 years. 12% are below 30 years of age. This may however

be explained by the surveys focus on the top traders, who are likely to have been in the trade longer. The presence of youth in fish trade also shows that it is vibrant and likely to be sustained into the future.

Table 18: Age range vs. Gender of the traders interviewed

Market			Age Range (years)										
		Total	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	≥ 70
Gikomba	Male	7			4	1	1		1				
	Females	13			1	2	2	3	3	2			
	Total	20			5	3	3	3	4	2			
City	Male	17		1	4	5	5	1		1			
	Females	3		1	1			1					
	Total	20		2	5	5	5	2		1			
Busia	Male	16	1	3	4	3	2	1	1	1			
	Females	4			1	1			2				
	Total	20	1	3	5	4	2	1	3	1			
Luanda	Males	2			1		1						
	Females	8			3	2		1	1		1		
	Total	10			4	2	1	1	1		1		
Oyugis	Males	2									1		1
	Females	8	1			1	3	2	1				
	Total	10	1			1	3	2	1		1		1
Mlolongo	Males	0											
	Females	10		4	1	1	1	2	1				
	Total	10		4	1	1	1	2	1				
total	90	2	9	20	16	15	11	10	4	2	0	1	

Experience

The traders have a wide range of years of experience ranging from 1 to more than 20 years. Many of the traders inherited their businesses or grew up around the fish trade business making it a natural career. This is especially evident in Busia. In most of the markets such as Gikomba and City most of the traders are related. In the City market many traders either took up the family business or were introduced into it by a close relative e.g. one trader used to be a mechanic but when business slowed down his brother gave him the idea of starting in fish trade.

“This market began long ago, the person

who started trading fish then, married here, has had his children here... some of them when they don't get the jobs they inherit the businesses. The daughters are here also. So it's like a family business.” Gikomba Fisheries Assistant

Other traders had either in another business that did not work out or made a lateral move. For example one trader in Luanda used to be a fisherman while another was a money changer for the traders before joining the business. There were also some former civil servants. In Mlolongo however, 7 out of the

10 women have been in the trade for less than 5 years. The most common reason for the women joining the trade was because it was a good or better business opportunity for example compared to selling vegetables. Below is a table showing the experience of the traders in years.

Table 19: Experience of the fish traders (years)

No. of years	Market						Total
	Gikomba	City	Busia	Luanda	Oyugis	Mlolongo	
0-5	4	1	7	2	2	7	23
6-10	4	5	4	3	3	1	20
11-15	3	5	1	1	1	2	13
16-20	4	6	2	4	4	-	20
21+	5	3	5	-	-	-	13

The combination of both new and experienced traders can be of value with newer traders learning from those more experienced.

However, there is also the risk of the older traders stifling the new entrants. This question was however not explored deeply.

“I was working as a teacher in a private school but I was underpaid. A friend of mine introduced me into the business which has better returns.” - Female trader, Gikomba, 5 years’ experience.

“I was born and brought up in the fish trading area. This is the only trade I have known.” -Busia male trader 35-39 years old, with 21 years’ experience.

“After form four I joined secretarial training but I didn’t get a job. I decided to venture in to business and landed in this.” -Oyugis female trader, 50-45 years old, with 25yrs experience.

The Fish Suppliers & Transport

Gikomba & City Markets

Wholesalers from Busia supply the wholesalers in the other markets in Nairobi, Luanda and other towns. In these markets the wholesaler will also do some processing and retailing while in Busia the wholesaler just repackages fish in ice and transports it to the other markets.

In Gikomba most of the traders had 1-2 suppliers from the lake region similarly to the City market where having 2 suppliers

was even more common. One trader had 4 suppliers. The main mode of delivery is lorries that arrive in the morning hours and are offloaded by young men. Smaller amounts of fish may be transported via general public transport.

Payment is most commonly through mobile money transfers. The fish is normally purchased on credit and payment is done when it is sold. Different traders had different arrangements with some paying at the end of the current day, the following or up to a week

later. A few of the suppliers may request that the money be directly deposited into their accounts. Cheques were also used although this is rare. When the supply of fish is low, the traders may pay a deposit in order to secure their orders.

Busia

This is a very busy market with fish coming in from Kenya and Uganda. Motorcycles and bicycles are common modes of transporting the fish which is packed in baskets. Most of the traders have one supplier from the beach and the mode of payment is similar to Nairobi, either cash or credit for up to 6 days.

Mlolongo

The women traders purchase the fish themselves from Gikomba and carry it using public transport (minibuses) or motorcycles (bodaboda). Many of the women do not have a specific trader, often purchasing from the one who has what they need.

The payment is usually on cash basis because the quantity is relatively small but credit arrangements are also possible. In these cases the money is sent using mobile money at the end of the day. The fish is wrapped in paper bags, baskets, or sacks. It is washed and gutted at Gikomba so as not to be 'smelly'

when in transit. Some traders even bought already fried pieces.

Luanda

The fish is most commonly transported in vans. Motorcycles and public transport are also options. The fish is packed in baskets and sacks. Most of the traders have 1 or 2 suppliers and payment is most often cash on delivery.

Oyugis

The fish is packed in baskets and cartons and transported in cars and motorcycles. The most common mode of payments is by mobile money and cash.

The packaging of the fish in sacks, baskets and cartons is not strictly according to the regulations but seems to have become an accepted depending on the fisheries officer. For instance in Gikomba, the fisheries officer says that those who bring their fish in sacks are often 'punished' by sending them to the back of the line when offloading.

Other suppliers

The fish traders have suppliers for the other inputs that they need to run their businesses. Most of these are from other traders and hawkers in the market. These include:-

Item	For example:-
1. Ice	A sack is @1000 KES in Busia 1500 KES in Nairobi
2. Polythene/plastic bags	Various sized (clear, black, green, yellow)
3. Charcoal/firewood	For those who fry
4. Frying oil	e.g. 2550 KES for 20 litres, 1275 KES for 10 litres
5. Baskets (in Busia)	3 for 250 KES
6. Water (traders buy water in all markets)	10 litres @ 10 KES, 60 litres for 150 KES

Processors

At the markets such as Gikomba there are people who are paid to descale and gut fish, fillet or deep fry it according to a customer's requests. They are paid by the traders according to the size of the fish and the job.

Traders' Assets

The set up for the fish trader is quite simple. The markets are generally congested; - a typical stall is normally one or two tables, while some traders set up on the ground. Depending on which processes he/she is

involved in, the trader will also have knives, crates, basins and buckets, trays, chopping boards, frying pan, charcoal cooker (Jiko), chair and dustbin. All these are locally made, relatively cheap and are easy to replace.

A few of the traders also had weighing scales in Gikomba, Busia and City markets. This was not common in the smaller markets who sell their fish in pieces and not per kilo.

The most important asset for the traders in the 2 main Nairobi markets is the chest freezers. These are packed together in a space (City) or makeshift room (Gikomba). In City market the space is so limited that some traders have freezers in warehouses away from the market.

Traders' Financial Arrangements

We asked the traders whether they had received any financial assistance from persons

other than a lending institution and/or loans in the last two years. It was emphasized that by assistance we meant money that they were not required to give back. If they answered truthfully then a good number (16) have had assistance from their relatives in amounts ranging from two thousand to one hundred thousand shillings. Approximately half have also taken loans in the last two years from various institutions such as banks, microfinance institutions and their Sacco or table banking groups. The loans were often to boost their business or increase their stock. Some of the traders used the loans for multiple uses for example one trader in Busia got a loan of 800,000 KES and used it to boost his business, build a house and pay school fees for his children. Yet another trader obtained an 80,000 KES loan which he used to 'expand his business, get married and build a house'.

Table 20: Financial assistance received by traders in the last two years

Trader (Market, serial no.)	Amount	Who from	What for
GIKOMBA[1]	50,000	Brother	To add deep freezer
GIKOMBA [3]	50,000	Brother	To improve stock
GIKOMBA [15]	50,000	Niece	To boost business
CITY[4]	20,000	Sister	To restock business
CITY[5]	10,000	Sister	To pay for stock
CITY [16]	100,000	Relative	To boost business
BUSIA [3]	70,000; 50,000	Sister; brother	For business
BUSIA [6]	100,000	Relatives	To expand the business
BUSIA [15]	20,000	Brother	Increase supply
BUSIA [20]	70,000	Girlfriend	To boost business
OYUGIS [2]	50,000	Husband	To improve business
OYUGIS [6]	10,000	Children	To improve stock
OYUGIS [9]	10,000	Brother	To increase stock & pay school fees
LUANDA [5]	20,000	Mother	For business
LUANDA [6]	20,000	Father	To increase stock
LUANDA [7]	2,000	Husband	To improve stock

Table 21: Financial loans received by traders in the last 2 years

Trader	Amount	From	Trader	Amount	From
GIKOMBA [1]	7000	Chama	CITY [20]	80,000	APDK microfinance
GIKOMBA [2]	400,000	COOP BANK	BUSIA[4]	200,000	KCB
GIKOMBA [3]	70,000	Chama	BUSIA [5]	250,000	KCB

Trader	Amount	From	Trader	Amount	From
GIKOMBA [4]	100,000	UPENDO SACCO	BUSIA [6]	800,000	Unspecified
GIKOMBA [5]	100,000	UPENDO SACCO	BUSIA [7]	80,000	Ministry of Trade
GIKOMBA [6]	400,000	UPENDO SACCO	BUSIA [8]	570,000	Bank & Table Banking
GIKOMBA [8]	60,000	LAC NYIERO	BUSIA [9]	unspecified	Table Banking & microfinance
GIKOMBA [11]	10,000	UPENDO SACCO	BUSIA [10]	20,000 300,000	Table Banking microfinance
GIKOMBA [13]	100,000	LAC NYIERO	BUSIA [13]	400,000	OPPORTUNITY KENYA
GIKOMBA [15]	60,000	LAC NYIERO	BUSIA [14]	75,000	KCB
GIKOMBA [16]	30,000	LAC NYIERO	BUSIA [16]	100,000	OPPORTUNITY KENYA
GIKOMBA [18]	100,000	UPENDO SACCO	BUSIA [17]	25,000	KCB
GIKOMBA [19]	20,000	Chama	BUSIA [19]	400,000	NABUHIA NAKANDI SACCO
CITY [1]	150,000 200,000	CHASE BANK COOPERATIVE	BUSIA [20]	200,000	SIDIAN BANK
CITY [5]	10,000	FAMILY BANK	LUANDA [3]	100,000	KWFT
CITY [11]	450,000	MICROFINANCE	LUANDA [4]	20,000	Chama
CITY [13]	200,000	MICROFINANCE	LUANDA [6]	30,000	Chama
CITY [14]	100,000	MICROFINANCE	LUANDA [7]	50,000	KWFT
CITY [15]	500,000	BARCLAYS	MLOLONGO [4]	30,000	Chama
CITY [16]	200,000	Chama	OYUGIS [4]	200,000	Bank
CITY [17]	50,000	MICROFINANCE	OYUGIS [5]	30,000	KWFT
CITY [19]	150,000	SAYDO SOCIETY	OYUGIS [8]	30,000	WAKENYA PAMOJA SACCO

It seems that across the markets (except for Mlolongo) these traders have access to financial services from their Sacco, banks and microfinance institutions.

Organizations

Most of the traders belong to groups (chamas) or associations in the markets. These serve a variety of purposes such as table banking,

welfare support in case of deaths and even more importantly serve as guarantors for loans from financial institutions. Additionally these groups advise the traders on business. A vast majority of the traders see the importance of belonging to one or more of these groups. Below is a list of some of the groups that were mentioned by the traders.

Table 20: Organizations linked to fish traders

Market	Groups
1. Gikomba	Mishel Kamkunti Sacco, SUSA, Upendo Sacco (100 plus members)
2. City	Kanyanam (around 300 members)
3. Mlolongo	Chama cha Wanawake
4. Luanda	Uchumi Women's group
5. Busia	Busia Multipurpose Fish Traders Association
6. Oyugis	Oyugis Tilapia group, Oyugis Umbrella Fish Sellers, Oyugis Tilapia Women group.

Government and others

Fisheries officers and public health officers offer support in terms of technical advice on fish handling, safety and hygiene as well as enforcing the fisheries regulations. With the exception of City market, where a workshop was organized and attended by a few traders this year, there is little formal support of this nature.

Only 26 of the traders said that they had ever received training in fish handling and safety. There generally does not seem to be much training or capacity building occurring for the traders although one mentioned attending a workshop by the German Technical Cooperation Agency (GTZ) and another by the European Union on filleting.

When asked about the topics that they would like to receive training, the following were the popular topics in no particular order. It is not clear whether these responses were mentioned merely because they featured in the preceding questions in the survey or if they were genuine felt needs. Therefore ranking or scoring these training needs could be misleading.

Value addition

Quality Control

Fish pond farming

Financial Management

Fish handling

Fish preservation

Marketing & Customer

Relations

Apart from extension services, the fisheries officers also enforce the Fisheries Act Cap 378 to ensure food safety and hygiene is

maintained. In some cases there was also the presence of Public health officers whose tasks include ensuring that the traders are medically fit and have medical certificates.

County officers are mostly concerned with collecting revenues from the traders and ensuring that the services (such as waste collection) are maintained.

Research (KMFRI)

KMFRI is present in 5 of the markets and collect data using EFMIS. However, the benefits of their research and insights were not immediately clear.

3.3.3 The consumers

We used three broad categories (individuals, retailers, institutions) to classify the type of customer and for each we asked the fish trader the total volume of fish bought by each per week, by type and form. Below are the tables representing City, Busia and Gikomba markets. The monthly volumes were extrapolated by multiplying by 4.2. In some cases the traders could not clearly separate the volumes sold by customer type and these have been put together. It should be noted that unlike the previous tables of volumes traded, these tables represent all the traders interviewed. Additionally they are based on recollection and not records. The volumes should be treated as approximate values. They however give insights into the types of customers and their fish preferences.

In Busia most of the top traders deal chiefly with traders from Nairobi markets. We observed that they simply received the fish in the baskets, added ice and then sent it off for transportation to Nairobi's City market or Gikomba. Hotels, restaurants and institutions are also major customers. Busia market handles close to 166,000 Kg of Tilapia per month the most significant amount by far across all the markets.

Table 23: Busia: Customer type against approximate volumes of fish bought per month

Customer Type	Fish type					
	Nile perch		Tilapia		Omena	
	vol. per week(kg)	sell price range (kes)	vol. per week (kg)	sell price range (kes)	vol. per week (kg)	sell price range
Individuals & traders	1760	250-260	9950	320-330	* 10 sacks	800shs/basin
Individuals & hotels	2700	240	4300	330-340		
Individuals	1000	250	3900	330-350		
Retailers & wholesalers	2400	260-270	17300	340-350		
Institutions			4000	330		
total per week	7860		39450			
Total per month	33012		165690			

Looking at the Busia table the largest share of tilapia goes to retailers and wholesalers.

Table 24: City market: Customer type against approximate volume of fish bought (KG)

Customer Type	Fish type					
	Nile perch		Tilapia		Omena	
	vol. per week(kg)	sell price range (kes)	vol. per week (kg)	sell price range (kes)	vol. per week (kg)	sell price range
Individuals	1480	550-580	1775	360-420	16	300-350
Institutions	905	500-600	170	400-450		
Hotels	1190	480-680	3405	370-420		
Butcheries	2970	500-550	280	380-400		
Supermarkets	240	550				
Fish traders	200	280	180	300-360		
total per week	6985		5810		16	
Total per month	29337		24,402		67	

In City Market hotels are the top buyers of tilapia while butcheries buy most of the Nile perch. Prices paid by hotels and institutions are significantly higher than those paid by retail customers.

Table 25: Gikomba: Customer type against approximate volume of fish bought (kg)

Customer Type	Fish type			
	Nile perch		Tilapia	
	vol. per week(kg)	sell price range	vol. per week (kg)	sell price range
Individuals	1095	(250-280) Whole (480-500) Fillet	1500	360-370
Fish Traders	1930	(250-370) Whole (500) Fillet	6505	360-380
Hotels	1670	(250-290) Whole (470-520) Fillet	2240	360-380
total per week	4695		10245	
Total per month	19719		43,029	

The two price ranges for Nile perch are for whole and filleted fish while tilapia is sold whole. Fish retailers are the top buyers of both Nile perch and tilapia.

Customers' mode of payment

Most of individual customers pay immediately using cash or mobile money. Payment terms depend on the relationship between the customer and the trader. Longtime customers are more likely to arrange for credit with settlement varying within the 1-4 day range.

Institutions like hotels, schools and supermarkets commonly pay monthly or weekly by cheque. Butcheries and some hotels often pay at the end of the day using mobile money transfers.

Customer 1: Male, 26 yrs., Oyugis.

He buys Nile perch for his family once a week because of its good taste. On special occasions however, he will buy other types of fish like Tilapia or meat. In his household fish is always an evening meal because of the short time that it takes to prepare it. He assumes that the fish he eats comes from the lake. Apart from fish, they also eat beef, tripe or goat meat. In a month

he may spend;
800 shs on fish
1000 shs on beef
560 shs on tripe
250 shs on goat meat

Individual consumer profiles

In each market a questionnaire was administered to a few of the individual consumers. These were picked largely based on their willingness to take the time to respond to the questionnaire. A total of 59 people; 11 men and 48 women were interviewed. All except 3 of these were purchasing for households/families.

Many people cited fish as a healthier protein than red meat and also tastier than other proteins. For high and medium income homes, it seems a variety of meat including fish is bought and expenditure was as high as 20,000 KES per month. Tilapia was more frequently mentioned as the fish of choice by most and especially in its deep fried form. One customer referred to it as a fish you can prepare for a respected guest indicating that for some, it is also a dish for special occasions.

***"I usually purchase fried fish (tilapia), because my wife does not know how to prepare the fish before frying."
Male customer, Mlolongo.***

Customer 2: Male, 42yrs, Luanda

He buys fish for his household once a week except on special occasions when he has visitors when he may

purchase fish thrice a week. He prefers to buy Omena, Tilapia and Catfish fresh and fried. His main reason for eating fish is because he is Luo and it's his favourite. It doesn't matter if it is wild or farmed 'so long as it is fish'.

"... In my tribe fish is everything"

He will also buy beef, chicken and liver depending on funds and on the duration that they have not consumed a given type of meat. Every month he spends:-

1200 shs on fish

150 shs on beef

400 shs on chicken

200 shs on liver

Catfish was mentioned by a few and seems to be a 'special occasion' fish for some.

"Yes, it varies, like when with visitors or function where people will want other types like catfish." Female Customer, Luanda on whether she bought different types of fish on special occasions.

Interestingly nearly all the respondents in City and Gikomba markets said that Pulses (beans, green grams) were their families' most important source of protein while those in Busia, Luanda, Oyugis and Mlolongo mentioned fish. 31 respondents cited fish as their most important source of protein.

The typical individual customer seems to be female. Some traders said that all their customers were female while others estimate their female quota to be 60-80%. This is not surprising as most women plan and purchase food for their families. However men often take charge of buying meat and so make up 20-40%. The age of the customer also ranges widely but the most commonly mentioned was 30 years and above. This may not necessarily be significant except to imply those who are mature and have families. It may also imply a stabilized income if considered together with the traders' assessment that their customers were mostly middle to high income earners. This was based mainly on the amounts that a customer would spend per purchase or even weekly. In City market customers make purchases ranging from 2000 to 6000 shillings, in Mlolongo as much as 4500 shillings, while in Gikomba market as much as 5000 per week may be spent. As shown in the table below the amounts that customers spend on fish and other meat sources.

Customer 3: Female, 30 yrs., City Market

She buys fish for her family once a week for their daily meals.

Although she buys both, Tilapia is more frequent than Nile Perch. She says that fish is a healthy

white meat and this is why she buys it. She will not buy farmed fish because 'it is not as tasty'. Every week she spends about 2,500 shs each on both fish and chicken. Monthly she spends:-

10,000 shs on fish

10,000 shs on chicken

1650 shs on goat

500 shs on liver

1000 shs on tripe

Reasons for buying and eating fish

1. Healthy protein source: This was the most often cited reason for why the customer was buying fish. Some even said that the fish had Omega 3 and was cholesterol free. Fish was also 'white meat' 'disease free' 'chemical free'. Fish is believed to be healthier for the family especially for those with cardiovascular and high blood pressure concerns. The depth of this belief was not explored comprehensively hence respondents could simply be quoting an often heard phrase. The strength of these convictions may be questionable

considering the fish purchased was often deep fried in oil of questionable quality.

2. Taste: Several respondents consider fish a tastier alternative to other proteins.
3. Easy to prepare: The appeal of fish included its relatively short preparation time as well as the availability of fried "ready to eat" options.
4. Socio-cultural reasons: Many of the respondents have eaten fish from their infancy and it is part of their culture. Changing food habits that are inculcated within is difficult. One woman at the City market said that she did not eat catfish (although she ate a lot of other fish including tilapia, Nile perch and mudfish) but would only prepare it for her husband.
"Catfish is not something that my mother cooked."

Expenditure on Fish vs. Other meats

We asked the respondents to give an estimate on their monthly expenditure on fish and other meats. As shown in the table, some will spend more on fish while others will spend more on one of the other meats. The frequency of purchase alone cannot give an idea of the expenditure because of the different forms and types of fish purchased. For example, one customer's daily purchases of fish balls are unlikely to equate to another's weekly purchase of Tilapia fillets in Nairobi which retail at approximately KES 1,000 per Kg.

Table 26: Amounts spent monthly on meats & fish by customers (KES)

RESPONDENT	# Fish Purchases	AMOUNT SPENT MONTHLY by Individual Consumers (KES)							
		FISH	BEEF	CHICKEN	GOAT	LIVER	TRIPE	GIZZARDS	TOTAL
CITY MARKET									
1	Weekly	4000	800	1200		1650			7650
2	Once a week	10000		10000	1650	500	1000		23150
3	Weekly	1600	1600	2800		2200			8200
4	Weekly	7200		1000				350	8550
5	Weekly	6000		2400	1600				10000
6	Weekly	6000	3200	2400		1600			13200
7	Weekly	8000	1600	2400		1100			13100
8	Weekly	4000	1600	3200	1600				10400
9	Weekly	6000	2000	2800		2200			13000
10	Weekly	2000	400						2400
11	Weekly	2000	800	1600		1100			5500
12	Weekly	4800		2000				700	7500
GIKOMBA									
1	Weekly	1200		1000		400			2600
2	Monthly	4000	800	1200	1200	550			7750
3	Monthly	4800		8800					13600
4	Monthly	3600	1400			1100			6100
5	Monthly	3000	1600	800	400	2200			8000
6	Monthly	1800	3200	1600		1100			7700
7	Weekly	2400	1600	800		2200			7000
8	MD	2400	1600	1600		550			6150
9	Weekly	1600	1600	2800					6000
10	Weekly	4400	3200	3200		2200			13000
11	Weekly	3200	1600	1600		1600			8000
12	Weekly	1800	800	800		550			3950
BUSIA									
1	Twice a week	2000		1500					3500
2	Twice a week	1500	1200	700	300		400	240	4340
3	Thrice a week	4800	1200	1000	1200	400	1500	500	10600
4	Four times a week	4800	680				1600		7080
5	Thrice a week	2400	680				1600		4680
6	Thrice a week	1000	1000	1000	500	800	300		4600
OYUGIS									
1	8 times a week	1850		1200					3050
2	Once a week	1600	700				250		2550
3	Daily	10000							10000
4	12 times a month	12000	350	2000	2000		500		16850
5	3 times a week	1500	700	500	370	1100	250		4420
6	Once a week	6000		1600					7600

RESPONDENT	# Fish Purchases	AMOUNT SPENT MONTHLY by Individual Consumers (KES)							
		FISH	BEEF	CHICKEN	GOAT	LIVER	TRIPE	GIZZARDS	TOTAL
7	Twice a week	1600	640	1200	800				4240
8	Once a week	2800	700	1200					4700
9	Once a week	400		600					1000
10	3 times a week	2400	340	1000		350	400		4490
11	Once a week	800	1000	250			560		2610
12	4 times a week	3200	680						3880
LUANDA									
1	Twice per week	2000	720	700		500	480		4400
2	Four times a week	3000			600				3600
3	Thrice per week	2400	720	700					3820
4	Thrice per week	12000	2800	2800					17600
5	Thrice per week	3200	360	1400					4960
6	Thrice per week	2000	720	700		500	500		4420
7	once per week	1200	150	400		200			1950
8	Twice per week	800	100	400		150			1450
9	once per week	1200	150	600		300			2250
10	Four times a month	1500		500					2000
11	md	3000	300	500	150	200			4150
MLOLONGO									
1	Twice a week	1400	600	600					2600
2	Three times a week	1200					600		1800
3	Four times a week	md	200			400			600
4	Four times a week	2500	1500						4000
5	Every market day	2000	700	500					3200
6	Once a week	1500			700				2200

Table 27: Individuals vs. monthly expense on fish

Monthly amount spent on fish (KES)	Number of individual consumers N=58*
0-2000	26
2001-5000	22
5001-9999	6
10,000 and above	4

*- Missing data on 1 respondent

In summary we can say that individual customers can be broadly categorized (not mutually exclusive):-

- Customers for whom fish is the most important source of protein. 31 (52.5%)
- Customers who are leaning towards fish

to replace red meat for health reasons such as high blood pressure or religious reasons. 11 (18.6%)

- Customers who eat fish as part of a variety of proteins they consume. 14 (23.7%).

3.3.4 Fish traders' SWOT Analysis

Below is a summarization of the strengths, weaknesses, opportunities and threats for the fish traders as has been given in the report.







Recommendations to KMAP

The following are recommendations to KMAP for fish farmers to commercialize their operations through increased market engagement.

1. Different and /or New Market channels:

It is clear from our survey that attempting to change the minds and attitudes of the top traders in the existing markets may not be easy at least in the short-term. Markets where non-traditional consumers of fish reside might be more feasible. Additionally 'new' traders may have to be approached in the existing markets. For example, in City market, explore the use of those with shops and the poultry traders. The market superintendent puts it this way:

"Let us not say that it is not conducive [for farmed fish]. ...The chicken traders have not refused the fish traders from selling chicken so can the same happen that the chicken traders sell farmed fish? Are chicken traders willing to buy? Sensitization could be done to the traders (chicken) and tell them to bring in the farmed fish". - City market respondent, on the possibility of farmed fish at the market.

b) Strengthen the existing Aqua Shops and use them as collection points: This is for farmers to bring in their fish together and strengthen their market positioning. One of the problems being experienced by fish farmers is the inability to meet the demand in terms of volume and consistency for example when they got supermarkets as their clients.

"In Machakos the supermarkets will tell the farmer to bring a sample and then they agree on a price and a range in size of fish. However they want one to keep up a constant supply of at least 50 fish per week. This is a bit difficult for the farmers because they have been left with one or two ponds." – Fisheries Officer, Mlolongo on markets for farmed fish.

c) Target youth and those in their twenties with strategies that seek to increase their interest and consumption of fish in general and farmed fish in particular.

Their perceptions and misconceptions are easier to address than with more mature audiences that want to be traditional. However the older (over 30s) can also change their consumer behavior given the right triggers being addressed e.g. improved taste, repackaging.

d) Create a market for small sized (100 -200g) fish by consistent supply.

This survey confirms that there is a market for smaller sized fish (e.g. in Mlolongo). This is a market that can be addressed by fish farmers profitably.

2. Target the traders' associations in each market.

Although the traders seem to have a negative attitude towards the farmed fish, many did indicate that they were willing to trade in it if some adjustments such as improved taste, shelf life and texture were made. Moreover if

the customers' acceptance of farmed fish is improved then the existing fish traders will also begin to trade in farmed fish. Going through the associations will be the best entry to engage with the traders. Suppliers as identified in this research should also be included.

One way to do this is through forums that are aimed at eliciting and addressing all the factors that are standing in the way of the traders marketing farmed fish. For instance the quantities and frequency of supply, the price ranges and so on. A similar separate forum can be done for the farmers and then the two groups come together in a forum that will enable them to reach a mutually beneficial agreement.

“No farmed fish because it is not allowed. They (traders) do not allow. Fish is done by the Luos and they will not allow farmed fish to come here while their fish is there. There is no farmed fish here.” –City Market respondent on the absence of farmed fish in the market

3. Value addition of farmed fish.

Apart from the more common methods of adding value e.g. frying, processes that are attractive, time saving or altogether innovative should be explored. Our survey showed that fried fish was very popular and at times was used by the traders to 'mask' fish that was slightly off. Fish farmers need to be innovative and aggressive in this e.g. sausages, coated products, marinated products and others. This recommendation blends with that of looking for new markets; new products must also be pursued in order to gain customer acceptance.

4. Improved Quality:

So as to achieve better consumer acceptance farmers evidently need to improve on their production practices in order to improve on the quality, taste, shelf life and other desirable characteristics for their fish.

b) Fish feed needs to be improved in quality and made more accessible:

Currently it drives the cost of production (70% of production cost) high. KMAP can influence those in the private sector to take advantage of the new zero-rating of raw materials for manufacture of animal feeds and pass on the reduced costs to farmers.

5. Improved harvesting and post-harvesting techniques:

Farmed fish could differentiate itself from wild catch by managing harvesting and post-harvest techniques to deliver fish that is safe to eat and meets sanitary and phytosanitary measures. The Standards and Market Access Program (SMAP) is an opportunity for fish farmers to receive training in producing fish that is up to the International standards of quality. Farmed fish may now be exported to the European Union and although we have enough local demand, it may not hurt in the long-term for farmers to 'cast their nets deeper'.

b) Collaboration with KMFRI to improve the quality:

KMFRI has done some research in the area of the assessment of post-harvest loss reduction among other areas and collaboration may benefit the farmers.

6. Education and Information campaigns:

This recommendation is informed

not only by the responses of the respondents but also the considerable literature review done in this survey. Aquaculture has been globally misunderstood and it is up to all stakeholders to collaborate in informing and educating the population with the correct information e.g. on health benefits and production. 'Evidence suggests that consumers' perceptions may be based more on beliefs and emotion than on objective knowledge'¹⁴. Some ways of doing

this are advertisements, campaigns, demonstrations, use of media, integration of fish farming in school education systems.

7. Mainstream women into fish farming.

This is a general recommendation as we did not delve deeply into gender issues. However we have established that in Kenya there is almost equal participation of both genders in the fish industry but at different levels.



“No farmed fish because it is not allowed. They (traders) do not allow. Fish is done by the Luos and they will not allow farmed fish to come here while their fish is there. There is no farmed fish here.” – City Market respondent on the absence of farmed fish in the market







Appendix 1: Survey Questionnaires

1. Questionnaire for Fish Traders

[A] Respondent Profile	
A1	Name
A2	Gender [a] Female [b] Male
A3	Age [a] 15-19 [b] 20-24 [c] 25-29 [d] 30-34
	[e] 35-39 [f] 40-44 [g] 45-49 [h] 50-54
	[i] 55-59 [j] 60-64 [k] 65-69 [l] 70 & above
A4	Contact details (phone number)
A5	How many years have you been selling fish? b) Why did you get into the fish trade?
B	
B1	Fish type: Please tell me the fish types that you trade in? (tick) [a] Omena [b] Nile perch [c] Tilapia
	[d] Catfish [e] Trout
	[f] Others (specify all)
B2	In what form do you buy the fish, specify for each type (e.g. Whole, Fresh, scaled, gutted, headless, frozen, chilled, sundried, smoked, filleted, fried, etc.
	[a] Omena:
	[b] Nile perch
	[c] Tilapia
	[d] Catfish
[e] Trout	
[f] Others (specify)	
B3	Source of supply: For each type of fish that you buy, please tell me whether it is from the wild, or farmed or both? Include proportion (%) by source Also note if it is from China.
	[c] Tilapia
	[ci] All wild [cii] All farmed
	[ciii] Mixed: ____% wild; _____% Farmed
	[civ] Imported (China)
	[d] Cat fish
	[di] All wild [dii] All farmed
	[diii] Mixed: ____% wild; _____% Farmed
	[div] Imported (china)
	[e] Trout
[ei] All wild [eii] All farmed	
[eiii] Mixed: ____% wild; _____% Farmed	
[eiv] Imported (China)	

[A] Respondent Profile																	
B4	Supplier Information																
B4a). Please tell me the following information about your fish suppliers																	
	<table border="1"> <thead> <tr> <th>Name and telephone number of supplier</th> <th>Type of Fish</th> <th>Form of delivery (packaging & Transport)</th> <th>Mode of Payment (e.g. cash on delivery, credit (daily, weekly, monthly), cash/mobile/banking/cheque</th> </tr> </thead> <tbody> <tr> <td>e.g. Mama Juma 0710 xxx xxx</td> <td>Tilapia</td> <td>Basket, motorcycle</td> <td>Cash, end of day by mpesa</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Name and telephone number of supplier	Type of Fish	Form of delivery (packaging & Transport)	Mode of Payment (e.g. cash on delivery, credit (daily, weekly, monthly), cash/mobile/banking/cheque	e.g. Mama Juma 0710 xxx xxx	Tilapia	Basket, motorcycle	Cash, end of day by mpesa								
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e.g. Mama Juma 0710 xxx xxx	Tilapia	Basket, motorcycle	Cash, end of day by mpesa														
B4b). Please tell me the following information about your suppliers for other business requirements e.g. ice, packaging materials, oil etc.																	
	<table border="1"> <thead> <tr> <th>Name and telephone number of supplier</th> <th>Type of Fish</th> <th>Form of delivery (packaging & Transport)</th> <th>Mode of Payment (e.g. cash on delivery, credit (daily, weekly, monthly), cash/mobile/banking/cheque</th> </tr> </thead> <tbody> <tr> <td>e.g. Mama Juma 0710 xxx xxx</td> <td>ice</td> <td>100shs per KG</td> <td>Cash, end of day by mpesa</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Name and telephone number of supplier	Type of Fish	Form of delivery (packaging & Transport)	Mode of Payment (e.g. cash on delivery, credit (daily, weekly, monthly), cash/mobile/banking/cheque	e.g. Mama Juma 0710 xxx xxx	ice	100shs per KG	Cash, end of day by mpesa								
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B5	Seasonality and Pricing																
Of the fish that you sell, would you tell me if their supply volume is constant throughout the year or does it vary? (Probe – 1.which months are supplies high and which are low, by species and source (wild versus farmed) specific)																	
B6	Average supply Price (per KG in KES) during high and low seasons for wild fish																
	<table border="1"> <tbody> <tr> <td rowspan="5">What is the price your suppliers charge for wild (type) during high season and during the low season?</td> <td>[a] Omena: _____ high _____ Low</td> </tr> <tr> <td>[b] Nile perch _____ high _____ Low</td> </tr> <tr> <td>[c] Tilapia _____ High _____ Low</td> </tr> <tr> <td>[d] Catfish _____ high _____ Low</td> </tr> <tr> <td>[f] Others (specify) _____ high _____ Low</td> </tr> </tbody> </table>	What is the price your suppliers charge for wild (type) during high season and during the low season?	[a] Omena: _____ high _____ Low	[b] Nile perch _____ high _____ Low	[c] Tilapia _____ High _____ Low	[d] Catfish _____ high _____ Low	[f] Others (specify) _____ high _____ Low										
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	[c] Tilapia _____ High _____ Low																
	[d] Catfish _____ high _____ Low																
	[f] Others (specify) _____ high _____ Low																
B7	Average supply price (per KG in KES) during high and low seasons for farmed fish?																
	<table border="1"> <tbody> <tr> <td rowspan="4">What is the price your suppliers charge for farmed (type) during the high and the low season?</td> <td>[c] Tilapia _____ High _____ Low</td> </tr> <tr> <td>[d] Catfish _____ high _____ Low</td> </tr> <tr> <td>[e] Trout _____ high _____ Low</td> </tr> <tr> <td>[f] Others (specify) _____ high _____ Low</td> </tr> </tbody> </table>	What is the price your suppliers charge for farmed (type) during the high and the low season?	[c] Tilapia _____ High _____ Low	[d] Catfish _____ high _____ Low	[e] Trout _____ high _____ Low	[f] Others (specify) _____ high _____ Low											
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	[d] Catfish _____ high _____ Low																
	[e] Trout _____ high _____ Low																
	[f] Others (specify) _____ high _____ Low																
C Customers & Fish Sales																	
C1	Form of fish sold: In what form do you sell the fish, specify for each type (e.g. Whole, Fresh, scaled, gutted, headless, frozen, chilled, sundried, smoked, filleted, fried, etc.																
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	[c] Tilapia																
	[d] Catfish																
	[e] Trout																
	[f] Others																

[A] Respondent Profile									
C2	Who are your customers (individuals, institutions, hotels, retailers etc?) Please tell me the following about your customers? Who are they & what do they buy? In what quantities and price?								
	<table border="1"> <thead> <tr> <th>Customer type</th> <th>Type of fish</th> <th>Volume per week</th> <th>Source-wild/farmed</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Customer type	Type of fish	Volume per week	Source-wild/farmed				
Customer type	Type of fish	Volume per week	Source-wild/farmed						
C3	What is your average sale price (per KG in KES) during high and low seasons for wild fish								
	<table border="1"> <tr> <td rowspan="6">What is your selling price for wild fish during the high and the low seasons?</td> <td>[a] Omena: _____ high _____ Low</td> </tr> <tr> <td>[b] Nile perch _____ high _____ Low</td> </tr> <tr> <td>[c] Tilapia _____ High _____ Low</td> </tr> <tr> <td>[d] Catfish _____ high _____ Low</td> </tr> <tr> <td>[e] Trout _____ high _____ Low</td> </tr> <tr> <td>[f] Others _____ high _____ Low</td> </tr> </table>	What is your selling price for wild fish during the high and the low seasons?	[a] Omena: _____ high _____ Low	[b] Nile perch _____ high _____ Low	[c] Tilapia _____ High _____ Low	[d] Catfish _____ high _____ Low	[e] Trout _____ high _____ Low	[f] Others _____ high _____ Low	
What is your selling price for wild fish during the high and the low seasons?	[a] Omena: _____ high _____ Low								
	[b] Nile perch _____ high _____ Low								
	[c] Tilapia _____ High _____ Low								
	[d] Catfish _____ high _____ Low								
	[e] Trout _____ high _____ Low								
	[f] Others _____ high _____ Low								
C5	What is your average sale price (per KG in KES) during high and low seasons for farmed fish								
	<table border="1"> <tr> <td rowspan="4">What is your selling price for farmed fish during the high and low seasons?</td> <td>[c] Tilapia _____ High _____ Low</td> </tr> <tr> <td>[d] Catfish _____ high _____ Low</td> </tr> <tr> <td>[e] Trout _____ high _____ Low</td> </tr> <tr> <td>[f] Others specify _____ high _____ Low</td> </tr> </table>	What is your selling price for farmed fish during the high and low seasons?	[c] Tilapia _____ High _____ Low	[d] Catfish _____ high _____ Low	[e] Trout _____ high _____ Low	[f] Others specify _____ high _____ Low			
What is your selling price for farmed fish during the high and low seasons?	[c] Tilapia _____ High _____ Low								
	[d] Catfish _____ high _____ Low								
	[e] Trout _____ high _____ Low								
	[f] Others specify _____ high _____ Low								
C6	a). What are the main factors that influence your customers' preference for fish? (Probe: type, source, form, size, price, etc.). b). Of the qualities you have mentioned above, please rank each of them on a scale of 1-3 (where 1 is less important; 3 is very important to the customer)								
C7	What is your customers' typical mode of Payment (e.g. cash on delivery, credit (daily, weekly, and monthly), cash/mobile/banking/cheque?)								
[D] Trader business Assets									
	Please tell me the current assets that you use for your business? (Also list the assets you have observed e.g. Deep freezer, fridge, pans, jikos, table, knives etc.)								
[E] Fish handling and hygiene									
E1	Explain to me some of the things you do to ensure your fish does not get spoiled. (probe for example: what is done to fish that is not sold at the end of the day or fish that is spoilt)								
E2	In your trade, what do you do to ensure your fish is safe for consumption? Please tell me for each of the following areas: a) Personal hygiene b) Work space c) General market environment								
E3	Please tell me how you are able to tell fresh fish from spoilt fish. What are some key characteristics you look at? (probe based on fish type, form and organoleptic)								
	<table border="1"> <tr> <td>Fresh is.....</td> <td>Spoilt is.....</td> </tr> <tr> <td> </td> <td> </td> </tr> </table>	Fresh is.....	Spoilt is.....						
Fresh is.....	Spoilt is.....								
E4	Have you ever received any training on fish handling and safety? [a] Yes [b] No								
	i). If the answer to question E4 above is Yes, what were the topics of the training and who facilitated it? What aspects of the training are you regularly using during your trade?								

[A] Respondent Profile	
	ii) If the Answer to question E4 above is NO, would you like to be trained? And on what topics?
F Financial services and arrangements	
F1	Is there any financial help you have received from anyone (even a relative) in the last 2 years towards improving your fish trade business? If yes tell me about it (probe: who, how much, and for what)
	F1 b) Did it help you? If so in what way?
F2	In the last 2 years have you taken any loan (mkopo)? (Probe how much, for what, by who (table banking, "Chama", bank, microfinance etc.)
	F2 b) Did it help you? If so in what way? If not probe for reasons why?
G Support Services and business linkages	
G1	In the last 2 years, have you received any form of support in form of advice, training, equipment etc. for your business? (Probe what, who)
G2	Are you a member of any group/association/cooperative of business traders? If yes ask B, if no go to C
	G2b) Please tell me more about it? (Probe: what group, services, no. of members and how does it support the trader etc.
	G2 c) Why is this so?
H Farmed Fish	
H1	According to your experience and/or observation in fish trade, what would you say generally about wild fish sales versus farmed fish sales?
H2	Are there any challenges associated with trade in farmed fish? Please tell me about them?
H3	Are there any advantages in trading in farmed fish? If so please tell me about them
H4	In future do you see yourself increasing your volume of trade for farmed fish? If trader is not currently selling farmed ask: In future do you see yourself starting to sell farmed fish? H4b). Ask All: And if so what are some of the changes you need to see for the above to happen? H4c) If you were not a fish trader, what would you be?
I	Is there anything else you would like to add?

2. Key informant interview

Key Informant interview for Markets Superintendent/ Fisheries Officer

1. Please tell me your name? How long have you worked in this post?
 - b). What are your responsibilities and duties? (Probe how many they are in the market)
2. Can you tell me briefly about this market? (Probe market size, main trade commodities, services, description of typical traders etc.)
 - b). Tell me more about the section that has been allocated to fish trade and marketing? (Probe area size, no. of traders, types of fish, services available etc.)
3. You deal with food and food products in this market. Are there any regulations and bylaws that govern how food is handled to keep it safe for human consumption? Tell me more about it?
 - b) Do you enforce these regulations and bylaws alone or you work in partnership with other public/ private agencies? (Probe who, what, how e.g. Public health)
 - c) What are some of the challenges you have experienced in enforcing these regulations and bylaws, especially in regards to fish traders? (Probe penalties and sensitization programmes)
4. You have mentioned a number of services that you provide, do you charge any levies from the users of the market? If so what are the charges to fish traders?
 - b). From your observation, are traders able to sell-off all the fish purchased by the end of business?
5. In the last two years what has been your observation in regards to the number of fish traders and volume of fish sold in this market? (Probe on trends)
 - b). Can you tell me about the demand supply trends in this market? For example are there seasons when the supply exceeds demand and vice versa? Probe what happens in these instances: when there is surplus and when fish is scarce?
 - b). Is there any wastage (that is fish thrown due to spoilage) in this market? If yes, what happens to this spoiled fish?
 - c). Are there any regulations and/or bylaws that provide guidelines on how the traders should dispose of spoiled fish in a safe and environmentally friendly way? Tell me more about it.
6. As from the year 2009, the Government of Kenya introduced fish farming in a number of constituencies nationally. Would you tell me if this market trades in farmed fish and if so what has been the change in volume over the last 2 years?
 - b). From your observation are there any advantages and disadvantages of selling farmed fish over wild fish in this market?
7. What are the plans in place for improving services in this market, especially infrastructure and support that will improve the business environment for the traders? Tell me more about it.
8. According to your records/observation which gender is more engaged in fish trade and marketing in this market?
 - b). Are any trade barriers that favour one gender over the other? For instance is it easier if one is a male trader or a female trader or is it about the same?
9. Is there anything that you would like to add?

3. Customer Questionnaire

Individual Customer Questionnaire

A Respondent Profile			
A1	Name (you can take first name only if hesitant)		
A2	Gender	[a] Female	[b] Male
A3	Age (in years)		
A4	Are you buying the fish for a household/ family or for yourself?	[a] self	[b] Household/family
B Frequency of purchase (open)			
	How often do you buy fish at this market? b) Are these instances only for daily meals or are there other occasions? Tell me more about them?		
B2	What type and form of fish do you usually purchase? Why is this? b) Does this vary if it is for a special occasion? Why is this		
C Influencing factors in Fish purchase & consumption			
C1	I'd like to know more about why you buy fish. What are some of the reasons that you purchase fish? b. What would you say is the most important reason?		
C2	How often do you buy other (beef, goat, chicken) meat?		
	Beef meat		Liver
	chicken		Matumbo
	goat		Gizzards
	Other_____		Other_____
	b) How do you or your household decide whether to eat fish or any other meat? Probe: reasons behind your preference of fish over meat etc.		
	c) Does it matter to you if the fish is from a farm or if it is from capture (lake, river)? Why or why not?		
C3	How much would you say that you spend on fish every month?		
	b) How does this compare with what you spend on other meat? E.g. what do you spend on beef?		
	Beef meat		Liver
	chicken		Matumbo
	goat		Gizzards
	Other_____		Other_____
	c) What would you say is yours/ your household's most important source of protein?		

4. Sales and Purchase data collection sheet

Market Study of the Aquaculture Market in Kenya (KMAP) Daily data record for fish purchased

Market Date.....

Name of Researcher..... Name of Trader.....

Fish type	Fish form	Total Amount purchased					Price purchased				Total KG <600g	Source (wild/ farmed)
		≤ 100g	>100-200g	>200-400	>400-600	<600	≤ 100g	>100-200g	>200-400g	>400-600g		

Daily data record for Fish Sales

Fish type	Fish form	Total Amount purchased					Price purchased				Total KG <600g	Source (wild/ farmed)
		≤ 100g	>100-200g	>200-400g	>400-600g	<600g	≤ 100g	>100-200g	>200-400g	>400-600g		
e.g. Tilapia	Whole	30 pieces/ 50 KG										





Appendix 2: EFMS tables – Volumes & Prices of Tilapia & Nile Perch in markets

1. City market

City Market	Fish Species	January	February	March	April	May	June	July	August	September	October	November	December	Annual total
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	30730	22094	22296	20455	17548	25433	89406	22636	38074	33877	24264	7405	354218
	Nile perch	63967	73471	77054	87288	88118	113490		75861	106166	117532	101587	15107	919641
2015	Fresh Tilapia	94697	95565	99350	107743	105666	138923	89406	98497	144240	151409	125851	22512	1273859
	Nile perch	23184	18811	31084	43977	19144	17692	21986	33683	27874	30273	36687	23350	327745
		43006	39562	99515	78790	76475	72414	85396	71371	97217	103786	127334	65114	959980
	66190	58373	130599	122767	95619	90106	107382	105054	125091	134059	164021	88464	1287725	

City Market	Fish Species	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
		Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	300	300	300	300	300	300	200	300	300	300	300	
	Nile perch	200	200	200	200	200	200-250		200	200	200	200	200
2015	Fresh Tilapia	300	300	300	300-350	300	300	300	300	300	300	300	23350
	Nile perch	200	200	200	200	200	200	200	200	200	200	200	200

2. Gikomba

Gikomba Market	Fish Species	January	February	March	April	May	June	July	August	September	October	November	December	Annual total
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	270970	262150	229844	272630	224600	252700	297000	256200	297500	225700	199300	133400	2921994
	Nile perch			1524		12900								14424
2015		270970	262150	231368	272630	237500	252700	297000	256200	297500	225700	199300	133400	2936418
	Fresh Tilapia	230800	192200	203300	149213	137710	165900	217802	227000	290400	296500	326800	262200	2699825
	Nile perch			9600	18800		9600			12400		10000		60400
		230800	192200	212900	168013	137710	175500	217802	227000	302800	296500	336800	262200	2760225

Gikomba Market	Fish Species	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
		Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	350	350	350	350	350	350	350	350	350	350	350	350
	Nile perch			220-350		350							
2015	Fresh Tilapia	350	350	350	350	350	350	300-350	350	350	350	350	350
	Nile perch			350	350		350			350		350	

3. Busia Market

Busia Market	Fish Species	January	February	March	April	May	June	July	August	September	October	November	December	Annual total
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	26920	38580	25678	18810	35216	23100	28710	13250	28679	32732	38290	5300	315265
	Nile perch		200	300						160				660
2015		26920	38780	25978	18810	35216	23100	28710	13250	28839	32732	38290	5300	315925
	Fresh Tilapia	56600	27930	32620	30210	30050	47250	36120	23828	21018	40273	21420	16291	383610
	Nile perch		130											130
		56600	28060	32620	30210	30050	47250	36120	23828	21018	40273	21420	16291	383740

Busia Market	Fish Species	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
		Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	270	270	270	270	270	270	270	300	300-310	270-700	270-780	270
	Nile perch		250	250						270			
2015	Fresh Tilapia	270-360	280-300	280-300	280-310	300	300-320	300-370	310-320	340-400	270-330	280-340	320-340
	Nile perch		250										

4. Luanda Market

Luanda Market	Fish Species	January	February	March	April	May	June	July	August	September	October	November	December	Annual total
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	2827	2534	2159	2808	1893	1775	2678	2652	1755	365	421	25041	315265
	Nile perch	10	8	8			65						91	660
2015	Fresh Tilapia	420	1529	1638	1392	2307	2022	3170	2863	1558	1718			18617
	Nile perch				418					675				1093

Luanda Market	Fish Species	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	
		Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	300-340	300	300-340	300-350	300-320	300-330	300-350	300-350	320-350	350	350	350	340
	Nile perch		180	200	180			350						
2015	Fresh Tilapia	350	350	350	300-320	300-320	300	300-330	300-350	300-350	300-350			
	Nile perch				320					300-350				

5. Oyugis

Oyugis Market	Fish Species	January	February	March	April	May	June	July	August	September	October	November	December	Annual total
		Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight	Total weight
2014	Fresh Tilapia	1900	1630	1380	1750	1770	1120	1480	1630	1160	9860	10700	760	35140
	Nile perch	2120	2560	1070	1560	1710	1060	1320	1430	1360	5080	6650	560	46480
2015	Fresh Tilapia	9560	3320	1500	1150	12200	3080	1020	1050	14300	37600	31500	2000	118280
	Nile perch	6720	2020	1490	1250	8500	3350	1110	1060	9100	9600	4100	1500	49800

Oyugis Market	Fish Species	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
		Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range	Price range
2014	Fresh Tilapia	550-650	600	550-600	600-650	600-650	600-650	600-650	600-650	600-650	650	600-650	650-700
	Nile perch	280-350	280-320	250-300	250-300	250-300	250	250-300	250	250-300	300	300-350	300-400
2015	Fresh Tilapia	650	650-700	700	600-700	650-670	650	600-700	650-700	650	650	650	650
	Nile perch	350-460	350-400	350	300-350	350-370	300-350	300-350	300	350-360	350-360	350-360	350

Appendix 3:

Terms of Reference

Kenya Market-led Aquaculture Programme Market analysis & business case development

Terms of Reference

Introduction

Farm Africa was founded in 1985; we have a track record of implementing successful grassroots development projects and improving relevant policies on agricultural development. We currently work in Ethiopia, Kenya, Tanzania and Uganda. We work with smallholder farmers, pastoralists and forest-based communities to develop innovative approaches to make sustainable improvements to their livelihood activities through more effective and productive natural resource management. In addition, we support our beneficiaries in value addition for their products and harvests and link them to markets in order to establish viable income-generating enterprises.

Farm Africa has received funding from the Embassy of the Netherlands in Kenya (EKN) to implement the Kenya Market-led Aquaculture Programme. In order to support the design of the project implementation, Farm Africa is seeking to engage a consultant with experience in conducting market and consumer studies to research and develop a market and consumer analysis and provide recommendations for medium-scale fish farmers to grow and commercialize their operations through increased market engagement.

Background to KMAP

The demand for fish in Kenya is rising because consumers are increasingly aware that fish is a vital source of healthy protein and essential nutrients. Farming fish offers significant economic benefits and, unlike capture or marine fisheries, does not rely on a depreciating natural resource. KMAP will support farmers and traders with technical and business training, link them to markets and input providers to ensure sustainable growth of their business. Input providers such as fingerling producers and feed producers will receive technical support and support in marketing. Through networking events on existing agricultural shows the different players in the value chain will be linked to each other and potential investors can be attracted with fact based economic models and linking them to expertise. KMAP will also promote the consumption of farmed fish and identify (new) market segments for farmed fish and fish products.

KMAP Objectives

KMAP will develop a vibrant aquaculture industry that generates sustainable incomes, food security, and employment through the following objectives:

- 1) Sustainably increase production and productivity of medium to large scale fish farmers, hatcheries and fish feed producers
- 2) Increase access to markets for medium to large scale fish farmers and input suppliers
- 3) Enhance the enabling environment to support aquaculture development

Purpose of the Study

Farm Africa wishes to commission a study of the aquaculture market in Kenya, covering the following specific matters:

- (a) A quantitative analysis of the current market for fish in Kenya, and future growth forecasts;
- (b) A quantitative and qualitative analysis of three specific markets within Kenya (Oyugis, Busia, Nairobi) of particular interest to the KMAP project;
- (c) A value chain analysis of the aquaculture industry in Kenya, including analysis of the main actors at each level of the value chain and relevant regulations.

Key outputs of the study

The consultant will submit a report to Farm Africa which addresses the following requirements:

- (a) A quantitative analysis of the current market for freshwater fish in Kenya, and future growth forecasts

The literature study of the current volume of production of fish is not the core of this study, but forms a point of reference. These figures, supported by the findings from this study, should guide coming up with a better estimate of actual figures.

 - i. What is the current volume of production of fish in Kenya, analysed by species of fish and by wild catch versus farmed fish?
 - ii. What is the current volume of consumption of fish in Kenya, analysed by species of fish and by wild catch versus farmed fish?
 - iii. What is the current volume of imports / exports of fish into / from Kenya, analysed by species of fish and by wild catch versus farmed fish?
 - iv. What is the projected change in production and consumption of fish in Kenya for the next 10 years (if possible, analysed by species of fish and by wild catch versus farmed fish)?
- (b) A quantitative analysis of five specific markets within Kenya (Oyugis, Busia Nairobi (City market and Gikomba)) and two village based markets near Kisumu and Nairobi – all of the questions in this section to be addressed for each of these markets separately
 - v. What is the current volume of fresh fish traded at this market, analysed by type of fish, by size of fish, and by wild catch versus farmed fish?
 - vi. What is the average price, and typical highest / lowest price for fresh fish at this market, analysed by species of fish, by size of fish, and by wild catch versus farmed fish?
 - vii. Who are the largest sellers of fresh fish at this market? For each of the [ten] largest sellers by overall volume, what volume of fish does each seller trade in a month, analysed by species of fish, by size of fish, and by wild catch versus farmed fish?
 - viii. Who are the buyers of fish at this market? For each of these categories of buyer (traders / processors / retailers / hotels and restaurants / individual consumers) what volume of fish is bought in a month, analysed by species of fish, by size of fish, and by wild catch versus farmed fish?
 - ix. Specifically with regard to fish bought by individual consumers, show the percentage of purchases analysed by the following segments: (a) gender; (b) age (c) income.
- (c) A qualitative analysis of traders at three specific markets within Kenya (Oyugis, Busia, Nairobi) and two village markets near Nairobi and Kisumu.
 - x. What is the profile of the traders considering: gender, volume of the business, percentage of farmed fish differentiated by species, quality, preferred size, number of clients and suppliers, how are the trade flows and financial arrangements with suppliers and customers and what infrastructure and assets do they have?

- xi. what are experiences trading in farmed fish, perspectives on farmed fish, barriers for entering in trading farmed fish, where do traders see opportunity and threats for farmed fish (SWOT analysis),
 - xii. What kind of post-harvest losses, processing in fish handling and preservation techniques for fish are used, are these in line with the policy, rules and regulations in fish trade at national and county/market level and do they adhere to it?
- (d) A value chain analysis of the fresh fish trade in Kenya, including analysis of the main actors at each level of the aquaculture value chain
- xiii. A diagram showing the structure and linkages for the aquaculture industry in Kenya, including the main actors at each level of the value chain;
 - xiv. For each main actor identified in the value chain analysis, information regarding the current size / scale of operations of the actor, and an assessment of their main strengths and weaknesses;
 - xv. Plans for the potential engagement of the actor within the KMAP project.
- The consultant will also be required to conduct a feedback session with Farm Africa in order to present their findings and to input in to the detailed planning of the KMAP project.

Competencies

The consultant should have the following competencies:

- Knowledge and work experience in value chain and market analysis (with experience in Kenya and Aquaculture);
- The ability to integrate technical, business and socio-cultural perspectives on aquaculture and/or agricultural value chains and markets;
- Strong interpersonal and intercultural communication skills, and networking capacities;
- Multi-stakeholder and consortium facilitation skills;
- Fluency in English and strong communication and writing skills.

Timing and Duration of the Assignment

The assignment will be carried out between 8th of April and 8th of May. A detailed work plan will be developed for the duration of this assignment.

Deliverables and Payment Terms

The consultant will be paid a day rate to be agreed with Farm Africa and, alongside the 'key outputs of the research', the consultant will deliver:

- A proposal detailed research work plan and budget with proposed milestones for reviewing research development
- An inception report detailing research methodology following feedback from KMAP team on work plan and proposal

Provide Farm Africa with all raw data in digital-interactive format (i.e. excel or equivalent), the data, reports and analysis are exclusively owned by Farm Africa.

