EAST AFRICA FISH MARKET ASSESSMENT

Size, Sustainability and Opportunities for growth in Aquaculture: Kenya, Uganda, Tanzania, and Rwanda

STUDY REPORT

Prepared for: Msingi East Africa

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PREPARED BY IPSOS LIMITED
CONTACT PERSONS: HILDA KIRITU- HILDA.KIRITU@IPSOS.COM,
ANNE WANYINGI- ANNE.WANYINGI@IPSOS.COM,
LUCY GATHII- LUCY.GATHII@IPSOS.COM.
ACORN HOUSE, 97 JAMES GICHURU ROAD, LAVINGTON. P. O. BOX 68230 – 00200 CITY SQUARE, TEL: +254 20 3862721-33. NAIROBI, KENYA

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List of Acronyms

AFSPAN- Aquaculture for Food Security, Poverty Alleviation and Nutrition

CAPI- Computer Aided Personalized Interviewing

CDO- Cooperative Development Organizations

EA- East Africa

EASTC- East African Statistical Training Centre

FAO- Food and Agriculture Organization of the United Nations

FAST- Faculty of Aquatic Sciences and Technology

GPS- Global Positioning System

IDI- In-depth Interview

KFDA- Kenya Fisheries Development Authority

kg- Kilogram

LPG- Liquid Petroleum Gas

MINAGRI- Ministry of Agriculture and Animal Resources

mt- Metric Tonnes

NBS- National Bureau of Statistics

NEMA- National Environment Management Authority

PPS- Probability Proportionate to Size

PSU- Primary Sampling Unit

RAB- Rwanda Agriculture Board

RARDA- Rwanda Animal Resources Development Authority

SPSS-Statistical Package for Social Sciences

SUA- Sokoine University of Agriculture

TAFIRI- Tanzania Fisheries Research Institute

USD- US Dollar

1 EXECUTIVE SUMMARY

1.1 Study Background

Msingi East Africa commissioned Ipsos to carry out a Market Assessment Study on the East African fish market (Kenya, Tanzania, Uganda and Rwanda) whose findings would be used to inform Msingi's strategic planning towards increasing the demand for fish in East Africa. The Fish Market Assessment Study aimed to provide the following information:

[1] Insights on the estimated size of the aquaculture market (both served, under-served and unserved/virgin market).

[2] Key market challenges, bottlenecks- highlighting available opportunities for improvements of existing distribution channels/routes to market within East Africa; and the role Msingi can play in supporting market actors to exploit these opportunities.

[3] Understanding policy and trade regulations in place and existing information gaps.

A multi-prong implementation approach was used in this study where data was collected using secondary research, consumer interviews with households, a fish tasting exercise with fish consumers, and a market players study where farmers, fish processors, retailers, storage and transportation companies, as well as cooperatives were interviewed.

1.2 East Africa Overview

Presented below is an overview of the fish industry in East Africa.

1.2.1 Size of Consumption and Potential Demand

The fish market size in East Africa (of current and potential consumption) is estimated at 1,292,043mt as shown in the table below. These figures have been computed based on the average household consumption or potential consumption in a month, projected against the total household population in each country. The estimated fish market size is observed to be highest in Tanzania, and lowest in Rwanda as shown below.

Table 1: Estimated market size in East Africa

Size of the market in metric tonnes (mt)	Kenya	Uganda	Tanzania	Rwanda	Total
Current consumption	287,681	214,676	556,942	42,225	1,101,524
Under-served (past consumers, willing to continue)	56,989	26,559	63,968	5,099	152,615
Un-served (Never consumed, but would consume)	22,836	4,763	8,328	1,977	37,904
Total fish market size (current +potential)	367,506	245,998	629,238	49,301	1,292,043

Fish is currently consumed by 75% of interviewed households in Kenya, 85% in Uganda, and 87% in Tanzania and Rwanda respectively. Key barriers to consumption across the countries include unavailability and pricing of fish, where fish is perceived as being expensive.

Whilst fish is consumed by a significantly high number of households across the markets, it is only considered as the most important source of protein for the households in Tanzania. Plant proteins take precedence in Kenya, and Uganda, while in Rwanda, households consider both animal and plant proteins as the most important sources of protein. This notwithstanding, fish is considered as the most favourite type of meat by most households in all markets by meat-eating households, except in Rwanda, where beef is the most favourite type of meat. Pricing and availability of meat are the key factors considered when making purchase decisions in Kenya, Uganda and Tanzania, while in Rwanda, the quality of meat and preference by family members takes precedence in the purchase decisions for meat.

Fish consumers are largely consuming Tilapia and Nile Perch fish varieties across the markets, while in Tanzania, a significant proportion is also consuming the Indian Mackerel fish variety. Most households in Kenya and Tanzania purchase fish in the deep-fried form, while in Uganda and Rwanda, most consumers purchase the Silver Cyprinid (*Dagaa/Mukene/Omena)* for consumption. Subsequently, most households across the markets (less than 13%) own storage equipment, and largely consume all fish purchased in a day, within the same day.

Fish-consuming households in Kenya purchase an average of 3.8kgs of fish in a month and spend about Ksh, 1,110 (equivalent to about USD.11) in a month on fish and fish products. In Uganda, households consume an average of 3.4kgs of fish and fish products and spend about UGX. 32,774 (an equivalent of about USD.9) in a month on fish and fish products. Fish consumption at the households is observed to be highest in Tanzania,

at an average of 5.8kgs, with households spending an average of TZS. 36,114 (equivalent to about USD.16) in a month on fish and fish products. Rwanda has the lowest average consumption, at 2.3kgs per month, with households spending an average of Rwf. 7,412 (equivalent to about USD.9) in a month on fish and fish products. Consumption across households is, however, not linear (similar across the households), and some households may be consuming more or less fish and fish products. Variations are for instance observed across regions- with consumption being higher in regions bordering water bodies, and household income bands- with consumption being higher in the more affluent households.

Most consumers across the markets believe that the fish they purchase and consume is wild fish from local sources. Interestingly, however, only small proportions can tell the difference between wild fish and farmed fish, or between local fish and imported fish. When prompted to do so through a fish tasting exercise of wild, farmed and imported fish samples, however, significant proportions can tell that there are differences in the fish samples. To most fish consumers across the markets, however, it does not matter whether fish is wild or farmed, or whether it is from local or imported sources, as to them, all fish is the same.

Major concerns that fish consumers have across the markets include the handling of fish during purchase, as it could be a source of food-borne diseases, and the fact that it could get spoilt since it is perishable. Future programmatic work can focus on addressing these, as well as addressing the issues of fish unavailability and pricing to drive up demand of fish in East Africa.

1.2.2 Fish Production, Processing and Route to Market

Fish Farming

Fish farmers in Kenya, Uganda and Tanzania are largely keeping the Tilapia and Catfish fish varieties, while in Rwanda, farmers are mainly keeping Tilapia. Farmers largely source fingerlings from local sources (largely from fellow farmers) across the markets, with small proportions owning a hatchery for fish production in Kenya, Uganda and Tanzania. None of the farmers interviewed in Rwanda, however, owns a hatchery.

For each batch/lot of fish farmed, farmers in Tanzania tend to purchase/source for the most number of fingerlings of the Tilapia species, at 52,000, while farmers in Kenya tend to purchase/source for the least number of fingerlings of the same species, at 945 fingerlings. In Uganda and Rwanda, farmers tend to purchase/source for an average of 11,404 fingerlings and 21,800 fingerlings of Tilapia respectively for each batch/lot farmed. For the Catfish species on the other hand, farmers in Uganda tend to be purchasing/sourcing for the least number of fingerlings for each batch/lot, at 90 fingerlings, while farmers in Tanzania tend to purchase the most number of fingerlings of the same species, at 3,500 for each batch/lot farmed. In Kenya, farmers purchase/source for an average of 550 fingerlings of the Catfish species, while farmers in Rwanda do not keep this species.

From each bath/lot, farmers in Tanzania tend to harvest the highest number of kgs from the Tilapia species on average, at 4,103kgs, while farmers in Kenya tend to harvest the least from the same species, at 109kgs. In Uganda and Rwanda, farmers tend to harvest an average of 3,297kgs and 1,300kgs respectively from the same species from each batch/lot kept. From each batch/lot of the Catfish species, farmers in Tanzania also tend to harvest the most, at 3,408kgs, while farmers in Uganda tend to be harvesting the least from the same species, at 25kgs. Farmers in Kenya harvest an average of 822kgs from the same species from each batch/lot kept.

From the total harvests made by farmers from each batch/lot across the markets, some degree of loss is observed, where farmers in Uganda for instance, sell an average of 2,994kgs of the Tilapia species, and none from the Catfish species. In Kenya, farmers sell an average of 105kgs and 359kgs from the Tilapia and Catfish species respectively, while in Tanzania, farmers sell an average of 3,936kgs Tilapia and 3,406kgs from the Catfish species. In Rwanda, on the other hand, farmers sell an average of 1,284kgs from the Tilapia species. Significant proportions of farmers across the markets sell fish in the live/fresh form to their customers (mainly individuals in the communities), and most do not also have access to storage equipment, which may be leading to losses from harvests made.

Key challenges faced by farmers across the markets include high costs of farming inputs, delays and quality control issues when sourcing for fingerlings, shortage of quality feeds, lack of knowledge and skills in fish farming, and low returns from the business ventures among other challenges. The presence of Chinese fish in the different markets is noted to not have major impacts on the fish farming sector, though significantly high proportions of farmers across the markets cannot tell whether Chinese fish has entered their market or not, which depicts knowledge gaps on industry developments.

Most farmers across the markets intend to construct new ponds, increase production capacities, improve on sales related services, and venture into value-addition, such as fish processing, in the future. Key training needs that farmers have, where future programmatic work can focus on include: latest technologies in fish production, fish disease management, marketing techniques and forecasting consumption and demand.

Fish Storage and Transportation

Fish storage and transportation businesses across the markets tend to largely handle the Tilapia and/or Nile Perch fish varieties, which are mainly wild catch fish varieties sourced locally or from imported sources (especially in Rwanda). Main customers of fish storage and transportation services across the countries comprise of processing factories, hotels, butcheries, hotels and restaurants, institutions, such as schools, as well as individual customers among others. Customers are sourced from both local and international markets.

It is observed that the more established entities across the markets tend to have access to modern storage and transportation equipment, while the less established entities are using improvised methods of storage (such as storage equipment meant for other purposes, e.g. refrigeration equipment meant for sodas, or use of ice blocks in buckets and other containers) and transportation (such as transportation of fish stocks in iced buckets using public means).

Key challenges faced by storage and transportation entities across the countries include limited access to modern storage and transportation equipment, especially for the less established entities, high costs of setting up and running the businesses, low fish supplies,

largely due to seasonal/climatic changes or illegal fishing, loss of fish stocks, largely due to power outages and use of inadequate storage equipment, insecurity and harassment by officials in relevant government, especially during transit among other challenges. These could be areas that future programmatic work can focus on in supporting this part of the value-chain.

Additionally, players in the storage and transportation sector across the markets recommend for a review of the process required to operate as a storage and transportation company, especially in Kenya, regulation of pricing of services to avoid exploitation, management of fish supplies to avoid hiccups, support in accessing modern equipment, linkages to sources of affordable credit, support in forecasting demand for services, improvement of transportation infrastructure to avoid delays and losses, as well as education of players on legal requirements needed to avoid penalties. These could be additional areas of focus in future programming.

Fish Processing

Fish processors across the markets largely process the Tilapia and/or Nile Perch fish varieties among other varieties, which are mainly wild catch varieties sourced locally (except in Rwanda, where fish is also largely sourced from imported sources). Fish is mainly received in the fresh, chilled or frozen form for processing, and is mainly processed into special cuts/fillet, minced, frozen, chilled, dried, smoked or salted and packed for selling.

Processors in Kenya tend to process the highest number of kgs on average, at 500,000kgs of Tilapia and 300,000kgs of Nile Perch in a month, followed by Tanzania, where an average of 241,021kgs of Nile Perch are processed in a month. In Rwanda, on the other hand, processors produce an average of 264kgs of Tilapia. Processors in Uganda were either unwilling to provide information on estimated numbers of kgs produced in a month, despite reassurances, or are having poor record keeping skills, as reported figures appear to be inaccurate based on the size of their operations; an average monthly production of 6kgs of Tilapia and 60kgs of Nile Perch. A former fish processor, who is

currently focusing on fish importation, was also interviewed in Kenya, where it is noted the factory imports an average of 20,000kgs of Tilapia for sale in a month.

From the average monthly production, processors tend to sell slightly lower volumes, which could be resulting from losses incurred in the different stages of processing, or from storage of fish produced in a month for longer periods of time. In Kenya for instance, whilst the former fish processor/current importer can sell all fish procured in a month, current processors sell an average of 200,000kg of Tilapia and 300,000kgs of Nile Perch in a month. In Tanzania, processors sell an average of 158,625kgs of Nile Perch in a month, while in Rwanda, processors sell an average of 211kgs of Tilapia in a month. As indicated, a possible reason of lower sales volumes reported in a month could be the storage of fish for longer periods. It was observed that fish processors across the markets tend to over-utilize their storage space, as the daily storage capacities tended to be higher than the optimal storage capacities.

Key challenges fish processors are facing across the markets include stiff competition in the industry, seasonal/climatic changes which affect the supply of fish, high cost of running the businesses, poor handling of fish stocks by suppliers resulting in losses, and stiff industry regulations. These could be key areas of focus in future programmatic work to support this part of the value-chain.

Additionally, processors desire to learn more about the latest technologies in fish processing, sources of affordable credit to boost business operations, quality control processes required in fish processing, marketing techniques, pricing policies and forecasting demand and consumption patterns. These could be additional areas of focus for future programming.

Fish Retailing

Fish retailers across the markets mainly stock the Tilapia and/or Nile Perch fish varieties, which is mainly wild catch sourced locally. Retailers largely consider the quality, size and pricing of fish when procuring fish stocks, as well as the reliability of the supplier.

Fish retailers in Kenya tend to procure the highest number of kgs for sale for each batch/lot procured in a month, an average of 720kgs of Tilapia and 1,360kgs of Nile

Perch, while retailers Tanzania tend to procure the least, an average of 193kgs of Tilapia and 125kgs of Nile Perch in a month. In Uganda, retailers procure an average of 223kgs of Tilapia and 495kgs of Nile Perch in a month, while in Rwanda, retailers procure an average of 225kgs of Tilapia in a month. It is observed that retailers tend to make a degree of losses, or tend to store fish procured for longer periods before selling them, as the volumes sold in a month tend to be lower than the volumes procured. In Kenya for instance, retailers sell an average of 639kgs of Tilapia and 1,252kgs of Nile Perch in a month, while in Uganda, retailers sell an average of 177kgs of Tilapia and 424kgs of Nile Perch. In Tanzania, retailers sell an average of 174kgs of Tilapia and 92kgs of Nile Perch in a month, while in Rwanda, retailers sell an average of 188kgs of Tilapia in a month.

Significant proportions of retailers across markets sell fish mainly in the live/fresh state among other forms, and it is observed that most of them do not own any storage equipment. The main customers of retailers across the markets are individuals in the communities, and retailers largely market their businesses through word of mouth, offering discounts and ensuring provision of quality stocks.

Key challenges faced by retailers across the markets include losses due to spoilage (significant proportions do not own storage equipment as indicated above), stiff competition in the industry, high costs of purchasing fish stocks, and fluctuating consumer preferences. Despite the challenges, retailers across the markets are, however, largely optimistic that the business environment will improve in future, and therefore intend to open new outlets, hire more staff and improve sales related services.

Retailers desire to learn more about pricing policies and market/competition pricing, consumption and demand forecasts, quality requirements for fish products and access to affordable credit to boost business operations. Retailers, additionally, recommend for the creation of awareness about fish and fish farming to drive up demand and manage supply of fish. These could be key areas of focus in future programmatic work.

1.2.3 Fish Price Analysis

Fish Farming

Fish farmers across the countries tend to largely make an average of USD.2 to USD.3 per kg from the sale of different fish varieties reared. In Kenya, farmers sell a kg of the different species kept at an average price of between Ksh.100 to Ksh.300 (equivalent to about USD.1 to USD.3), while in Uganda, farmers sell a kg of the different species kept an average price of between UGX. 7,000 to UGX. 11,000 (equivalent to USD.2 to USD.3). In Tanzania, farmers sell a kg of the different species farmed for TZS. 7,000 to TZS. 7,944 (equivalent to about USD.3 to USD.4), while in Rwanda, farmers sell a kg of Tilapia for Rwf 3,100 (equivalent to about USD.4).

From the average total sales made from each batch/lot reared, farmers in Tanzania tend to be making a higher margin/profit, an average of about TZS. 23,590,889 to TZS. 30,905,362 (equivalent to about USD. 10,380 to USD. 13,598) from each batch/lot of different species reared, while farmers in Kenya tend to be making the least, an average of Ksh. 5,000 to Ksh. 80,000 (equivalent to about USD.50 to USD.792) from each batch/lot of different species reared. Farmers in Uganda on the other hand are making an average of UGX. 792,150 to UGX. 24,330,000 (equivalent to about USD.222 to USD. 6,812) from the different species reared per batch/lot, while in Rwanda, farmers are making an average of Rwf.3.8M (equivalent to about USD. 4,674).

Fish Processing

Fish processors across the markets sell a kg of the different fish varieties processed for an average minimum of about USD. 2 when the price of products is lowest, and an average maximum of about USD.15 when the pricing is highest.

The pricing of processed products is observed to be highest in Kenya, where players sell a kg of the different fish varieties for an average of about Ksh.788 to Ksh. 1,500 (equivalent to about USD.8 to USD.15) when prices of products are highest, and about Ksh.477 to Ksh. 1,500 (equivalent to USD.5 to USD.15) when prices of products are lowest. The pricing of processed products in Uganda, on the other hand, averages at between UGX. 18,500 to UGX. 28,000 (equivalent to about USD.5 to USD.8) per kg

when the pricing is at its highest, and between UGX. 13,750 to UGX. 24,000 (equivalent to about USD. 4 to USD.7) per kg when the pricing is at its lowest.

In Tanzania, processors sell a kg of different varieties of processed fish for an average of between TZS. 4,900 to TZS. 18,700 (equivalent to about USD.2 to USD.8) when the price is highest, and an average of TZS. 4,500 to TZS. 13,700 (equivalent to about USD.2 to USD.6) per kg when the price is lowest, while in Rwanda, a kg of processed Tilapia (mainly processed by interviewed processors) is sold at an average of about Rwf. 4,900 (equivalent to about USD.6) per kg when prices are highest, and about Rwf. 3,500 (equivalent to about USD.4) per kg when prices are lowest.

From the average total sales made from each batch/lot processed in a month, processors in Uganda seem to be making the highest margin/profit in a month, an average of about and about UGX.2B to UGX.3B (equivalent to about USD. 635,000 to USD. 855,000). As indicated in previous sections, however, the information obtained from processors in Uganda on the average number of kgs processed in a month (used to compute the average total sales made in a month), could be under-estimated or over-estimated due to fear of disclosing this information, or an issue of poor record-keeping. Processors in Kenya follow closely in terms of the average margin/profit made in a month, an average of Ksh.166M to Ksh.375M (equivalent to about USD.1.6M to USD.3.7M). The former fish processor/current importer interviewed in Kenya tends to make slightly less, an average of about Ksh.12M (equivalent to about USD.1.1M) in a month.

In Tanzania, processors make a margin of about TZS.3.7M to about TZS. 2.1B (equivalent to about USD. 1,650 to USD. 955,350) in a month, while in Rwanda, processors make a margin/profit of about Rwf. 924,000 to about Rwf.1.2M (equivalent to about USD. 1,109 to USD. 1,552) in a month.

Fish Retailing

Fish retailers across the markets make an average of about less than a dollar to about USD.2 for each kg sold from the different fish varieties stocked in a month. Retailers in Tanzania and Rwanda tend to be making slightly more per kg from sales made in a month compared to Kenya and Uganda.

In Tanzania, retailers procure different fish varieties for sale at an average price of between TZS. 3,000 to TZS. 8,200 (equivalent to about USD.1 to USD.4) per kg, and re-sell at an average of between TZS. 4,000 to TZS. 9,800 (equivalent to about USD.2 to USD.4) per kg, and therefore making an average of about TZS.600 to TZS. 3,390 (equivalent to less than USD.1 to USD.2) from each kg sold. In Rwanda, retailers procure different fish varieties for sale at an average price of between Rwf. 1,167 to Rwf. 3,000 (equivalent to about USD.1 to USD.3) per kg, and re-sell at an average of between Rwf. 1,500 to Rwf. 4,500 (equivalent to about USD.2 to USD.5) per kg, therefore making an average of about Rwf.200 to Rwf. 1,500 (equivalent to less than USD.1 to about USD.2) from each kg sold.

In Kenya, on the other hand, retailers procure different fish varieties for sale at an average price of between Ksh.300 to Ksh.400 (equivalent to about USD. 3 to USD.4) per kg, and re-sell at an average of between Ksh.277 to Ksh.500 (equivalent to about USD.3 to USD.5) per kg, therefore making an average of about Ksh.13 to Ksh.134 (equivalent to about USD.1 or less) from each kg sold. In Uganda, retailers procure different fish varieties for sale at an average price of between UGX. 4,000 to UGX. 11,600 (equivalent to about USD.1 to USD.3) per kg. They then re-sell at an average of between UGX. 5,600 to UGX. 16,000 (equivalent to about USD.2 to USD.5) per kg, making an average of about UGX.700 to about UGX. 4,900 (equivalent to about USD. 1 or less) from each kg sold.

1.2.4 Market Organization

Fish Farming

A considerable proportion of farmers across the markets (less than half of those interviewed, or none, as is the case in Rwanda) are not members of any cooperative or association to support their business operations.

The small proportions that are members of a cooperative or an association tend to pay a membership subscription of about USD.6 to USD.7, that is largely renewable after every year or after a longer period (Kenya and Uganda), or monthly (Tanzania). Benefits accrued by members across the markets include, linkages to markets for selling products,

access to affordable credit, sourcing of fingerlings and quality feeds, construction of ponds and provision of fish storage services among others.

Cooperative/association members across the markets recommend for linkages to affordable credit where this facility is non-existent, pricing and quality controls, access to information and training opportunities and improvement of the cooperatives/associations' governance structure among other improvements. These could be areas of focus in future programmatic work to encourage cooperatives/associations' membership growth in this part of the value-chain.

Fish Storage and Transportation

Similarly, few storage and transportation companies are members of a cooperative or association across the markets. Kenya has the highest number of those in a cooperative/association (3 out of 5), while in Rwanda, none of the companies interviewed is a member of any cooperative or association.

It is observed that membership subscription in cooperatives or associations varies across the markets. In Kenya, some members make daily or weekly payments of about Ksh.20 to Ksh.100 (equivalent to less than USD.1 to USD.1), while others pay a one-off fee of about Ksh.500 to Ksh. 1,500 (equivalent to about USD.5 to USD.15), complemented by daily/weekly contributions. In Uganda, cooperatives/associations require membership subscription of about UGX. 5,000 to UGX. 10,000 (equivalent to about USD.2 to USD.3), and which is largely renewable annually, while in Tanzania, some members pay a one-off membership joining fee of TZS. 300,000 (equivalent to about USD.132), while others require a monthly contribution fee of TZS. 10,000 (equivalent to about USD.4).

Benefits accrued by members across the markets include access to affordable credit, provision of savings options for members, insurance services, albeit at an informal level in most cases, access to inputs at subsidized prices, linkages to markets and provision of regular updates on the industry developments among other benefits.

Storage and transportation businesses recommend for cooperatives/associations to expand their operations to other regions for accessibility, increased engagement by the management to keep everyone updated on the cooperatives/associations' operations, and

support to members to access modern equipment for use. These could be areas of focus in future programmatic work to encourage cooperatives/associations' membership growth in this part of the value-chain.

Fish Processing

A similar trend is observed with fish processors across the markets, where none of those interviewed in Kenya and Rwanda are members of any cooperative or association for instance, while only small proportions are members of a cooperative/association in Uganda and Tanzania.

A membership subscription fee ranging between UGX. 50,000 to UGX. 120,000 (equivalent to about USD.14 to USD.34) is payable in Uganda, while in Tanzania, members pay a subscription fee of between TZS. 10,000 to TZS. 100,000 (equivalent to about USD.4 to USD.44), which is largely payable annually. Benefits accrued by members include sourcing of good quality fish feeds for those engaging in fish farming, assistance in resources management and regulation of production capacities, construction of ponds for those involved in fish farming and provision of fish storage space after harvesting, and sourcing for markets for products.

Processors recommend for cooperatives/associations to engage in lobbying on areas of members' interest for a more favourable business environment, and provide access to better fishing equipment to, for instance, avoid issues with illegal fishing. These could be areas of focus in future programmatic work to encourage cooperatives/associations' membership growth in this part of the value-chain.

Fish Retailing

Similarly, most fish retailers interviewed across the markets are not members of any cooperative or association. The small proportions that are members largely pay a subscription fee of between USD.3 to USD.13, which is largely a one-off fee (Tanzania and Rwanda) or payable after 6 months to 1 year (Kenya and Uganda).

Benefits accrued by members include access to affordable credit, linkages to markets, sourcing of quality fish stocks, discounted prices on products and savings options for members.

Retailers recommend that cooperatives/associations should provide loan facilities where these are non-existent, process loan applications in a timely manner and also increase the borrowing limits, incorporate a savings options where this is missing, market products in international markets, actively lobby for funding for effective management, lower membership subscription fees, and improve on their governance structure, by for instance, treating all members equally, among making other improvements. These could be areas of focus in future programmatic work to encourage cooperatives/associations' membership growth in this part of the value-chain.

Cooperatives Administration

Cooperatives' structure within countries tend to vary, where for instance in Tanzania, the highest membership base is indicated as being 600 members, while the less established cooperatives have as few as 21 members. A similar trend is observed in the other markets, where in Uganda, where the more established entities have a membership base of 315 members and the less established ones have a membership base of 22 members. In Kenya and Rwanda, the more established entities have about 300 members in each market, while the less established ones have as low as 8 members and 12 members respectively. Membership across the markets largely comprise of fish farmers, fishermen, fish traders, fish processors and fish experts.

Cooperatives across the markets are largely relying on membership subscriptions to run their operations, while few are also receiving funding from organizations such as the FAO (Food and Agriculture Organization of the United Nations) in Kenya. Membership subscription payment varies, where some cooperatives require daily, weekly, monthly or annual payment, while others charge a one-off fee. In Kenya, fees range from Ksh. 1,000 to Ksh. 2,000 (equivalent to about USD.10 to USD.20), which is renewable annually, while in Uganda, fees range from UGX. 2,000 (equivalent to about USD.1) for weekly contributions, while others make annual subscriptions of about UGX. 30,000 (equivalent to about USD.8). In Tanzania, some cooperatives charge as low as TZS. 20,000 (equivalent to about USD.20), while others charged as high as TZS. 250,000 (equivalent to about USD.110) as joining fees. Others also charge monthly contributions, which

range from TZS. 5,000 to TZS. 10,000 (equivalent to about USD.2 to USD.4). In Rwanda, some cooperatives charge monthly contributions of about Rwf. 5,000 (equivalent to about USD.6).

Benefits cited by administrators of cooperatives are similar to those cited by members in sections above. These include price controls, access to fingerlings and quality feeds, access to extension services and technical support, access to affordable credit, scheduled harvesting to manage supply, savings options, and regular updates on industry developments.

Key challenges cited by cooperatives include low membership bases due to lack of awareness on benefits of cooperative membership among players, limited access to markets for members' products, low pricing of products in the markets leading to exploitation by middlemen (especially in market where Chinese fish is present), lack of quality fingerlings and feeds for members, lack of qualified labour for members, difficult processes of setting up businesses, delayed payments of loans by members which affects cash flow, and low awareness levels of legal requirements among members which leads to hefty penalties. These could be issues addressed in future programmatic work to support market organization.

Additionally, cooperative administrators recommend for assistance in linking members to access affordable credit, assistance for members to access quality inputs, such as fingerlings and feeds at affordable pricing, regulation of fish importation to protect the local industry, sensitization of the public on fish consumption and fish farming to drive up demand and supply, as well as re view of existing laws and regulations to encourage more players to set up business ventures in the fish industry. These are additional areas that can be considered in future programming.

1.2.5 Policy and Trade Regulations

It is observed that whilst various laws and policies exist to regulate the fishing industry across the markets, the knowledge and adherence to these laws and policies is limited, with some requirements being noted to be difficult to comply with, mainly because of cost and lengthy processes involved.

Fish Farming

Fish farmers in perceive that to operate as a fish farmer in Kenya, one largely needs to have certification from NEMA (National Environment Management Authority), have constant water supply and have fishing equipment among other requirements. A significant proportion of practicing fish farmers (17%), however, are not aware of the requirements needed to comply with. The most difficult requirements to comply with from the farmers' perspective are the certification from NEMA and ensuring consistent water supply, mainly because of the cost element involved. In Uganda, farmers perceive that they largely need approval from the Fisheries Department licencing from the local government and availability of capital to set up a fish farming business. Similarly, a significant proportion (26%) of practicing farmers, however, do not know which legal requirements are required for fish farming. The most difficult requirements to comply with are the approval from the Fisheries Department and licensing from the local government, mainly because of the cost element and lengthy processes involved.

In Tanzania, fish farmers perceive that to operate in this line of business one largely needs to comply with the environmental impact assessment provision from the National Environment Management Council (NEMC), have a business permit and have approval from Tanzania Fisheries among other requirements. The most difficult requirement to comply with is the NEMC provision, mainly because the requirement involved long process to acquire due to bureaucracy. In Rwanda, fish farmers perceive that to operate in this line of business, one largely needs to have access to a fish pond, have constant supply of water, a good size of land, a business permit and have storage equipment among other requirements. Farmers largely feel that the requirements needed are not difficult to comply with. However, a few perceive that accessing a fish pond is the most difficult requirement to comply with, since it is costly and involves a long bureaucratic process.

Fish Processing

Fish processors on the other hand, largely perceive that to operate in the different markets, one largely needs a medical health certification or insurance, which is largely

renewable after a period of less than a year (2 to 6 months in Kenya, Uganda, and Tanzania) up to a year (Kenya and Uganda) or longer (3 years in Tanzania and 14 months in Rwanda).

Fish Retailing

Fish retailers in Kenya perceive that they largely need to have a medical health certificate, licensing from the Fisheries Department and a business license among other requirements operate a fish retailing business. The most difficult requirement to comply with is the health certification, mainly because of the cost element required. In Uganda, retailers perceive that they largely need to have capital, equipment, a business licence, health certification and a good business location to operate as a fish retailer. The most difficult requirements to comply with include availability of capital, health certification and acquiring a business licence, as these are costly, involve lengthy processes and one can't run the business without them.

In Tanzania on the other hand, fish retailers perceive that they largely need to have a medical health certification and a business licence among other requirements to operate as a fish retailer. These two requirements are largely perceived as the most difficult to comply with, largely because of the cost element and the lengthy processes involved in acquiring them. In Rwanda, fish retailers perceive that they largely need to have medical health certification, pay local government weekly taxes, have a business licence and have required equipment. The most difficult to comply with is payment of local government weekly taxes, largely because they are costly.

1.2.6 Conclusions and Recommendations

Whist fish consumption is high in East Africa, demand can be driven up by addressing the issues of unavailability, pricing, and hygiene at various fish handling points in the value-chain. Further, supporting processing of fish into non-perishable forms can address consumers' concern of fish spoilage and encourage purchase of more fish for consumption. Additionally, as noted from the supply side, there is a need to create more awareness on the nutritional value of fish, which currently competes with plant and other animal proteins.

There is a heavy reliance on wild catch fish in the value-chain to meet demand. For sustainability, there is a need to grow the fish farming sector in East Africa to meet demand from local sources, and perhaps, also rely on fish importation to protect the dwindling volumes of wild catch fish in the interim. Awareness creation among consumers to mitigate negative perceptions around farmed and imported fish may, however, be necessary to encourage consumption of these varieties.

Additionally, there is a need to support players across the supply value-chain, by not only addressing the key challenges and bottlenecks they currently face, but by also addressing existing knowledge gaps for players to operate more sustainably. Market organization (through cooperatives and associations) can be an ideal avenue to utilize, which currently seems to be under-developed. Policies and regulations that govern the fishing industry in the different markets should also be favourable to encourage more players to take up business opportunities in the industry.

1.2.7 Future Communication

For future programmatic work, consumers (current and potential) can largely be reached through the radio and television, while market players can largely be reached through similar channels, in addition to newspapers, the internet and social media sites, and other formal gatherings (such as organized industry forums) and informal gatherings (word of mouth from fellow stakeholders in the value-chain).

2 INTRODUCTION

2.1 Study Background and Purpose

Msingi, an ambitious and innovative industry development organisation, supports the growth of competitive industries in East Africa. Aquaculture is the first focus industry Msingi has selected with the aim of supporting its growth to a competitive, inclusive and resilient industry in East Africa. Through the transformation of aquaculture in East Africa, it is expected that there will be a significant increase in the supply of farmed fish with a vision of achieving 220,000mt by the year 2030. Against this background, Msingi commissioned Ipsos to carry out a Market Assessment Study on the East African fish market (Kenya, Tanzania, Uganda and Rwanda) whose findings would be used to inform Msingi's strategic planning towards increasing the demand for fish in East Africa.

2.2 Study Objectives

The Fish Market Assessment Study aimed to provide the following information:

[1] Insights on the **size of the aquaculture market** (both served, under-served and unserved/virgin market).

[2] Key **market challenges, bottlenecks**- highlighting **available opportunities** for improvements of existing distribution channels/routes to market within East Africa; and the role Msingi can play in supporting market actors to exploit these opportunities.

[3] Understanding **policy and trade regulations** in place and existing information gaps.

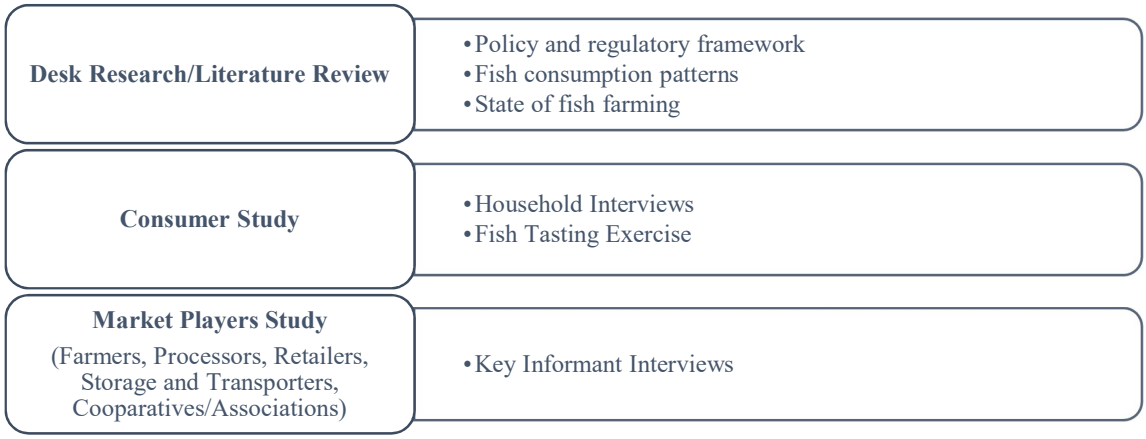
2.3 Study Scope

This study was implemented in **Kenya, Tanzania, Uganda and Rwanda**. A robust approach was implemented that sought to review the demand-side of East Africa's aquaculture to inform market actors on the status of the market and its expected growth trajectory.

2.4 Study Approach

A multi-prong implementation approach was used in this study as summarized below.

Figure 1: Study approach summary



Each component is expounded further in the section below.

2.4.1 Study Design

The design of study comprised a desk research phase (review of available literature relevant to the study) and a primary research phase (collection of fresh data). The primary research phase comprised of carrying out two components: a consumer study and a market players study as expounded below.

A. Desk Research

The study commenced with a review of available literature/materials on the fish market in the study countries. Findings from this phase would be used to complement the primary research phase of the study. The information sought included regulations and policies on the fish industry as well as fish production and consumption patterns and farming practices. Insights from this component have been incorporated in the Study Findings Section of this report.

B. Consumer Study- Households

The primary research phase comprised of carrying out a quantitative consumer study across the study markets. This component would help estimate the size of both consumption and potential demand (served, underserved and unserved markets) in East Africa for each country including identifying the key markets within countries. Further, it would provide insights into consumer preferences driving fish purchases and their variation across the region, as well as the level of preference for fish against other

competing products/sources of protein. Additionally, the consumer study would help in the identification of key retail channels and how these vary across the region. This component would also provide insights on consumer price variations across the region. The following applied during the consumer survey in each study market:

Target Population- the consumer segment of the study targeted the general public in the study countries. Qualifying adults (18 years and above) in the households were targeted for interview.

Sampling- a quantitative research approach was used in the consumer study. The sample size considered for each study country (nationally representative) were as shown in the table below including the precision or margin of error. These sample sizes would provide reliable results from the study that would allow for reasonable breakout analysis at basic demographic level (location, age, gender etc.). The samples were designed to provide estimates at regional and urban/rural levels.

Table 2: Consumer study household sample

Country	Sample Size	Random Effects/ Margins of Error	Confidence Level	Approximate Adult Population
Kenya	1,000 interviews	3.1%	95%	20 Million
Tanzania	1,200 interviews	2.8%	95%	24 Million
Uganda	1,000 interviews	3.1%	95%	20 Million
Rwanda	600 interviews	4.0%	95%	6 Million

Sample distribution- The sample sizes in each country were split in a ratio of 50:50 between urban and rural settings for implementation.

Sampling Frame and Sample Allocation- One of the limitations in this study was the fact that at the time of implementation, there was no available data on fish consumption patterns (in each study country) that would be used to inform the sampling and sample allocation of the consumer study. Therefore, Ipsos used the latest census data from each country as a proxy to inform the sampling and sample allocation. The first level was to determine the target number of interviews by Region/Province proportionate to population distribution and stratified by rural, urban sample segments. Based on administrative units, the Primary Sampling Unit (PSU) was the sub-location (Kenya), Parish (Uganda), Ward (Tanzania) and Sector (Rwanda). The PSUs were selected by

probability proportion to size (PPS) whereby all the PSUs were listed with their respective population stratified by urban and rural settings.

Household Identification- Once at the sampling point, interviewers identified a landmark (e.g. a school, church, mosque, police post, chief's camp, shop etc.) closest to the households to be selected. From the landmark, the interviewers used a date score (done by summing up the date on the day of interview). This would determine the first household to be sampled. For instance, on the 12th of November 2017, all the interviews began at the 3rd household from the landmark (i.e. 3; 1+2=3) on the left-hand side as stipulated by the left-hand rule. This approach was only applicable in the urban setup. In the rural set-up, interviewers walked 500 meters to the sampling point and 200 meters from the landmark and used the left-hand rule in the household identification process. In the urban areas, four households were skipped after every successful interview to ensure that each sampling point was well covered. In the event of an unsuccessful interview the interviewer knocked on the immediate next household until a successful interview was achieved. In the rural areas/single-dwelling where the households were sparsely distributed, a minimum distance of 200 meters was kept between successful interviews.

Respondent Selection- After a successful household identification process, the interviewer was tasked to select a respondent. In each household, the key decision maker of which food items are purchased in the household was selected for interview (aged 18 years and above). In instances where the selected respondent was not available at the time of call, three call backs were made to find the respondent. If the respondent was totally unavailable, a substitution was made by moving to the next eligible household (in terms of the stipulated household identification process).

C. Consumer Study- Fish Tasting Exercise

To observe whether consumers could identify wild, farmed and imported fish, as well as tell the difference between them, a fish tasting exercise was carried out. At the inception stage, this exercise had been envisaged to target busy restaurants/hotels that sold fish, where customers coming in to take meals would be asked to taste three samples of cooked fish (wild, farmed and imported) and interviewed to check whether they could

identify the varieties and tell the differences between them. At the execution stage however, a challenge was faced where several restaurants/hotels declined to have their customers provided with the different varieties for fear that their market positioning would be compromised. One restaurant for instance indicated that they had positioned themselves as selling wild catch only and did not want their customers to begin doubting the source of their stock as a result of the fish tasting exercise.

To overcome this challenge, the approach was slightly tweaked where a venue was hired in a natural setting (hotel/restaurant) for carrying out the exercise independently. A chef was hired to cook the 3 varieties of fish (wild, farmed and imported) which were served to respondents recruited to participate in the exercise. All fish was of the same variety (Tilapia) and was prepared in the same way (deep frying) for uniformity. Feedback was then sought from the respondents through an interviewing process and data captured for analysis. Guidelines used during this exercise are included in the Annex Section of this report. A minimum of 50 interviews per location was targeted in each market as shown in the table below.

Table 3: Consumer study fish tasting sample

Country	Location 1		Location 2		Total
Kenya	Nairobi	50	Kisumu	50	100
Uganda	Kampala	50	Entebbe	50	100
Tanzania	Dar es Salaam	50			50
Rwanda	Kigali	50			50
Total					300

D. Market Players Study

This study also incorporated a market players' component and was implemented in key towns of each targeted market (depending on where the market players were located). This component would help in gauging the level of understanding of key market dynamics (location of demand, price, preferences, route to market) among EA aquaculture producers, the level of infrastructure and investment by aquaculture producers in processing, marketing, distribution and retail. Further, this segment would assist in mapping of key marketing and distribution channels -including identification of key players in fish processing as well as identification of key players in wholesale and distribution (including last mile distribution and point of sale). Additionally, this

component would enable an analysis of costs and mark-ups along the value chain in route to market and an analysis of the current state of key distribution and marketing infrastructure (e.g. insulated trucks, large and small; cold stores; etc.). Further, this component would enable an analysis of critical issues, constraints and inefficiencies in route to market for fish from aquaculture as well as assessing potential to expand production. Further, this component would explore the state of organized marketing for small-scale fish farmers- the role of aggregation in obtaining better fish prices, the opportunities for marketing capacity building through cooperatives as well as the role of cooperatives in facilitating efficient harvesting, storage and transportation to markets.

For the market players segment, semi-structured interviews (including open-ended and closed-ended questions) and in-depth interviews (guided discussions) were targeted for implementation as summarized below.

Table 4: Market players sample

Country	Semi-structured interviews with fish retailers	Semi-structured interviews with fish farms and ponds	Semi-structured interviews with fish processors	IDIs with leaders of cooperatives supporting fish marketing and storage	IDIs with fish storage and transportation businesses
Uganda	50	14	14	7	7
Kenya	50	12	12	6	5
Tanzania	50	9	9	5	4
Rwanda	50	5	5	2	2
Total	200	40	40	20	18

A semi-structured interviewing approach was used with fish marketers/retailers and owners/key decision makers of fish farms and ponds while in-depth interviews were used to obtain information from leaders of cooperatives supporting fish farming as well as storage and transportation businesses.

For the fish retailers segment, interviews were distributed across different categories of retailers as shown in the table below.

Table 5: Fish retailers sample distribution[1]

Sample distribution for fish retailers	
Fish Retailer Category	Sample size
Fish retailers at estates (*mama samaki*)	25
Fish retailers at fish meat markets (city market, Gikomba and equivalent)	15
Fish retailers at fish Specialist shops *(e.g. Aloha fish market)*	5
Main Supermarket Outlets	5
Total	50

Key informants for the market players' segment were purposively selected. To identify the organizations for interview, a two-prong approach was used where companies in the different segments targeted were researched during the desk review phase (and their presence verified during fieldwork) as well as through snowballing techniques during fieldwork/data collection. Key decision makers in the different companies/firms were targeted for interview.

2.4.2 Study Management

The Fish Market Assessment was executed in three stages described below.

A. Pre-Study Implementation Activities

This stage of the study comprised carrying out preliminary activities as follows:

Inception Meetings- these were initial meetings held between the Ipsos and Msingi study lead teams. The key objective of these meetings was to ensure that all parties had a common understanding of the study objectives, methodology, target participants, timelines, anticipated risks to the study and the expected deliverables. Additionally, the meetings were used to introduce key contact persons managing the study from both parties to assure a smooth implementation process. After the last meeting, an inception report capturing the way forward was prepared by Ipsos and submitted to Msingi. It was used to guide the study implementation process.

Desk Research- this phase incorporated a review of available literature on the fish industry that was relevant to the objectives of the study. Insights from this phase

[1] Fish retailers interviewed in this study did not include eateries

informed the design on the data collection instruments for use in the primary research phase as well as the identification of market players for targeting. Additionally, insights from this phase would also inform the overall study findings as appropriate.

Instrument Design and Localization - Ipsos designed the instruments (questionnaires and discussion guides) for the different segments targeted that were used for data collection. The design of the instruments involved a consultative process with the Msingi team. The final approved English versions of the instruments were localized/translated into local languages where appropriate for use in data collection. The translations were reviewed during the training processes to ensure that the original meaning of the questions was not lost during the translation process.

Instrument Scripting- an electronic mode of data collection was used for the quantitative segment of the study (structured instruments for the consumers, processors, retailers and fish farmers segments) using the Ipsos Computer Aided Personalized Interviewing (CAPI) Platform. The final approved versions of the questionnaires were scripted (translated into an electronic format for use in mobile devices) for use in data collection. This incorporated the inclusion of the translated versions of the questionnaires for the data collection team to use as needed. *See more details of the Ipsos CAPI Platform in the Appendix Section.*

B. Study Implementation Activities

This stage comprised of carrying out the following activities:

Data Collection Team Recruitment and Training- This comprised of recruitment of a competent and experienced team to carry out data collection. Local teams were engaged to cater for cultural intricacies. Standard Ipsos recruitment procedures were applied during this phase to ensure quality outputs from the data collection process (recruitment procedures are included in the Annex Section). The recruited team was taken through training sessions, whose key objective was to lay a firm understanding of the study objectives and key expectations from the study. Two centralized training sessions were held in each study market (Nairobi in Kenya, Kampala in Uganda, Kigali in Rwanda and Dar es Salaam in Tanzania) - one for the qualitative segment and the other for the

quantitative segment of the study (an overview of the content covered during the training sessions is included in the Annex Section). The qualitative segment training took a period of 1 day and included a systematic review of the study instruments as well as role-play sessions for the moderators to practice administering the instruments. The role-play sessions also served as a second check on the flow of the study instruments before they were used in data collection. The quantitative segment training took 5 days and a similar approach as the qualitative segment was used. The role-play sessions in the quantitative segment were also used to check the translations in the instruments before these were used for data collection. Additionally, a pilot exercise with real respondents (general public in areas not part of the main study sample) was incorporated for the consumer segment of the study. This provided the interviewers with an additional opportunity to practice administering the instrument in natural settings. In addition, interviewers recruited to interview senior persons in the Market Study component of the study, practiced administering the study instruments with senior staff at Ipsos during the training process. A debrief session was held with the data collection team after the practice interviews (in both the qualitative and quantitative training sessions) to address existing knowledge gaps before the main data collection was rolled out. Key insights from the training sessions were used to not only revise the study instruments as needed (all revisions were shared with the Msingi team for review) but to also inform the planning phase prior to commencement of the data collection phase.

Data Collection- Following the successful completion of the training phase, the data collection phase commenced. Data collection activities were phased such that fieldwork kicked-off first in Kenya followed by the other markets. This allowed for learnings to be cascaded across the study markets for smooth implementation. Data collection activities in the four markets were carried out in the months of November 2017 to January 2018. For the Consumer Segment, a team of 30 interviewers and 6 supervisors were engaged in each market. Each supervisor worked with a lean team of 5 interviewers for ease of team management. For the Market Players segment, a team of 5 interviewers and 1 supervisor was engaged in the quantitative segment, while a team of 3 moderators and 1

supervisor was engaged in the qualitative segment. Each interviewer/moderator worked closely with their supervisor and communicated any issues experienced daily. The supervisor then cascaded any issues that needed extra attention to the field manager for resolution. If the issue raised required technical assistance, the same was cascaded to the project management team. The interviewer/moderator was not expected to make any decisions regarding the project on their own without direction. A CAPI data collection approach was used in the quantitative segment of the study while interviews made up the qualitative segment. This technology ensured the application of quality control procedures throughout the data collection processes.

C. Post-Study Implementation Activities

This phase of the study comprised of data handling, analysis and reporting. The following applied in this phase:

Data Handling: Ipsos was responsible for maintaining data integrity and monitoring the safety of the human subjects in this study. For the qualitative segment of the study, the interaction was audio recorded and later transcribed for analysis. Consent was requested to audio-record the conversation with the respondent in each case. In cases where the respondent declined to be audio recorded, the interviewers wrote notes detailing the interview. These notes or transcripts were coded and later analysed for reporting. For the quantitative segment of the study, a different strategy was adopted. Upon completion of each interview, data on the CAPI platform was immediately uploaded to the Ipsos cloud servers for storage. No copy of the data was left on the mobile device used for data collection. On the Ipsos server, only the essential project team at Ipsos had access to the data. When sharing the data with the rest of the study team, care was taken to remove identifying information of the respondents to maintain their privacy. Data was shared using password protected files to the study team. For each day of data collection, a person responsible for ensuring data quality checked the data received on the server and gave feedback to the field team for action. This ensured that at the end, the quality of the data collected was good.

Data Analysis- The analysis phase mainly comprised of analysing collected data and preparing the study report for submission. The qualitative data from the notes and transcripts were coded using qualitative analysis software – specifically Nvivo and the coded information used for reporting. Codes were developed to fill into the research questions for this study to ensure that the final report met the objectives of this study. The quantitative data on the other hand, from the interviews with the consumers and part of the market players, was already being entered on a CAPI platform. This data was extracted in SPSS (Statistical Package for Social Sciences) for analysis. Open-ended responses were translated and coded to enable data minimization. A detailed data processing instruction file was developed and used for analysis. Data was provided in SPSS and in addition to that, Excel tables were provided in conformity with the data processing instructions for use in report writing.

Reporting- Data was triangulated and results presented on a country by country basis. The data was presented based on the total scores rather that at individual respondent level for confidentiality purposes.

Data Storage- Data collected in this study will be stored on the Ipsos server for a period of three years (from the final reporting date) after which the files will be destroyed.

2.4.3 Key Study Challenges/Limitations

Some challenges were faced during the implementation of this study as described below.

Sampling Design- the planning and designing of the study was affected by the unavailability of complete and up-to-date information on the different sector players that would inform the sampling design. For instance, there existed no complete records of cooperatives, storage and transportation companies, fish processors, fish farms and ponds and fish retailers, from which a scientifically designed sample could be drawn from. Further, information was lacking on fish consumption patterns across the targeted markets which could be used to inform the distribution of the consumer segment sample. Thus, proxies, such as the general population information from the latest census data in each country (Consumer Segment), and market insights to purposively target the market players, were used. Finally, with regards to the consumer interviews, the sample used for

implementation was only sufficient to provide insights at country and regional level, and would not show insights at local, district or county level, due to the high margin of error that results from smaller sample sizes at this level.

Market Players- as mentioned, there were no reliable records across the study countries to inform the sampling and targeting of market players relevant for interviewing in this study. Reliance on available information from the desk research phase was therefore used to identify viable firms/companies to target. During data collection, though many companies/firms were listed as existing in secondary sources, most were found to have closed down while others were not located. The most affected category of market players were the fish processors, especially in Kenya and Uganda. Additionally, the few firms/companies that were still in existence were unwilling to participate in research studies. Information from informal discussions with representatives of these companies (including leaders of their associations) alluded to numerous challenges being experienced in the industry that caused frustrations and fear about the future of the industry. Further, in Tanzania, the government slapped fines on five fish processing companies in Mwanza which were found to be accepting and processing immature fish banned by the law. This caused panic among the players and those that were approached to complete the quotas set in Tanzania were unwilling to participate in any research study after these fines were imposed. The unwillingness of these companies/firms to participate in research studies had an impact on the success rates and prolonged the data collection period as attempts to persuade them were made.

Government Approvals- before implementation of any research work in each study country, Ipsos and its partners liaised with the relevant government authorities for the acquisition of required research permits to allow for the smooth implementation of research studies. In Tanzania, this process took longer to acquire due to the implemented Statistical Act of 2015 (came into effect in the last quarter of 2016) which revolutionized how research activities are implemented in Tanzania by any research agency. This act stipulates that unlike in the past where authorization was sought directly from the local government, all studies would need to firstly be cleared by the National Bureau of

Statistics (NBS). This process involves submission of each study's design and instruments for review before approval/permits are granted. Additionally, all enumerators involved in a study would need to be approved by having a certificate in data collection from the East African Statistical Training Centre (EASTC). Ipsos fast-tracked this process by relying on the already created rapport with NBS through implementation of other studies in the past in the country. This process however still took time compared to the other study markets and delayed the implementation of this study in Tanzania.

Fish Tasting Exercise- as indicated previously, the design of this component of the study sought to interview customers of busy restaurants/hotels that regularly sell fish as they came in to take their meals. This approach would ensure that respondents were targeted in a natural setting that would enable them provide insights sought after. A challenge was faced however where most restaurants/hotels approached to participate declined citing that the fish tasting exercise would impact their business negatively by compromising their business positioning. The study was however able to overcome this challenge by tweaking the data collection approach (discussed in the sections above).

Duplication of Information- at the onset of the study's implementation, it was noted that there were no well-coordinated efforts to coordinate activities in the fish industry across the study markets. Thus, some duplication may be observed in the study findings with what has already been done by other interested parties in the industry. Findings from this study are however at a larger scale as they provide insights at a country level.

2.4.4 Research Ethics

All team members involved in this study were trained in research ethics. Informed consent was sought from all potential study participants before interviews were administered. During the informed consent process, data collectors explained to eligible participants the basic purpose and conduct of the study, including confidentiality procedures and the right to refuse or withdraw at any time. For all data collection activities, interviewers were required to verify, via their own signature, that informed consent was obtained for each participant interviewed. This procedure was done using

electronic devices, rather than paper; however, we offered contact information on a card to participants if any of them would wish to reach out to the study lead team. There was no physical risk and very minimal social risk to participants in this study. We collected personal and household/company information; however, no identifying information was collected from the participants to avoid the risk associated with unintentional disclosure of these details. With appropriate confidentiality procedures in place, we feel that the disclosure is unlikely. Data was presented in aggregate in all reports. Names of all participants were removed from all datasets prior to analysis. All study participants were assigned coded id numbers, which were used on all study and consent documents. Additionally, GPS coordinates of selected households and companies were only used for quality control purposes and was not included in analysis as part of the confidentiality processes for protecting the identities of participating respondents. Participation in the study was voluntary and there was no compensation for participation in this study.

3 STUDY FINDINGS

This section of the report presents the amalgamated insights from both the desk (secondary) research and primary research phases of the study. The findings are presented by each country of focus, beginning with a summary of key findings from each country.

3.1 Focus on Kenya

Markets are often subject to the laws of demand and supply. There must be a steady supply to meet the demand. On the other hand, to sustain an industry, there must be consistent demand to consume goods that have been supplied. Presented in this section are findings of the state of the fishing industry in Kenya.

3.1.1 Summary of Findings

Key Findings in Kenya

Size of fish consumption and potential demand

- The current market for fish consumption (current and potential consumption) in Kenya is estimated at 367,506mt.
- Fish is currently consumed by 75% of households interviewed in Kenya. Unavailability, the 'bad' smell of fish, and pricing are some of the main barriers to fish consumption in Kenya.
- Whilst fish is consumed by a significantly high number of households, only 16% consider it as at the most important source of protein for the household. Plant proteins are considered as the most important source of protein by most households (43%).
- This notwithstanding, fish is considered as the most favourite type of meat (by 27% households consuming meat) followed closely by beef (26%). Pricing and availability are some of the key factors considered by households when choosing meat types to consume.
- Fish consumers in Kenya are mainly purchasing and consuming Tilapia and Nile Perch fish varieties. Most consumers (70%) are also purchasing fish in the deep-fried form, purchasing the Silver Cyprinid (*Dagaa/Mukene/Omena)* (54%), or fish in the fresh form (25%) for consumption.
- Subsequently, whilst a significantly high proportion of households (60%) have access to electricity, small proportions (less than 10%) have access to storage

equipment, which influences fish forms purchased. Consequently, over 70% of different fish forms is purchased and consumed within the same day.

- Fish-consuming households purchase and consume an average of 3.8kgs of fish in a month, with consumption observed to be higher in the urban areas. Different households, however, tend to purchase and consume more or less of different types and forms of fish. Consumption is, therefore, not linear/the same across households. Consumption of fresh fish was for instance observed to be higher than other fish forms.
- Households tend to spend an average of Ksh, 1,110 (equivalent to about USD.11) in a month on fish and fish products, with some variations being observed across the regions and monthly household income bands.
- Small proportions of households (39%) ware also consuming fish outside the household, more so, in the urban areas, though, consumption in the households is generally higher.
- Most consumers believe that the fish they purchase and consume is wild fish from local sources. Interestingly, however, only small proportions perceive they can tell the difference between wild fish and farmed fish (34%) or between local and imported (18%). When prompted to do so through a fish tasting exercise, however, most (over 90%) could perceive there were differences in the wild, farmed and imported fish samples presented, though, only small proportions could correctly identify them. To most consumers, however, it does not matter whether fish is farmed, wild, local or imported, because most of them, all fish is the same.
- Key concerns for fish consumers include the handling of fish during purchase, as it could be a source of food-borne diseases, and that it could get spoilt since it is highly perishable.

Fish production, processing and route to market

Fish Farming

- Most fish farmers interviewed are keeping Tilapia and Catfish species, largely because of the species' demand, affordability and availability of fingerlings in the market
- Fish farmers are sourcing fingerlings largely from local sources (the Kenya Marine and Fisheries Research Institute and from fellow farmers among other sources), with a significant proportion (33%) owning a hatchery, largely for more than 5 years.

- Farmers purchase an average of about 945 fingerlings of the Tilapia species and 550 fingerlings of the Catfish species per batch/lot for production. An average of 109kgs and 822kgs are harvested from Tilapia and Catfish respectively.
- From the total harvests made by farmers, an average of 105kgs and 359kgs are sold from the Tilapia and Catfish species respectively. An average cost of production of about Ksh. 10,170 (equivalent to USD.101) and Ksh. 27,800 (equivalent to USD.275) is incurred for rearing each batch/lot of Tilapia and Catfish species. Factors driving the cost of production include the cost of quality feeds, maintenance of consistent water supply and the cost of fingerlings among others.
- Key challenges faced by fish farmers include the cost of farming inputs, lack of security in the farms, shortage of quality feeds, inability to manage diseases and shortage of water among others. The main challenges faced when accessing fingerlings include quality control issues, low supplies, high prices and delays in receiving the fingerlings. The presence of Chinese fish in Kenya has also been perceived to lower the pricing of fish leading to low returns.
- Critical factors noted by farmers that are needed for succeeding in fish farming include availability of water, access to capital, appropriate soil types and access to new technologies.
- Most farmers intend to construct new ponds in the future as well as increase their production capacities among other initiatives. Key training needs include marketing techniques and latest technologies in fish production among others.

Fish processing

- Interviewed fish processors process different fish varieties, including Tilapia, Tuna, Nile Perch and Salmon fish, which are largely wild catch, and sourced locally.
- Fish is largely received in the fresh, chilled and/or frozen form for processing, and is largely processed into special cuts/fillet, frozen or dried and packed for sale.
- Processors are processing an average of 500,000kgs of Tilapia and Tuna fish each, an average of 350,000kgs of Nile Perch and 20,000 of Salmon. In comparison, a former fish processor is importing an average of 20,000kgs of Tilapia for trading locally. However, whilst the former fish processor can sell all the imported fish in a month, local fish processors are selling slightly lower quantities than quantities processed in a month, an average of 200,000kgs of Tilapia and 300,000kgs of Nile Perch for instance, either due to losses incurred at different stages of processing, or due to storing processed fish for longer periods.

- Indeed, processors are currently over-utilizing their storage capacities, as the maximum daily capacity (166,900kgs) is higher than the daily optimal capacity (104,167kgs).
- Key challenges faced by processors include, stiff competition in the industry and seasonal/climatic changes which affect the supply of fish. Processors tend to cope with these challenges through reducing pricing of products to overcome competition, and reducing workforce when the supply of fish is low.
- To support business growth, processors have invested in training/innovations in fish production, hygiene standards and quality control issues in the past. They desire to learn more about the latest technologies in fish processing, accessing affordable credit, sourcing for fish supplies and maintaining quality controls in businesses.

Storage and transportation

- Storage and transportation businesses mainly handle wild catch fish, though, a few also handle farmed and imported varieties. Some of the fish varieties handled include Tilapia, Nile Perch, Mudfish, Lung Fish and Catfish.
- Main customers of fish storage and transportation services include hotels, restaurants, butcheries, institutions- such as schools, and individuals. The demand for these services is perceived to have generally increased in the last 2 years.
- The more established entities tend to have access to modern storage equipment, while less established entities are improvising coolers, freezers and other equipment meant for other uses (such as the storage of sodas). Losses are experienced as a result.
- Key challenges faced by storage and transportation businesses include limited access to adequate storage and transportation equipment-especially by the small-scale players, lengthy and costly processes required to operate storage and transportation entities, rising costs of running the businesses optimally, harassment of small-scale players by more established entities in the access of fish supplies, and the presence of Chinese fish in the market which was affecting product pricing.
- Key recommendations made by this group include: a review of the processes required to operate storage and transportation businesses in Kenya, regulation of the pricing of services in the industry to avoid exploitation, support in accessing modern equipment that also had adequate capacity to meet demand, access to information and knowledge of forecasting demand and accessing markets, education on government requirements for operation, educational

drives to keep members abreast of the developments, linkages to affordable credit and regulation of accessing fish supplies.

Fish retailers

- Fish retailers in Kenya largely stock wild catch fish varieties obtained locally, with main varieties kept including Tilapia and Nile Perch.
- Quality, size, pricing, and reliability of the supplier are some of the key factors retailers consider when making purchases of fish stocks.
- On average, retailers procure about 720kgs of Tilapia and 1,360kgs of Nile Perch fish varieties in a month, and sell an average of 639kgs and 1,252kgs of the same species respectively, which could be resulting from losses incurred.
- Retailers mainly sell fish in the live/fresh or cooked/ready for consumption states, and their main customers are individuals in the communities. Retailers largely market their businesses through word of mouth and through offering discounts.
- Retailers perceive that the business environment has largely worsened in the last 2 years, mainly because the businesses have not been profitable, and because there is no ready market.
- Key challenges faced by retailers include losses of fish stocks due to spoilage-30% of the interviewed retailer indicated they do not have access to storage equipment, and stiff competition in the market. Additionally, a significant proportion (34%) are trading in Chinese fish. The presence of Chinese fish in the market has largely lowered the pricing of products in the market.
- Retailers are largely optimistic that the business environment will improve, and, most retailers therefore intend to open new outlets, hire more staff and improve sales-related services.
- Retailers are interested in learning more about pricing policies, consumption and demand forecasts and competition/market pricing among others. To grow the industry, retailers recommend for an increase in fish supply, and creation of awareness about fish and fish farming to drive demand and supply. Critical factors needed for success in this line of business include, good customer relations and a steady supply of fish stocks among others.

Fish price analysis

- Fish farmers sell a kg of the different species kept at an average price of between Ksh.100 to Ksh.300 (equivalent to about USD.1 to USD.3). From the average sales made from each batch/lot, farmers tend to make a mark-up/profit of about Ksh. 5,000 to Ksh. 80,000 (equivalent to about USD.50 to USD.792) from different species reared per batch/lot, with some being more profitable (such as Catfish), than others.

- Fish processors tend to sell a kg of the different species processed for an average of about Ksh.788 to Ksh. 1,500 (equivalent to about USD.8 to USD.15) when prices of products are highest, and about Ksh.477 to Ksh. 1,500 (equivalent to USD.5 to USD.15) when prices of products are lowest. Imported fish sold by a former fish processor goes for about Ksh.600 (equivalent to about USD.6) per kg and this pricing tends to be constant. From average sales made in a month, processors tend to make about Ksh.166M to Ksh.375M (equivalent to about USD.1.6M to USD.3.7M). The former fish processor/current importer tends to make slightly less, an average of about Ksh.12M (equivalent to about USD.1.1M) per month.
- Fish retailers procure different fish varieties for sale at an average price of between Ksh.300 to Ksh.400 (equivalent to about USD. 3 to USD.4) per kg. They then re-sell at an average of between Ksh.277 to Ksh.500 (equivalent to about USD.3 to USD.5) per kg, making an average of about Ksh.13 to Ksh.134 (equivalent to about USD.1 or less) from each kg sold.

Market organization/cooperatives and associations

- A considerable proportion of fish farmers (58%) are not members of any cooperative or association. The 42% of farmers who are members pay a subscription fee of about Ksh.580 (equivalent to about USD.6) for each round paid, which tends to last for about a year. Some of the membership benefits accrued include: linkages to markets, access to credit, sourcing of fingerlings and quality feeds among others. Access to affordable credit, opportunities for knowledge transfer, improvement of the cooperatives/associations' governance structure, price controls and quality control checks are some of the recommendations made by members for cooperatives/associations to consider.
- A considerable number of storage and transportation businesses interviewed (3 out of 5) are members of a cooperative or an association. The structure of membership subscription varies, with some making daily/weekly of about Ksh.20 to Ksh.100 (equivalent to less than USD.1 to USD.1), while others pay a one-off fee of about Ksh.500 to Ksh. 1,500 (equivalent to about USD.5 to USD.15), complemented by daily/weekly contributions. Some of the membership benefits accrued include access to affordable credit, savings options and insurance services, though at an informal level. A recommendation made by members is for cooperatives/associations to expand their operations to other regions for more accessibility.
- Though processors collaborate on some aspects of their business operations (such as standardizing pricing of products), none is a member of any cooperative or association.

- Most retailers (86%) are not members of any cooperative or association. The small proportion that is part of a cooperative or association (14%) largely pay a membership subscription of about Ksh. 1,158 (equivalent to about USD.12), which is renewable annually by most members. Some of the membership benefits accrued include access to credit, linkages to markets, sourcing of quality fish stocks and discounted prices on products. Recommendations made by members for improving the operations of cooperatives/associations include: treatment of members equally, provision of loans and timely processing of applications, incorporation of a savings option for members, and marketing of members' products in international markets among others.
- Cooperatives' structure in Kenya tend to vary. The more established cooperatives have membership bases as high as 300 members, while the less established ones have as few as 8 members, largely comprising of fish farmers and fishermen. Cooperatives tend to rely on membership subscriptions to run their affairs, where fees range from Ksh. 1,000 to Ksh. 2,000 (equivalent to about USD.10 to USD.20), and renewable yearly. A few however receive funding from organizations such as the FAO. Benefits accrued by members include regulation of harvest schedules and pricing of products, training opportunities, access to fingerlings, extension services and technical support. Key challenges faced by cooperatives include challenges in accessing markets for members' products, low demand for farmed fish, and reduced prices due to the entry of Chinese fish, exploitation of members by middlemen, challenges in accessing quality fingerlings and feeds, lack of affordable credit, access to water and qualified labour among other challenges. Recommendations made by cooperatives to help them function better include helping them access affordable credit to help their members access farming inputs (such as fingerlings, feeds and equipment) at affordable prices as well as venture into fish processing. Cooperatives also recommend for regulation of fish importation to protect the local industry, as well as sensitization of the public on the importance of consuming fish to drive demand, among other areas of support.

Policy and trade regulations

- The fishing industry in Kenya is regulated by the Fisheries Department in the Ministry of Agriculture, Livestock and Fisheries. Though there exists various policies and guidelines regulating the industry, there seems to be gaps in the level of awareness among players in the value-chain.
- Fish farmers perceive that to operate in this line of business in Kenya, one largely needs certification from NEMA, have constant water supply and fishing

equipment among other requirements. A few (17%) are not aware of the requirements needed. The most difficult requirements for farmers include the assessment and certification by NEMA and having constant water supply, mainly because of the cost element involved.

- Fish processors on the other hand perceive that they largely need a health insurance and a medical health certification to function. Some processors perceive that their staff need to undergo health checks after 5 months, while others perceive that their staff need to undergo health checks after 1 year.
- Fish retailers perceive that they largely need to have a medical health certificate, licensing from the Fisheries Department and a business license among other requirements needed to operate. The most difficult requirement to comply with is the health certification, mainly because of the cost element required.

Future communication

- Consumers and potential fish consumers can be reached largely through the radio and television as these are the main channels of information about food and general nutrition. Most consumers access these channels daily. Only a small proportion (5%) has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Fish farmers can be reached through the internet, the television and radio as these are their main channels of relevant information on the fish industry. They largely access these channels on a daily or weekly basis. Only a small proportion (17%) has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Storage and transportation businesses can be reached through the television, radio and newspapers, as they access these channels daily. None has heard about Msingi in the past.
- Processors can be reached through the television and the internet. They access these channels daily. None has heard about Msingi in the past
- Fish retailers can be reached largely through the television and the radio. They largely access these channels daily. Only 4% of the retailers has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Cooperatives' administrators can be reached through the internet social media sites and through word of mouth from fellow stakeholders. None has heard about Msingi in the past.

3.1.2 The Size of Consumption and Potential Demand

This sub-section provides insights on the estimated market size in Kenya, consumers' preferences and insights on fish non-consumption in the country.

A. Estimated Market Size

The importance of fish as a source of food and essential nutrients is reported across a variety of literature. The estimated current size of the market for fish is 287, 681 tonnes of fish in a year for Kenya- including Silver Cyprinid *(Dagaa/Mukene/Omena)* as discussed further below. The size of the under-served market (past consumers who would be willing to continue consuming) on the other hand is estimated at 56,989 tonnes, while the size of the un-served market (potential consumers) is estimated at 22,836 tonnes as shown below. The total size of the fish market in Kenya (current and potential) is therefore estimated at 367,506 tonnes as shown below.

Table 6: Estimated market size for fish per annum

Size of the market in metric tonnes (mt)	Kenya
Current consumption	287,681
Under-served (past consumers, willing to continue)	56,989
Un-served (Never consumed, but would consume)	22,836
Total fish market size (current +potential)	367,506

These figures have been computed based on average consumption figures per month projected against the total population in the country. The assumption that has been made in computing the annual market size is that consumption is linear (where each household consumes the same amount of fish on average); which might not be the case. However, this provides a good proxy estimate and provides an insight on the size of the market.

As indicated above, the estimated size of the fish market in Kenya includes *Dagaa/Mukene/Omena.* When the *Dagaa/Mukene/Omena* is excluded from the computation, the estimated size of fish in Kenya is an average of 193,173 tonnes per annum, while the size of *Dagaa/Mukene/Omena* is estimated at 94,479 tonnes per annum as shown below.

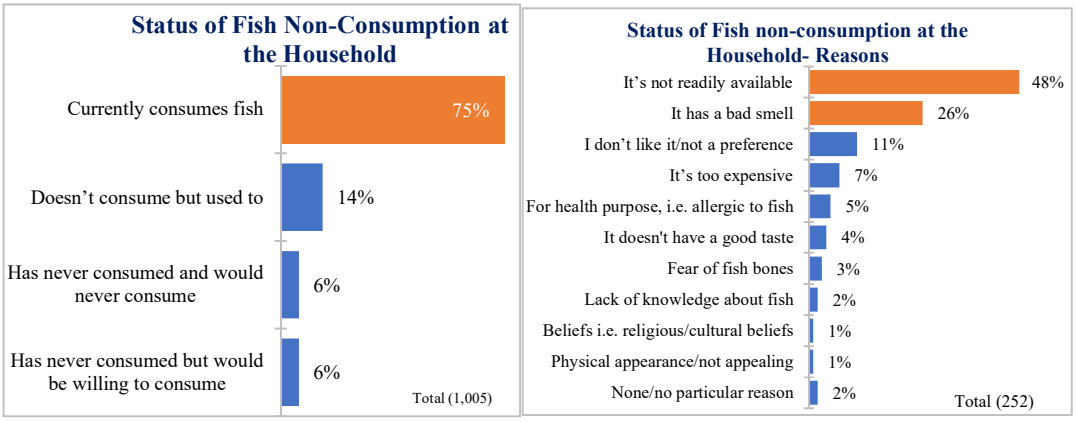
Table 7: Estimated market size for fish per annum- Region

Estimated market size for fish in tonnes									
	Total (1,005)	Central (130)	Coast (90)	Eastern (140)	Nairobi (143)	North Eastern (40)	Nyanza (131)	Rift Valley (241)	Western (90)
Beef	284,144	41,626	19,377	36,998	55,671	5,079	34,326	65,639	25,429
Chicken	211,164	30,031	16,754	26,849	36,114	1,876	24,268	52,308	22,964
Fish - Overall including Silver Cyprinid *(Dagaa/Mukene/Omena)*	287,651	14,199	45,651	11,079	67,226	3,189	46,670	58,772	40,864
Fish - Excluding Silver Cyprinid *(Dagaa/Mukene/Omena)*	193,173	9,700	35,863	9,757	49,518	1,735	23,593	42,092	20,914
Fish - Silver Cyprinid *(Dagaa/Mukene/Omena)*	94,479	4,500	9,788	1,322	17,709	1,454	23,076	16,680	19,950

B. Fish Non-Consumption

While various activities have been done to increase the demand and supply of fish- both wild fish and farmed fish, government officials in Kenya have in the past been cited saying that fish consumption in the country is not big enough to support aquaculture.[2] It was observed from the interviews with consumers that about 75% of households interviewed were consuming fish. A significant proportion though (about 25%) are not currently consuming fish as shown below. It is noted that the two main barriers to consumption include the non-availability of fish (48%), and the fish having a bad smell (26%).

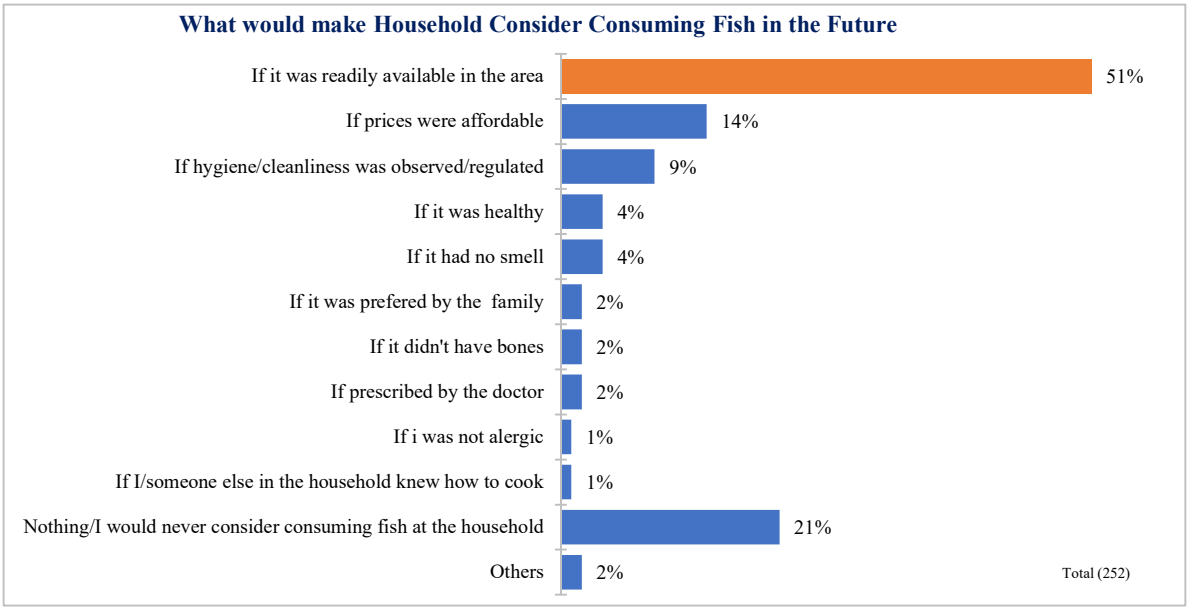
Figure 2: Status of fish non-consumption at the household



[2] https://thefishsite.com/articles/kenyan-fish-consumption-not-enough-to-sustain-aquaculture-1

It is therefore expected that the main factors that would make non-consuming households to consume fish would be to address the issue of availability as shown in the chart below, addressing pricing, and observing hygiene in handling and processing.

Figure 3: Factors that would make non-consuming households consume fish in the future



There is however potential to increase consumption of fish in the country from these findings, noting that only a small proportion of households that indicated they would never consider consuming fish.

C. Consumer Preferences

In this sub-section, we explore consumer preferences on the type of protein consumed at the household.

Type of Protein Consumed at the Household

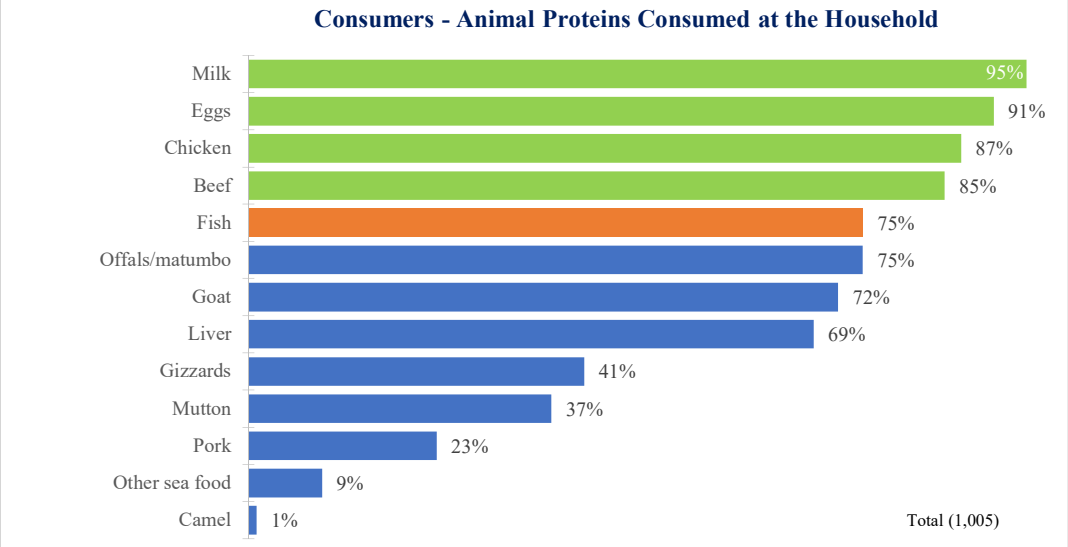
From the survey data collected, it is noted that almost half of the households (43%) consume plant protein (such as legumes) as their most important source of protein. About 30% of the households consider other animal protein such as beef, chicken, pork, mutton, milk, eggs, liver, and offal as an important source of protein. On the other hand, 16% of the respondents view fish as an important protein source, while 11% consider a combination of animal and plant protein as important.

Table 8: Most important source of protein for the household

Most important source of protein for household											
	Total (1,005)	Urban (505)	Rural (500)	Central (130)	Coast (90)	Eastern (140)	Nairobi (143)	North Eastern (40)	Nyanza (131)	Rift Valley (241)	Western (90)
Plant protein	43%	38%	47%	62%	36%	61%	26%	52%	26%	43%	39%
Other animal protein	30%	34%	27%	22%	28%	19%	36%	40%	28%	34%	42%
Fish	16%	18%	13%	2%	31%	4%	24%	-	34%	12%	17%
Both (animal and plant protein)	11%	9%	12%	13%	6%	15%	13%	8%	12%	11%	-

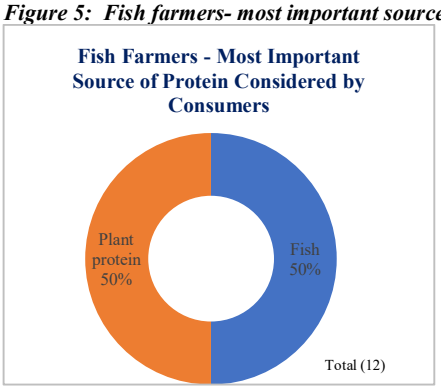
From the consumer perspective, milk is the most commonly consumed animal protein in the household (95%), followed by eggs (91%), chicken (87%) and beef (85%). On the other hand, fish was mentioned as consumed by 75% of the households.

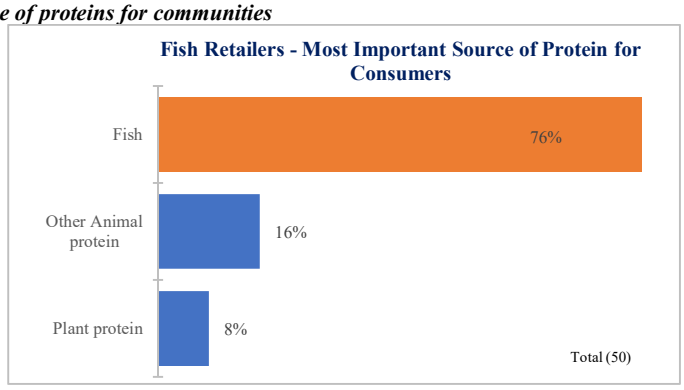
Figure 4: Animal proteins consumed at the household



Some bit of consistency was observed with what the fish farmers and fish traders was mentioned as to what they perceive to be the most important source of protein for the consumers; with fish being mentioned prominently. However (as shown in the second figure below), a disconnect was observed in terms of how fish retailers view the place of plant protein consumption in the household.

Figure 5: Fish farmers- most important source of proteins for communities





All in all, in terms of consumption of fish across the regions, it was noted that the highest consumption of fish in Kenya was observed in regions close to the main water bodies in Kenya such as Nyanza and Western that are close to Lake Victoria, and Mombasa that is next to the Indian Ocean. The other region where high consumption of fish was observed was Nairobi. More details on the regional differences in fish consumption are shown in the table below.

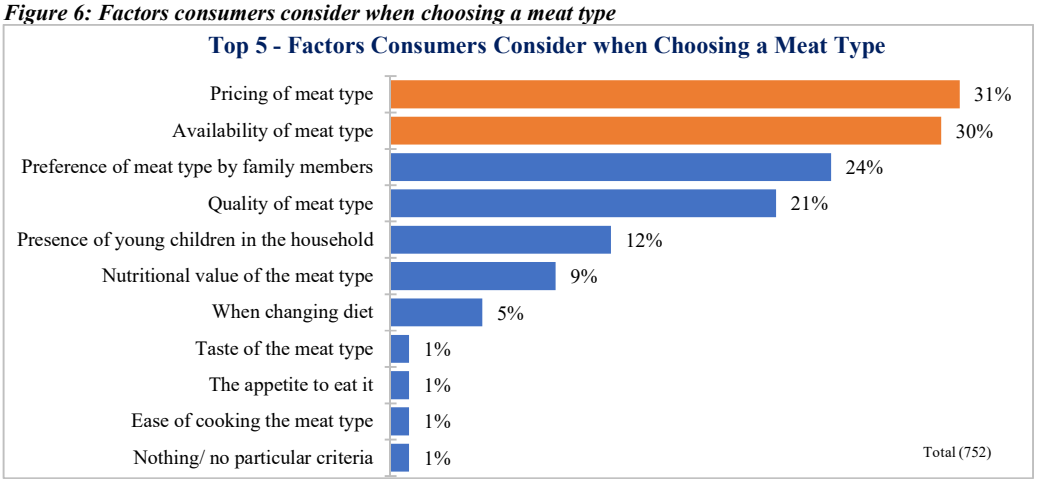
Table 9: Animal proteins consumed at the household- Region

Animal proteins consumed at the household											
	Total (1,005)	Urban (505)	Rural (500)	Central (130)	Coast (90)	Eastern (140)	Nairobi (143)	North Eastern (40)	Nyanza (131)	Rift Valley (241)	Western (90)
Milk	95%	95%	96%	98%	90%	97%	95%	95%	94%	95%	97%
Eggs	91%	93%	88%	94%	81%	91%	94%	80%	95%	89%	93%
Chicken	87%	90%	84%	90%	94%	86%	86%	25%	91%	88%	96%
Beef	85%	89%	81%	88%	90%	90%	92%	32%	77%	82%	98%
Fish	75%	84%	66%	46%	99%	46%	95%	35%	92%	74%	100%
Offals/*matumbo*	75%	73%	77%	78%	68%	81%	73%	42%	67%	81%	82%
Goat	72%	70%	75%	75%	82%	86%	66%	88%	57%	83%	32%
Liver	69%	72%	67%	74%	76%	66%	71%	60%	53%	76%	72%
Gizzards	41%	40%	41%	59%	48%	46%	44%	2%	19%	30%	70%
Mutton	37%	33%	41%	52%	28%	37%	24%	30%	8%	58%	39%
Pork	23%	23%	23%	51%	8%	21%	34%	-	14%	11%	37%
Other sea food	9%	10%	8%	4%	46%	6%	7%	-	3%	5%	7%
Camel	1%	1%	1%	-	1%	1%	-	10%	-	-	-

Factors Influencing Consumer Choice for Type of Meat

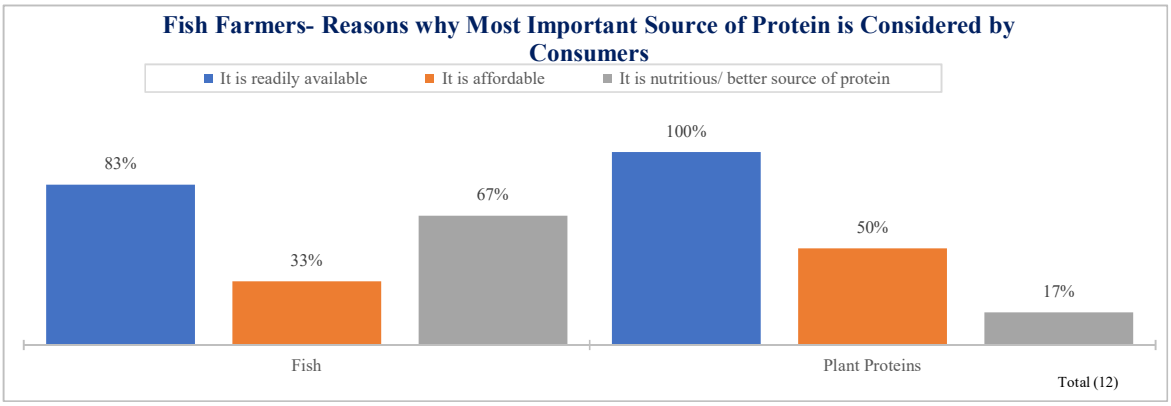
In choosing whether to purchase fish or other types of animal proteins, consumers make several considerations with the pricing and availability of meat being mentioned by most consumers.

Figure 6: Factors consumers consider when choosing a meat type



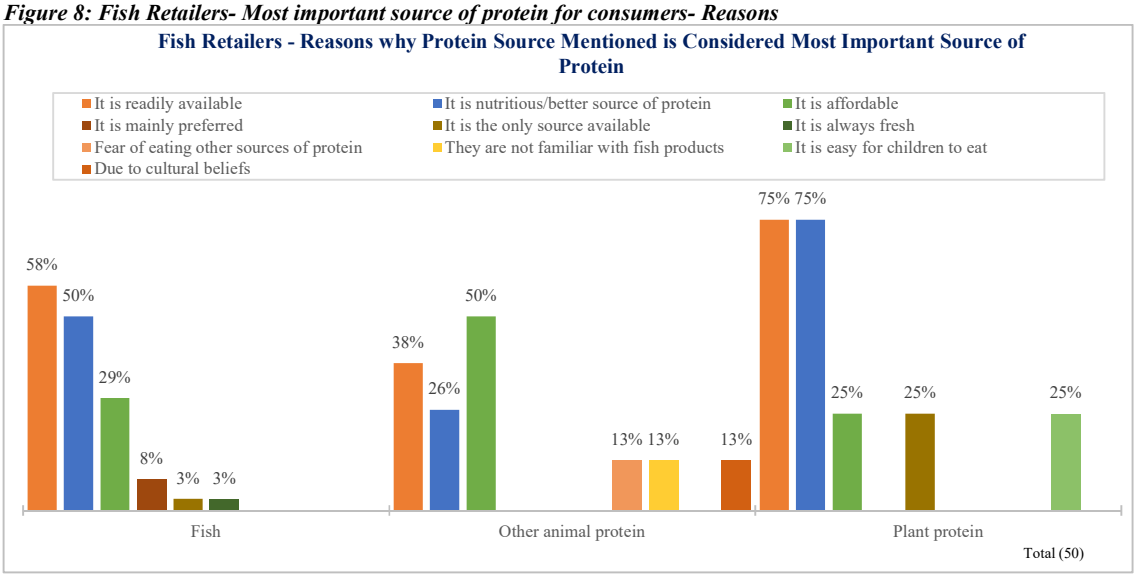
This information matches with what the fish farmers mentioned because they noted that affordability, availability and nutritional status of a source of protein play a significant role in the decision-making process on the type of protein households consume as shown below.

Figure 7: Fish Farmers- Most important source of protein for consumers- Reasons



Additionally, this information was consistent with that obtained from fish retailers who noted that availability, nutritional status of a protein and affordability play a significant role in encouraging uptake as shown in the figure below.

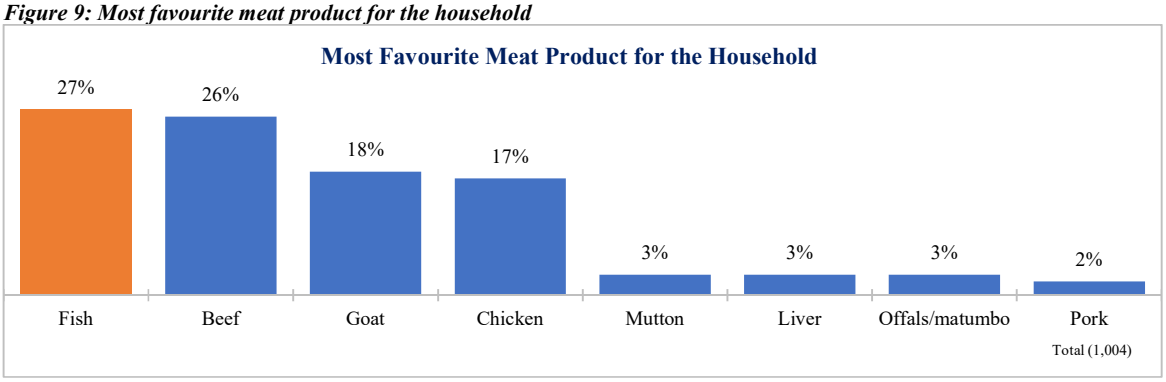
Figure 8: Fish Retailers- Most important source of protein for consumers- Reasons



Favorite Types of Meat for the Household

From all meat types consumed in the households, it was observed that fish was the most favourite meat product in the household and it competes in terms of favourability at the same level with beef.

Figure 9: Most favourite meat product for the household



However, regional variations were observed such as is the case in North Eastern and Central where fish is not the most favourite type of meat for the household.

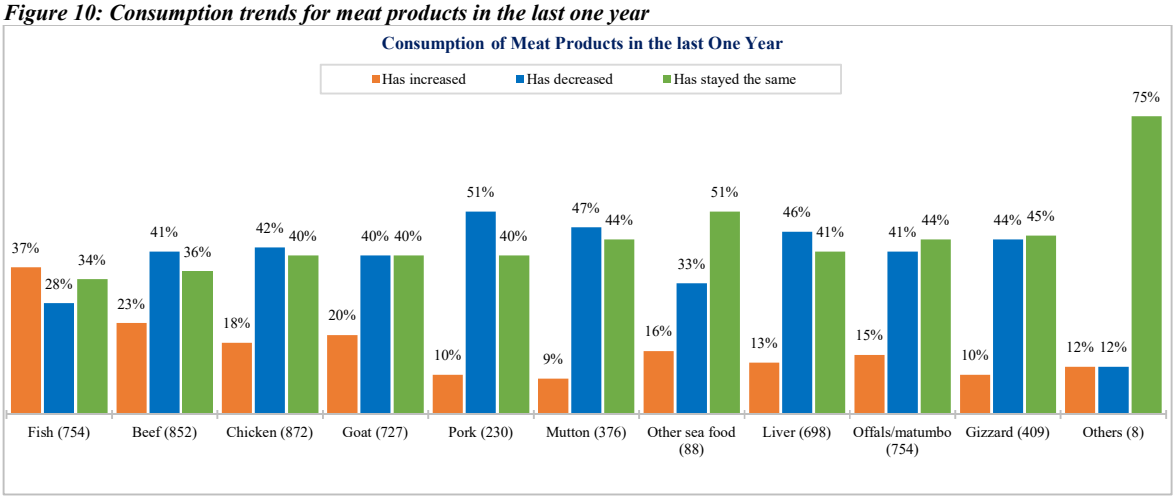
Table 10: Favourite type of meat for the household

Most favorite types of meat for household											
	Total (1,004)	Urban (505)	Rural (499)	Central (130)	Coast (90)	Eastern (140)	Nairobi (143)	North Eastern (39)	Nyanza (131)	Rift Valley (241)	Western (90)
Fish	27%	34%	20%	11%	37%	10%	39%	-	51%	23%	39%
Beef	26%	25%	26%	32%	17%	31%	32%	5%	24%	24%	22%
Goat	18%	16%	20%	15%	19%	28%	8%	64%	6%	26%	1%
Chicken	17%	13%	20%	25%	23%	18%	11%	10%	10%	14%	22%
Mutton	3%	2%	5%	5%	-	1%	-	5%	-	10%	-
Liver	3%	3%	3%	3%	2%	1%	5%	5%	2%	2%	8%
Offals/*matumbo*	3%	3%	3%	2%	1%	8%	1%	-	5%	1%	4%
Pork	2%	2%	1%	5%	-	1%	3%	-	1%	-	3%

Fish Consumption Trends

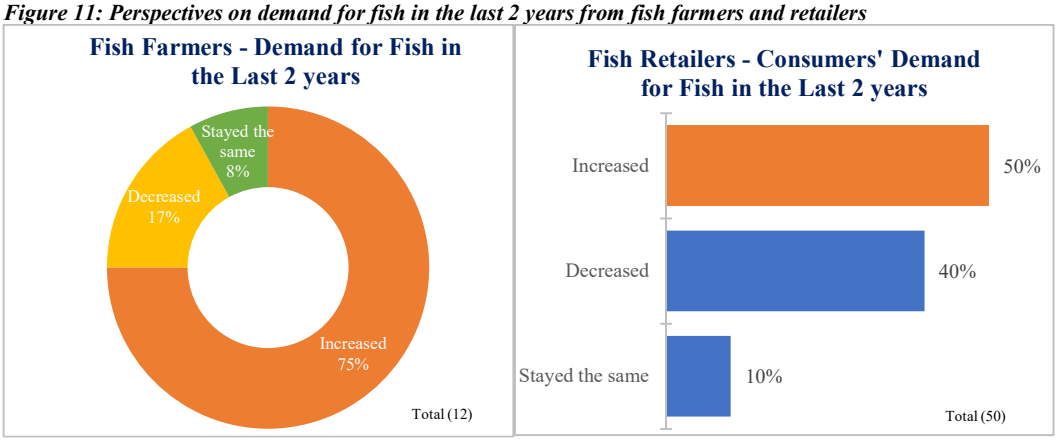
It was observed that the consumption of fish has increased over the last one year compared to other animal proteins, based on what consumers mentioned.

Figure 10: Consumption trends for meat products in the last one year



This information is consistent with what fish farmers and retailers mentioned, with a sizeable proportion noting that demand had increased over the last two years. For instance, demand from the farmers perspective had increased based on 75% of the responses, while for the retailers, 50% highlighted the increase in consumption. More details on the consumption trends is shown in the figures below.

Figure 11: Perspectives on demand for fish in the last 2 years from fish farmers and retailers

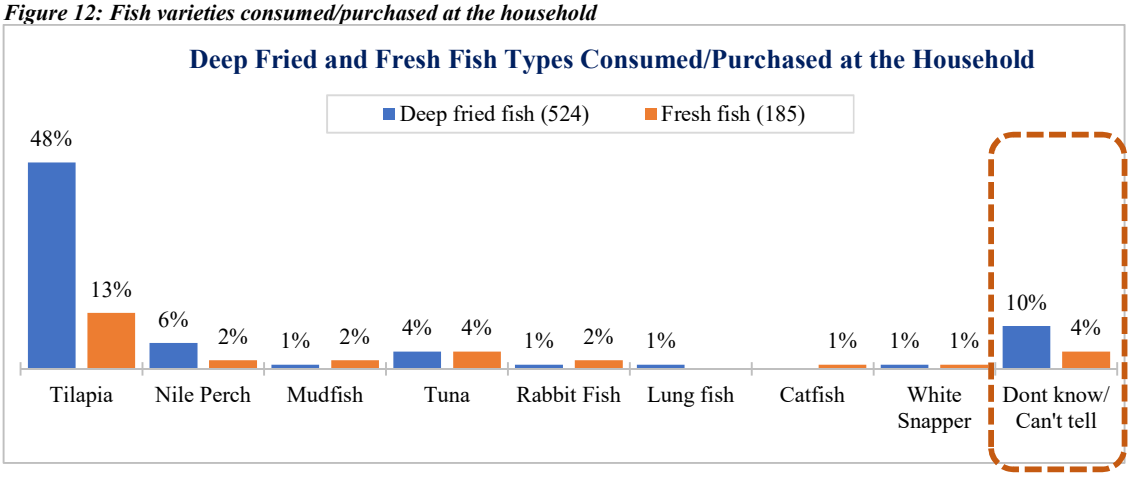


Fish Variety Purchased and Consumed at Home

Secondary data showed that Tilapia is the main type of fish that is consumed, although more and more consumers were beginning to consume dried sardines (*Dagaa/Mukene/Omena*) and Nile Perch.[3] It was further noted from secondary data that in terms of fish captured in Kenyan waters, which can be assumed [to be] consumed in Kenya, these are predominantly Carps, Barbels and other Cyprinids, other miscellaneous freshwater fishes such as Nile Perch and Tilapia.[4] Such reports note that most of this fish is wild and the main sources of production include the Indian Ocean, as well as from the two major natural lakes i.e., Lake Turkana and Lake Victoria, in addition to other smaller lakes such as Lake Naivasha and Lake Baringo. Further, the reports noted that freshwater fish landings have always been higher than those from the marine waters of Kenya[5] and the study sought to assess this fact with consumers. From the primary research phase of the study, it was found that most people tend to buy Tilapia in both deep-fried form as well as in the fresh form. It was observed that 48% mentioned that this is the type of fish that they purchased and consumed at their household in the deep-fried form as shown below.

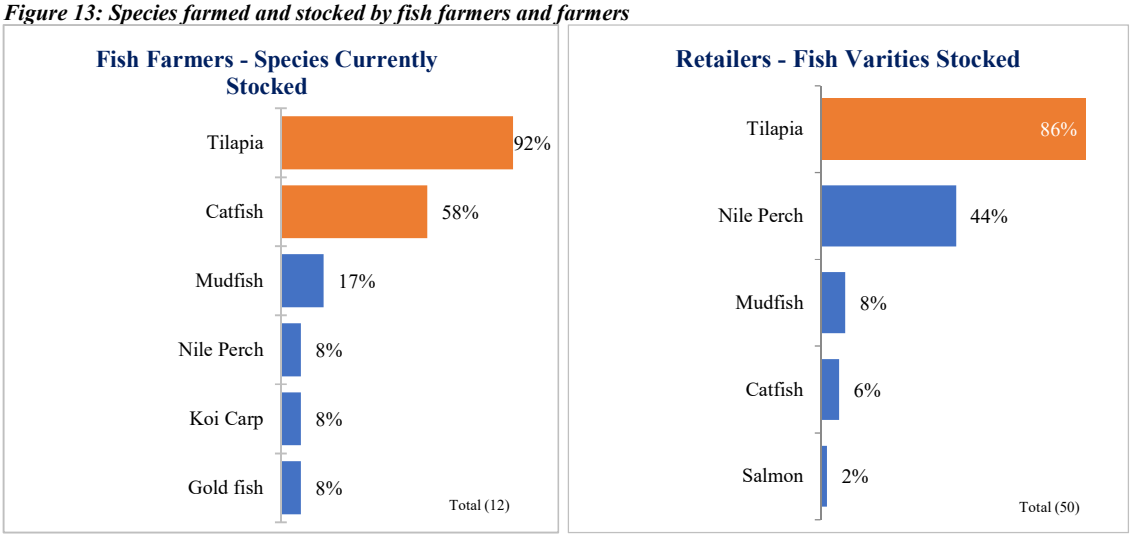
[3] http://www.fao.org/blogs/blue-growth-blog/notes-from-kenya-eat-fish-for-a-better-life/en/
[4] http://www.fao.org/fishery/facp/KEN/en
[5] ibid

Figure 12: Fish varieties consumed/purchased at the household



It is however interesting to note that about 10% of the respondents don't know the name of the fish that they purchase, which depicts knowledge gaps among the consumers on fish varieties. We note a correlation between what is mainly consumed and what is mainly kept by the fish farmers; as Tilapia was mentioned by 92% of the fish farmers, followed by Catfish (58%), among other species as shown in the first figure below. The same correlation is observed in terms of the fish types that fish retailers stock, with 86% mentioning that they stocked Tilapia.

Figure 13: Species farmed and stocked by fish farmers and farmers



The justification given by the fish farmers for keeping Tilapia included high demand in the market for stocked species, affordability, availability, better returns and cost effectiveness of maintenance.

Table 11: Fish farmers- Reasons for stocking species

Reasons for stocking species						
	Tilapia (11)	Catfish (7)	Nile Perch (1)	Mudfish (2)	Koi Carp (1)	Gold Fish (1)
High demand in the market	55%	29%	-	-	-	-
Affordable to purchase	45%	29%	-	100%	-	-
Readily available fingerlings	36%	14%	100%	-	-	-
Do well/provide better returns	36%	57%	-	-	100%	100%
Cost effective to maintain	27%	29%	-	50%	-	-
Less prone to diseases	27%	29%	-	50%	-	-
They have a good taste	9%	-	-	-	-	-
Grows faster than other species	9%	-	-	-	-	-

Similar reasons were given by the retailers for stocking Tilapia with availability being mentioned by 72% of the retailers, providing better returns (47%) and affordability (35%).

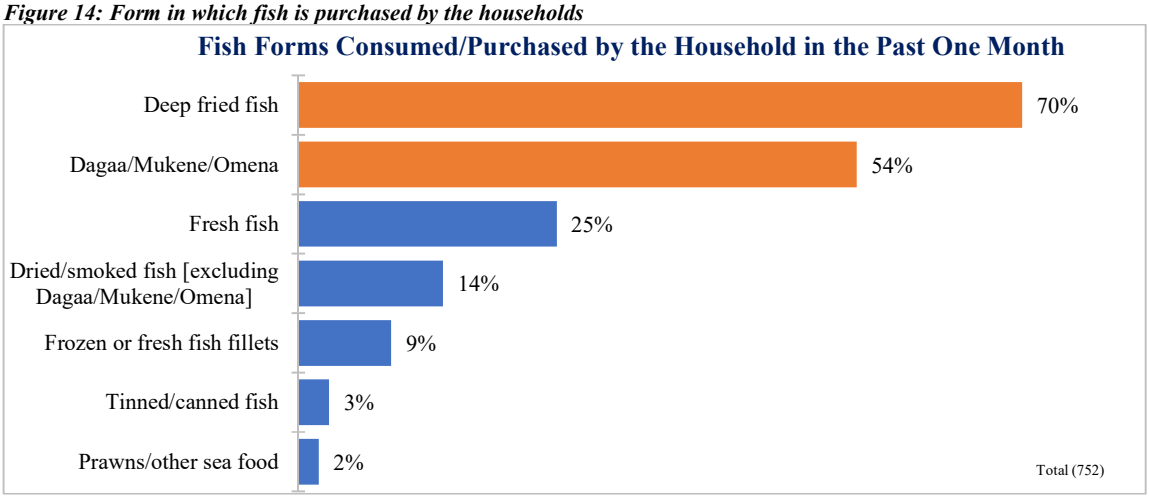
Table 12: Fish retailers- Reasons for stocking fish varieties

Reasons for stocking fish varieties					
	Tilapia (43)	Catfish (3)	Nile Perch (21)	Salmon (1)	Mudfish (3)
Readily available	72%	33%	57%	-	67%
Affordable to purchase	35%	67%	33%	-	
Do well/provide better returns	47%	67%	43%	100%	33%
Stay fresh longer	28%	33%	29%	-	67%
I trust the source	30%	33%	14%	-	33%
Good smell	2%	-	-	-	-
Good taste	5%	-	5%	-	-
Customers' preference	23%	-	14%	-	-
Has no bones	-	-	5%	-	-

Form in Which Fish is Purchased

Approximately 70% of the households buy fish in the deep-fried form or in dried form. Fresh fish on the other hand is consumed by about 25% of the households, while frozen fish or fish fillets is purchased by 9% of the households.

Figure 14: Form in which fish is purchased by the households



There are some regional variations in the types of fish consumed at the household between fresh fish, frozen fish and *Dagaa/Mukene/Omena* though consistency was observed in the consumption of deep fried fish. It is also apparent that the consumption of tinned/canned fish is highest in North Eastern Kenya. It was observed that *Dagaa/Mukene/Omena* is mainly consumed in Nyanza and Nairobi, while fresh fish is mainly consumed at the Coast, Central and Nairobi regions.

Table 13: Form in which fish is purchased by the households -Region

Types of fish consumed in household in the past one month									
	Total (752)	Central (60)	Coast (89)	Eastern (64)	Nairobi (136)	North Eastern (14)	Nyanza (120)	Rift Valley (179)	Western (90)
Deep fried fish	70%	63%	61%	67%	89%	29%	65%	77%	53%
Dagaa/Mukene/ Omena	54%	38%	46%	20%	67%	29%	75%	46%	66%
Fresh fish	25%	32%	57%	17%	29%	29%	20%	16%	9%
Dried/smoked fish [excluding *Dagaa/Mukene/ Omena]*	14%	5%	3%	2%	18%	-	8%	8%	53%
Frozen or fresh fish fillets	9%	10%	22%	2%	21%	7%	4%	2%	2%
Tinned/canned fish	3%	-	1%	-	8%	50%	-	-	-
Prawns/other sea food	2%	-	10%	-	2%	-	1%	-	-

There were no significant variations in terms of fish type consumed across the different household income categories, except for the fact that frozen fish is consumed more by the affluent households as shown below.

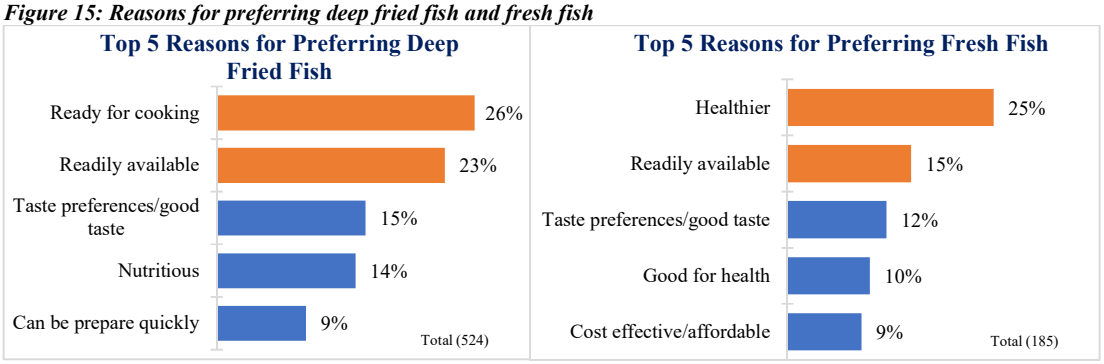
Table 14: Form in which fish is purchased by the households- Household income

Types of fish consumed in household in the past one month								
	Total (752)	Below USD. 100 (243)	USD. 101 - 200 (223)	USD. 201 - 500 (133)	USD. 501 - 750 (42)	USD. 751 -1,000 (18)	USD. 1,001 – 1,500 (8)	Above USD. 1,500 (33)
Deep fried fish	70%	63%	67%	79%	79%	78%	50%	85%
Dagaa/Mukene/ Omena	54%	59%	56%	48%	52%	39%	25%	42%
Fresh fish	25%	21%	25%	33%	31%	17%	12%	18%
Dried/smoked fish [excluding *Dagaa/Mukene/ Omena]*	14%	20%	12%	9%	12%	17%	25%	15%
Frozen or fresh fish fillets	9%	4%	5%	18%	12%	11%	50%	15%
Tinned/canned fish	3%	2%	2%	4%	7%	6%	-	-
Prawns/other sea food	2%	2%	1%	1%	-	6%	12%	-

The main reasons for preferring deep fried fish was cited as being that it is ready for cooking and that it is readily available. On the other hand, fresh fish is preferred by some

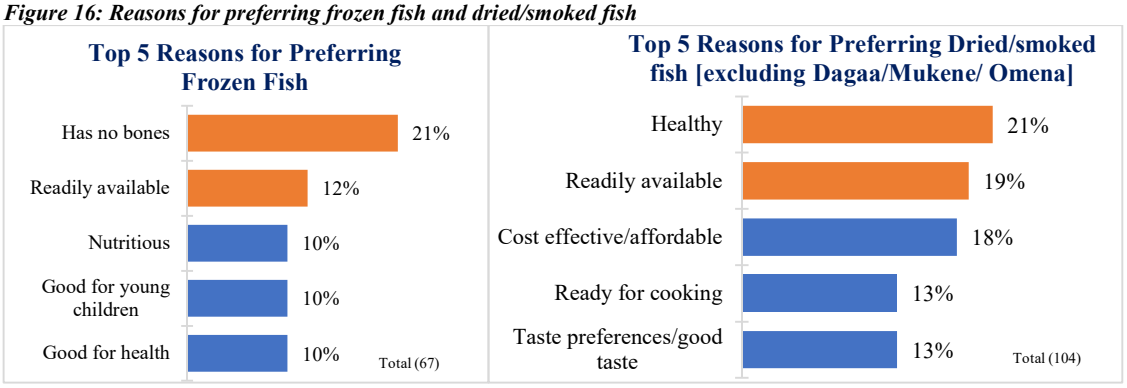
mainly because it is perceived as healthier, that it is readily available as well as owing to taste preferences.

Figure 15: Reasons for preferring deep fried fish and fresh fish



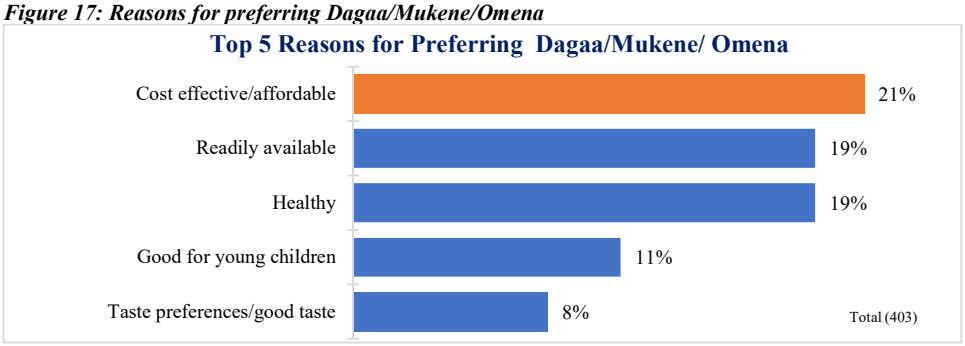
On the other hand, frozen fish is preferred because it has no bones (connoting to the possibility that it is mainly either Nile Perch or other filleted fish) and is readily available. Dried/smoked fish is preferred because it is perceived as healthy and readily available.

Figure 16: Reasons for preferring frozen fish and dried/smoked fish



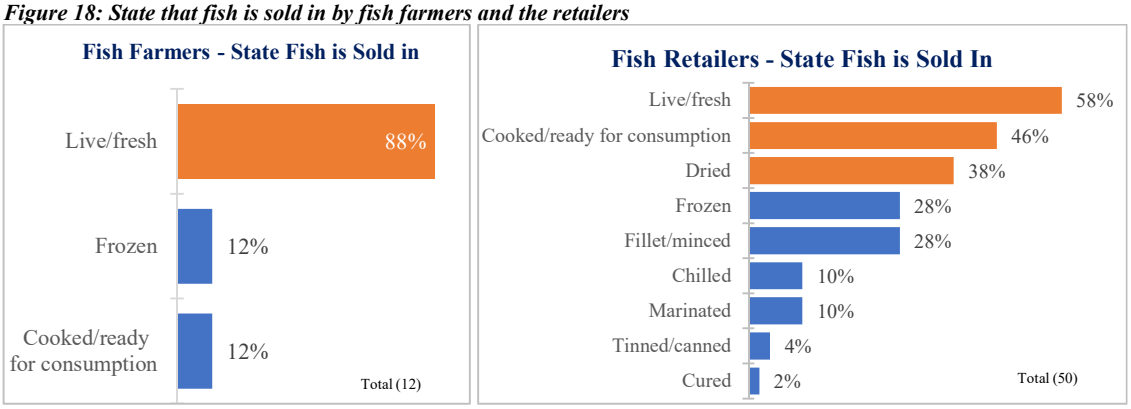
On the other hand, *Dagaa/Mukene/Omena* is preferred for the cost element, its availability and the perception that it is healthy as shown below.

Figure 17: Reasons for preferring Dagaa/Mukene/Omena



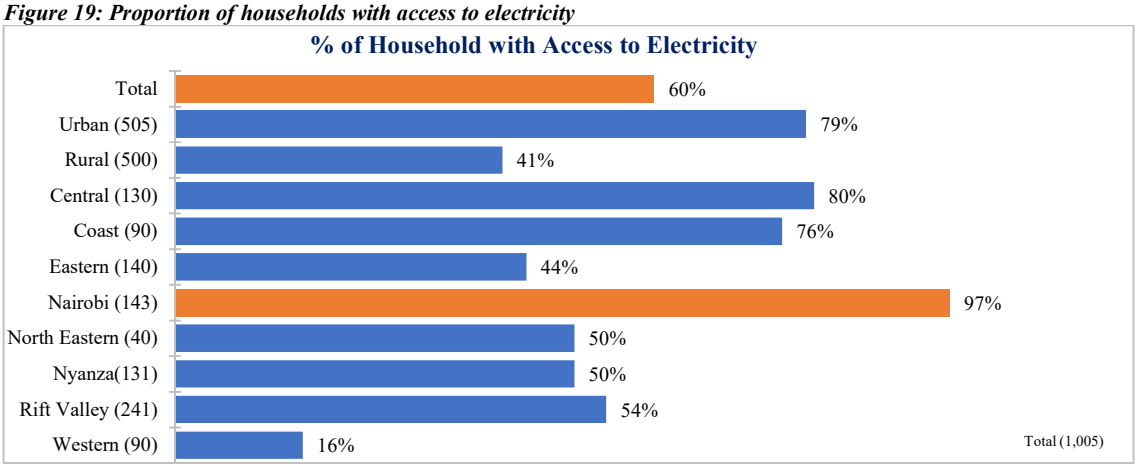
Fish sold by farmers was mainly sold in its fresh form (88%) and one can see the contribution retailers make because 46% of the fish is sold in cooked form, though 58% is still sold in its fresh form as shown below.

Figure 18: State that fish is sold in by fish farmers and the retailers



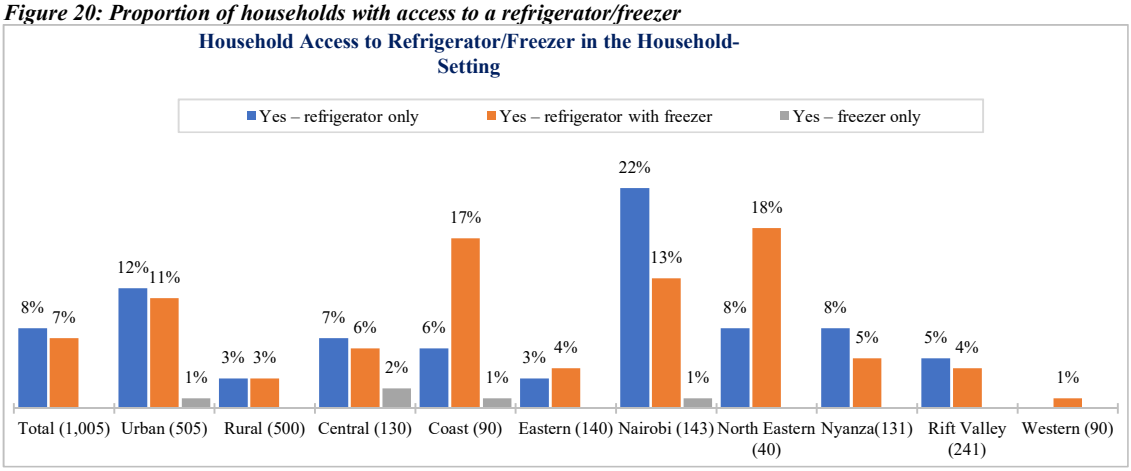
As can be seen in the later chapters on the challenges faced by fish farmers and retailers, there is a lack of storage equipment to preserve this perishable product and deep frying is the next available preservation method they can use in the short term. This lack of storage equipment to preserve fish in also affects the consumers with only about 60% of the households having access to electricity and this figure is more predominant in urban areas.

Figure 19: Proportion of households with access to electricity



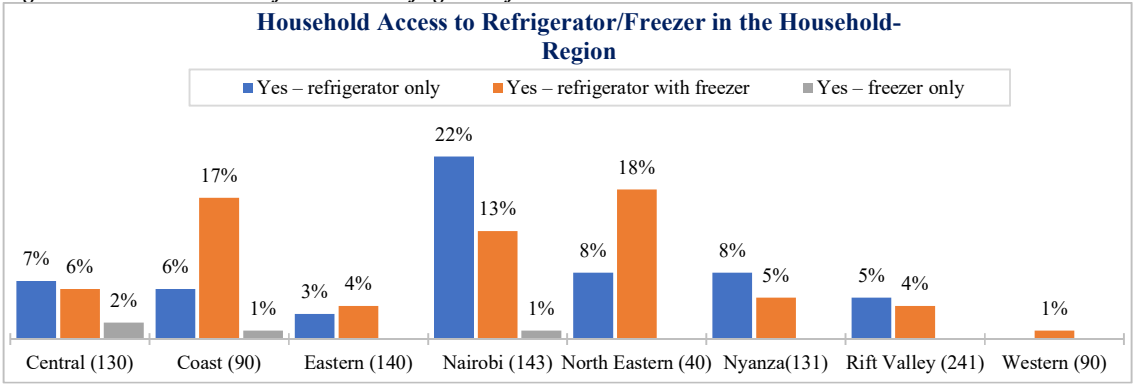
Even then, less than 10% have access to any form of refrigeration. For instance, only 8% have access to a basic refrigerator without a freezer. Further, 7% have access to a refrigerator with a freezer while less than 1% have access to a stand-alone freezer.

Figure 20: Proportion of households with access to a refrigerator/freezer



Nairobi has the largest number of households that have a refrigerator/freezer, followed by North Eastern and Coast regions. Few households have access to refrigerators/freezers in the lake regions of Kenya such as Nyanza and Western regions.

Figure 21: Household level of access to a refrigerator/freezer



It is therefore not a surprise that most of the people tend to consume all the fish the same day that it is purchased (as shown in the table below), and perhaps pushing the demand for deep fried fish that is less perishable.

Table 15: Methods used to preserve fish

Methods used to preserve fish							
	Deep Fried Fish (524)	Fresh Fish (185)	Frozen or fresh fish fillets (67)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (104)	*Dagaa/ Mukene/ Omena* (403)	Tinned/ canned fish (19)	Prawns/ other sea food (13)
No need to preserve/consume all in a day	85%	75%	81%	74%	72%	79%	69%
Keep in refrigerator	7%	9%	15%	6%	1%	21%	8%
Keep in freezer	1%	4%	4%	1%	-	5%	8%
Smoking	2%	2%	-	4%	-	-	-
Drying	6%	11%	3%	18%	29%	-	8%
Deep frying	1%	1%	1%	-	-	-	-
Keep in a cool dry place	1%	-	-	1%	1%	-	-
Roasting	-	-	-	1%	-	-	-
Salting	-	2%	-	1%	-	-	8%
Uses wheat flour to dry the fish	-	1%	-	-	-	-	-
Put in a container/wrap and cover it	1%	1%	-	1%	1%	5%	-

Amount of Fish Purchased on Average for Home Consumption

It was observed that on average, households purchase/consume 3.8kgs of fish in a month. Fish consumption in the urban areas was observed to be higher than in the rural areas as shown below.

Table 16: Amount of fish purchased in a month on average- Setting

How much fish does your household consume in a month on average? (kgs)			
	Total (752)	Urban (423)	Rural (329)
Average household consumption of fish in a month (kgs)	3.8	4.2	3.3

Regional variations on household fish consumption were observed where for instance, households in Nairobi (6kgs) and Coast (5.3kgs) Regions were observed to have the highest monthly consumption as shown below.

Table 17: Amount of fish purchased in a month on average- Region

How much fish does your household consume in a month on average? (kgs)									
	Total (752)	Central (60)	Coast (89)	Eastern (64)	Nairobi (136)	North Eastern (14)	Nyanza (120)	Rift Valley (179)	Western (90)
Average household consumption of fish in a month (kgs)	3.8	2.1	5.3	1.6	6	2.4	3.6	3.1	3.8

Across different household income bands, there no significant differences observed in terms of the number of kgs of fish consumed in the household as shown below.

Table 18: Amount of fish purchased in a month on average- Household income

How much fish does your household consume in a month on average? (kgs)							
	Total (752)	Below USD. 100 (243)	USD. 101 – 200 (223)	USD. 201 – 500 (133)	USD. 501 – 750 (42)	USD. 751 -1,000 (18)	USD. 1001 – 1,500 (8)
Average household consumption of fish in a month (kgs)	3.8	3.7	3.6	4.1	4.4	3.1	3.7

With regards to the purchase and consumption of different fish forms, it was observed that fish consumers tended to consume more of fresh fish (3.1kgs) than other fish forms as shown below.

Table 19: Amount of fish purchased in a month on average- Fish forms

Over the past one month, how much of …… was purchased on average in kgs?			
	Total (752)	Urban (423)	Rural (329)
Deep fried fish	2.9	3.0	2.7
Fresh fish	3.1	3.5	2.6
Frozen or fresh fish fillets	2.8	2.8	2.8
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.5	2.5	2.6
Dagaa/Mukene/Omena	2.3	2.2	2.4
Prawns/other sea food	2.9	3.0	2.7
Tinned/canned fish	2.1	1.9	3.0

In reading the above figures however, it is important to put into consideration that consumers tend to purchase more than one variety of fish. The average household consumption of some fish forms would therefore be higher/lower than others. As noted in the previous section for instance (on forms of fish purchased), most consumers tend to purchase and consume deep-fried fish (70%) and *Dagaa/Mukene/Omena* (54%) more than other fish varieties. The same consumers could also be purchasing other fish varieties or different forms of the same fish varieties.

When the same data is reviewed from a regional point of view, some variations are noted in terms of the amounts purchased on average per household, with the higher purchase/consumption being observed in Nairobi.

Table 20: Amount of fish purchased in a month on average- Region

Over the past one month, how much of …… was purchased on average? (kgs)									
	Total (752)	Central (60)	Coast (89)	Eastern (64)	Nairobi (136)	North Eastern (14)	Nyanza (120)	Rift Valley (179)	Western (90)
Deep fried fish	2.9	2.1	2.5	1.6	4.0	1.8	2.8	2.7	3.2
Fresh fish	3.1	2.3	3.5	2.4	3.4	1.6	3.3	3.0	2.6
Frozen or fresh fish fillets	2.8	2.6	3.1	3.0	2.8	3.0	2.1	3.0	1.8
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.5	1.3	2.0	0.5	2.8	-	4.2	1.8	2.5
Dagaa/Mukene/Omena	2.3	1.7	2.4	0.9	2.4	3.9	2.4	1.9	2.8
Prawns/other sea food	2.9	-	2.7	-	4.3	-	1.0	-	-
Tinned/canned fish	2.1	-	1.0	-	1.8	2.8	-	-	-

From the perspective of household income, the more affluent households tend to purchase more per month on average as compared to the other households as shown in the table below.

Table 21: Amount of fish purchased in a month on average- Household income

Over the past one month, how much of …… was purchased on average in Kgs.?								
	Total (752)	Below USD. 100 (243)	USD. 101 – 200 (223)	USD. 201 – 500 (133)	USD. 501 – 750 (42)	USD. 751 - 1,000 (18)	USD. 1,001 – 1,500 (8)	Above USD. 1,500 (33)
Deep fried fish	2.9	2.9	2.7	3.3	2.5	2.4	4.2	3.8
Fresh fish	3.1	2.6	3.4	3.3	2.4	1.2	4.0	5.7
Frozen or fresh fish fillets	2.8	4.7	2.3	2.6	3.8	1.0	2.6	2.9
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.5	2.3	2.7	3.5	2.7	1.7	1.0	2.6
Dagaa/Mukene/Omena	2.3	2.4	2.2	2.1	1.6	2.0	1.5	4.2
Prawns/other sea food	2.9	4.2	3.0	1.0	-	1.0	1.0	-
Tinned/canned fish	2.1	2.1	2.1	2.2	2.3	1.0	-	-

On average, households spend about Ksh. 1,110 (equivalent to about USD.11) a month on fish and fish products consumed in the household. A higher spend is observed in Nairobi as shown below.

Table 22: Average spend in total on fish and fish products in a month (Ksh.)- Region

On average, how much does this household spend in total on fish and fish products in a month? (Ksh.)											
	Total (752)	Urban (423)	Rural (329)	Central (60)	Coast (89)	Eastern (64)	Nairobi (136)	North Eastern (14)	Nyanza (120)	Rift Valley (179)	Western (90)
Average Spend	1,110	1,310	852	840	1,200	582	1,905	1,649	1,131	843	790

There is however not much variation in terms of average household spend on fish across the different household income categories as shown below.

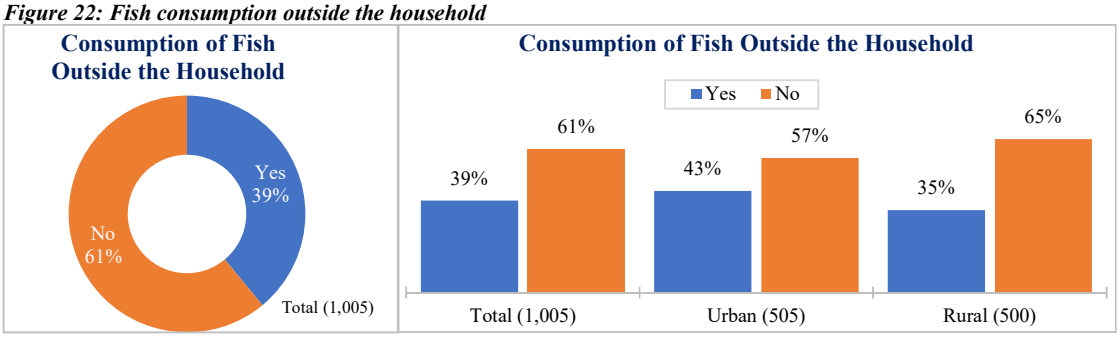
Table 23: Average spend in total on fish and fish products in a month- Household income

On average, how much does this household spend in total (on fish and fish products in a month?)								
	Total (752)	Below USD. 100 (243)	USD. 101 – 200 (223)	USD. 201 – 500 (133)	USD. 501 – 750 (42)	USD. 751 - 1000 (18)	USD. 1001 – 1500 (8)	Above USD.1500 (33)
Average Spend	1,110	925	1,090	1,300	1,433	1,063	1,094	1,523

Fish Consumption Outside the Household

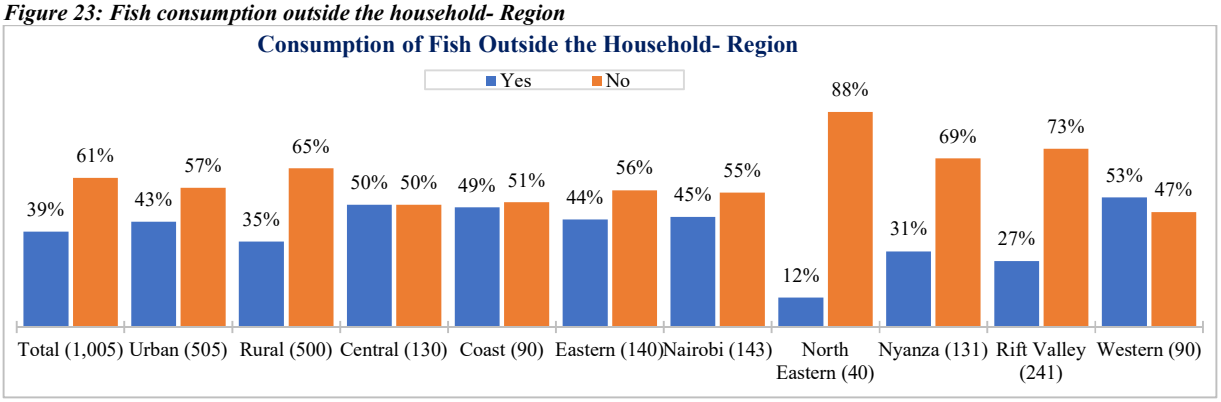
Almost 40% of fish consumers consume fish outside the household. This trend is more common in the urban areas as compared to the rural areas where a margin of 8% is observed.

Figure 22: Fish consumption outside the household



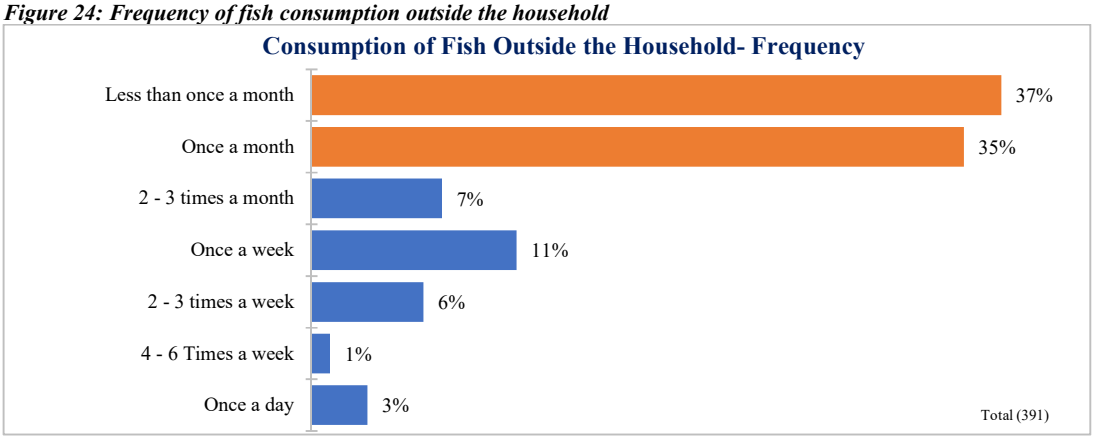
In terms of regional differences, more people tend to eat fish outside the household in Central, Coast, Western, and Nairobi regions of Kenya.

Figure 23: Fish consumption outside the household- Region



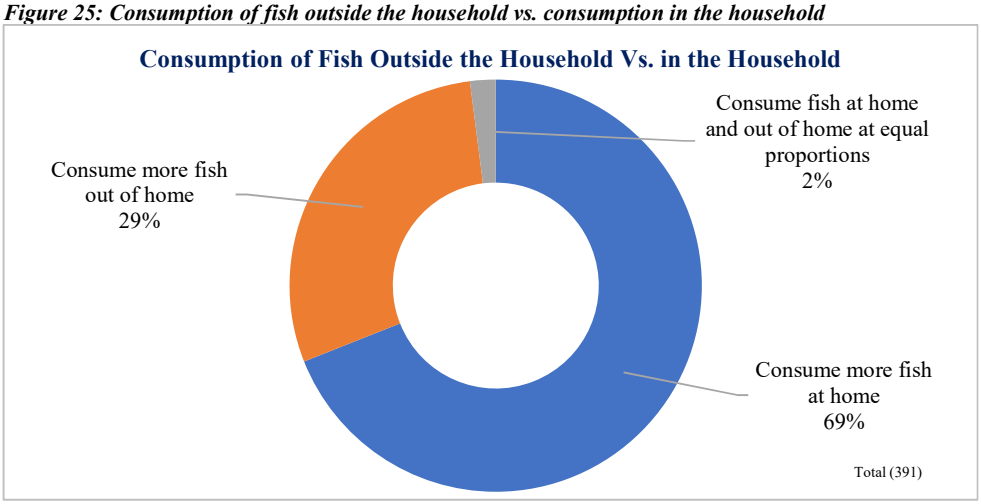
It was observed that the frequency of fish outside the home was largely either less than once a month (37%) or once a month (35%) as shown below.

Figure 24: Frequency of fish consumption outside the household



All in all, more fish (69%) is consumed in the household as compared to the amount of fish consumed outside the household as shown in the figure below.

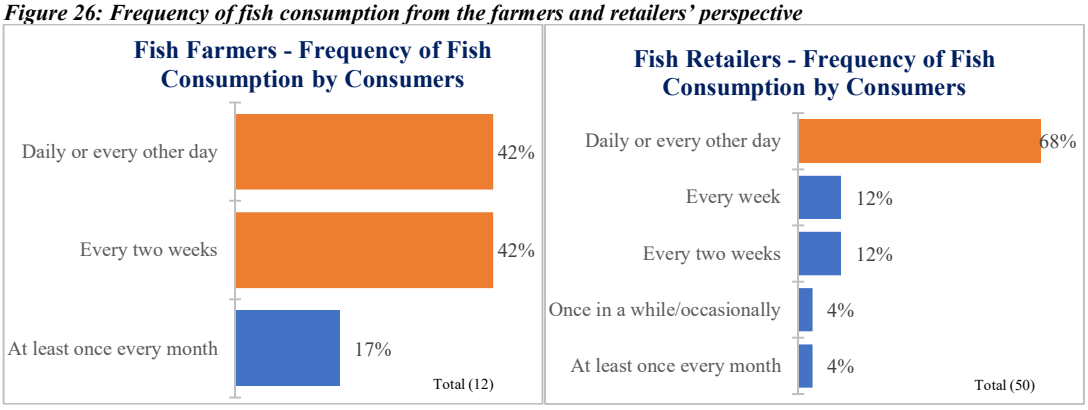
Figure 25: Consumption of fish outside the household vs. consumption in the household



Frequency of Fish Consumption

Most of the consumers eat fish two to three times a week, while the fish farmers hold the view that a sizeable proportion of fish consumers (42%) consume fish every other day. A slightly higher proportion of retailers noted that fish is consumed every other day as shown below.

Figure 26: Frequency of fish consumption from the farmers and retailers' perspective



The Preference for Wild vs Farmed Fish

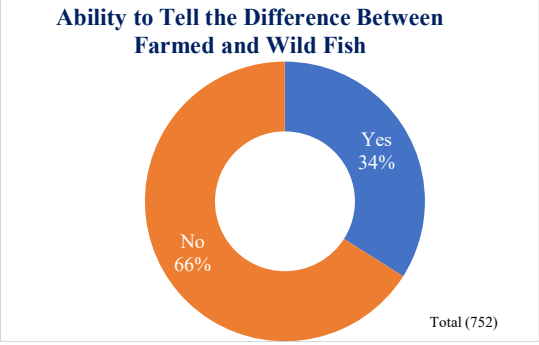
The consumers believe that about most of the fish they purchase is local wild catch fish from the lakes, rivers, streams and other waterbodies as shown in the table below. All in all, it will be observed from the supply side data presented in subsequent sections that a significant amount of fish sold is drawn from farms or imports.

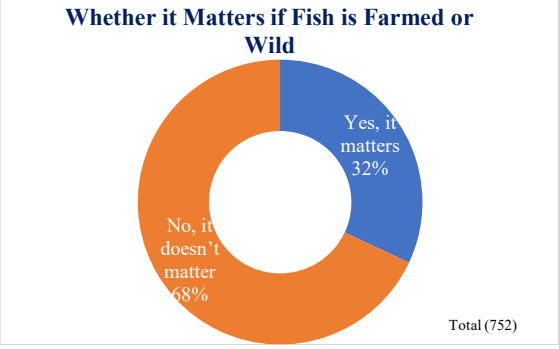
Table 24: Perceptions around the source of fish purchased locally

Perceived source of fish purchased/consumed at the household	Deep Fried Fish (524)	Fresh Fish (185)	Frozen or Fresh Fish fillet (67)	Dried/smoked Fish [excluding *Dagaa/ Mukene/Omena]* (104)	*Dagaa/ Mukene/ Omena* (403)	Tinned/ Canned Fish (19)	Prawns/ other sea food (13)
Local – wild fish [from lakes, rivers, streams, the ocean]	95%	94%	88%	99%	100%	68%	92%
Local – fish farms, fish cages and ponds	16%	18%	12%	8%	4%	-	8%
Imported – wild fish	2%	4%	10%	1%	1%	21%	-
Imported – fish farms, fish cages and ponds	1%	1%	4%	1%	-	11%	-

What is interesting though, is that only a third (34%) of the consumers can tell the difference between farmed fish and wild fish. As will be seen in subsequent sections, when asked to taste different fish samples (wild, farmed, imported), a significant proportion of fish consumers is able to tell that there is a difference in the fish samples, and with sizeable numbers being able to correctly identify the presented samples. To more than half of fish consumers, though (68%), it does not matter whether the fish is farmed or wild.

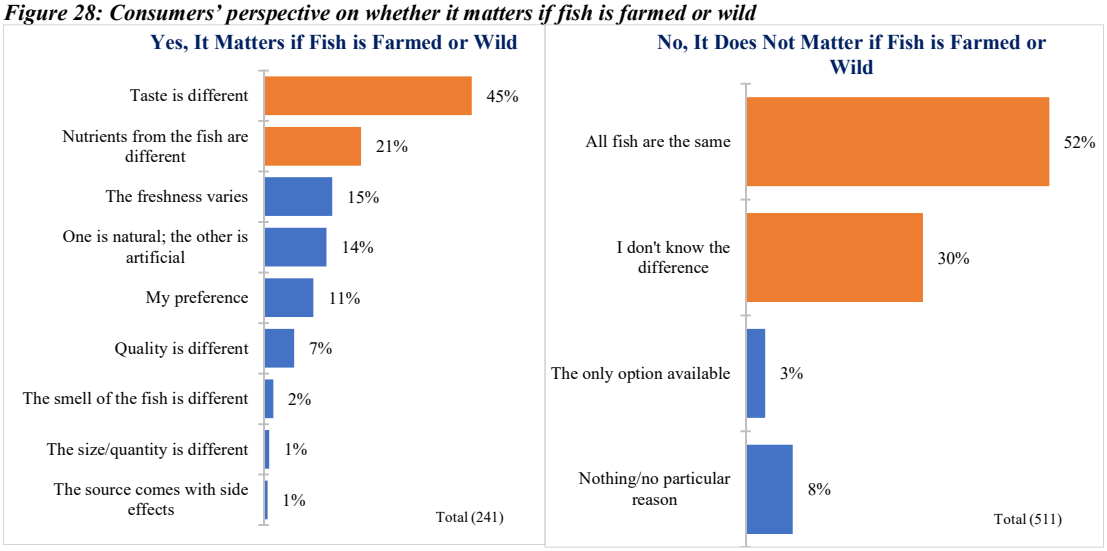
Figure 27: Ability to tell the difference between farmed and wild fish





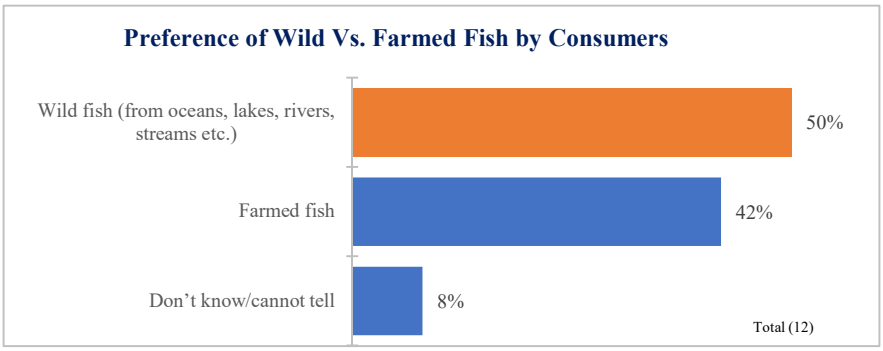
For those to whom it matters whether fish was wild or farmed, the taste is mainly perceived to be different (45%) and there is also a perception that the nutritional value is compromised (21%) among other reasons as shown below. For those to whom it does not matter whether fish is wild or farmed on the other hand, all fish is perceived to be the same by more than half (52%), while a significant proportion (30%) cannot tell the difference as shown below.

Figure 28: Consumers' perspective on whether it matters if fish is farmed or wild



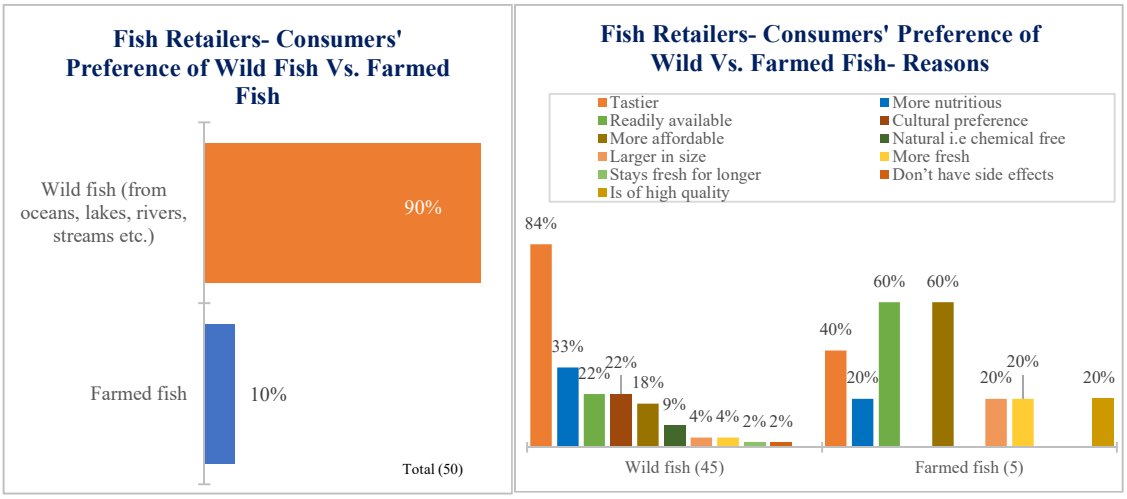
This was the same perspective held by the fish farmers where half of the farmers noted that there is a strong preference for wild fish as shown below. The farmers indicated that they mainly held this perspective because wild fish was readily available, more affordable, more nutritious, freshers, tastier and 'more natural. Those who held the perspective that farmed fish was preferred more by consumers provided mainly the same reasons by noting that it was more available, affordable, nutritious and stayed fresh for longer.

Figure 29: Fish farmers- Consumers' preferences of wild vs. farmed fish



The retailers on the other hand mentioned the same, with 90% agreeing that there was a preference for wild fish, which was fuelled by the notion that wild catch fish is tastier (84%) and more nutritious (33%) among other reasons as shown below.

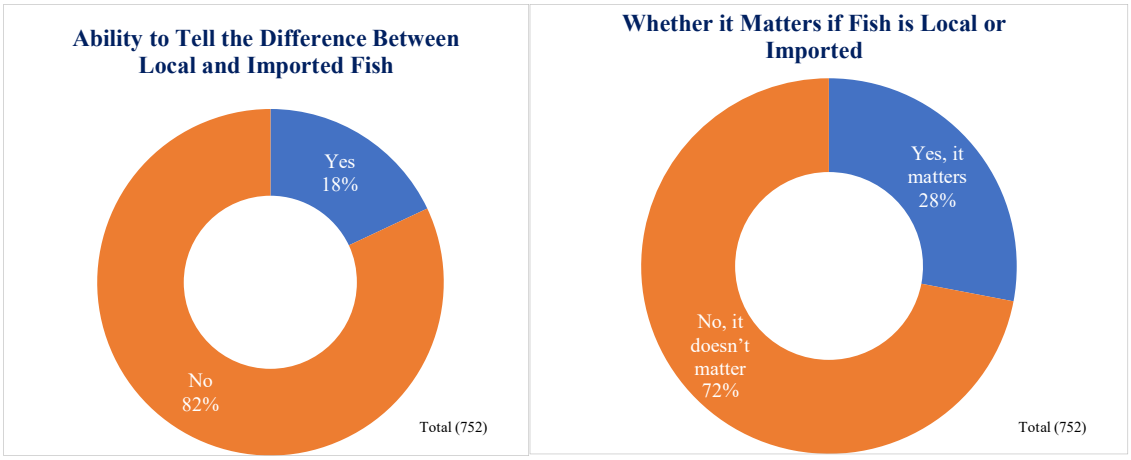
Figure 30: Fish retailers- Consumers' preference of wild vs. farmed fish



The Preference for Local vs. Imported Fish

In the same way, 82% of the consumers are not able to tell the difference between local and imported fish; with 72% of the consumers noting that it does not matter to them whether the fish is local or imported. However, from a fish tasting exercise that was implemented (discussed in the sections below), significant proportions of fish consumers can tell differences between local, wild and imported fish varieties, with sizeable proportions being able to identify imported fish.

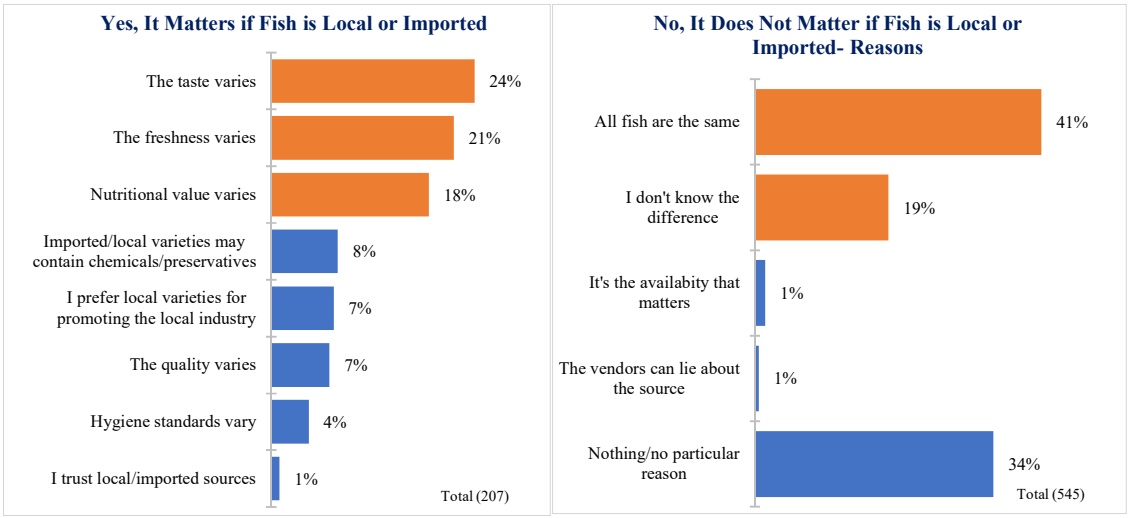
Figure 31: Ability to tell the difference between local and imported fish



For those to whom it matters that the fish if local or imported, the taste, freshness and nutritional value is are largely perceived to vary as shown below. For those to whom it

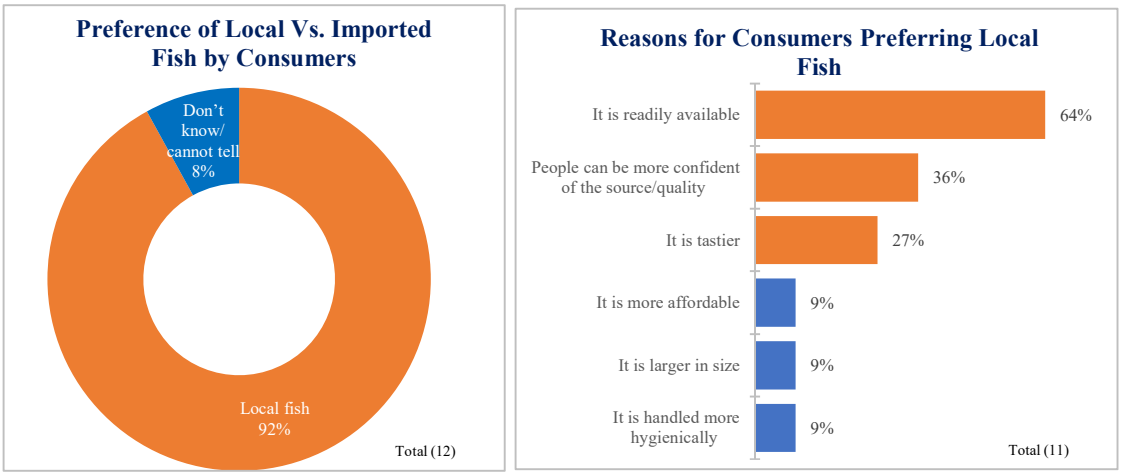
does not matter if fish is from local or imported sources, most perceive that all fish are the same, with a significant proportion also indicating that they cannot tell the difference.

Figure 32: Consumers- Whether it matters if fish is from local or imported sources



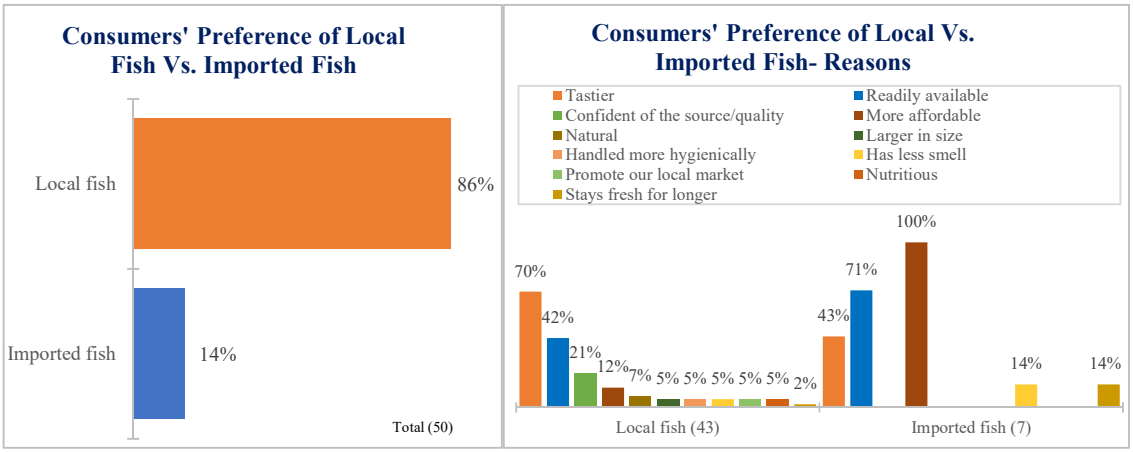
In addition, most of the farmers (92%) indicated that consumers preferred local fish over imported fish, because of availability (64%), confidence in its source (36%) and because it was tastier (27%) among other reasons as shown below.

Figure 33: Fish farmers- Consumer preferences of local vs. imported



Subsequently, retailers perceived that consumers mainly preferred local fish (86%) over imported fish largely because it was tastier (70%), readily available (42%), among other reasons as shown below.

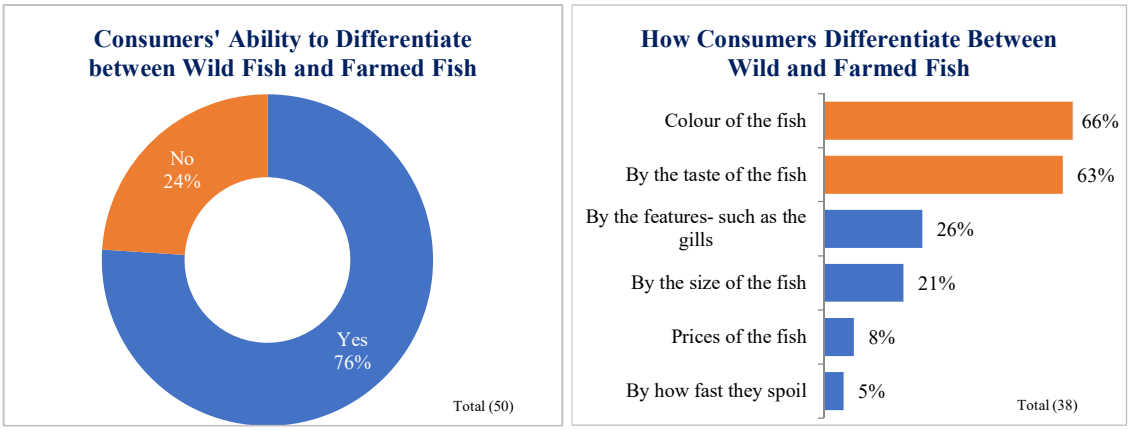
Figure 34: Fish retailers- consumers' preference of local vs. imported fish



Fish Tasting Exercise

The retailers indicated that consumers were largely able to differentiate between wild fish and farmed fish (76%), largely by the colour of the fish (66%) and the taste of the fish (63%) among other ways as shown below.

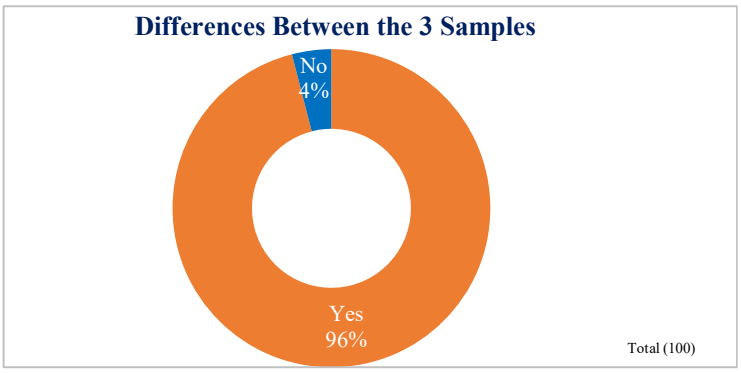
Figure 35: Fish retailers- Consumers' ability to differentiate between wild fish and farmed fish



Thus, the study sought to test, through a fish tasting exercise, whether consumers could tell the difference between farmed, wild and imported fish. Recruited consumers were invited to taste 3 samples of cooked Tilapia fish (deep-fried) which was sourced from different places; one was a wild variety, the other was farmed while the third one was imported (see more details of how the fish tasting exercise was implemented in the study design section of this report). Participating consumers were then asked to provide feedback on existing differences in the three samples of fish. As shown below, a

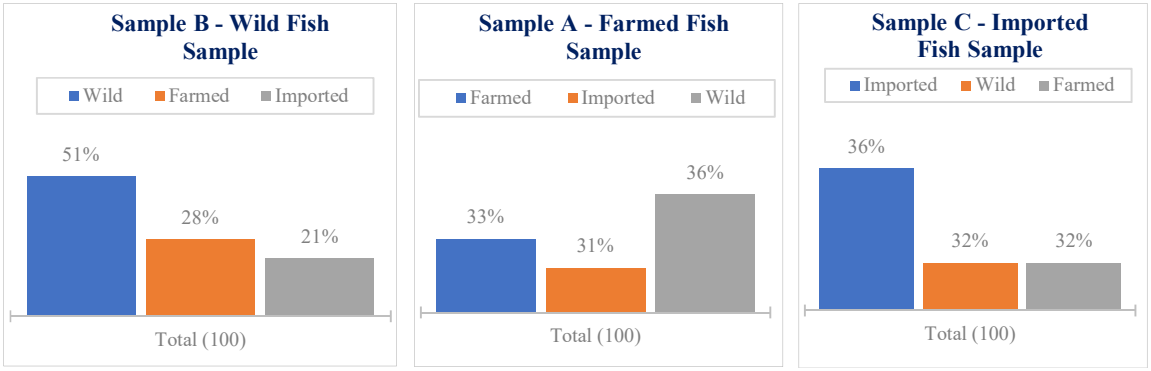
significant proportion (96%) could tell that there was a difference in the three samples of fish.

Figure 36: % of respondents that claim to tell the difference



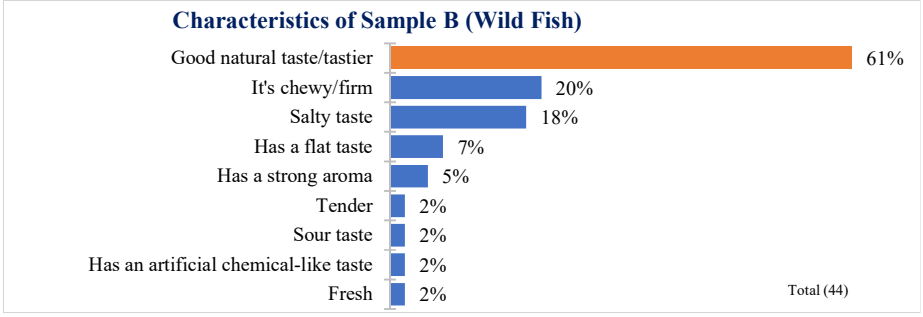
Further, 55% correctly identified wild fish, 33% correctly identified farmed fish, while 36% correctly identified the imported fish samples.

Figure 37: Fish tasting exercise results



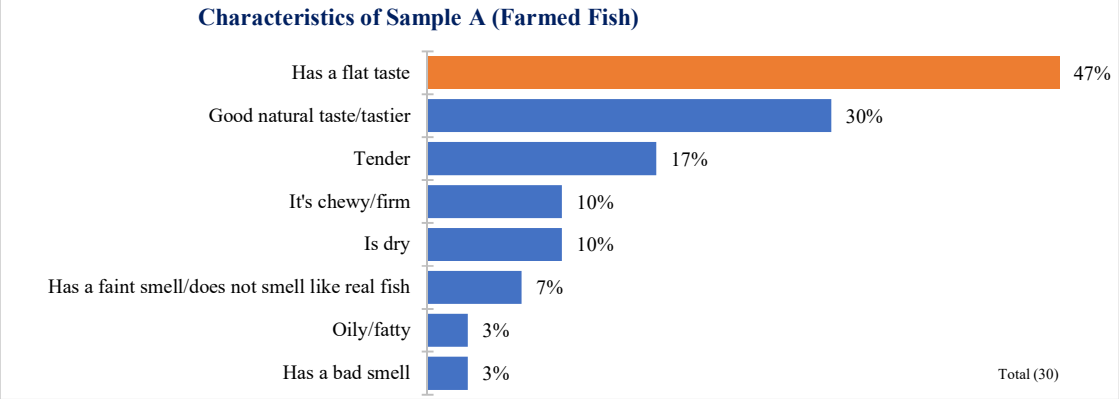
For those that correctly identified those fish samples, the study explored further to understand what it was that made it easy for them to identify that type of fish. Wild fish is said to have a good natural taste and is chewy or firm.

Figure 38: Characteristics of wild fish



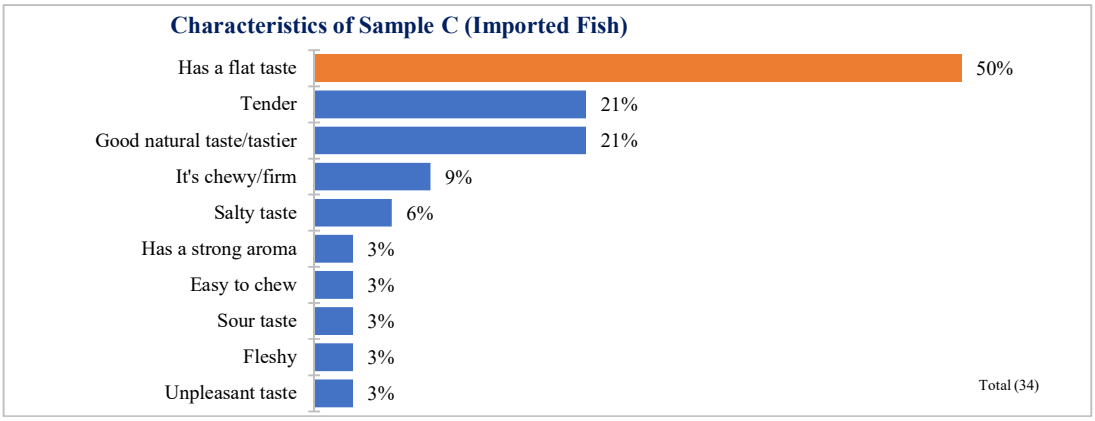
Farmed fish on the other hand seemed difficult to distinguish from wild fish to the participants of the fish tasting exercise and it was observed by some that it had a flat taste, while to others, it had a good natural taste.

Figure 39: Characteristics of farmed fish



The imported fish sample on the other hand was said to have a flat taste by 50% of the respondents.

Figure 40: Characteristics of imported fish

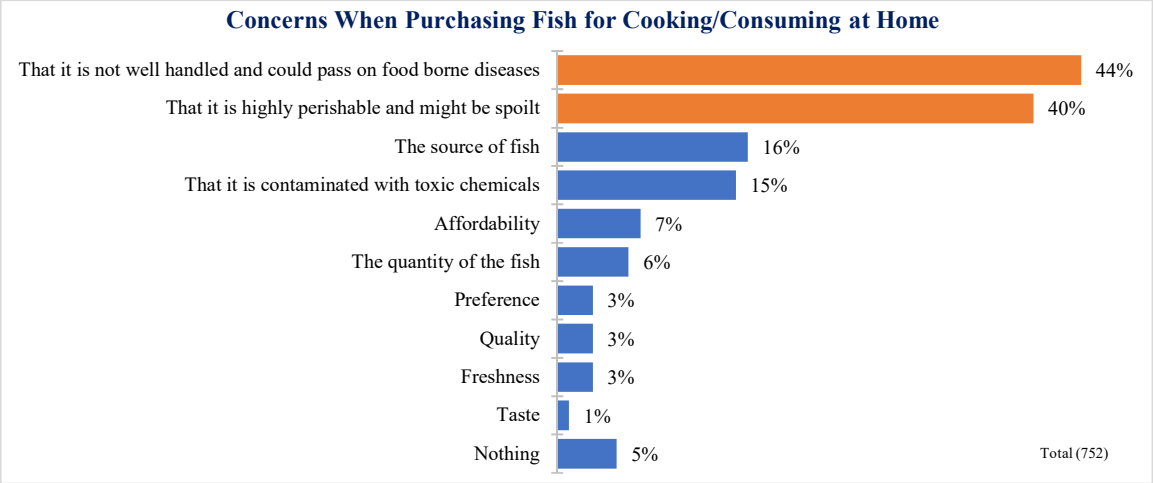


What however can be observed is that it is very difficult for the consumers to distinguish between the three fish samples because even when some respondents mentioned an attribute as a characteristic of a fish sample, others gave a contradictory attribute for the same fish sample.

Consumer Concerns and Perceptions

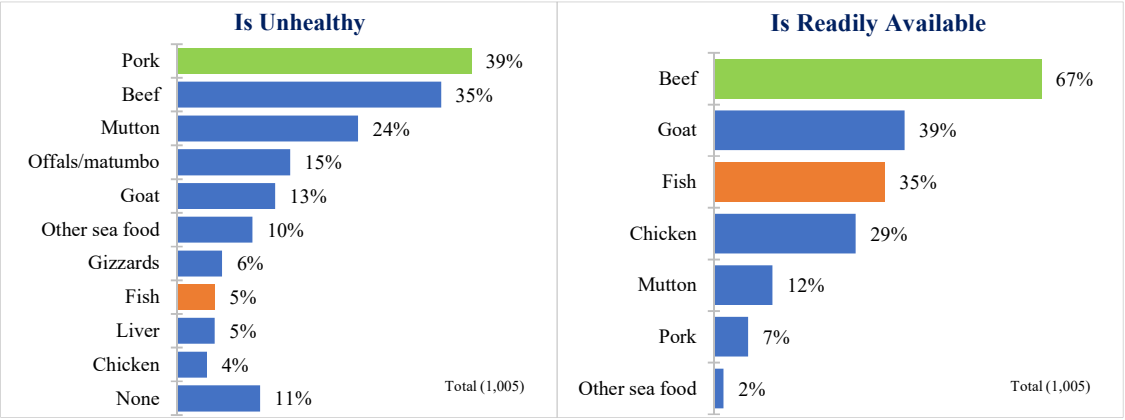
Consumers are worried about fish handling when purchasing fish for cooking or when consuming fish. This is compounded by the fact that it is highly perishable considering the infrastructure and facilities available for fish retailers in Kenya.

Figure 41:Concerns consumers have when purchasing fish for cooking/consuming at home



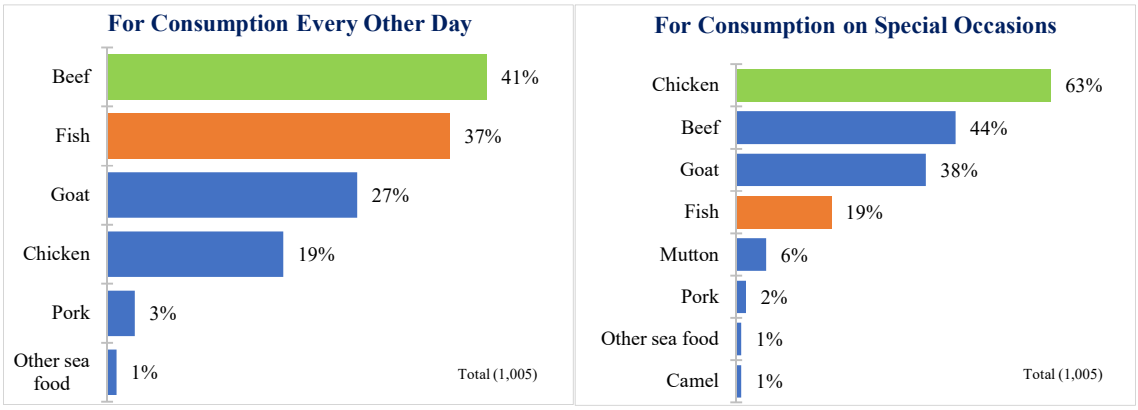
The study explored perceptions around various attributes. For instance, 39% and 35% of the household respondents considered pork and beef as unhealthy respectively. Beef has the highest score in terms of availability; with 67% mentioning that is readily available.

Figure 42: Meat that is unhealthy and meat that is readily available



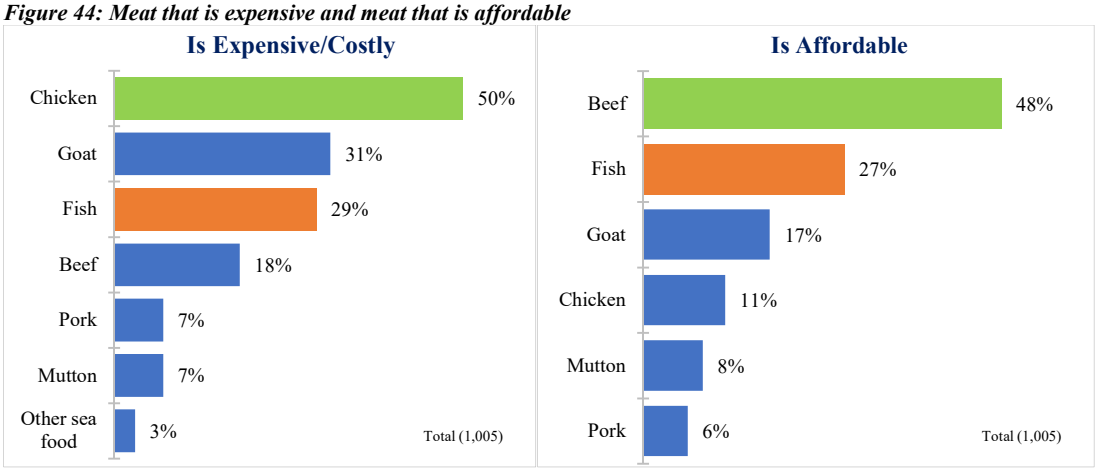
Further, beef is considered as a type of meat that can be consumed every other day, while chicken is mainly considered for consumption on special occasions.

Figure 43: Type of meat for consumption every other day and on special occasions



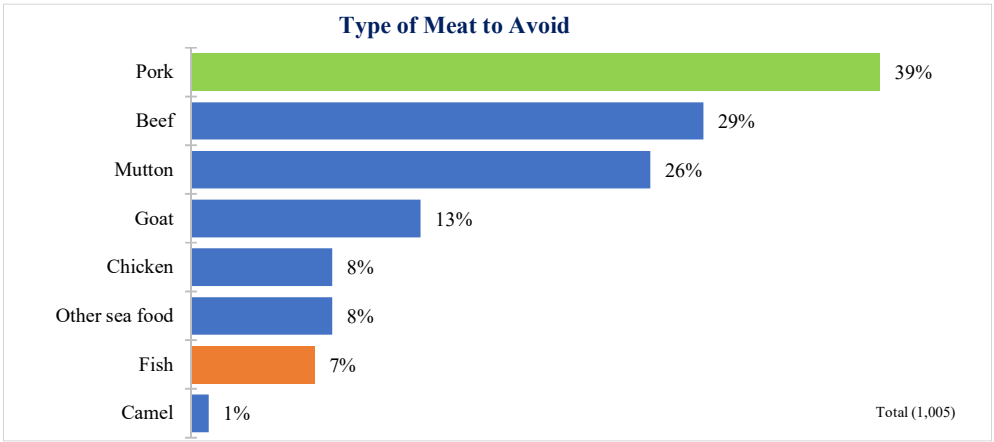
On the other hand, chicken is considered costly, while beef is considered affordable.

Figure 44: Meat that is expensive and meat that is affordable



Pork on the other hand was mentioned by 39% of the respondents as a type of meat to avoid.

Figure 45: Type of meat to avoid



The study also explored a longer list of attributes and observed the fact that fish has very strong attributes in term of being nutritious for young children, being quick and easy to prepare, and being a healthier source of proteins. Consumption can be driven up by ensuring that the prices are affordable and making it readily available. The fact that wild fish feels more natural to the consumers is a fact that would need to be addressed if alternatives are made available that are not wild.

Table 25: Perceptions around various attributes

Perceptions on various attributes (Total- 752)				
	Agree	Neither Agree nor Disagree	Disagree	Average Differences
Fish is nutritious for young children	91%	6%	3%	88%
Fish is quick and easy to prepare	91%	5%	4%	87%
Fish is a healthier source of protein than other sources	90%	6%	4%	86%
I would be willing to consume more fish products if the price went down	89%	5%	5%	84%
I feel comfortable buying and preparing fish at home	87%	7%	6%	81%
I would be willing to consume more fish products if it was available near me	84%	10%	6%	78%
Wild fish is more "natural"	82%	14%	4%	78%
Everyone should eat fish once a week	77%	12%	12%	65%
Generally, fish is too expensive	78%	8%	14%	64%
It is easy to judge the freshness of fish and other sea food	72%	17%	12%	60%
Wild fish is safer/free from chemicals or artificial boosters than farmed fish	70%	19%	11%	59%
Frozen fish is tasteless	62%	23%	16%	46%
People in this location traditionally eat fish	60%	20%	21%	39%
Wild fish is more expensive than farmed fish	57%	26%	18%	39%
Fish fillet is mainly consumed by children	60%	15%	24%	36%
Farmed fish spoils quickly even when frozen, it turns green	49%	35%	15%	34%
Farmed fish is fragile/breaks apart when being cut and fried	45%	39%	16%	29%
Fish sold in the supermarkets is not good quality fish	40%	29%	30%	10%
Fish from China is more affordable than fish from other sources	31%	47%	23%	8%
Fish sold in this area is not handled hygienically	45%	17%	38%	7%
Imported fish is larger in size than local fish	29%	48%	22%	7%
Farmed fish is larger in size than wild fish	35%	33%	32%	3%
Farm raised fish is of the same quality as wild fish from the rivers, lakes and the sea.	30%	27%	42%	-12%
Farmed fish is tastier than wild fish	24%	29%	48%	-24%
Fish from China is tastier than fish from other sources	10%	49%	42%	-32%
In rural areas, fish is never consumed	27%	11%	62%	-35%

On the other hand, there is need to address several issues that are lowering the positive perception of fish. For instance, there is a view that fish is never consumed in the rural areas. There is also the perception that wild fish is tastier than farmed fish or Chinese fish which is likely to affect the market for fish if it is not wild. Indeed, a considerable proportion of the respondents felt that farmed fish is not of the same quality as wild fish. Further, there were issues that would need to be addressed on the size of fish, the hygiene standards at points of sale and affordability. While one would anticipate that supermarkets have better storage infrastructure to store fish which is perishable in nature;

a sizeable proportion of the respondents felt that fish sold at the supermarkets is not of good quality, and so this point of sale might not yield good results.

What these perceptions indicate is that fish has very good perceptual attributes and these can be enhanced to increase consumption for fish, if the supply issues mentioned subsequently in the barriers to consumption are addressed.

3.1.3 Fish Production, Processing and Route to Market

This section provides insights on the supply side of the fish industry, specifically from fish farmers, fish retailers, storage and transportation businesses as well as an overview of the market organization through cooperatives and associations.

A. Fish Farming Trends

With a growing population in Kenya, there has been a decline of fish production from the natural water resources[6]. This has generated the need to grow the fish farming sector in the country. Aquaculture in Kenya can be categorized into three broad divisions: a) warm fresh water aquaculture dominated by the production of various species of Tilapia and the African Catfish, mainly under semi intensive systems using earthen ponds [but also in cages on Lake Victoria]; b) cold fresh water aquaculture involving the production of Rainbow Trout under intensive systems using raceways and tanks; and c) marine water aquaculture (mari-culture) which is underdeveloped.[7] The sector is predominantly run by enterprises as displayed by secondary data on the subject[8]. The study thus sought to interview several fish farmers (12 owners/key decision makers) to gain insights into the sector.

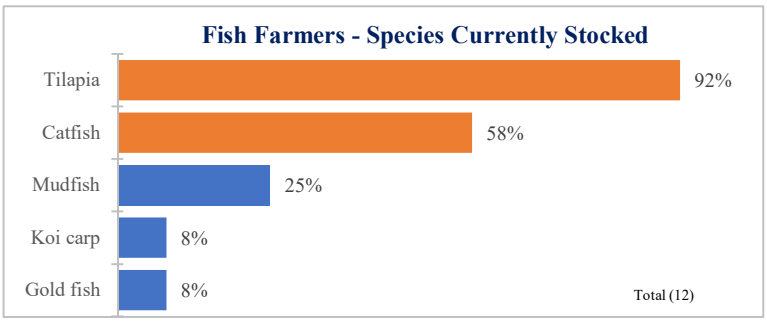
Fish Species Farmed

As noted earlier, most farmers keep Tilapia, followed by Catfish, among other species as shown below. It was observed that some fish farmers confused the English names of

[6] http://www.afspan.eu/modules/partners/partner.php?partner_id=21&title=fisheries-department-ministry-of-fisheries-development-kenya
[7] Ibid
[8] http://www.fao.org/fishery/countrysector/naso_kenya/en

the fish varieties farmed. One farmer for instance had initially reported that he farmed Nile Perch, but which was later confirmed to be Mudfish.

Figure 46: Species farmed and stocked by fish farmers



The main motivations for keeping Tilapia included its high demand in the market, affordability, because its fingerlings are readily available, and because it does well and provides better returns as shown below.

Table 26: Fish farmers-Reasons for stocking species

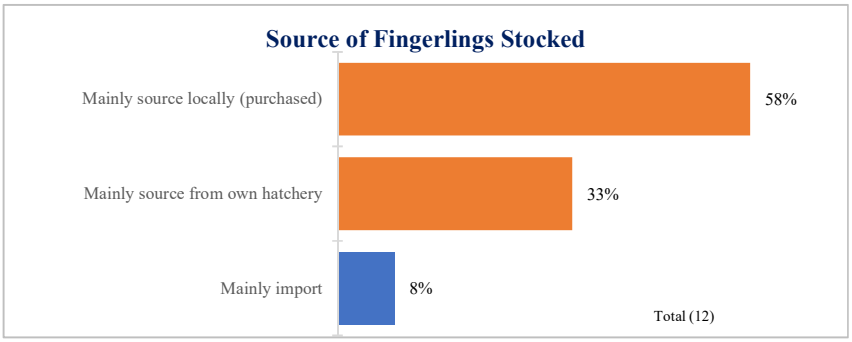
Reasons for stocking species					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
High demand in the market	55%	29%	-	-	-
Affordable to purchase	45%	29%	100%	-	-
Readily available fingerlings	36%	14%	100%	-	-
Do well/provide better returns	36%	57%	-	100%	100%
Cost effective to maintain	27%	29%	50%	-	-
Less prone to diseases	27%	29%	50%	-	-
They have a good taste	9%	-	-	-	-
Grows faster than other species	9%	-	-	-	-

On the other hand, farmers that keep Catfish do so mainly because it provides better returns, it is cost effective to maintain and that it is in high demand as well as affordable for consumers to purchase.

Sources of Fingerlings

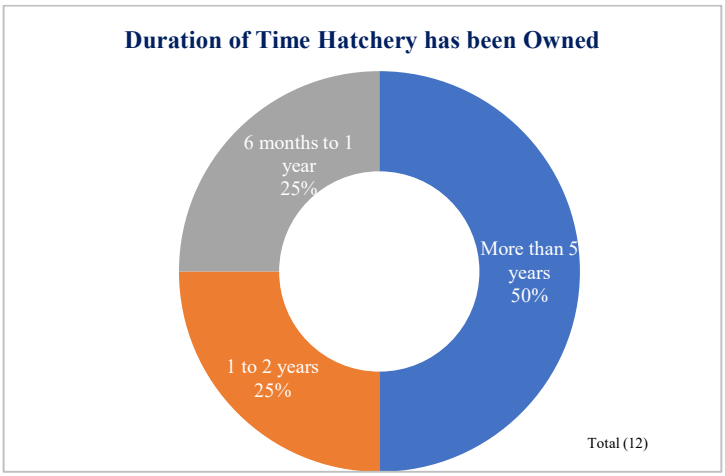
Fish farmers indicated that they largely purchased the fingerlings they stocked from local sources (58%). A considerable proportion (33%) also indicated that they owned their own hatcheries for fish production as shown below. Those who purchased from local sources indicated that they largely did so because it was affordable, the species were healthier/less prone to diseases, the species were more readily available, provided better returns and were more cost effective to rear. The one farmer who mainly imported fingerlings indicated that he did so because it was affordable.

Figure 47: Fish farmers- Source of fingerlings stocked



Most farmers who owned a hatchery for producing their own fingerlings indicated that they had owned it for more than 5 years as shown below (50%).

Figure 48: Fish farmers- Duration of time hatchery has been owned



On the other hand, farmers that purchased fingerlings indicated that they mainly sourced them from Kenya Marine and Fisheries Research Institute, other fish farmers and from natural sources (such as Lake Victoria) as shown below.

Table 27: Fish farmers- Source of species stocked

Source of species currently stocked					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
From Kenya Marine and Fisheries Research Institute	27%	29%	100%	-	-
From other farmers in the area/from ponds	27%	14%	-	100%	100%
From the lake, e.g. Victoria	18%	-	-	-	-
From Sagana hatcheries.	9%	14%	-	-	-
Hatcheries in Thika	9%	14%	50%	-	-
From United Kingdom	9%	-	-	-	-
From Netherlands	9%	-	-	-	-
From Indonesia	-	29%	-	-	-

Number of Fingerlings Purchased and Amount of Fish Harvested

It is estimated that on average, farmers purchase about 550 fingerlings or more for Tilapia and Catfish each and 100 fingerlings or less for other species kept such as Mudfish among others as shown in the table below.

Table 28: Fish farmers- Number of fingerlings purchased per batch/lot

Fingerlings purchased for farming per batch/lot					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
Average number of fingerlings purchased per batch	945	550	83	50	50

Additionally, it was observed that farmers harvest an average of between 109kgs of Tilapia and 822kgs of Catfish per batch/lot as shown below (10% of the farmers interviewed had ventured in the business recently- less than 6 months- and had therefore not yet harvested from their first batch/lot.

Table 29: Fish farmers- Kgs of mature fish harvested per batch/lot

Kgs of mature fish harvested per batch/lot					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
Average amount of fish harvested (kgs)	109	822	33	-	-

This amount appears low considering the number of fingerlings purchased and this could mean either of the following: that first, they are experiencing a significant amount of loss of their fish population, or that they are not keeping proper records of the amounts that they harvest and these issues can be explored in future studies. However, some consistency is noted with the amount of fish they sell per batch, especially for Tilapia, as shown below, which perhaps points to the issue that they may be experiencing significant losses in the production process.

Table 30: Fish farms/ponds- Kgs sold from harvest per batch/lot

Kgs sold from harvest per batch/lot					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
Average amount of fish sold for each batch of fish (kgs)	105	359	25	-	-

Average Cost of Production

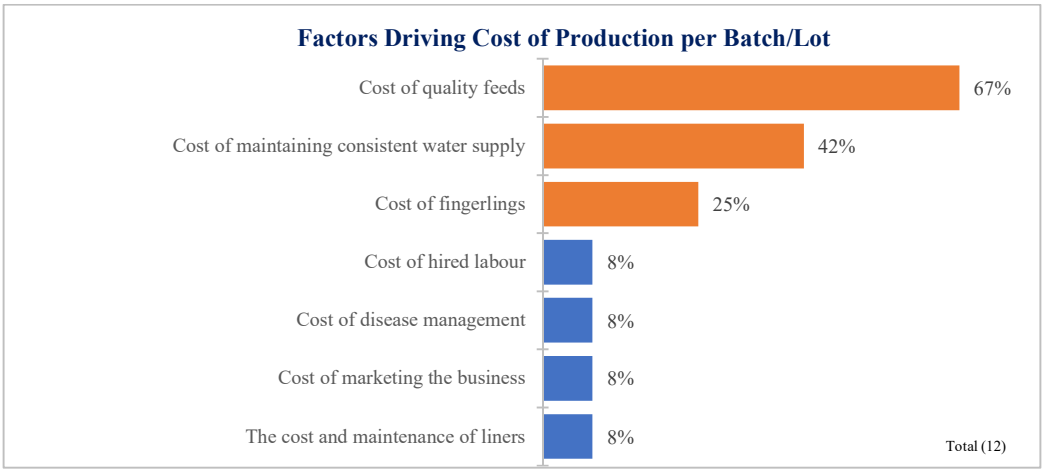
In terms of the cost of production for the business, it was observed that farmers spend an average of about Ksh. 5,000 to Ksh. 27,800 (equivalent to about USD.50 to USD.275) for keeping different species per batch/lot as shown below.

Table 31: Fish farmers- Total cost of production

Total cost incurred in production (Ksh.)					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
Average amount incurred in the production of fish per batch (kgs)	10,170	27,800	1,700	5,000	5,000

As shown below, the main items driving the cost of production were the cost of feeds (67%), the cost of maintaining consistent water supply (42%) and the cost of fingerlings (25%) among other costs as shown below.

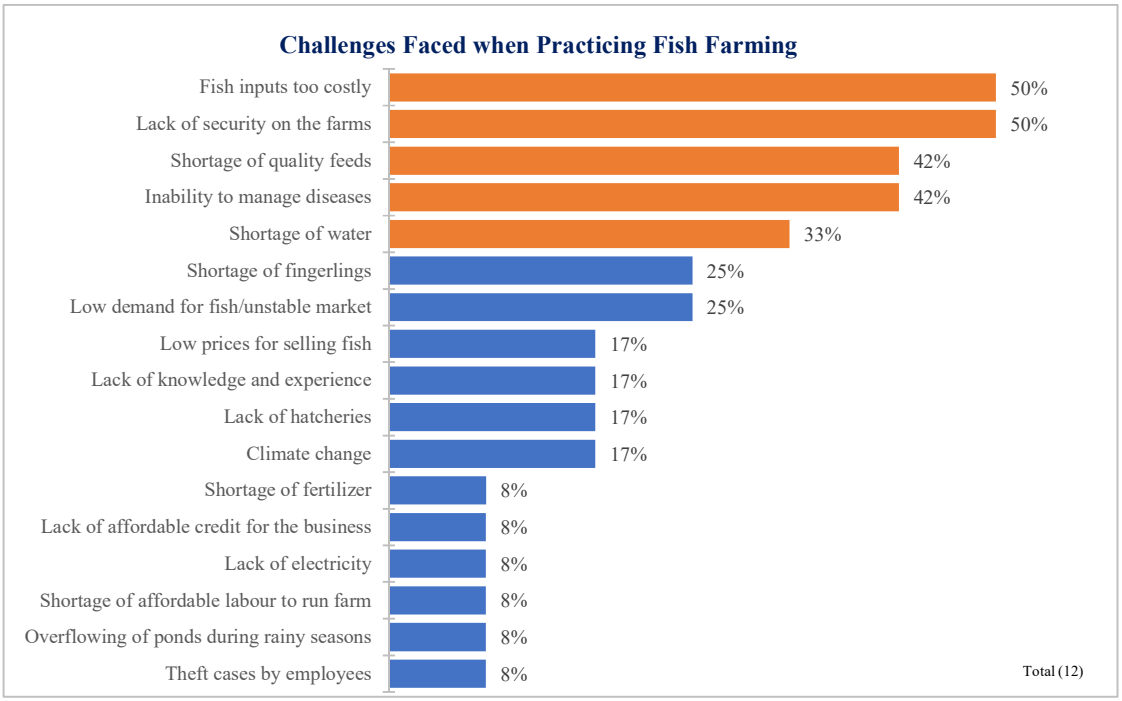
Figure 49: Fish farmers- Factors driving cost of production



Challenges and Bottlenecks

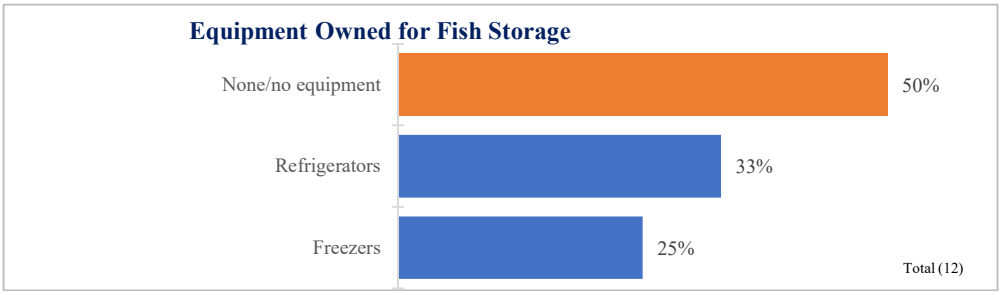
Fish farmers are facing several challenges, with some of the most pressing ones being the cost of farming inputs (50%), insecurity in the farmers (50%), shortage of quality feeds (42%), inability to manage diseases (42%) and shortage of water on the farm/pond (33%) as shown below.

Figure 50: Fish farmers- Challenges faced in fish farming



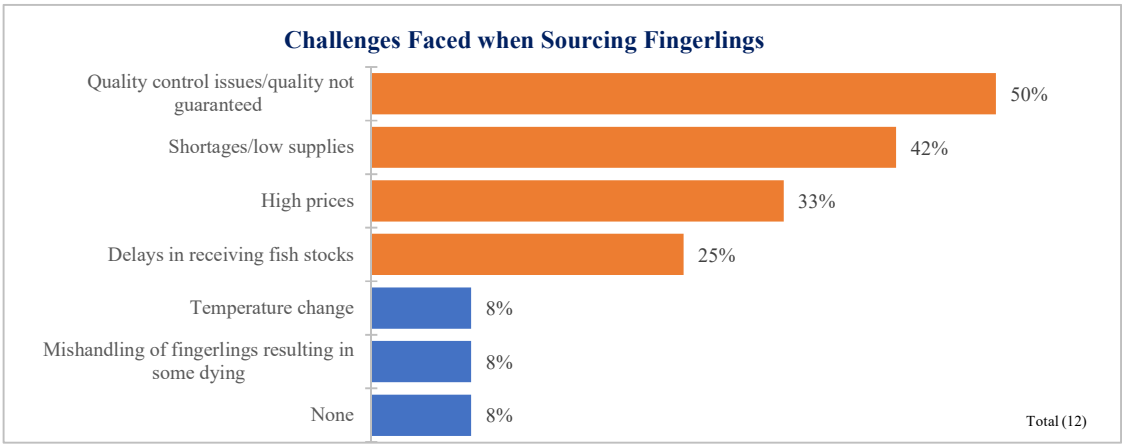
As observed in the previous section, farmers were experiencing a lower return on their investment and one of the key drivers of this could be theft and losses from predators as shown above (insecurity in the farmers). In addition to that, and though not noted in the above as a challenge, we note that 50% of the fish farmers possess no cold storage equipment for fish as shown below.

Figure 51: Fish storage equipment owned by the fish farmers



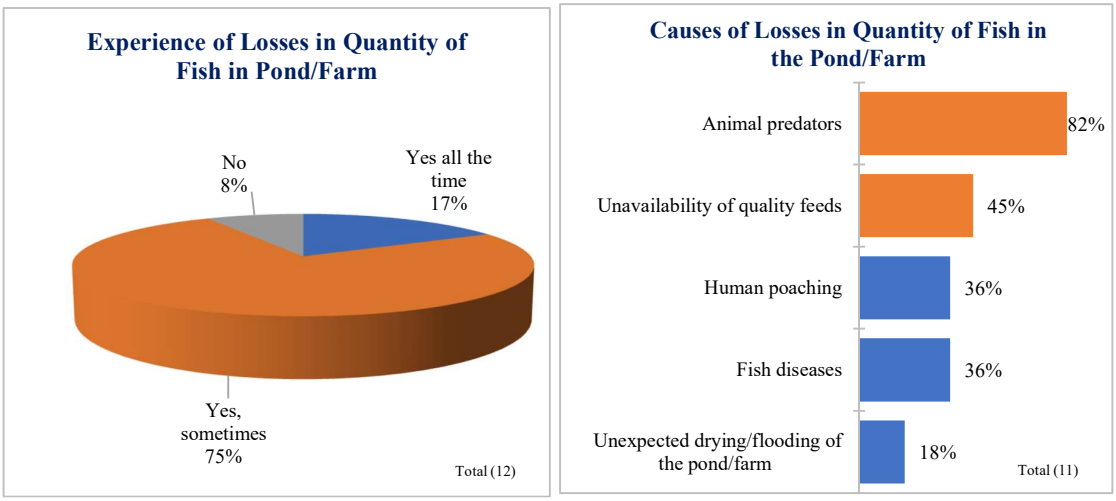
Additionally, accessing quality fingerlings for farming was reported as a major set-back by farmers. As shown below, guaranteeing the quality of the fingerlings (50%), shortage or low supplies (42%), high prices in accessing the fingerlings (33%) and delays in receiving the stocks (25%) were some of the major issues cited.

Figure 52: Fish farmers- Challenges faced when sourcing fingerlings



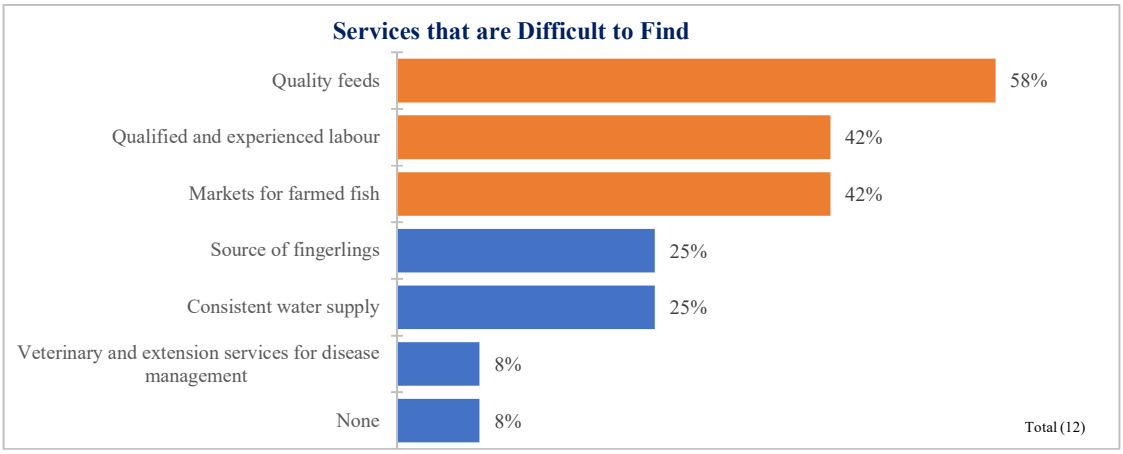
Further, farmers indicated that they largely experience loses in the quantity of fish farmed (75%). This was reported as being largely because of animal predators (82%) and the unavailability of quality feeds (45%) among other reasons as shown below.

Figure 53: Fish farmers- Losses of fish in farmers



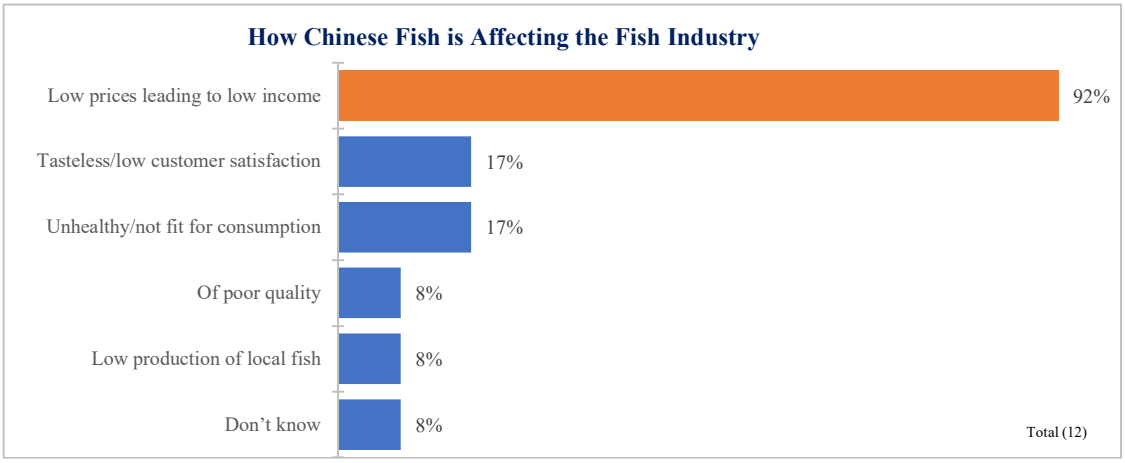
Accessing quality feeds was also reported as being the most difficult service to access as shown below (58%). In addition to this, there is an issue in accessing qualified and experienced labour for the business (42%) and accessing markets for the farmed fish (42%) among others.

Figure 54: Fish farmers- Accessibility of services



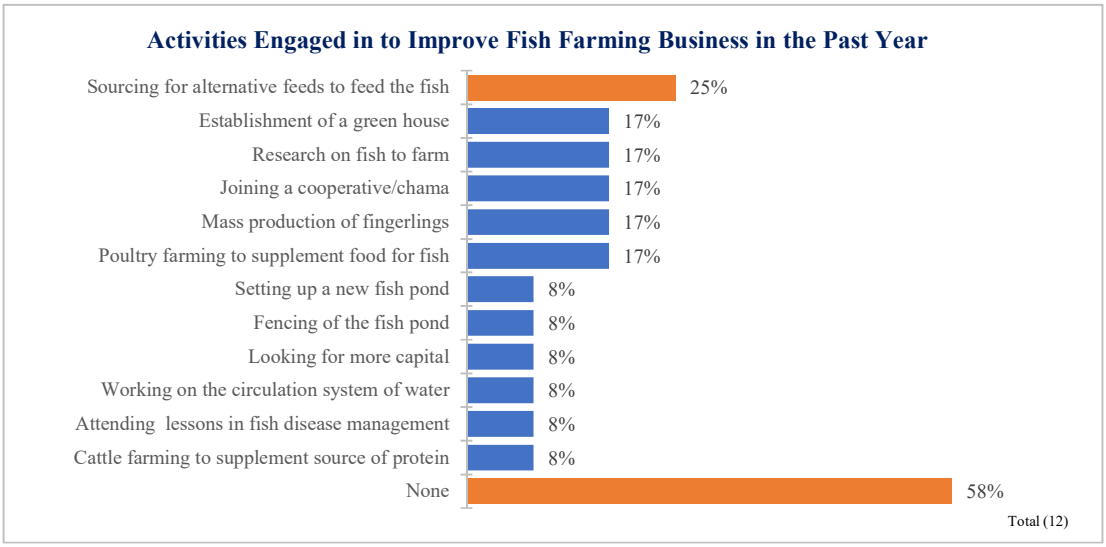
Farmers also indicated that the entry of Chinese fish in the Kenyan market had mainly led to low prices of fish which in turn resulted in low incomes (92%) as shown below.

Figure 55: Fish farmers- Impact of Chinese fish



In terms of what the farmers are doing to mitigate against the challenges that they face, it is worrying to note that a significant proportion of farmers (58%) have not engaged in any activities to improve their fish farming business in the past year as shown in the figure below. Those that had done so indicated that they sourced for alternative feeds for their fish (25%), established green houses to obtain feeds for their fish (17%), researched into fish farming (17%), joined a cooperative or savings group (17%), engaged in mass production of fingerlings (17%) and engaged in poultry farming to supplement food for fish.

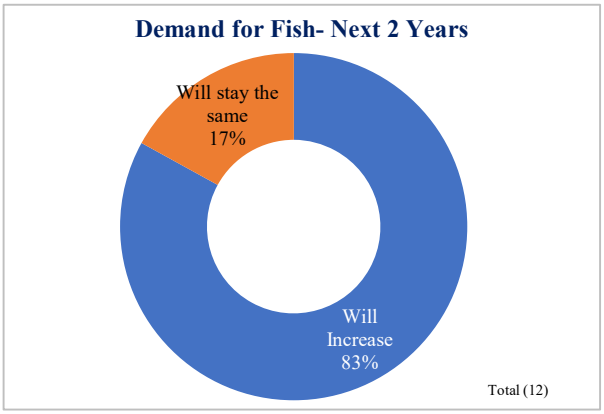
Figure 56: Fish farmers- Activities to improve fish farming businesses in the past year



Future Fish Farming Opportunities

Despite the challenges faced in the industry, farmers are optimistic that the demand for fish is likely to increase (83%) largely because of its nutritious status, availability, affordability, because fish is considered to part of the people's culture and because of the growing population. The few farmers (2 of them) who felt that the demand for fish will stay the same in the next 2 years held this perception because of comparison with the previous year's business performance, and because fish was readily available.

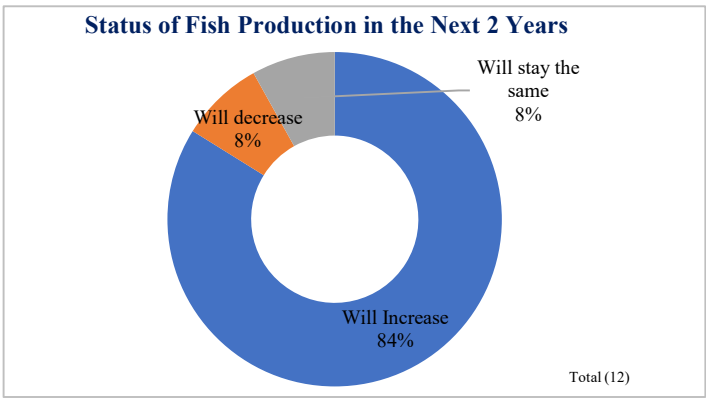
Figure 57: Fish farmers- Demand for fish in the next 2 years



Additionally, there is optimism by most farmers that the production of fish is expected to increase in the next 2 years as shown below. Farmers mainly held this view because of the high demand for fish, emerging technological innovations, because fish farming

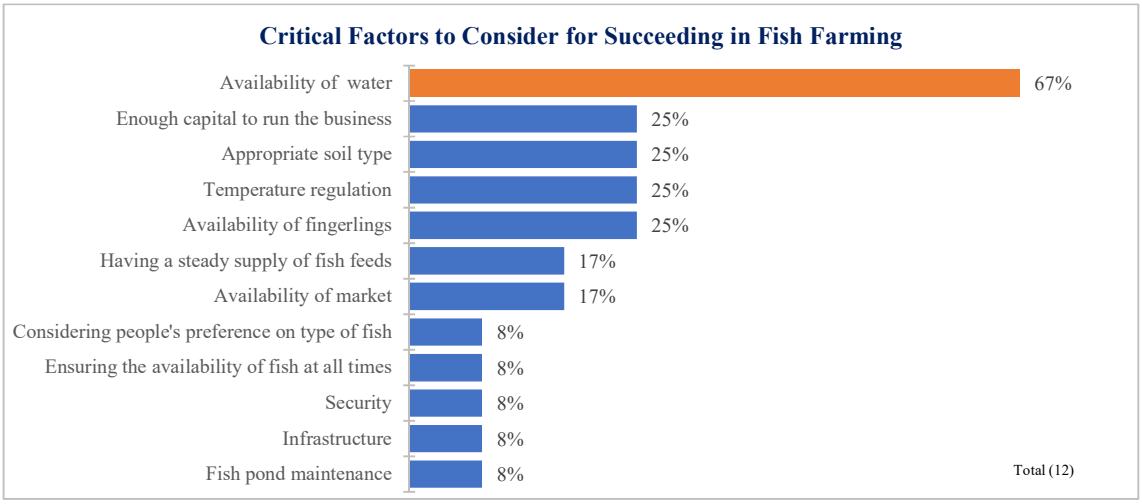
is a good source of livelihood, continued support from the Ministry of Fisheries (including provision of funding), and the increased interest in digging more fish ponds.

Figure 58: Fish farmers- Production of fish in the next 2 years



Due to this anticipated growth in the industry, the farmers noted several issues such as access to water (67%), access to capital (25%), appropriate soil type and possibly new pond technologies that are not soil dependent (25%) among other considerations, that would need to be considered for one to succeed in the fish farming business. For some of these areas, as can be seen in the figure below, the farmers would probably need support.

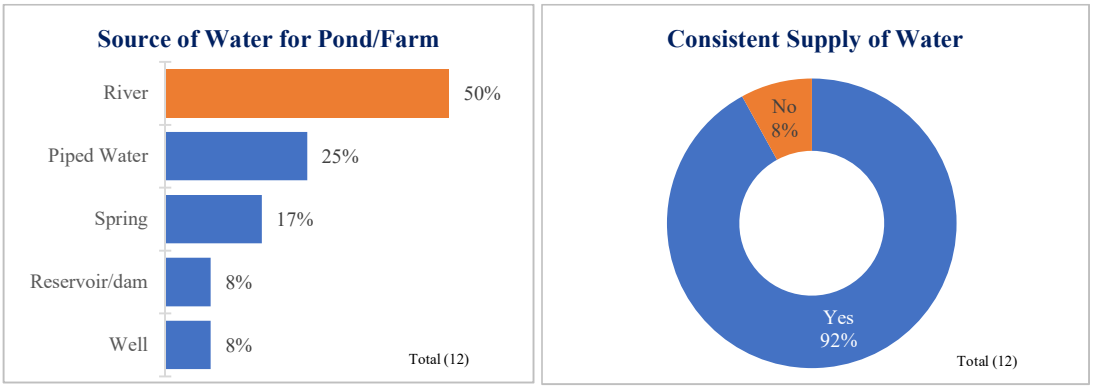
Figure 59: Fish farmers- Critical factors for success



Since availability of water was cited as one of the most critical factors needed for succeeding in fish farming, the study explored the access to water by participating farmers. It was noted that the farmers' source of water for fish farming largely came from

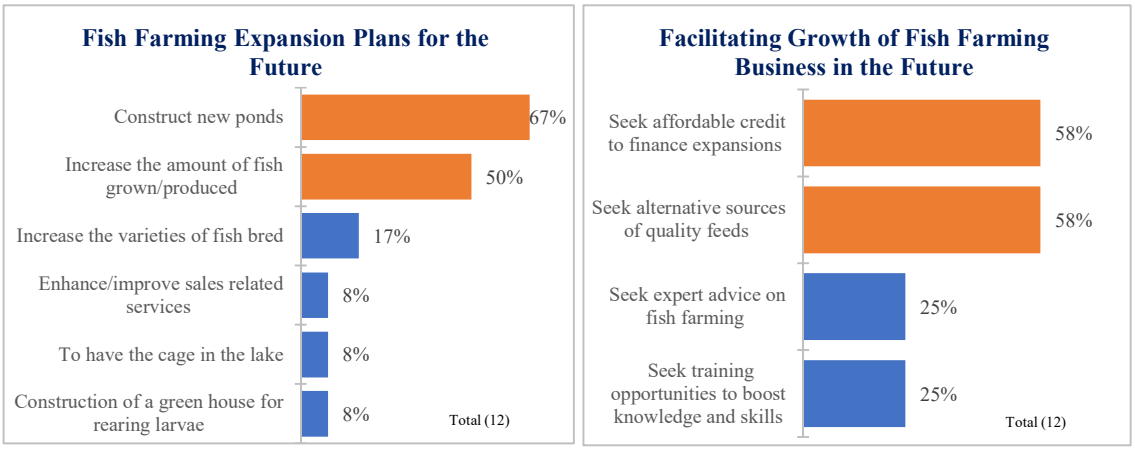
the rivers (50%), and that the supply of water was mainly consistent (92%). All farmers indicated that they had exclusive control of the water supply to their farmers. While this is done for environmental protection by the government, a collaborative approach could be negotiated through policy, to encourage fish farming.

Figure 60: Fish farmers- Source of water and consistency in supply



With regards to the future, a sizeable proportion of farmers indicated that they would construct new ponds (67%), increase their production capacity (50%), and increase the variety of fish reared. They planned to engage in these business expansions through largely seeking for affordable credit (58%) and seeking alternative sources of quality feeds (58%) among others as shown below.

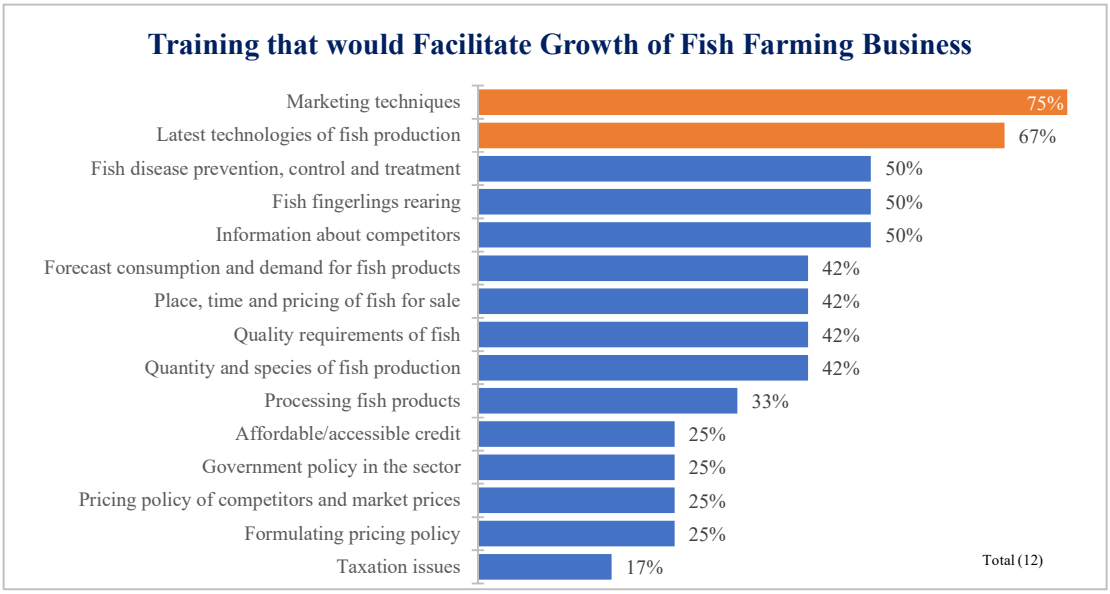
Figure 61: Fish farmers- Fish farming expansion plans



Training on marketing techniques to apply in the fish farming business was cited by a considerable proportion of farmers (75%) as being a key need in facilitating business growth. In the previous section, a sizeable proportion of the farmers (25%) had indicated

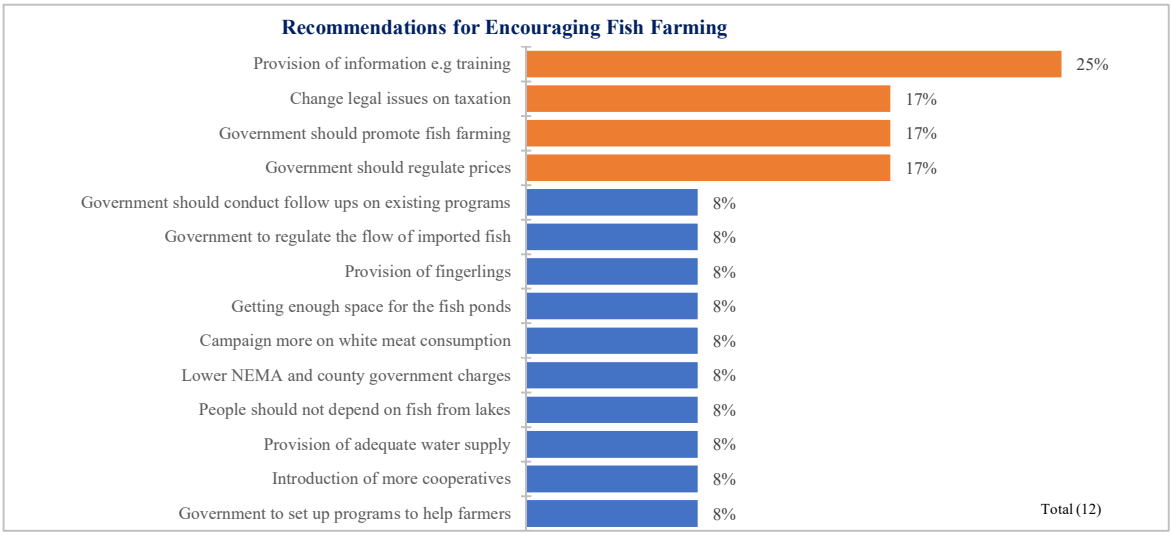
that they did not engage in any marketing activities to promote their business, and training on the latest technologies in fish production (67%) was noted as critical by the farmers among other training needs.

Figure 62: Fish farmers- Training to facilitate growth of farming business



To grow the fish farming industry in the country, farmers recommended that there is a need to ensure access to relevant information (25%), review of taxation issues (17%), promotion of fish farming by the government (17%) and regulation of fish prices by the government (17%) among others as shown below.

Figure 63: Fish farmers- Recommendations for encouraging fish farming



B. Fish Processing

As indicated in the study design section of this report, the fish processors category was the most difficult to achieve successful interviews because a number had closed and at the time of writing this report, only 3 fish processors had agreed to participate in the interviews for this study. Later, an additional interview was carried out with a former fish processor who now focuses on processing other meat types (beef, lamb, goat, mutton and poultry), but importing fish for trading. Presented in this section are insights that were gleaned from them.

Species Processed

Fish processors interviewed indicated that they processed different fish varieties which included Tilapia, Tuna, Nile Perch and Salmon fish varieties, and Salmon. These were mainly sourced from fishermen, fish importers and fish farmers. The former fish processor/current fish importer on the other hand, was currently importing Tilapia for trading, mainly from China and Vietnam.

Additionally, it was noted that all fish processed was mainly wild catch and was largely sourced from local sources, with some (Tuna and Salmon), being imported.

Further, it was noted that processors preferred to process these types of fish species due to different motivations, which included availability, affordability, ability to stay fresh for longer, better returns and because the source(s) was trusted. Further, the former fish processor/current fish importer indicated that they mainly preferred to import Tilapia for trading because it was readily available, came in processed form, and was affordable to purchase.

Additionally, it was observed that fish processors receive fish in its fresh form, chilled and/or frozen form for processing. Subsequently, the fish is processed into special cuts/fillet, minced, frozen, machine-dried or sun-dried and packed for selling. Further, the former fish processor/current fish importer mainly received the Tilapia fish for trading in the frozen form and largely re-packages it for sale (either whole or in filleted form).

Further, it was noted that fish processors (all) mainly use advanced machines in their processing business and desire to acquire dehydrating machines, largely for storage and transportation purposes. However, none of them had any plans of improving their equipment for the business, at least for the next few years.

Amount Processed and Sold

It was observed that processors produce an average of 500,000 kgs of Tilapia, 500,000kgs of Tuna, 350,000 kgs of Nile Perch and 20,000 kgs of Salmon fish per month as shown below.

Table 32: Processors- Amount of fish processed/produced per month

Amount of fish processed/produced (kgs) per month				
	Tilapia (2)	Tuna fish (2)	Nile Perch (2)	Salmon (1)
Average production (kgs)	500,000	500,000	350,000	20,000

Additionally, it was noted that the former fish processor was importing an average of 20,000kgs of Tilapia for trading locally. In comparison, the factory was currently processing an average of 50,000kgs of beef, 30,000kgs of poultry and 8,000kgs of lamb, goat and mutton respectively in a month, which implied that beef was more popular with meat consumers.

Table 33: Former fish processor- Average amount of meat procured in a month

Amount of meat procured (kgs) per month					
	Fish (Tilapia)	Beef	Poultry	Goat	Lamb
Average procured (kgs)	20,000	50,000	30,000	8,000	8,000

Further, fish processors indicated that the amount of fish they processed had largely increased in the last 2 years, mainly because of increased demand and supply. Similarly, the former fish processor/current fish importer indicated that the amount of fish imported for trading had largely increased in the last 2 years, mainly because of increased demand and supply from imported sources. The same trend was observed for other meat types the processor was handling.

It was however observed that the amount of fish sold by processors for the different varieties was slightly lower than the amount of fish produced. As shown below, processors sell 200,000 kgs of processed Tilapia, 300,000 kgs of processed Nile Perch, 250,000kgs of processed Tuna and 20,000 kgs of processed Salmon in a month. This could be because of losses incurred during different stages of processing, or storage of fish produced for longer periods of time.

Figure 64: Processors- Amount of fish sold in a month (kgs)

Amount of fish sold (kgs)				
	Tilapia (2)	Nile Perch (2)	Tuna (2)	Salmon (1)
Average amount of fish sold (kgs)	200,000	350,000	250,000	20,000

The former fish processor/current fish importer on the other hand indicated that all the imported fish, and processed meat types is sold in a month as shown below.

Table 34: Former fish processor- Average amount of meat sold in a month (kgs)

Amount of meat processed/procured (kgs) per month					
	Fish (Tilapia)	Beef	Poultry	Goat	Lamb
Average procured/produced (kgs)	20,000	50,000	30,000	8,000	8,000

Further, processors indicated that they sold their products daily (in smaller proportions) but that the Salmon species was sold once every month. The former fish processor/current fish importer on the other hand indicated that the factory sold the imported Tilapia largely on a daily basis.

It was further noted that fish processors sold their processed products to fish retail traders, supermarkets, institutions, wholesalers as well as exports to other markets.

The former fish processor/current fish importer on the other hand indicated that they mainly sold the imported fish in its whole form (with no value-addition) to the *'Mama Market'*, which mainly comprised of local fish fryers/traders who sold it to individual customers in the estates. The value-added versions of the fish (fish fingers, fish burgers etc.) on the other hand were mainly sold to supermarket chains, institutions such as hotels, restaurants and catering institutions among others.

Sales and Marketing

It was noted that processors largely relied on giving discounts, moderating the pricing of products and using word of mouth to make their products attractive in the market. The former fish processor/current fish importer on the other hand largely relied on products promotions and sponsorship of selected events to gain visibility.

Further, processors largely delivered products to some of their buyers while other buyers picked their fish at the factories. It was noted that an average of 60% of products sold were delivered to buyers while an average of 40% was picked by buyers at the processors' premises.

Table 35: Processors- Proportion of products delivered/picked by customers

Proportion of products purchased/picked at premises. Total (3)		
	Proportion delivered to buyers	Proportion buyers pick at premises
Average proportion of products delivered/picked at the premises	60%	40%

Additionally, processors delivered products to customers using their own transport, specialized trucks and by air, mainly to get more customers, to minimize spoilage and because the destinations were far away. All processors indicated that they planned to continue delivering product using the same means in the next 2 years because of the efficiencies experienced.

Further, processors were mainly freezing and salting products to preserve them during transportation. Customers however preferred products to also be smoked and chilled in addition to freezing and salting.

Processors perceived that they largely had 5 to 10 competitors in the market. One of the processor, however, could not tell the number of competitors they had in the market. None of the processors could also approximate the sales volumes of their competition. The former fish processor/current fish importer on the other hand indicated that the firm had 2 main competitors, especially in the line of processing of other meat types.

It was also observed that there were areas that processors were collaborating on in the market, largely in pricing of products and ensuring employees working in the sector were certified. Processors indicated that these collaborations ensured competition was level and high standards were maintained in the market. The former fish processor/current fish importer on the other hand indicated that meat processors did not have any areas they were collaborating on.

Further, all processors indicated that they maintained a database of suppliers, distributors and customers that was regularly updated. They acknowledged that this was important in the management of their businesses. The telephone was mainly used to communicate with these groups of stakeholders, in addition to physical meetings and communication on email/internet.

Fish Supply

The interviewed fish processors had an average of 9 suppliers of fish for their businesses. However, the number of suppliers ranged from 3 to 20 as shown below. It was observed that the former fish processor/current fish importer mainly worked with contracted ranches who grazed the animals for them for maintaining steady supply. This is an approach that can be encouraged in the fish industry to avoid overreliance on wild catch (all processed fish was indicated as being mainly wild catch) and encourage uptake of fish farming to meet the growing demand.

Table 36: Processors- Number of suppliers

Number of fish suppliers	
Average number of fish suppliers	9
Maximum of number of fish suppliers	20
Minimum of number of fish suppliers	3

The quality of the products being supplied was mentioned as being one of the main criteria that processors used to select their suppliers. Additionally, processors also looked at the side of the fish, the reliability, reputation, and ease of access of the supplier, hygiene standards practiced by the supplier and existence of quality of certification. The same criteria were mentioned by the former fish processor/current fish importer, who also indicated that pricing of products was a key determinant of suppliers the factory engaged with.

Fish processors indicated that supply of fish products was mainly highest in the month of June and lowest in the month of January. It was observed government bans on fishing was the main reason for the low fish supply (all processors indicated that they processed wild catches mainly from local sources as stated previously), showing a heavy reliance on wild catch and heralding an opportunity for farmed fish. Other reasons for low fish supplies included seasonal/climatic changes, refusal by fishermen to sell fish stocks, transportation issues, and high competition for supplies. On the other hand, it was noted from the former fish processor/current importer that supply of fish for trading was largely stable from international markets.

During such moments when fish supplies are low, processors indicated that they tend to lower utilization of their installed production capacity, perhaps explaining their

hesitation to improve the technology that they are using for production. Other coping mechanisms employed included importation of fish for processing, increase of prices for products sold and reduction of staff working in the factories. Interestingly, some processors indicated that they also offered better prices for the fish to cope with the dwindling supply, which would tend to entice suppliers to engage in illegal fishing to meet the demand.

Fish Handling by the Processors

Fish processors indicated that they largely determined the quality of fish for processing by looking at its freshness, colour, size and weight of the fish. The former fish processor/current fish importer indicated that they largely engaged certified fish suppliers from international sources which guaranteed the quality of fish supplied.

Further, it was noted that fish spoilage was experienced by most fish processors, mainly during transportation into the factory (about 1% of the fish supplied was rejected as bad quality), during processing, during storage, and when selling the processed products. It was noted that fish that gets spoilt during the various stages is mainly destroyed/buried or disposed together with other waste, sold to local traders for re-sale, sold as animal feed or the supplier is mandated to go back with it if spoilage is noted during the supply process. Additionally, it was noted that other waste from the production process, such as fish skeletons, scales, bones, fins and fish heads, is mainly sold off locally or disposed together with other waste.

Fish Storage Status

All participating processors reported that they had access to electricity and a back-up generator for use during power outages. Further, all processors owned freezers for fish storage and some also owned refrigerators, ice boxes and refrigerated showcases.

With regards to storage capacity, it was observed that processors were over-utilizing their storage space. As shown below, the maximum capacity of fish stocks stored in day was more than the optimal capacity in a day. All processors, however, indicated that they had plans of boosting their storage capacity in the future. This boost was projected to increase their sales by 50%.

Table 37: Processors- Storage capacity

Storage capacity		
	Maximum Capacity	Optimal Capacity
Average storage capacity (kgs)	166,900	104,167

Lack of capital and lack of space to house expansions were reported as the main limiting factors towards making investments to boost storage capacity. Other challenges cited included lack of space to house the expansions and inadequate infrastructure. To overcome these challenges, processors indicated that they would look for accessible credit to finance their investment plans, extend their working spaces as well as focus on building modern facilities.

Challenges and Bottlenecks that Fish Processors Face

For fish processors, the most pressing challenges faced in the industry included high prices of fish supplies, stiff competition, seasonal/climatic changes, lack of specialized transportation options, high business taxes, high cost of business, lack of capital to invest and high interest rates on credit options among others. The most pressing challenges were cited as being stiff competition and seasonal/climatic changes. The former fish processor/current fish importer, on the other hand, indicated that the main challenge the factory faced that discouraged them from continuing to focus on fish processing was the unavailability of fish stocks for processing, and the high local prices for the products (local pricing of the products was indicated to be twice that offered by international sources).

Fish processors indicated that they were currently dealing with the challenges by reducing prices (to overcome competition), reducing workforce (during climatic changes when business was low), and improving fish handling to improve the product offering. Improving customer service was another way processors felt they could overcome the challenges faced. They however felt that nothing else could be done to overcome climatic changes affecting their businesses. The former fish processor/current fish importer, on the other hand, overcame the challenge of low supply and high prices by focusing on fish imports that came in already processed.

Further, processors felt that the presence of imported fish in the market mainly reduced the demand for local fish and compromised the quality in the market. One of the

processors, however, felt that there was no effect, most likely because imported fish was part of their stock and business was therefore not affected (some of the fish for processing were obtained from imported sources as indicated previously). Subsequently, processors largely felt that there was no need for regulating importation of fish, mainly because it would interfere with business. The former fish processor/current fish importer, on the other hand, felt that fish imports helped to meet fish demand in the country and the running of a sustainable business.

The recent ban of plastics in the country was also reported as having an impact on the fish processors' businesses. It had largely increased the price for buying packing bags for customers and as a result, some products are no longer packed. To overcome this challenge, processors have resorted to selling alternative bags to customers while others have not taken any action.

Available Opportunities for Fish Processing

Fish processors felt that demand for fish had largely increased in the last 2 years because of an increase in demand and affordability of products. The former fish processor/current fish importer held the same view. Processors were also optimistic that the demand for fish would increase in the next 2 years mainly because of the increased number of customers. The former fish processor/current fish importer agreed with this view and added that the products from imported sources were also readily available at affordable prices to meet the demand. To grow the local industry, the fish importer recommended that efforts should be made to substitute the imported fish with locally farmed fish. The fish importer held the view that locally farmed fish would suffice to meet the demand since, from the importer's experience, the local consumers are not very particular about the source of fish, all they care about is quality, affordability and availability.

To support growth of their business growth, processors had largely invested in training/innovations in fish production, hygiene standards and quality control. Processors desired to learn more about the latest technologies in fish processing, accessing affordable credit to support their businesses, sourcing for fish supplies and maintaining quality controls in the businesses. These would therefore be areas of support

for this group. Processors indicated that these initiatives would largely boost their customer bases, expand their businesses, improve efficiencies and increase production capacities.

In the next 2 years, processors planned to increase their storage and production capacities as well as invest in more processing equipment. The former fish processors/current fish importer on the other hand indicated that the factory would be willing to support initiatives to grow the aquaculture industry in the country to grow efforts of substituting imported fish with local varieties.

C. Fish Storage and Transportation

This sub-section looks at the fish storage and transportation operations, challenges and recommendations made by the players. A total of 5 storage and transportation companies were interviewed through a qualitative approach; presented below are insights gleaned from them.

Business Operations

It was observed that the storage and transportation companies mainly handled wild catch fish varieties, and this was largely driven by demand/customer preferences. Wild catch varieties were indicated as being tastier than the others. A few however, indicated that they were also storing and transporting farmed varieties as well as Chinese imported varieties. Some of the commonly stored and transported varieties included Tilapia, Nile Perch, Mudfish, Lung fish and Catfish. Further, it was observed that the main customers served by storage and transportation companies included hotels and restaurants, butcheries, institutions- such as schools, and individual customers in the communities.

Additionally, it was observed that the demand for fish storage and transportation services had largely increased in the last 2 years, mainly because of the growing demand for fish in the market. Gatuguta Storage Company for instance indicated that they used to store 4 to 5 tonnes of fish in a month in the past but they were currently handling at least 8 tonnes in a month. Other more established entities indicated that they currently handled at least 3 tonnes in a week. It was further noted that storage companies were also offering

storage services to other players in the market at an average price of Ksh. 10 (equivalent to less than USD.1) per kg of fish.

Further, it was observed that the more established entities had access to cold rooms and trucks with appropriate storage facilities for preservation during transportation. The less established entities were, however, improvising coolers, freezers and other equipment meant for other uses (such as storage of sodas) for storing their products/preserving them during transportation. As a result, they were largely experiencing losses in their business with as high as 100kgs to 200kgs being lost in a week. To overcome these loses, some of the companies indicated they would strive to purchase products when they had a ready market, where stocks would be cleared off immediately, or they would look for alternative markets for the spoilt stocks. One transporter for instance indicated that there was a ready market for the spoilt fish, which was used by traders to make smoked fish known locally as *'obambo'*. Additionally, the spoilt fish would be bought by manufacturers of fish feeds for use.

Challenges Faced

It was observed that several challenges were faced by storage and transportation entities. Firstly, it was observed that the small-scale players had challenges accessing adequate storage for their products which was reliable. It was for instance noted that the most commonly used equipment were freezers, coolers and other containers not designed for the storage of fish. These were observed to have limited space and would also require purchase of ice blocks for instance, which were not only cumbersome to transport, but also added to the business costs. Additionally, some of the equipment was not owned by the companies and there was fear that the owners could collect them any time. Further, it was observed that storage space provided in central places was not adequate as it was firstly limited, and secondly posed security issues. The coolers were for instance commonly left unlocked and the theft of products was rampant. Additionally, it was observed that the reliance on electricity to run the storage equipment was not sustainable as there were numerous power outages which resulted in loses. The electricity bills were also cited as being high, and which increased the cost of running the businesses.

Secondly, it was observed that the mode of transport used by the small-scale players was not appropriate largely because they could not access appropriate means for use. The transportation managers indicated that they for instance sometimes used public means designed for transporting the people and there were therefore high chances that the products would be contaminated before reaching their destination (these were mostly carried in open containers or containers not covered appropriately). The fish would also cause discomfort for the public in the vehicles due to the smell. Additionally, in case of delays on the way, the ice blocks would not hold and the fish would get spoilt before reaching the intended destination. Chances of losing the luggage transported through public means was also high and it attracted penalties from the government authorities. The cost of hiring lorries or other means was cited as being too high, while other alternatives means such as bicycles could not cover long distances. Carpooling, which was explored as an alternative by some of the players, would sometimes work but would result in disagreements especially when the tonnage being transported for all contributing members was not perceived to be equal. Further, it was observed that storage and transportation companies were sometimes not in control of the quality of the products they were handling as they were received when already packed. When these were then sold to customers, and the quality was found to be compromised, the losses would be borne by the storage or transportation company.

Thirdly, it was observed that the processes required to operate a storage or transportation company were lengthy and costly. It was noted for instance noted that in addition to applying for certifications required to transport fish, transporters were still required to pay a standard fee every time they were transporting the products, and the amount depended on the tonnage being transported. Additionally, it was noted that there was a gap between government expectations from the players during transportation, and what the players understood as being necessary for transportation. There were complaints for instance that players would still be required to part with bribes or face prosecution even after presenting the required certifications to the government authorities when products were in transit.

Fourthly, transporters operating with their own vehicles indicated that, the cost of fuel had increased over time and had added to the cost of running the business. Further, it was observed that parking space and costs were also an issue, in addition to police harassment and bribe requests on the roads.

Fifthly, it was noted that the bulk buyers sometimes harassed the small-scale players by booking and paying for the fish stocks in advance, which resulted in shortages of fish stocks for the small-scale players. They indicated that their attempts to apply the same mechanisms of booking stocks in advance would sometimes not work as the fishermen usually opted to deal with bulk buyers to guarantee their profits.

Lastly, the presence of the Chinese fish was cited as greatly affecting the pricing of products in the market, as the price of the Chinese fish was almost half of that of the local species. This was affecting the return on investment for the companies, as some were also involved in the purchase and sale of fish in addition to offering transportation and storage services. However, it was observed that some of the companies had taken up the storage and transportation of the Chinese imports as a way of coping with the developments in the market. The demand for these varieties was, however, indicated as being low as compared to the local varieties. Additionally, it was observed that the government bans from fishing wild catch was also affecting the businesses, especially those that were majorly dealing with wild fish varieties. The months of June, July, August cited as being periods when the shortage of fish is mostly felt.

All in all, storage and transportation companies were optimistic about the future and projected that the demand for their services in the next two years would largely increase. To prepare for the growth, most players indicated that they planned to invest in appropriate storage equipment (access to cold rooms) and specialised trucks to ensure they remained competitive in the market.

Available Opportunities

Storage and transportation companies made several recommendations for consideration in assisting them to function better. Firstly, they recommended that the costs and processes of acquiring the required licences and certifications be made affordable to

make the cost of running the business affordable, as well as attract more players in the sector. Additionally, storage companies recommended that there was the need to regulate the cost of hiring storage spaces across the industry to enable them to expand their business operations.

Secondly, storage businesses recommended that there was a need to increase the capacity of transportation vehicles to enable them to get the required stocks in good time. It was noted that the supplies provided at a time were limited and did not often meet the demand.

Thirdly, the small-scale companies recommended for the establishment of modern storage areas that had adequate spacing that can be accessible at an affordable fee. Additionally, it was observed that the reliance on electricity for the storage equipment was costly and a recommendation for equipment that could use alternative sources of energy was made. This, they observed, would help in reducing the losses experienced from lack of reliable storage equipment.

Fourthly, storage and transportation companies recommended for coordinated efforts to help them know where the demand was and how to access the markets. Further, they recommended for support to help them access the required tools of trade, such as adequate storage rooms, specialized trucks for transportation, and packaging facilities to enable them sell competitive products. The Chinese fish was for instance cited to have very attractive packaging which would eventually draw in buyers when alternatives were unavailable.

Fifthly, players noted that there was the need for the government to educate them on the required fees, rules and regulations that they were required to comply with. This, they noted, would reduce chances of exploitation when running their businesses by unscrupulous officials.

Sixthly, storage and transportation companies recommended for workshops/educational forums that would help them stay abreast of the industry developments as well as share knowledge and learnings for best practice.

Seventhly, players requested for linkages to institutions that could offer them affordable credit to expand their business operations. Though there were numerous available opportunities to access credit, it was noted that the interest rates and other terms of payment were unfavourable and this especially discouraged the small-scale players.

Lastly, the small-scale players called for regulation of access to fish supplies, especially from the natural water sources, to enable them to have equal chances of accessing products to sustain their businesses.

D. Fish Retail Market

In this sub-section, we look at the retail for fish but with a focus on the retailers as compared to the other players in the value chain.

Main Purchase Point for the Consumers

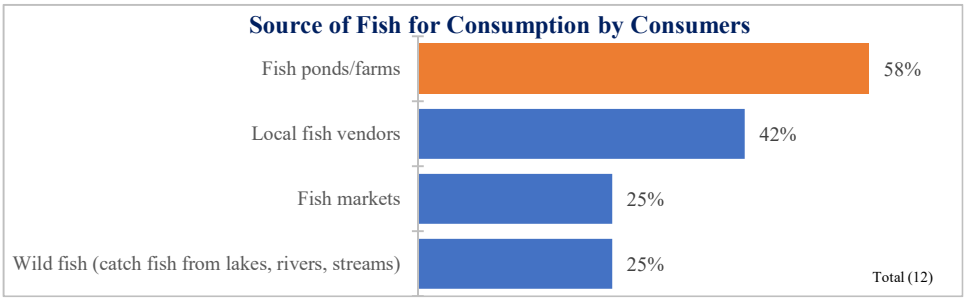
Around 52% of consumers purchase deep fried fish (consumed by the largest proportion of fish consumers) from street vendors, while 28% buy from the markets. Less than 10% of consumers as can be shown in the table below purchase the fish for household consumption from specialised fish shops.

Table 38: Point of purchase of various fish forms by the consumers

Where/source of fish purchased and consumed at the household								
	Deep Fried Fish (524)	Fresh Fish (185)	Frozen or fresh fish fillets (67)	Dried/smoked fish [excluding *Dagaa/Mukene/ Omena]* (104)	*Dagaa/Mukene/ Omena* (403)	Tinned/ canned fish (19)	Prawns/ other sea food (13)	Other Fish (18)
From a street vendor/local fish fryer	52%	27%	33%	47%	43%	5%	15%	33%
From the market (general)	28%	35%	15%	49%	44%	26%	8%	44%
From the supermarket	1%	1%	9%	1%	1%	53%	15%	-
From the fish market [like City Market]	6%	4%	4%	2%	3%	5%	-	-
From a fish shop	6%	17%	28%	1%	5%	11%	23%	17%
From other fish vendor	6%	12%	6%	-	4%	-	38%	6%
From a fish farm/pond	1%	4%	4%	-	-	-	-	-

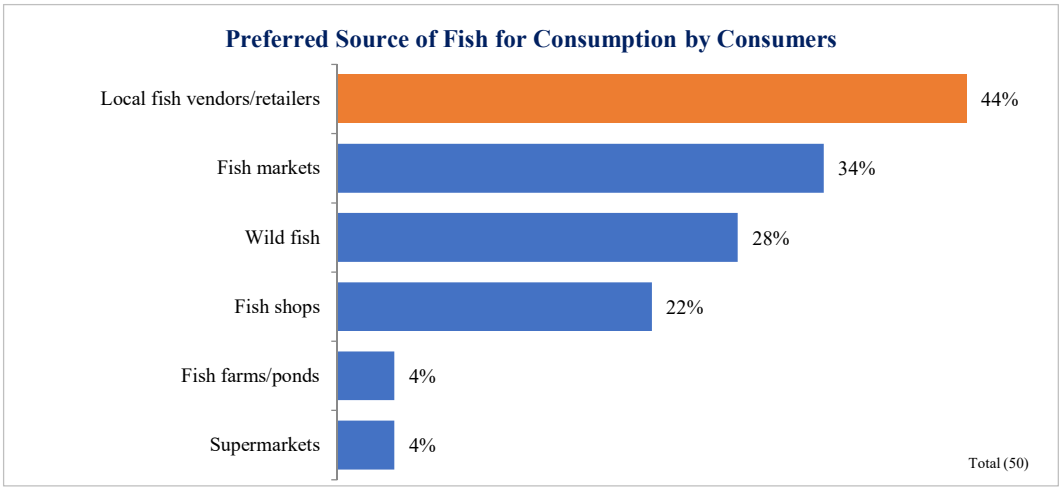
On the other hand, fish farmers noted that fish consumers around them largely purchased fish for consumption from their fish farmers (58%) and from local fish vendors (42%) and from the markets (25%) as shown below.

Figure 65: Fish farmers- Source of fish by consumers



However, probably due to their positioning, fish retailers perceived that consumers largely preferred purchasing fish for consumption from fish vendors/retailers (44%) among other sources as shown below.

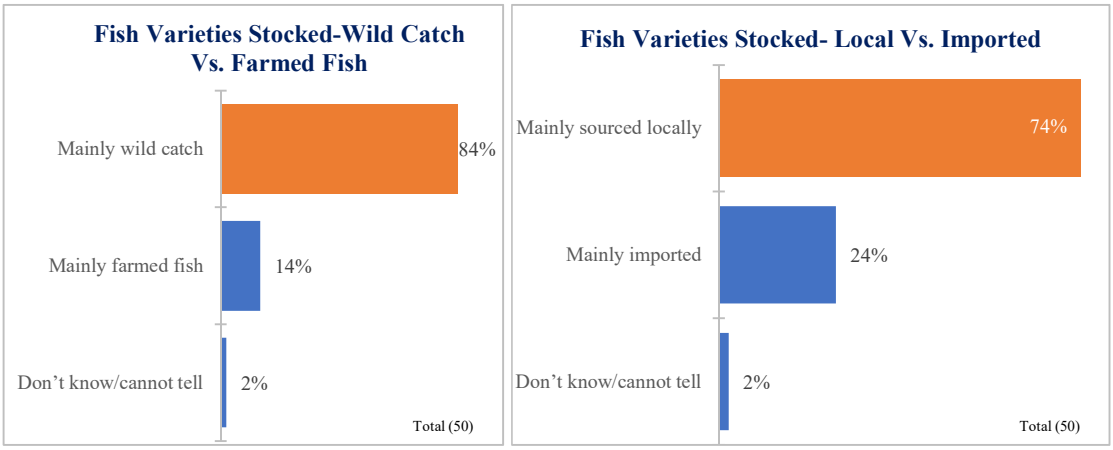
Figure 66: Fish retailers- Preferred source of fish by consumers



Type of Fish Stocked by the Retailers

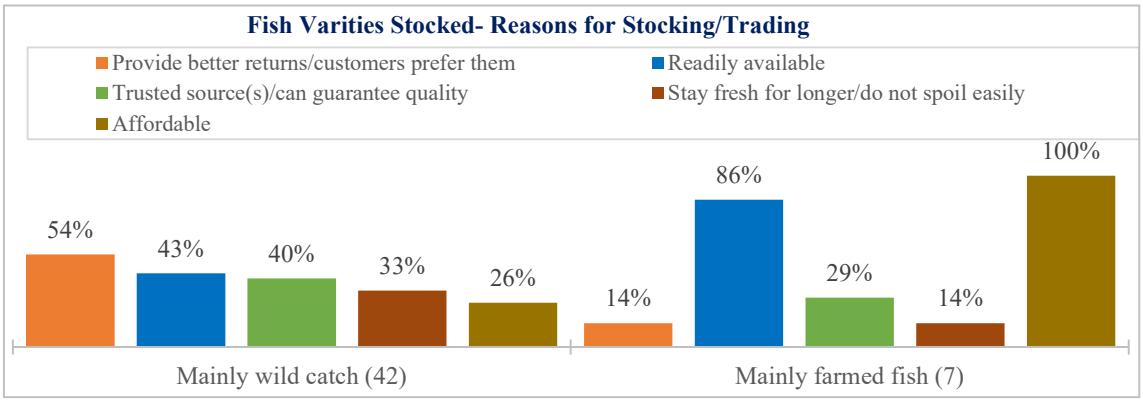
Fish retailers indicated that they mainly stocked wild catch fish at their businesses (84%) and that these were largely locally sourced (74%). Interestingly, 2% of the retailers could not identify the fish varieties they stocked as wild catch fish or farmed fish, or whether these were local or imported varieties.

Figure 67: Fish retailers- Fish varieties stocked



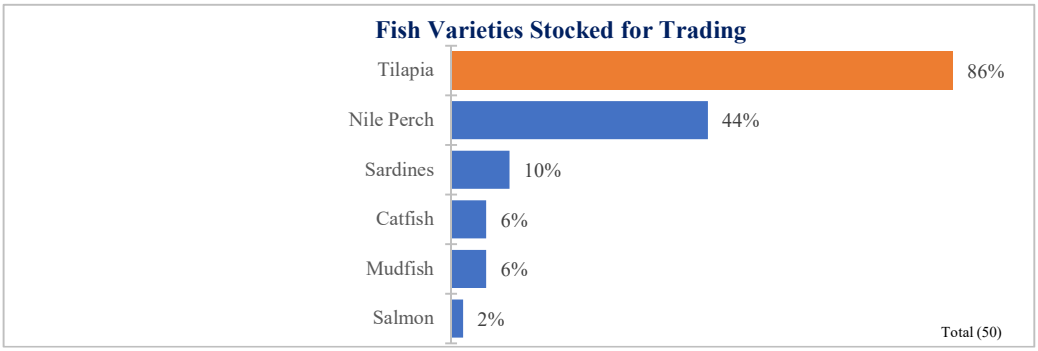
The fish retailers largely preferred stocking wild catch due to the better returns as customers tend to prefer them (54%) among other reasons as shown below. Those that preferred to mainly stock farmed fish did so largely because it was affordable and readily available as shown below.

Figure 68: Fish retailers- Reasons for stocking fish varieties and varieties stocked



The main fish type they stocked was the Tilapia fish variety (86%) as shown below.

Figure 69: Fish retailers- Varieties stocked for trading



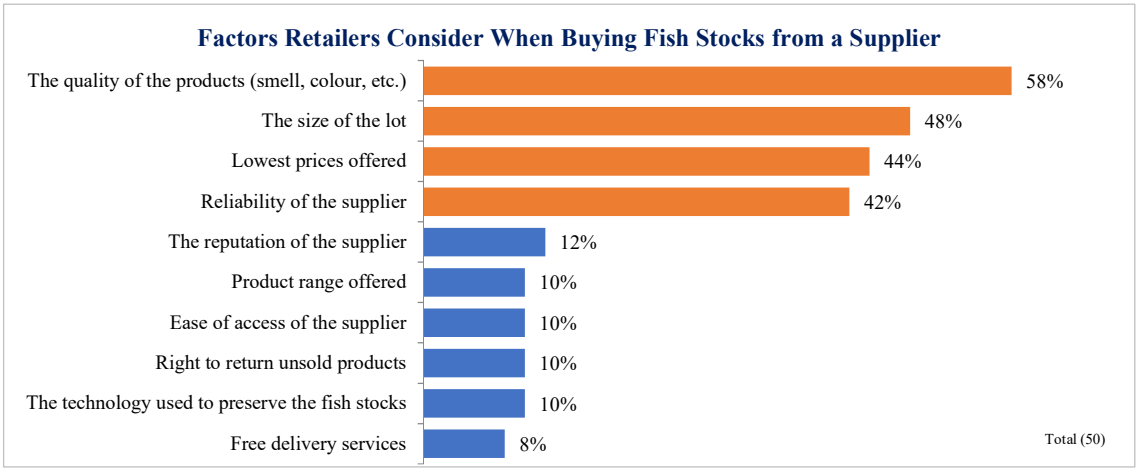
It was observed that fish retailers sourced their fish stocks from a variety of sources with some of the most common ones being from the lakes and their surrounding fish markets. The table below shows the sources for the various sources of fish varieties kept.

Table 39: Fish Retailers- Source of Fish for Trading

Source of fish for trading					
	Tilapia (43)	Nile Perch (21)	Catfish (3)	Salmon (1)	Mudfish (3)
Lake i.e. Lake Victoria, Lake Naivasha	60%	57%	67%	-	-
Fish market	21%	14%	33%	-	33%
From fish ponds/farms	5%	-		-	33%
From suppliers	9%	15%		-	-
Imported	7%	5%	-		-
From fishermen	-	5%	-		-
Indian Ocean	-	-	-	100%	33%

The retailers mentioned that when making purchase decisions, they largely look for quality of products (58%), size of the lot (48%), low prices (44%) and reliability of suppliers (42%) among other factors as shown below.

Figure 70: Fish retailers- What retailers look for when buying stocks from suppliers



Average Amount of Fish Stocked and Resold

On average, the retailers stocked an average of 720kgs of the Tilapia species and 1,360kgs of the Nile Perch species (species stocked by most retailers) for each batch/lot procured in a month.

Table 40:Estimated number of kgs of fish procured per batch/lot in a month

Number of kgs procured in a month per batch/lot					
	Tilapia (43)	Nile Perch (21)	Catfish (3)	Salmon (1)	Mudfish (3)
Average amount that retailers procure in a month for resale	720	1,360	2,503	1,000	1,233

On the other hand, it was noted that out of the batch/lot of fish procured in each month, retailers largely sold an average of 639kgs of Tilapia and 1,252kgs of Nile Perch (species commonly stocked) indicating some extent of losses.

Table 41: Retailers- Number of kgs sold per batch/lot

Number of kgs. sold from each batch/lot per month					
	Tilapia (43)	Nile Perch (21)	Catfish (3)	Salmon (1)	Mudfish (3)
average amount that retailers manage to sell in a month	639	1,252	2,335	1,000	1,187

The retailers noted that sales made from fresh/live fish, cooked/ready for consumption and dried fish forms were largely higher than other forms.

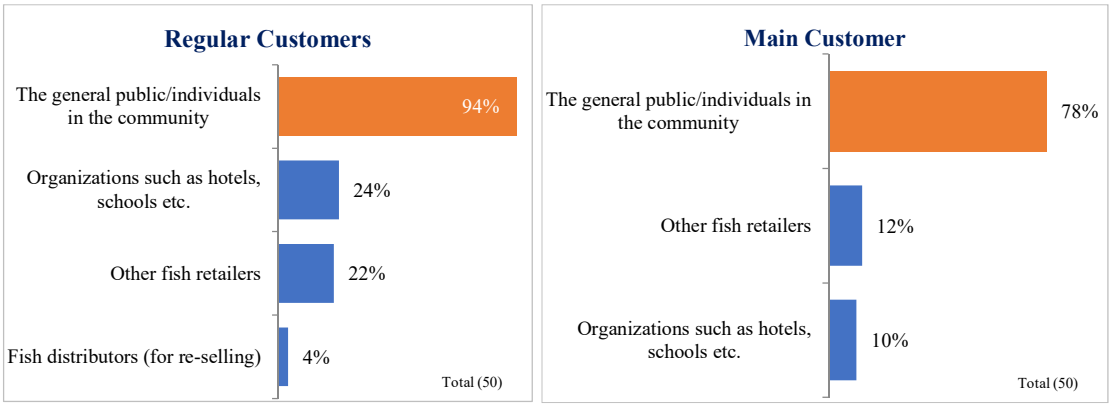
Table 42: Fish retailers- Proportions of sales from fish states

Proportions of fish states that make up sales		
	Live/fresh (29)	Cooked/ready for consumption (23)
Proportion of sales in this form	38%	63%

The Main Customers for the Retailers

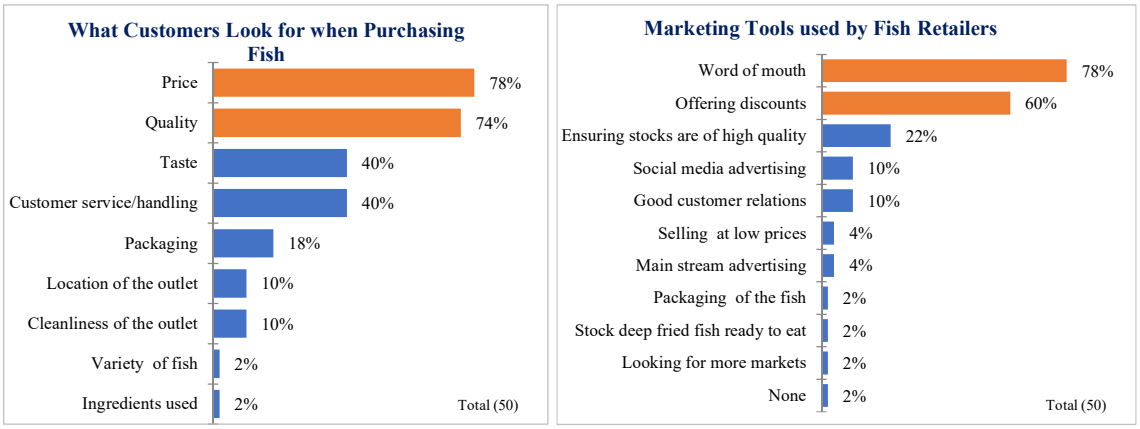
The fish retailers' customers were largely individuals in the communities (94%). These were also cited as the main customers (78%) as shown below.

Figure 71: Fish retailers- Regular and main customers



The retailers indicated that their customers largely looked at the pricing (78%) and quality of products (74%) when making purchase decisions. Due to the nature of the customers they have, retailers thus market their products largely through word of mouth (78%) and through market incentives such as offering of discounts (60%).

Figure 72: Fish retailers- What customers look for and marketing tools applied



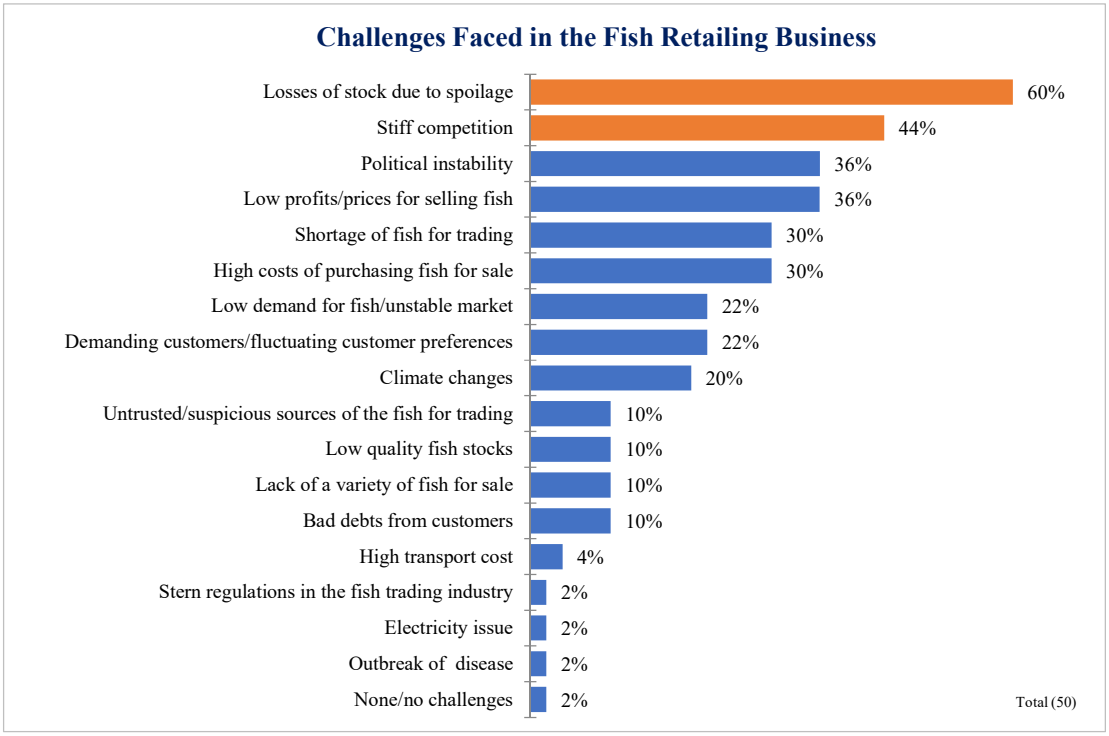
Challenges and Bottlenecks that Retailers Face

It was observed that fish retailers felt that the fish trading business had worsened in the past two years (60%). This perception was driven by reasons such as unprofitable business situations (53%) and a lack of ready markets (33%) among others as shown below.

Figure 73: Retailers- Fish trading business in the last 2 years

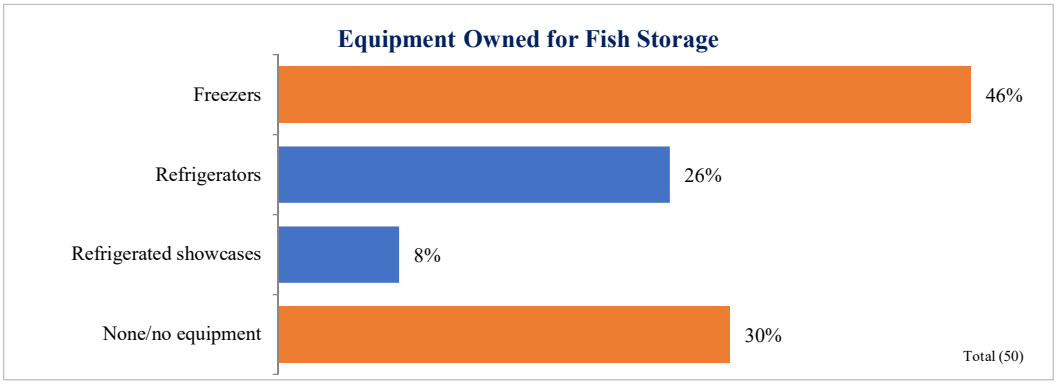
Further, retailers cited losses in the business due to spoilage (60%) and stiff competition (44%) as some of the main challenges they had experienced in their trade as shown below.

Figure 74:Retailers- Challenges faced



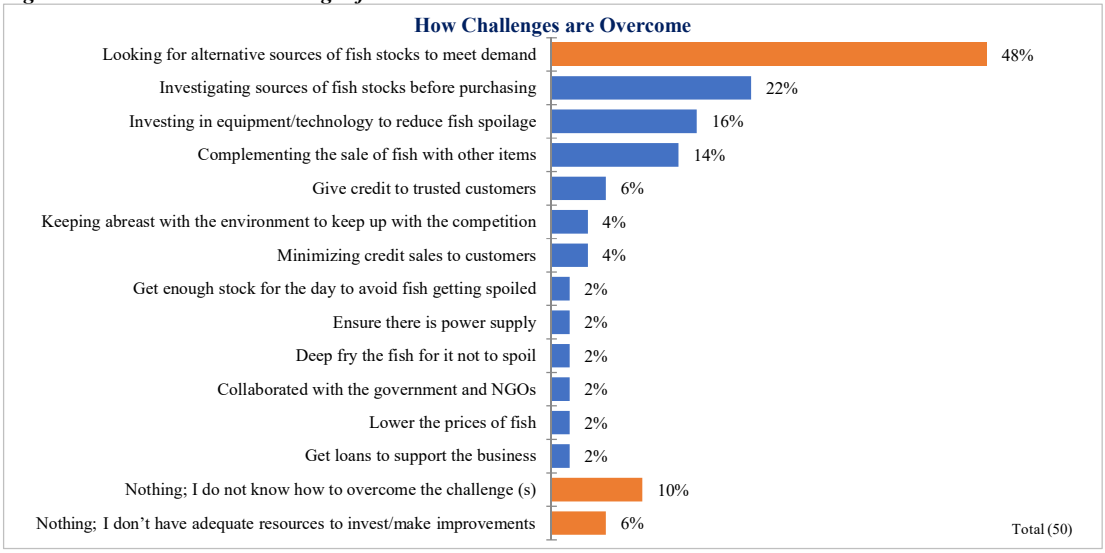
As spoilage was mentioned by the retailers, we sought to find out the proportion of these that had access to storage equipment. It was noted that approximately 46% had freezers, 26% had refrigerators, and 8% had showcases. On the other hand, 30% of the retailers had no storage equipment to preserve their fish as shown in the figure below. These would likely be the fish retailers in the estates who formed a larger proportion of retailers interviewed.

Figure 75: Type of Storage Equipment Owned by the Retailers



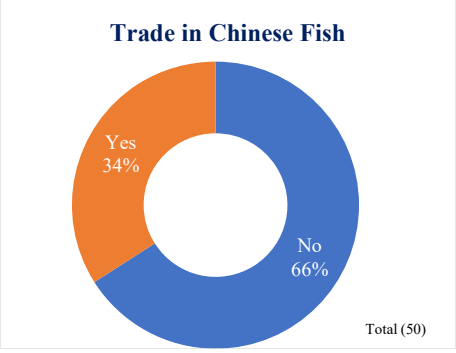
Most retailers have sought solutions to the challenges that they face in their operations. For instance, they have tried to find alternative sources of fish to meet the increasing demand (48%), while 22% have become more diligent in obtaining source information about the stock they purchase to avoid losses. However, a significant proportion of the retailers indicated that they either did not know how to overcome challenges faced (10%) or did not have adequate resources to address the challenges (6%) as shown below.

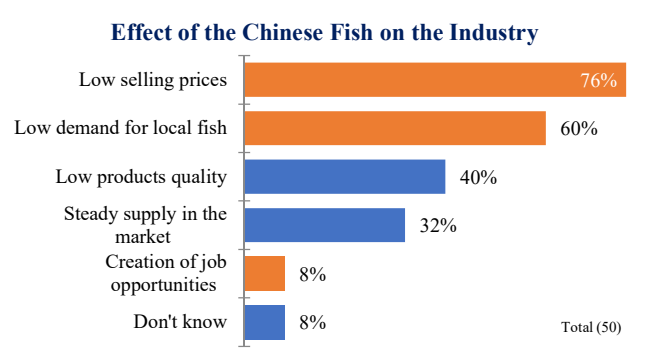
Figure 76: Retailers- How challenges faced are overcome



It was observed that a sizeable proportion of fish retailers (34%) were trading in Chinese fish; most likely as an alternative source to meet demand/overcome losses from spoilage. Most retailers however felt that the Chinese fish had had a negative impact on the industry, largely because it had lowered the prices of products (76%), which would explain the non-profitability of businesses cited above, as well the as low demand for local products, which the majority of the retailers (66%) were trading in. A small proportion of retailers (8%) however, felt that the Chinese fish had created additional job opportunities, which would explain the stiff competition experienced in the fish trading business.

Figure 77: Retailers- Trade in Chinese fish and impact on industry

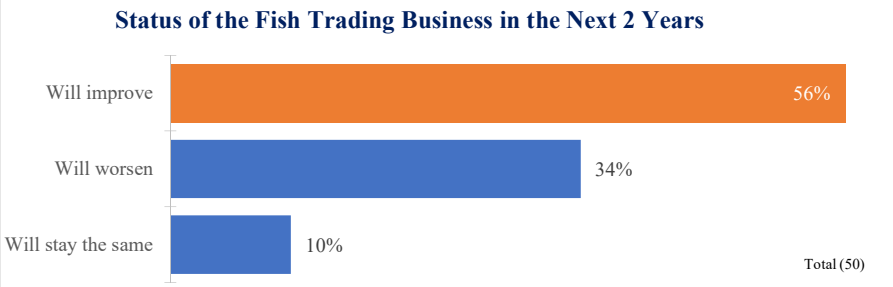




Available Opportunities for Fish Retailing

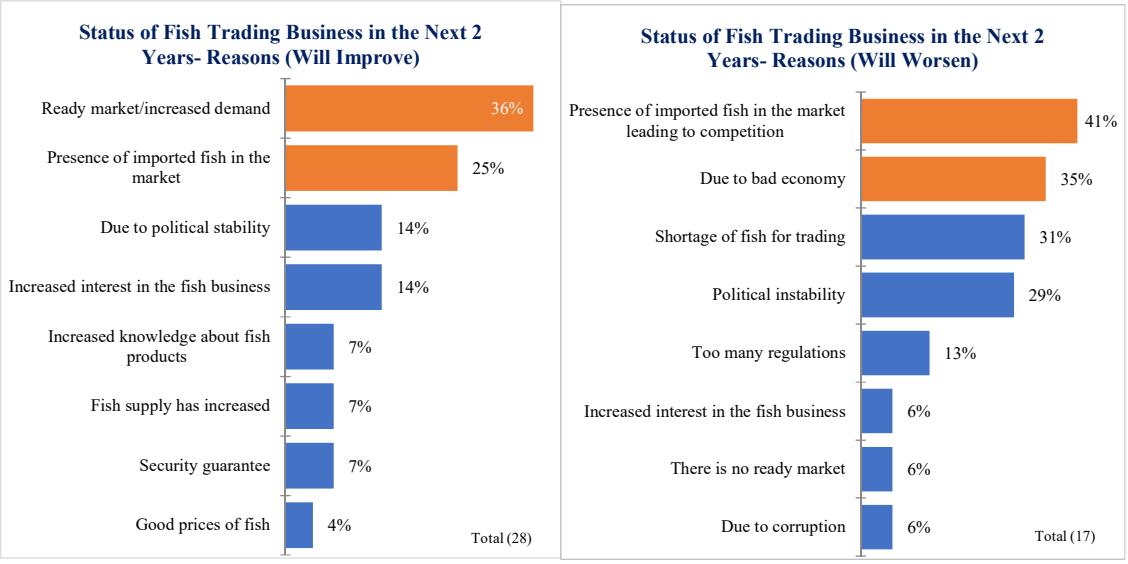
Despite the challenges, fish retailers were optimistic that the business environment will improve in the next 2 years (56%), however, a sizeable proportion (34%) felt that the business environment would worsen over that time.

Figure 78: Retailers- Business environment status- next 2 years



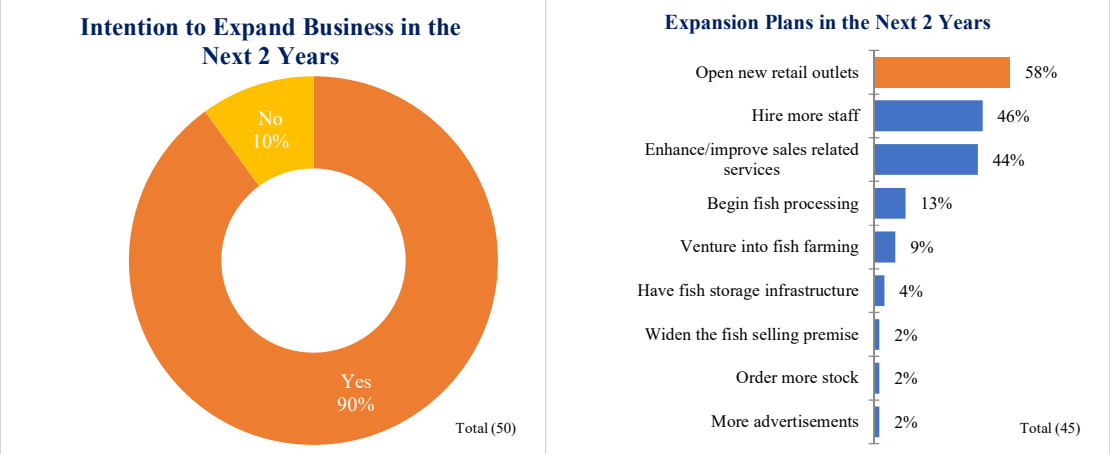
Retailers that were optimistic largely cited increased demand (36%) and presence of imported fish (25%) which would be useful in meeting the demand among other reasons as shown below. On the other hand, retailers that were pessimistic largely felt that the presence of imported fish in the market would bring about competition (41%) and that the economy was not conducive for business (35%) as shown below.

Figure 79: Retailers- Fish trading business in the next 2 years- Reasons



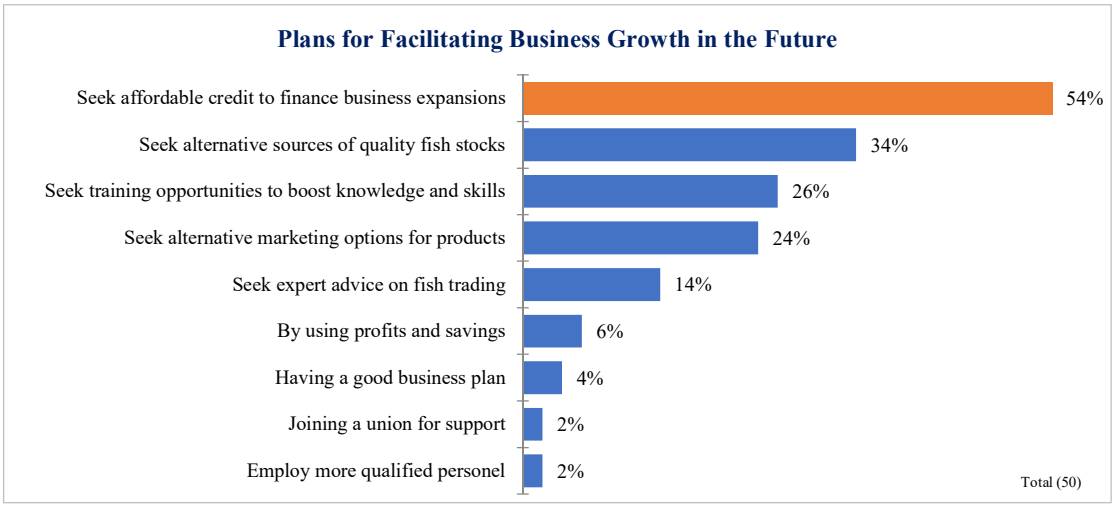
All in all, the fish retailing industry is bound to grow as most of the retailers (90%) intend to expand their business in the next 2 years. Expansion plans largely include opening of new retail outlets (58%) among other initiatives as shown below.

Figure 80: Retailers- Business expansion plans in the next 2 years



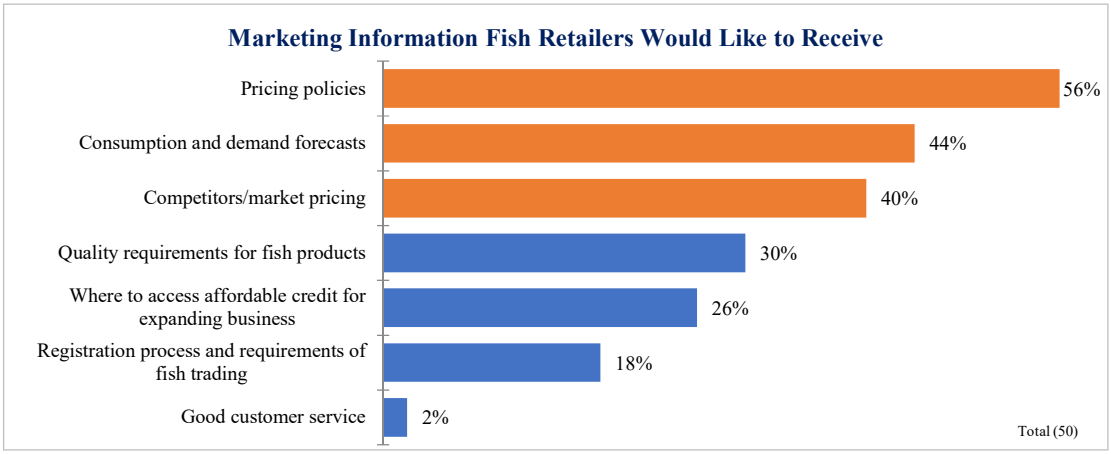
Making affordable credit accessible to retailers would be one way to support this part of the value chain in the fish industry. As shown below, retailers largely intend to seek affordable credit (54%) to finance their business expansion plans among other options.

Figure 81: Retailers- Plans to facilitate business growth in the future



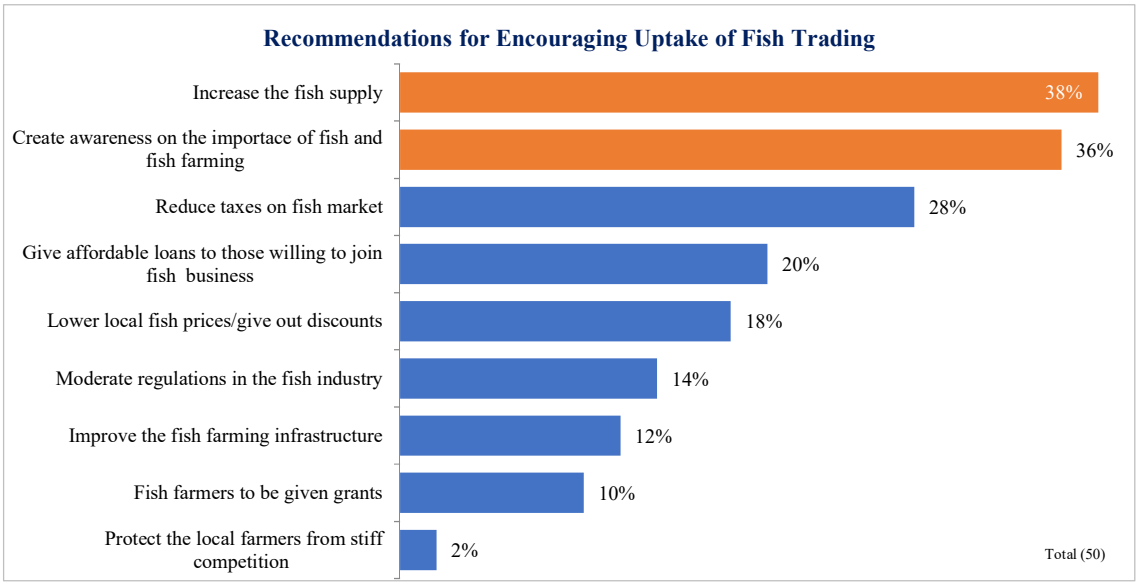
Further, retailers would be interested in receiving information on pricing policies (56%), consumption and demand forecasts (44%) and competitors/market pricing (40%) among other market information to support them in their trade.

Figure 82: Retailers- Market information fish retailers would be interested in



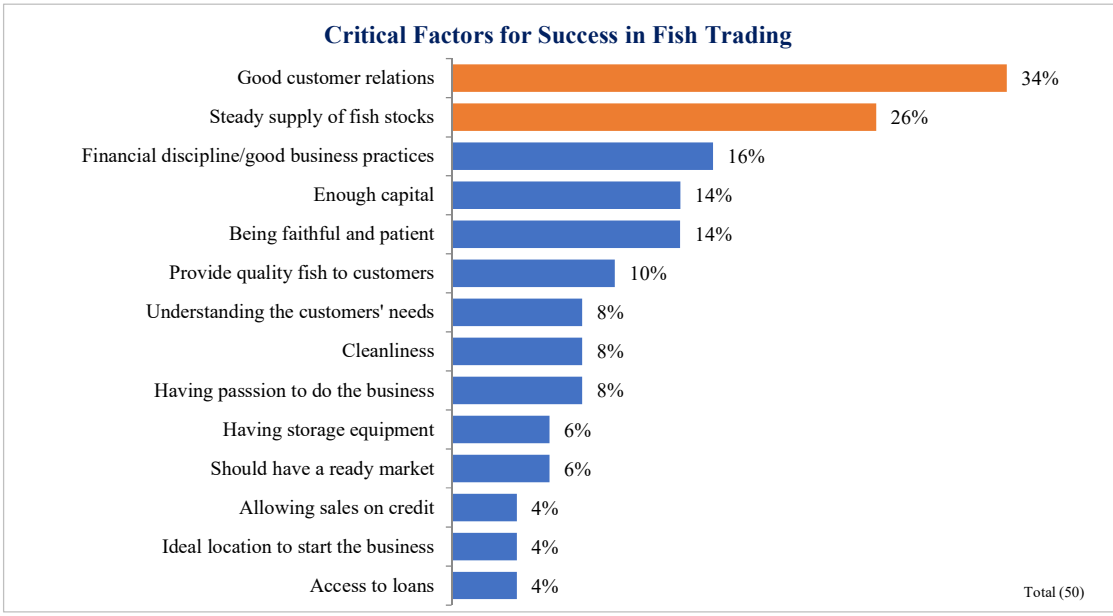
To grow the industry, retailers recommended that the steady supply of fish be looked into (38%) as well as creation of awareness on the importance of fish and fish farming (36%) among implementing other initiatives shown below.

Figure 83: Retailers- Encouraging the fish trading business



Lastly, those wishing to venture into fish retailing were advised to focus on good customer relations (34%) and ensure the steady supply of fish stocks in their outlets (26%) among others to guarantee success in the venture as shown below.

Figure 84: Retailers- Recommendations for succeeding in fish trading



3.1.4 Fish Price Analysis

This section presents insights on the prices of fish in the value chain as well as the mark-ups/profits made by various players in the value-chain.

Fish Prices from Farmer, Processor, Retailer to Consumer

Fish Farmers

The farmers indicated that they sold or would sell each kg of fish for an average price of between Ksh.100 to Ksh,300 (equivalent to about USD.1 to USD.3) as shown below.

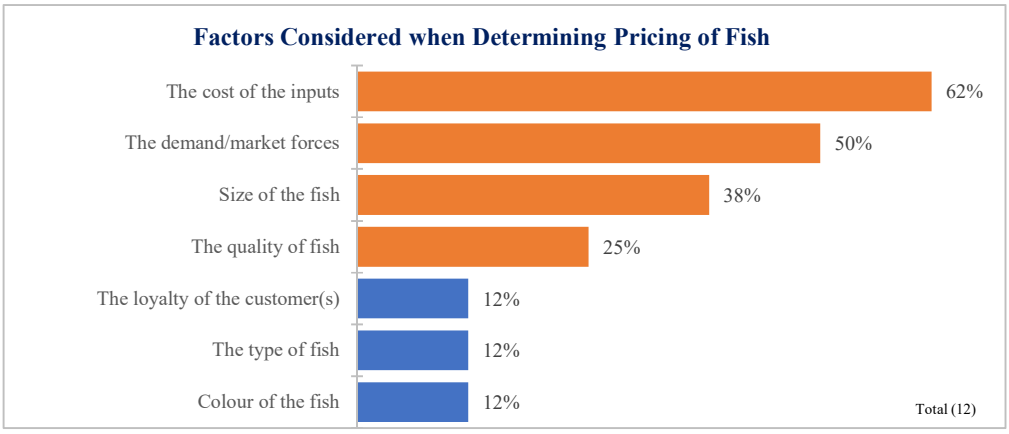
Table 43: Fish farmers- Average selling price per kg

Amount sold/will sell per kg (Ksh)					
	Tilapia (11)	Catfish (7)	Mudfish (3)	Koi Carp (1)	Gold Fish (1)
Average selling price per kg	264	300	275	100	100

It was further noted that fish was mainly sold in the live/fresh state by farmers, with significant proportions also selling it in the cooked/ready for consumption state (7 out of the 11 farmers keeping Tilapia) and frozen state (1 out of the 11 farmers stocking Tilapia).

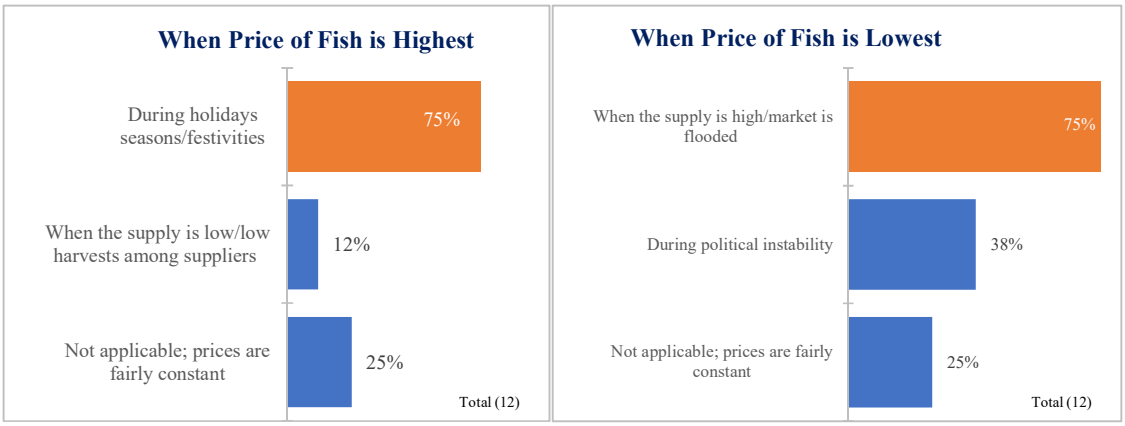
Regarding the pricing model and marketing rationale of fish by farmers, it was observed that farmers mainly considered the cost of inputs (62%), the demand/market forces (50%), the size of the fish (38%) and the quality of the fish (25%) when determining the pricing of fish.

Figure 85: Fish farmers- Factors considered when determining the pricing of fish



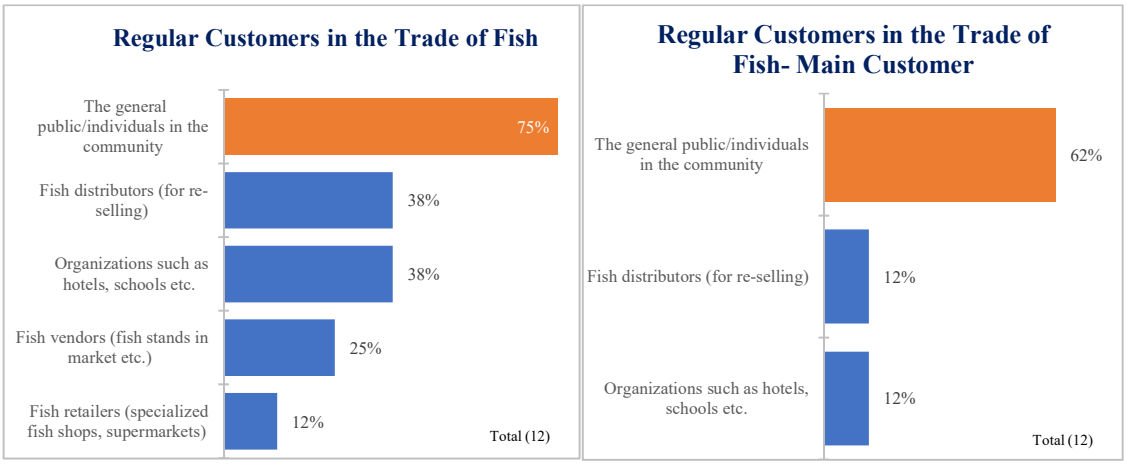
Additionally, prices of fish were observed to be mainly highest during the holiday seasons/festivities (75%) and mainly lowest when the market is flooded (75%) as shown below.

Figure 86: Fish farmers- Factors affecting pricing



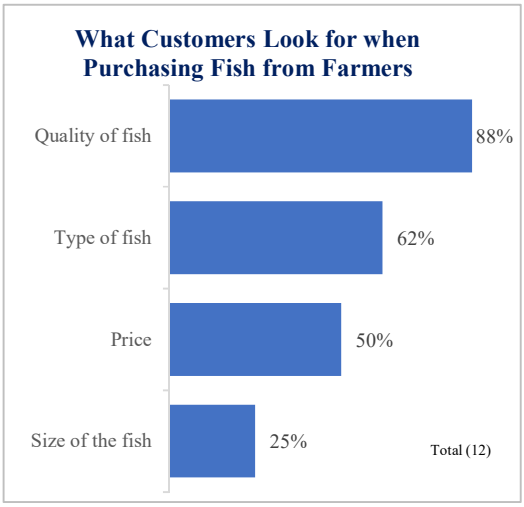
The regular customers for the farmers were observed to be largely individuals in the communities (75%) among other customers, and these were also reported as the main customers (62%) by most of the farmers.

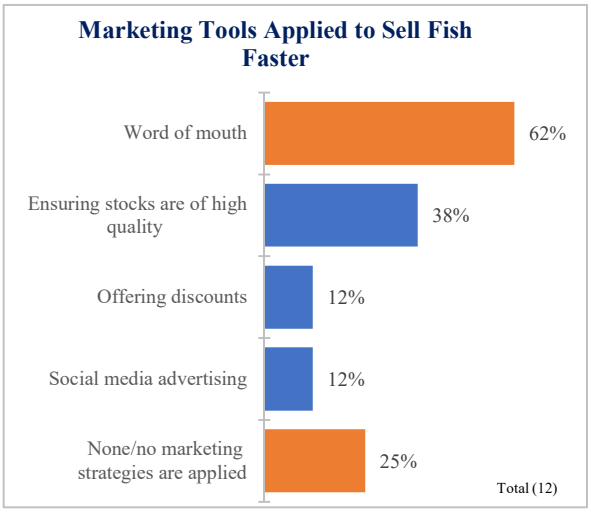
Figure 87: Fish farmers- Fish customers



Farmers also indicated that customers largely look out for the quality of fish (88%), the type of fish (62%), pricing (50%) and the size of fish (25%) when making purchases. When marketing their products, farmers cited word of mouth (62%) as one of the most commonly used method among others. A small proportion of farmers however indicated that they did not apply any marketing strategies.

Figure 88: Fish farmers- Customer preferences and marketing tools applied





Fish Processors

It was noted that when prices were highest, fish processors sold a kg of Tilapia at an average price of Ksh. 1,000 (equivalent to about USD.10) and a kg of Nile Perch at an average price of Ksh.788 (equivalent to about USD.8). A kg of Tuna on the other hand was sold at Ksh. 1,500 (equivalent to about USD.15). One processor who processed the Salmon fish variety, however, declined to provide this information. When prices of products were lowest on the other hand, it was noted that a kg of Tilapia and Tuna fish varieties was sold at the same pricing as shown below, but a kg of Nile Perch was sold at a slightly lower cost of Ksh.477 (equivalent to about USD.5). The same processor who processed the Salmon fish variety declined to provide this information.

Table 44: Fish processors- Average selling price of products per kg

Average selling price of fish products per kg (Ksh.)				
	Tilapia (2)	Nile Perch (2)	Tuna (2)	Salmon (1)
Average price when price is highest	1,000	788	1,500	-
Average price when price is lowest	1,000	477	1,500	-

Additionally, the former fish processor (interviewed at a later stage) who now focused on fish importation for trading, indicated that the factory sold a kg of Tilapia (fish species imported for trading) at an average price of Ksh.600 (equivalent to about USD.6) to their main customers (comprising of institutions and supermarket chains for distribution). The factory also sold a kg of whole Tilapia at an average price of Ksh.300 (equivalent to about USD.3) to the '*Mama Market'* (comprising of local fish retailers/fryers) for re-sale

in the estates. In comparison with other types of meats processed, the former fish processor indicated that the factory sold a kg of beef at Ksh.600 (equivalent to about USD.6), while a kg of poultry, goat or lamb was slightly more expensive, selling at Ksh.700 (equivalent to about USD.7).

Fish Retailers

For fish retailers on the other hand, it was observed that this group largely procured different fish varieties for sale at an average price of between Ksh.300 to Ksh.400 (equivalent to about USD. 3 to USD.4) per kg as shown below.

Table 45: Retailers- Cost of procuring fish per kg

Cost of procuring fish per kg					
Ksh.	Tilapia (43)	Nile Perch (21)	Catfish (3)	Salmon (1)	Mudfish (3)
Average price per kg.	378	361	383	300	417

Retailers on the other hand, re-sold the procured fish stocks for an average of between Ksh.277 to Ksh.500 (equivalent to about USD.3 to USD.5) per kg for the different fish varieties as shown below.

Table 46: Retailers- Selling price fish per kg (Ksh.)

Amount sold per kg of fish (Ksh.)					
	Tilapia (43)	Nile Perch (21)	Catfish (3)	Salmon (1)	Mudfish (3)
Average selling price per kg	391	441	517	360	500

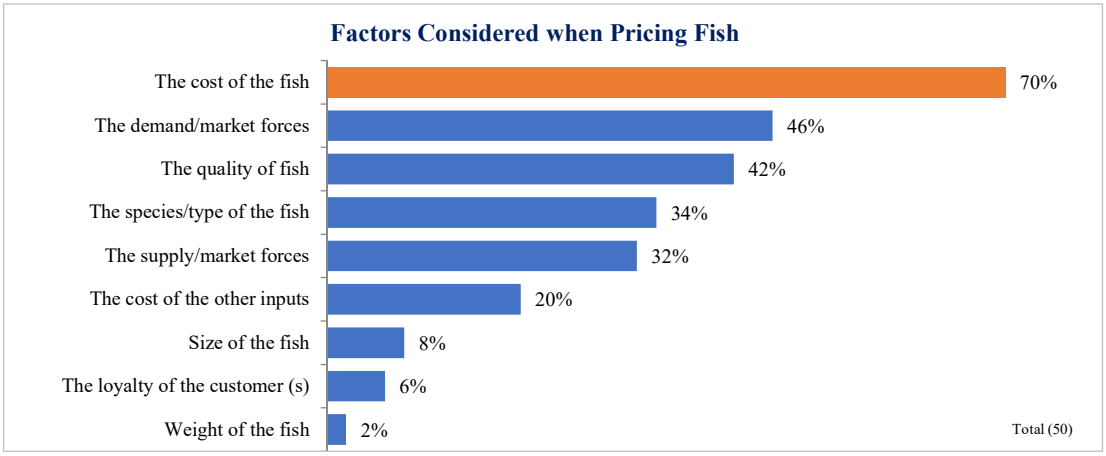
It was observed that fish retailers spent an average of Ksh. 15,375 (equivalent to about USD. 152) per month to run their retail businesses, with the minimum cost for less established retailers spending as a minimum of Ksh.100 (equivalent to about USD.1) and the more established retailers spending a maximum of Ksh. 95,000 (equivalent to about USD.941). The factors driving the cost of running the business included rent, electricity, hired labour and marketing costs.

Table 47: Fish retailers- Total cost of running the business per month

Total cost of running the business in a month (Ksh.).	
Total (50)	
Average cost of running a fish retail business	15,375
Maximum cost	95,000
Minimum cost	100

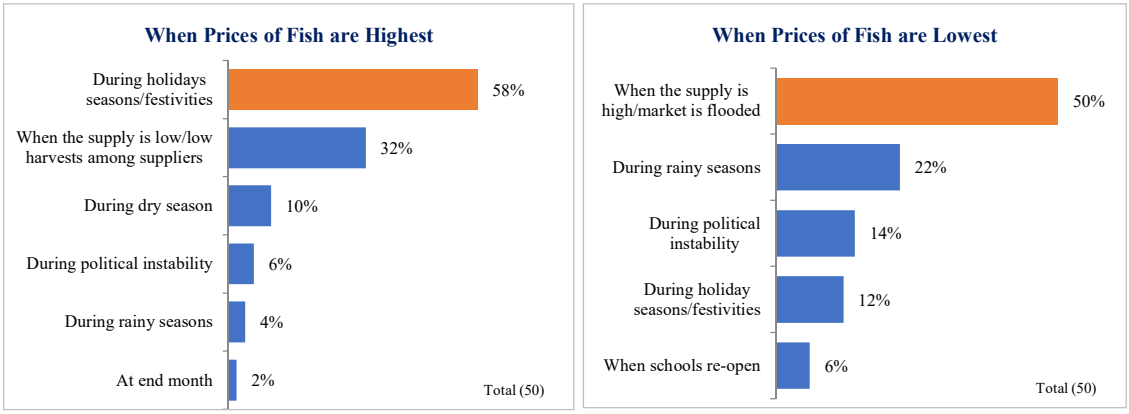
In terms of determining the sales price for fish, the retailers indicated that they largely considered the cost of the fish (70%) among other factors as shown below.

Figure 89: Fish Retailers- Factors considered when pricing fish



Fluctuations are often observed in the market in terms of the supply for fish and the retailers indicated that the prices of selling the fish were largely highest during holiday seasons/festivities (58%) and lowest when the market was flooded (50%) among other periods as shown below.

Figure 90: Fish Retailers- Periods when fish prices are highest/lowest



From a consumer perspective, and as discussed previously, households consume an average of 3.8kgs of fish in a month. Consumers, however, tend to purchase more than one variety or form of fish as mentioned previously, with more consumers purchasing deep-fried fish and *Dagaa/Mukene/Omena*. The aggregated amount of fish and fish products purchased/consumed at the households in a month tends to be higher therefore.

As shown in the table below, deep-fried fish, purchased/consumed by most fish consumers as noted in the previous sections (70% fish consumers), costs an average of

Ksh. 307 (equivalent to about USD.3) per kg, while *Dagaa/Mukene/Omena,* also purchased/consumed by a significant proportion of fish consumers (54% of the fish consumers) is observed to cost the least; at Ksh.156 (equivalent to about USD.2) per kg. The tinned/canned fish form is observed to the most expensive, at Ksh.504 (equivalent to about USD.5), though, as observed in the previous sections, this is consumed by a significantly low number of fish consumers (3% of fish consumers).

Noting that the average price of fish from the retailers is slightly higher than the average prices reported by consumers (at Ksh.300 or more- or equivalent to about USD.3 or more- per kg for different fish varieties stocked by retailers), the price difference could be attributed to several factors: firstly, fish retailers were only interviewed in the urban setting where prices tend to be higher. The consumers on the other hand were interviewed at a national level (urban and rural settings) and prices of products in the rural settings tend to be lower, and this influences the average pricing of products reported by consumers. Secondly, pricing would also be affected by regional variations as well as an influx of fish from other sources such as that obtained from the imports. Some consistency is however observed, where, for instance rural households mentioned that they purchase fresh fish at Ksh. 288 (equivalent to about USD.3) per kg, and earlier, the average price of fresh fish at the farms was noted as being Ksh. 264 (also equivalent to about USD.3) per kg.

Additionally, it is interesting to note that deep-fried fish is cheaper than fresh fish, possibly due to the associated costs of handling fresh fish, such as storage costs, which could be passed on to the end consumer. Further, the price of fish is observed to be higher in the urban settings than in the rural settings as shown below.

Table 48: Average purchase price per kg- Setting

Average price per kg (Ksh.)			
	Total (752)	Urban (423)	Rural (329)
Deep fried fish	307	332	271
Fresh fish	331	361	288
Frozen or fresh fish fillets	300	317	216
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	214	213	215
Dagaa/Mukene/Omena	156	153	161
Prawns/other sea food	369	380	333
Tinned/canned fish	504	539	373

Across the regions, the highest prices per category of fish are in Nairobi and the North-Eastern regions of the country.

Table 49: Average price per kg- Region

Average price per kg (Ksh.)									
	Total (752)	Central (60)	Coast (89)	Eastern (64)	Nairobi (136)	North Eastern (14)	Nyanza (120)	Rift Valley (179)	Western (90)
Deep fried fish	307	298	297	294	360	200	305	295	248
Fresh fish	331	343	316	222	426	600	279	254	379
Frozen or fresh fish fillets	300	288	248	225	361	350	270	225	300
Dried/smoked fish [excluding *Dagaa/Mukene/ Omena*]	214	97	140	100	273	-	265	213	188
Dagaa/Mukene/ Omena	156	167	174	133	168	175	158	157	122
Prawns/other sea food	369	-	295	-	580	-	400	-	-
Tinned/canned fish	504	-	2,000	-	434	401	-	-	-

Fish Prices- Mark-up

This section provides an indication of the average mark-up/profit made by various players in the value-chain.

Fish Farmers

It was noted that farmers were making an average mark-up/profit of about Ksh. 5,000 to Ksh. 80,000 (equivalent to about USD.50 to USD.792) from each batch/lot of fish reared as shown below. The Mudfish variety was observed to be the least profitable while the Catfish variety was observed to be the most profitable as shown below.

Table 50: Fish farmers- Average mark-up (Ksh.)[9]

Average mark-up price per batch/lot (Ksh.)					
	Average number of kgs sold per batch/lot	Average selling price per kg	Total sales per batch/lot (Ksh.)	Average cost of production per batch/lot (Ksh.)	Average mark-up/profit per batch/lot (Ksh)
Tilapia (11)	105	264	27,720	10,170	17,550
Catfish (7)	359	300	107,700	27,800	79,900
Mudfish (3)	25	275	6,875	1,700	5,175

[9] Farmers stocking the Koi Carp and Gold Fish varieties had recently ventured in the business and had not harvested fish from their first batch/lot yet.

Fish Processors

From the information obtained from fish processors, it was noted that fish processors were making an average of between Ksh. 166M to Ksh. 375M (equivalent to about USD.1.6 to USD.3.7M) per month from their businesses when pricing of products was either highest or lowest as shown below.

Table 51: Fish processors- Average mark-up (Ksh.)

Average mark-up/profit per month (Ksh.)					
	Average selling price per kg when price is highest (Ksh.)	Average kgs sold in a month when price is highest	Total average sales in a month (Ksh.)	Average selling price per kg when price is lowest (Ksh.)	Total average sales in a month (Ksh.) when price is lowest
Tilapia (2)	1,000	200,000	200,000,000	1,000	200,000,000
Nile Perch (2)	788	350,000	275,800,000	477	166,950,000
Tuna (2)	1,500	250,000	375,000,000	1,500	375,000,000
Salmon (1)[10]	-	20,000	-	-	-

These figures, however, appeared to be quite high, which could be resulting from several possibilities: firstly, there was hesitation among processors in providing information on amounts of fish processed or sold and the pricing of products. The data collectors re-assured the participants of confidentiality, but the information provided could have still be erroneous. As noted above, one of the processors handling the Salmon fish variety declined to provide information on fish pricing. Secondly, since the figures above are computed using the average amounts of fish reported as sold in a month, the record keeping of sales information by processors could be inaccurate, which would result to over-estimations or under-estimations. Thirdly, the computed figures provide an indication of gross profits, which do not consider the cost of running the businesses in month. As indicated in previous sections, the former fish processor who was currently focusing on fish importation for trade, as well as processing of other meat types, indicated that the factory had opted to stop processing fish locally as the costs of running the business were too high.

[10] The fish processor stocking Salmon declined to provide information on average pricing of products

Further, it was noted that the former fish processor was making an average of Ksh. 12,000,000 (equivalent to about USD.1.1M) per month from fish sales as shown below. In comparison, it was noted that sales from beef were the highest for this processor as shown above. Similarly, these were gross figures which did not factor in the cost of running the meat processing business.

Table 52: Former fish processor - Average mark-up (Ksh.)

Average mark-up price per month (Ksh.)				
	Average kgs procured/processed in a month	Average kgs sold in a month (kgs)	Selling price per kg	Total monthly sales (kgs)
Fish (Tilapia)	20,000	20,000	600	12,000,000
Beef	50,000	50,000	600	30,000,000
Poultry	30,000	30,000	700	21,000,000
Lamb	8,000	8,000	700	5,600,000
Goat	8,000	8,000	700	5,600,000

Exploring the cost of running fish processing businesses would be ideal in future studies to provide a more accurate picture of profits made by these players in the value-chain.

Fish Retailers

It was noted that fish retailers were making an average of about Ksh.13 to Ksh.134 (equivalent to about USD.1 or less) for each kg sold from the different fish varieties stocked as shown below. The most profitable fish variety was observed to be Catfish, while Tilapia was observed to be the least profitable.

Table 53: Fish retailers- Average mark-up per kg (Ksh.)

Average mark-up price (Ksh.)			
	Average buying price per kg.	Average selling price per kg.	Average mark-up/profit
Tilapia (43)	378	391	13
Nile Perch (21)	361	441	80
Catfish (3)	383	517	134
Salmon (1)	300	360	60
Mudfish (3)	417	500	83

As noted in the previous sections, retailers were mainly trading wild catch which was largely sourced from local sources. A kg of Tilapia, which can be assumed to be sourced locally, is procured at an average cost of Ksh.378 (equivalent to about USD.4) per kg as shown in the table above. As noted in previous sections however, imported Tilapia (sold by the former fish processors) is sold to retailers at an average cost of Ksh.300 (equivalent to about USD.3) per kg, and would therefore be more appealing to the retailers.

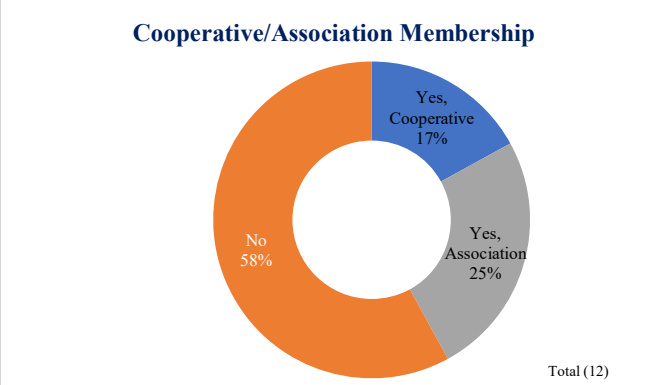
3.1.5 Market Organization/Cooperatives and Associations

As we note that marketing organisations, cooperatives and associations run across the value chain, we have organised this section in terms of the different players in this value chain.

Fish Farmers

A considerable proportion of fish farmers (58%) are not members of any cooperative or association to boost their fish farming businesses. Cooperatives/associations that some of the interviewed farmers were members of included Kirinyaga Fish Farmers Association, Kenya Fish Farmers Association, Dunga Fisheries and Tich Kouma.

Figure 91: Fish farmers- Cooperative/association membership



Additionally, it was observed that all cooperatives/associations cited were registered and required membership subscriptions to be paid by their members. As shown below, members pay an average subscription fee of Ksh.580 (equivalent to about USD.6), though this ranges from Ksh.300 to Ksh. 1,000 (equivalent to about USD.3 to USD.10).

Table 54: Fish farmers- Cooperative/association membership subscription fee

Membership subscription fees (Ksh).	
Total (5)	
Average subscription fee	580
Minimum subscription fee	300
Maximum subscription fee	1,000

Further, it was noted that the membership subscription fee paid largely lasts for a period of one year (reported by 4 members), while one of the members indicated that the membership subscription lasts for half a year. Some of the benefits that members enjoy

included linkages to markets for their products, access to credit for their businesses, sourcing of fingerlings and quality feeds, as well as recognition by the FAO.

Fish farmers felt that the cooperatives/associations they were in were performing well (rated as good or average) based on the benefits they provided to members. Subsequently, most farmers did not have many recommendations for the cooperatives/associations' improvement. All the same, cooperatives/associations supporting this part of the value chain could help by providing affordable credit to members, facilitating opportunities for members to learn from other groups with similar interests, improving on their governance structure, participating in the regulation of imported fish, participating in efforts to control prices of products and improving on quality control checks in the various levels of production. These were the most pressing issues reported by members which could be considered in the future.

Storage and Transportation Businesses

It was observed that 3 of the 5-fish storage and transportation companies were in cooperatives/associations. Further, these were observed to be largely the more established entities. The small-scale players were largely observed to be operating on their own. Further, it was observed that the cooperatives/associations' structures for this group was flexible such that they accommodated members based on their ability to make contributions (share ownership). For instance, the Wichlum Sacco in Siaya allowed members to make membership contributions either daily, weekly, or monthly depending on what was comfortable for specific members and benefits accrued depended on shares owned. A minimum contribution was largely defined which ranged from Ksh.20 to Ksh. 100 (equivalent to less than USD.1 to USD.1), but the maximum contributions were undefined. A membership registration fee was however defined which ranged from Ksh. 500 to Ksh. 1,500 (equivalent to about USD.5 to USD.15). This was largely a one-off fee which was later complemented by the daily/weekly/monthly contributions. Additionally, it was observed that the storage and transportation companies worked with others in the value chain- such as fishermen and traders- in the organized set-ups/cooperatives.

Some of the benefits accrued for the more established cooperatives included access to affordable credit (with interest rates ranging from 10% to 15%) which allowed members to boost their business operations. The amounts advanced at a given point varied and were mainly defined by the number of shares each member had in the cooperative. Further, it was observed that the more established cooperatives also offered savings options for members, which was accessible at the end of defined periods of time, mainly, annually. Additionally, some of the cooperatives also provided insurance services, albeit informally, where they would cater for members' emergencies (such as sickness, death, accidents etc.) by raising funds.

Members who were in cooperatives were largely happy with the cooperatives' performance and recommended that these be expanded to include other regions/ opening of branches for more accessibility and growth for the members.

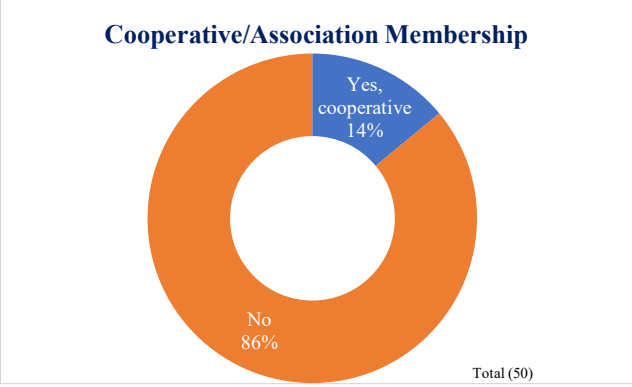
Fish Processors

It was observed that though processors had collaborations among themselves on some aspects of their business operations (such as pricing and employees' qualifications standardization), they were not formally organized in cooperatives or associations in support of their businesses and, possibly, this is one of the areas that can be explored in the future.

Fish Retailers

It was noted that only a small proportion of fish retailers (14%) were in organized settings (cooperatives/associations) to support their business ventures.

Figure 92: Retailers- Cooperative membership



Most retailers that were in cooperatives (6 out of 7 retailers) indicated that their cooperatives were registered. Additionally, a large proportion of the retailers (5 out of 7 retailers) indicated that they pay a membership subscription fee to the cooperative. Further, it was observed that retailers who paid a membership subscription fee paid an average of Ksh. 1,158 (equivalent to about USD.12). It was observed, however, that membership subscription fees ranged between Ksh. 200 and Ksh. 5,000 (equivalent to about USD.2 and USD.50 respectively) as shown below.

Table 55: Retailers- Cooperative membership subscription fee

Cooperative membership subscription fee (Ksh).	
Total (5)	
Average subscription fee	1,158
Maximum subscription fee	5,000
Minimum subscription fee	200

The membership fee paid to cooperatives was largely renewable annually (reported by 3 out of 5 retailers), though one of the retailers indicated that their membership subscription was a one-off fee, while the other noted it was renewable after every 6 weeks.

Retailers in cooperatives also indicated that a key membership benefits they enjoyed included access to credit to invest in their businesses, linkages to markets for their products, sourcing of quality fish stocks, and discounted prices on the products. A significant proportion (2 out of the 7 retailers), however, perceived that they did not enjoy any benefits, a factor which questions some of the cooperatives' effectiveness.

The performance of cooperatives on benefits provided was rated as being mainly good or average. It was, however, observed that cooperatives supporting fish retailers seem to be struggling in running their affairs. As indicated above, some of the members felt that there were no benefits accrued from the cooperative they were members of. Additionally, a sizeable proportion (2 out of 7 retailers) recommended that members need to be treated equally in the cooperative. In addition to streamlining people/members management in the cooperatives, cooperatives/associations supporting this part of the value chain would also benefit by providing loans to members as recommended by a sizeable proportion of the retailers (2 out of 7 retailers) in cooperatives. Members also recommended that cooperatives/association should incorporate a savings component to enable members

save profits from their businesses, process loan applications in a timely manner, look for international markets for members to sell their products, provide security for their members to reduce loss of fish stocks through theft, improve on teamwork during group projects, lower the registration fee to encourage membership growth, as well as open more branches for accessibility.

Cooperatives' Administrators' Perspective

In addition to speaking from the members of cooperatives, this study sought insights from the administrators of cooperatives providing support to various players in the value chain. In Kenya, 6 cooperatives were interviewed through a qualitative approach and insights gleaned from them are presented in this section.

Cooperative Structure

It was observed that some cooperatives were highly organized and regulated membership entry, while others were unstructured and comprised of individual farmers who came together to meet specific needs (such as regulating pricing of their products). The membership bases were also observed to vary with the organized cooperatives having as many as 300 members while the less organized ones having as few as 8 members. Membership entry also appeared to be regulated with criteria that needed to be met including ownership of a boat, fishing gear, being a fisherman, practice of fish farming (in the region where the cooperative operates) among other criteria. The more organized cooperatives largely utilized formal channels of communication (such as main stream media, trade fairs, *barazas*- community meetings- among others) to advertise themselves and grow their membership bases, while the less organized ones utilized informal channels such as word of mouth to grow their membership bases. It was also observed that some of the cooperatives have been in existence for a long time (over 30 years) while others were recently formed (at least 1 year of existence). It was noted that there were not so many cooperatives in place focusing on fish farming, this would be one of the areas that can be targeted for programmatic work.

Funding Model

It was observed that cooperatives do get funding from the government, such as the Lake Basin Authority, as well as from other non-governmental organizations, such as the FAO. This funding was observed to be both monetary and provision of equipment (such as cooler boxes for preserving the fish). It was also observed that some cooperatives charged a fee, ranging from Ksh. 1,000 to Ksh. 2,000 (equivalent to about USD.10 to USD.20), and renewable yearly, but some cooperatives, largely those receiving funding from other sources, did not charge a fee. This was used to sustain the running of the cooperatives' affairs.

Benefits of Membership

It was observed that members of cooperatives preferred to organize themselves in clusters, of largely between 15 to 30 members to be able to make meaningful decisions, such as setting prices of buying and selling their products as well as regulating their harvest schedules. The Kibos Fish Farmers cooperative for instance indicated that they regulated the harvesting schedules to enable them look for markets for their members. Further, it was observed that some cooperatives, such as the Makindi Sacco, offered their members training opportunities on various issues of interest, albeit at a fee (a subsidized gate entrance fee). Additionally, some offered their members with fingerlings (at subsidized prices- such as Ksh. 10 per fingerling or an equivalent of less than USD.1 per fingerling) for fish farming as well as access to extension services and technical support. Other cooperatives, such as Urithi Cooperative, indicated that they encouraged their members to invest in farming (for utilizing tracks of land purchased through another wing of the cooperative) and the cooperative took up the management of the fish farms including sale of produce for them.

It was observed that though access to affordable credit was crucial in supporting players in the fish industry, most cooperatives were not offering this facility, largely due to mismanagement (for those that have tried to offer it in the past) and lack of technical support to manage funds for those that had not considered it. Further, the less organized cooperatives indicated that though they desired to offer their members access to inputs

at discounted rates, as well as access to competitive pricing for members' products, the cooperatives did not have the capacity to lobby for these kinds of benefits.

Trade Regulations and Policy Issues

It was observed that for cooperatives to be in operation, they had to register with the government and get the necessary approvals, such as licencing from NEMA for fish farming, an importation licence for importing feeds and a licence to set up a hatchery for rearing fingerlings.

Challenges Faced by the Cooperatives

It was observed that several cooperatives around the lake region focused on fish harvested from the lakes, while those in the mainland mainly focused on fish obtained from the fish farms. For this reason, the challenges cooperatives faced varied as they were location specific.

Cooperatives in the mainland indicated that they had problems accessing markets for their produce as the demand was still low in these regions. Attempts to seek for assistance had not borne fruit as the fish sector had not yet been given priority. The Makindi Sacco for instance indicated that the focus in the region was still on cattle farming and other sectors in agriculture. Further, it was observed that the demand for farmed fish was still low and the entry of Chinese fish had worsened situation, as these were now available at lower prices. The cost of production for the farmers on the other hand would not allow them to subsidize their pricing for levelled competition. Additionally, it was observed that there was exploitation by middlemen who would buy the produce from the farmers at low prices and sell to the end consumers at higher prices. This exploitation was mainly observed to be a lack of organized efforts in marketing. Farming was observed to be done in unison but when it came to marketing, the farmers were mostly left on their own to market their produce.

Further, it was observed that accessing quality fingerlings was problematic as those accessible were of poor quality (resulted to stunted growth) which produced low harvests. Attempts by the cooperatives to produce the fingerlings (by investing in

hatcheries) was observed to be a solution but which resulted in low uptake. Farmers would not take up more fingerlings before clearing their old stocks (harvesting and selling), and this resulted in low demand for fingerlings. Additionally, accessibility to feeds and other farming inputs was also cited as being problematic. The sources were either too far off or were not reliable. It was for instance observed that the manufacturing of feeds was not well regulated and some of the feeds being circulated in the market were not of quality despite the cooperatives making the initiatives of educating the manufactures of the formulas to apply for producing quality feeds. Additionally, cooperatives that considered importation found that the process was too lengthy and costly. Getting approval/licencing for importing feeds was for instance cited as costing around Ksh. 130,000 (equivalent to about USD. 1,287) and had a limited time of use. If it expired before being utilized, another one had to be applied for.

Additionally, farmers around the lake regions complained of water hyacinth which mainly blocked their cages and resulted in losses of their stocks (due to lack of oxygen). It was also observed that farmers in these regions required education and provision of information on which varieties work together. The Fishing and Eco-tourism cooperative for instance cited that a problem their members were facing is high reproduction rates where both sexes of fish were farmed together. Further, it was noted that the Catfish variety does not do well in captivity and farmers practicing cage farming would therefore experience low harvests. To help in reproduction, the farmers would have to invest in injecting hormones, which added to the costs of production which were not anticipated at the beginning.

Further, the problem of accessing affordable credit for farmers was cited as being a major challenge in the growth of already existing farmers and a hinderance of aspiring farmers. Some of the farmers were for instance lacking storage and preservation equipment and would be forced to rely on the customers to come with their own cooler boxes when purchasing fish from them.

Poor infrastructure, such the lack of back-up systems of electricity was cited as a challenge. The Makindi Sacco had for instance invested in a hatchery and cited that when

electricity went off, there were numerous losses of seeds experienced. Additionally, accessibility to water was cited as challenge, largely because of the numerous processes that one had to go through to be granted access to invest in alternative sources. This has led to cooperatives downsizing their production capacities to minimize on losses.

Lastly, accessibility to qualified labour and extension services was cited as a challenge. The Fish Farmer-Arthi Self Help Group for instance indicated that they had challenges with the personnel hired to construct ponds for some of their members. The ponds were not deep enough and resulted in animal predators feeding on their stock resulting to losses. Further, availability of extension services was cited as a problem. It was observed that the government had frozen the employment of this line of work and the few available officers could not adequately support the farmers.

Recommendations for the Future

Cooperatives recommended that they should be provided with access to affordable credit to empower them to control the quality of the fingerlings (through investing in hatcheries), feeds and other farming inputs, as well as preservation and storage equipment, and provide them to their members at affordable prices. Further, cooperatives recommended that there should be mechanisms to support farmers to do contract farming to secure markets for their produce, as well as mechanisms to link the farmers to the end consumers in the market.

Cooperatives were also keen on investing in fish processing as this would provide better returns to their members. It was noted for instance that a kilo of unprocessed fish was retailing for an average of Ksh. 300 (equivalent to about USD.3), which took the farmer an average of 8 to 9 months of waiting, and which would in turn make an average of Ksh.600 (equivalent to about USD.6) when processed, and would be sold in less than 24 hours of processing. Value-addition and product presentation was also cited as being key in driving up sales, since for instance, the Catfish, with its whiskers on a supermarket shelf, would scare the average consumer from purchasing.

Further, cooperatives recommended for the regulation of the fish importation industry to protect the local industry. Other ways of supporting the local industry was to subsidize the cost of inputs for the farmers. Cooperatives also recommended for the government to support the industry through sensitization on the importance of fish, especially the farmed varieties, and promotion of products, to drive up demand. Investing of factories for processing commonly consumed products, such as samosas, which could be made using fish, was also indicated as an area of focus.

Illegal fishing at the natural water bodies was also cited as a key area of focus especially for farmers who had invested in cage farming. The cooperatives called on the government to remove the illegal nets and improve on security in the lakes.

Further, cooperatives called on the government to reduce the fees required to import alternatives feeds as well as the general fees required to set up and run successful fish farming enterprises to encourage more uptake of the trade.

Additionally, cooperatives recommend for the establishment of training centres for knowledge sharing on best practices in the industry.

Lastly, some cooperatives felt that transiting and changing from fish farming to other crop enterprises may be the most feasible approach. It is perceived that fish farming is no longer profitable and diversification may be the most viable option.

3.1.6 Policy and Trade Regulations

This section of the report explores the currently existing standards regulating the fish industry in Kenya including suppliers/market players' awareness of and adherence to existing regulations.

Current Status

In Kenya, the Fisheries Department in the Ministry of Agriculture, Livestock and Fisheries is mandated to provide leadership in the management and development of aquaculture and fisheries resources. The Ministry coordinates, develops, and manages the fisheries and aquaculture sectors by making it innovative and commercially-oriented to increase earnings and improve livelihoods in addition to addressing food security and

unemployment. Its objectives include: strengthening institutional capacity, policy and legal framework for fisheries development; promoting sustainable utilization of marine fisheries; promoting sustainable development and utilization of inland fisheries; encouraging the development of aquaculture; promoting fish quality assurance, value addition and marketing; strengthen extension services; improving fisheries infrastructure; and mainstreaming HIV and AIDS activities in ministerial programs and projects. In the Kenya Vision 2030, the government has named processing, which includes fish processing, as a priority area for investment promotion.

That notwithstanding, the fisheries sector in Kenya is regulated by certain regulations, one of which is the Fisheries Act (cap 378) of the laws of Kenya. This Act creates the Fisheries Department as the national institution mandated to manage the fisheries sector and currently operates under the Ministry of Agriculture, Livestock & Fisheries. Basic fisheries legislation is set out in six parts and 26 sections of the Fisheries Act (cap378). The Act applies to both marine and inland fisheries, and broadly empowers the Director of Fisheries, with the approval of the Minister, to issue regulations, to promote the development of fisheries and aquaculture and to ensure the proper management of specific fisheries. It provides for the establishment of a fisheries officer under the Fisheries Department, who is expected to work in co-operation with other appropriate agencies and other departments of Government. The officer is required to promote the development of traditional and industrial fisheries, fish culture and related industries through such measures as (a) providing extension and training services; (b) conducting research and surveys; (c) promoting co-operation among fishermen; (d) promoting arrangements for the orderly marketing of fish; (e) providing infrastructure facilities; and (f) stocking waters with fish and supplying fish for stocking.

While this officer is mandated to promote the development of traditional and industrial fisheries, the same act seems to limit his ability to impose measures necessary for the proper management of any fishery to the water bodies containing wild fish stocks. The Act is silent on his involvement in developing the fisheries in the country with the slightest hint being observed in Section 23 (k) where he is tasked with promoting and

regulating or controlling the cultivation of live fish of any kind or species. The Act is silent on what this means but it appears there is a clearer mandate in sub-section (d) of the same section, where he can regulate prescribed methods of handling, storage and processing of fish; and in sub-section (e) where he is expected to provide for inspection of fish trading and processing establishments and fish products in accordance with established standards.

There appears to be recent improvements to this Act in the form of the Fisheries Management and Development Act No. 35 of 2016, which protects, manages, uses and develops the aquatic resources in a manner which is consistent with ecologically sustainable development, uplifts the living standards of the fishing communities and introduces fishing to traditionally non-fishing communities as well as enhances food security. The Act provides for creation of a Fisheries Council whose function is to review and advise the national Government on policies in relation to the co-ordination of fisheries management regarding the aquatic environment and human dimensions; development of the fisheries sector, as well as facilitation of research, education, capacity development in fisheries and the management of fisheries resources. It also provides for "artisanal fisheries" which are essentially small scale traditional fisheries that may be carried out for subsistence or commercial purposes in which the owner is directly involved in the day-to-day running of the enterprise and relatively small amounts of capital are used. It also provides for the creation of a Fish Marketing Authority. On aquaculture, the Act provides for the creation of an aquaculture development plan, every three years, which seeks to ensure sustainable use of resources to support aquaculture, set standards for aquaculture, regulate the acquisition of fish seed and introduction of species and regulate the management of aquaculture waste. It however seems to lack guidance on the role of the Government and established authorities in promoting investments in aquaculture, beyond regulation and beyond providing research and education to the sector in general.

Over the years, the Government has constructed several aquaculture facilities in various parts of the country. These facilities serve as research centres, training facilities for

fisheries personnel and fish farmers, aquaculture demonstration centres and sources of fingerling to farmers. Some of the prominent ones include: a) Sagana Fish Farm - Kirinyaga; b) Kiganjo Trout Hatchery – Nyeri; c) Ndaragua Trout Farm – Nyandarua; d) Chwele Fish Farm (Lake Basin Development Authority) in Bungoma; e) Wakhungu Fish Farm-Busia; f) Sangoro Research Station (Kenya Marine and Fisheries Research Institute) in Rachuonyo and g) Kibos Fish Hatchery (Lake Basin Development Authority)-Kisumu.[11] Beyond this, there appears to be an increased level of participation in growing the sector through non-governmental organisations, parties and aquaculture associations as compared to government intervention in the sector. There is no comprehensive policy on aquaculture, including legislation and this is an indicator of the low priority the policy makers have accorded aquaculture as an economic activity.

All in all, fish farmers are collectively represented through the Aquaculture Association of Kenya; which is an organisation that brings together all fish farmers in Kenya and links them to the Government and other stakeholders with the sole purpose of providing them with one voice, as well as creating awareness amongst members on sustainable aquaculture farming and marketing.

The Fish Marketing Authority was created to market fish and fish products from Kenya, and its functions include: ensuring that fish and fishery products from Kenya enjoy market access at local, national, regional and international levels as premier products and, to this end, that the products and markets are developed and diversified; identifying fish market needs and trends and advising fisheries stakeholders accordingly; [as well as] organizing stakeholders to ensure smooth marketing of fish and fishery products.[12]

Other efforts to increase demand for fish and fish products include: collaboration of the sector and KFDA (Kenya Fisheries Development Authority) to develop effective fish

[11] Aquaculture in Kenya; Status, Challenges and Opportunities (2008); Mbugua H. Mwangi. Directorate of aquaculture development – Kenya

[12] Fisheries Management and Development Act35 of 2016

auction systems in major fish production areas and fish markets in major urban centres; the sector shall be encouraged to ensure efficient marketing systems and effective linkages along the different trading levels.[13] The EU-funded Indian Ocean Commission SmartFish Programme (co-implemented by FAO), in collaboration with the Government of Kenya, have launched the "Eat fish for a better life" campaign [TV and radio spots] aiming to promote the consumption of local fish and to inform the public about the importance of fish consumption for our health and growth. As part of the campaign, three Kenyan celebrities joined together to take part in a public service announcement about fish consumption that has been launched and is being aired on Kenyan television channels.[14]

Challenges and Bottlenecks

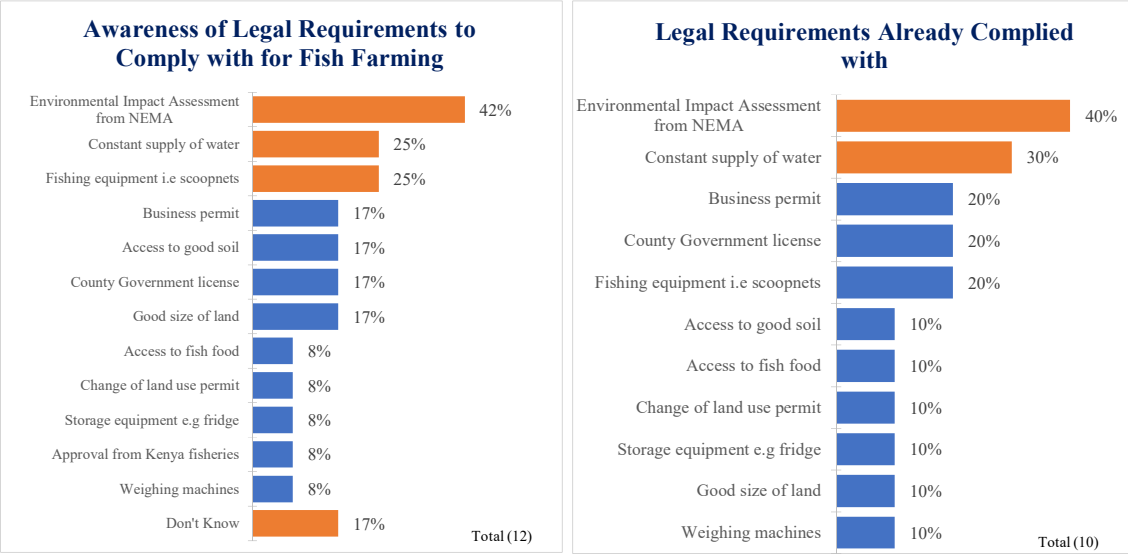
The primary research phase of the study sought to understand the awareness levels of legal standards required to operate in the industry as well as the major hurdles faced in running affairs. Presented below are the awareness levels from each category interviewed in the supply side as well as perceptions on the most difficult legal requirement to comply with in running businesses.

Fish Farmers

Fish farmers largely perceived that to start and run a successful fish farming business in Kenya, one needed to comply with the environmental impact assessment provision from the National Environment Management Authority (NEMA), have constant supply of water and have fishing equipment among other requirements as shown below. A few retailers, however, indicated that they did not know the requirements needed as shown below. Further, it was also observed that out of all the requirements farmers perceived they needed to have, they had largely complied with the NEMA requirement and had ensured constant supply of water among others as shown below.

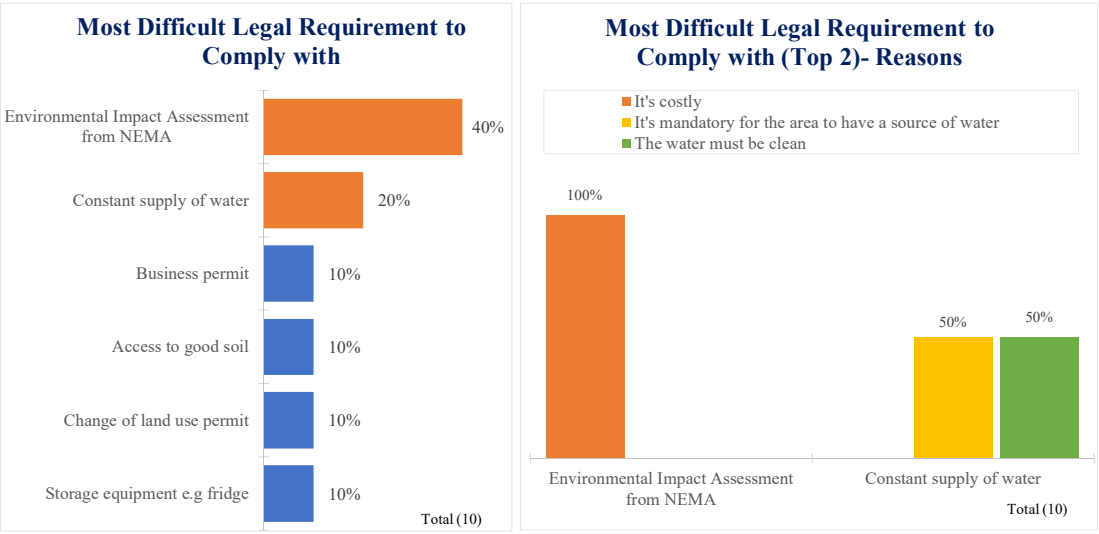
[13] KENYA FISHERIES POLICY Ministry of Livestock and Fisheries Development 29 October 2005
[14] http://www.fao.org/blogs/blue-growth-blog/notes-from-kenya-eat-fish-for-a-better-life/en/

Figure 93: Fish farmers- Awareness of legal requirements to run business



Further, farmers indicated that the most difficult requirement to comply with was the NEMA provision and ensuring constant supply of water, among others, mainly because both requirements were costly among other reasons as shown below.

Figure 94: Fish farmers- Most difficult legal requirements



Processors

The 3 interviewed fish processors indicated that to operate as a fish processor, one needed a health insurance certification, a medical health certification and a veterinary health certification. All health certifications were reported as being important because they ensured physical and mental fitness of the workers to handle food products.

All staff working for the processors were reported as having the health mutual certification and the medical health certification. Two processors, however, indicated that some of their staff did not have the veterinary health certification.

Processors indicated that the duration of time required for staff to undergo health checks ranged from an average of 5 months to 1 year.

Table 56: Processors- Duration of time required for health checks

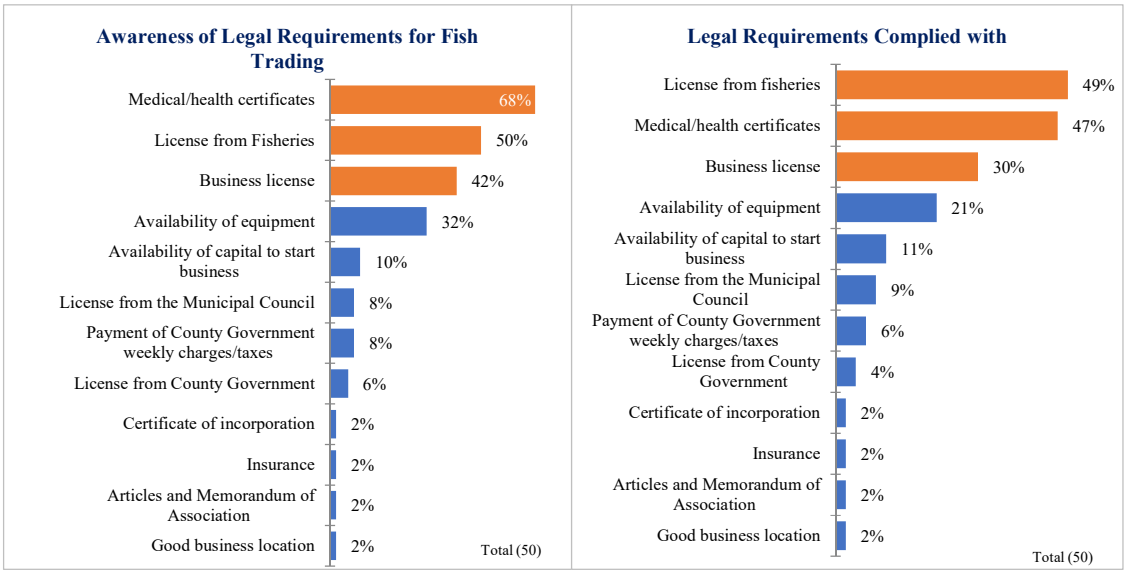
Duration of time required for going for health check		
Total (3)		
	Months	Years
Average duration of time	5	1

It was observed that going for health checks for staff in processing factories was a government requirement as well as a requirement for one of the processing factories.

Fish Retailers

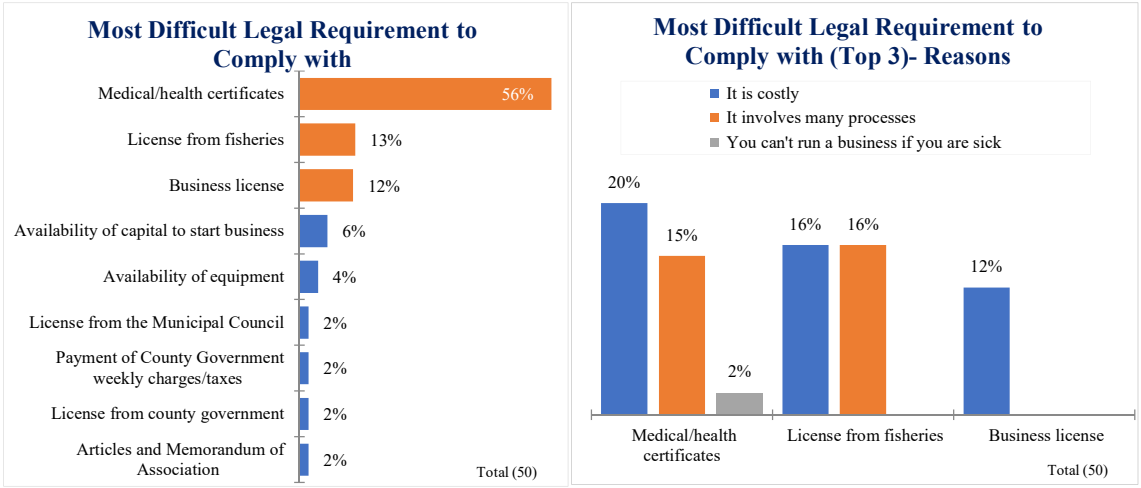
Fish retailers indicated that to start and run a successful fish retailing business, one mainly needed a medical/health certificate (68%), a licence from the Ministry of Fisheries (50%) and a business licence (42%) among other provisions as show below. Consequently, these were the requirements that retailers cited they had largely compiled with as shown below.

Figure 95: Retailers- Legal requirements for running business



Further, retailers indicated that these same requirements were largely the most complied with as shown below, largely because they were costly and involved lengthy processes.

Figure 96: Retailers- Most difficult legal requirement to comply with



3.1.7 Demographic Information and Future Communication Insights

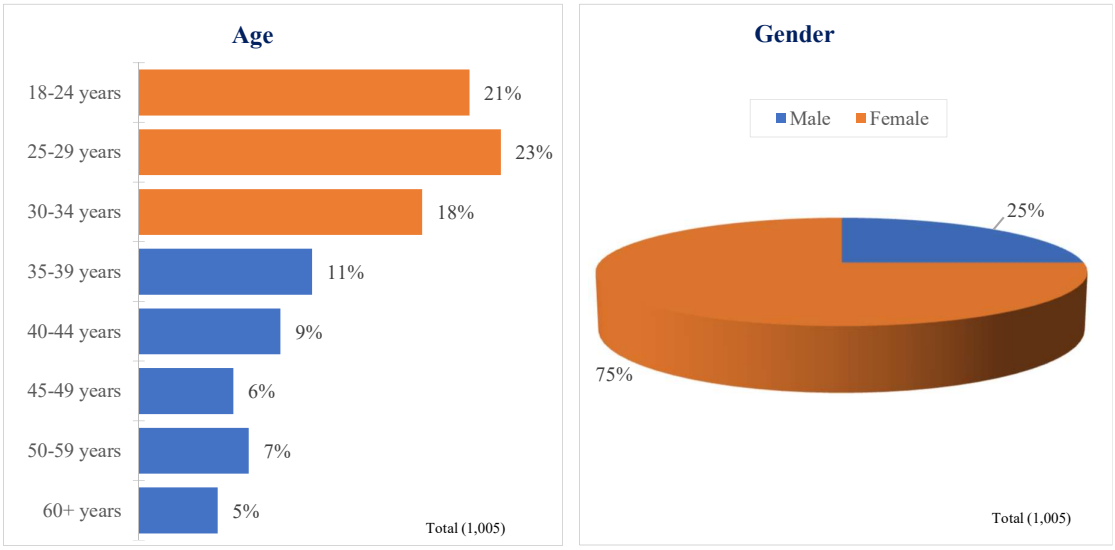
This study targeted consumers as well as market players in the fish industry. Demographic information/profile of participating respondents as well as channels of communication that can be utilized for future programming is presented below.

A. Demographic Information

Consumers

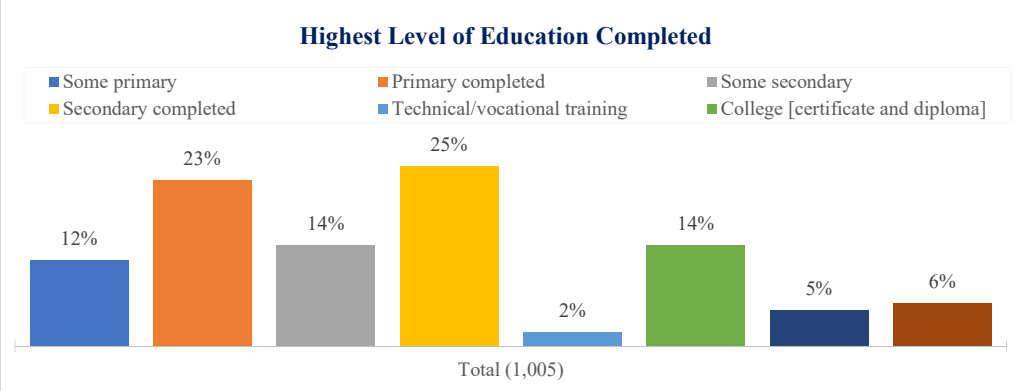
The consumer study targeted persons aged 18 years (adults) and above in Kenya at the households. Interviewed persons in selected households were key decision makers of food items purchased in the household. As shown in the figure below, key decision makers of food items purchased in the households were largely aged between 18 years and 34 years (62%) and were mainly female (75%).

Figure 97: Consumers- Age and gender



Further, key decision makers on food items purchased in the households had largely completed secondary school (25%) and primary school (23%) as their highest level of education completed as shown below. A significant portion (14%) had also completed college as their highest level of education.

Figure 98: Consumers- Level of education



Additionally, households interviewed have an average of 4 people as shown in the table below. This trend was observed across the regions, with North Eastern, Western and Coast Regions having a slightly higher number of people living in the households.

Table 57: Consumers- Number of people in the household

Number of people in the household											
	Total (1,005)	Urban (505)	Rural (500)	Centra l (130)	Coast (90)	Eastern (140)	Nairobi (143)	North Eastern (40)	Nyanza (131)	Rift Valley (241)	Western (90)
Average number of people in the household	4	4	5	4	5	4	4	6	4	4	5

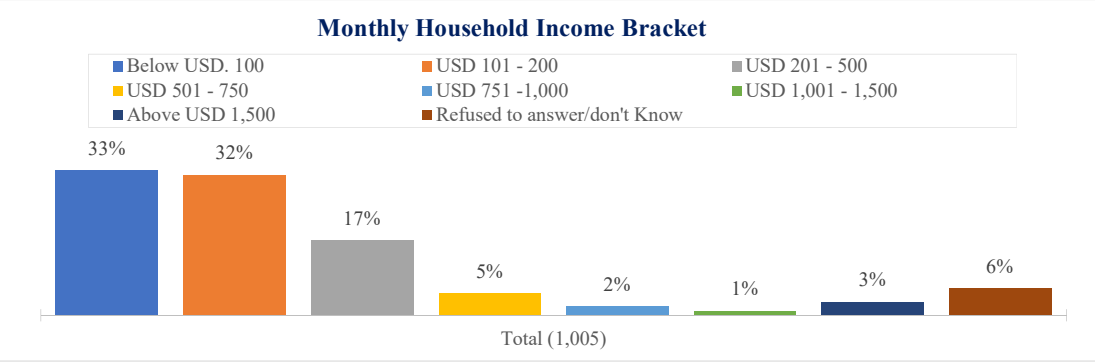
Further, it was observed that the people living in the households were mainly adults (aged 18 years and above) with an average of 2 persons falling under this category as shown in the table below.

Table 58: Consumers- Number of people in the household (age brackets)

Number of people living in the household						
	Adults [18 years and above, including servants if they share the same cooking pot]	Children [12 but less than 18 years]	Children [6 but less than 12 years]	Children [2 years but less than 6 years]	Children [6 months but less than 2 years]	Children [under 6 months]
Average number of people	2	1	1	1	-	-

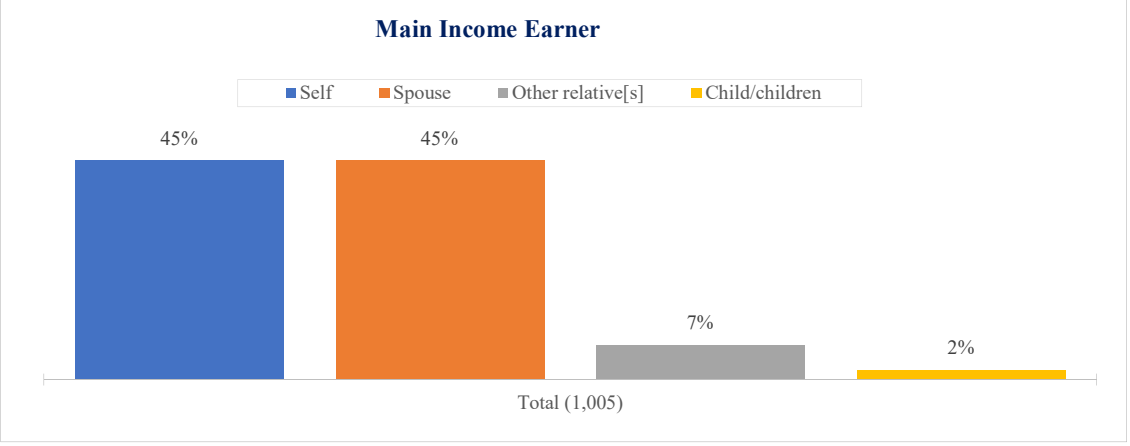
Additionally, a significant number of households (33%) reported that their monthly income was below USD. 100 as shown below. An equally significant portion also, (49%) reported that their monthly household income was between USD. 101 to USD. 200 as shown in the figure below. About 6% of those interviewed either refused to provide this information despite re-assurances on confidentiality, or indicated that they did not know this information (with some of the reasons cited being that their spouses do not disclose their income to them).

Figure 99: Consumers- Monthly household income bracket



The main income earner in the household was also reported to be mainly either the key decision maker of food items purchased in the household (person interviewed/self) (45%) or their spouse (45%) as shown below.

Figure 100: Consumers- Main income earner



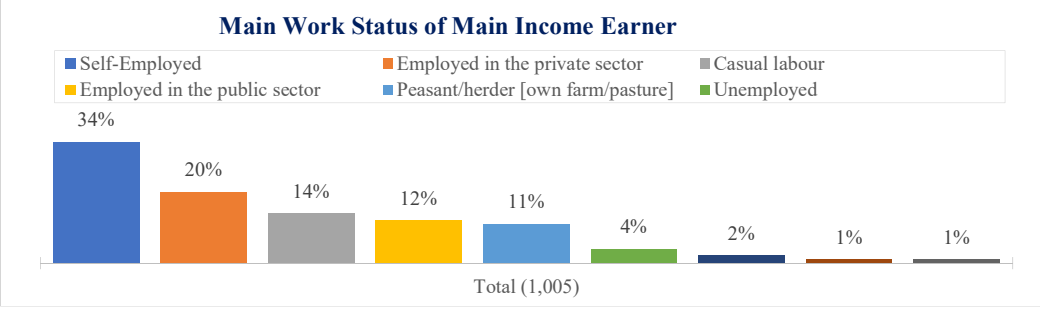
In addition, it was observed that on average, 2 persons earned an income in the household and contributed to the household's income and expenditure as shown below.

Table 59: Consumers- Number of people in the household contributing to income and expenditure

Number of persons in household earning an income and contributing to household income and expenditure									
	Total (1,005)	Below USD. 100 (331)	USD. 101 - 200 (326)	USD. 201 - 500 (171)	USD. 501 - 750 (48)	USD. 751 - 1,000 (20)	USD. 1,001 – 1,500 (9)	Above USD. 1,500 (35)	Don't know/refused to answer (65)
Average number of people in the household contributing to income and expenditure	2	1	2	2	2	2	2	2	1

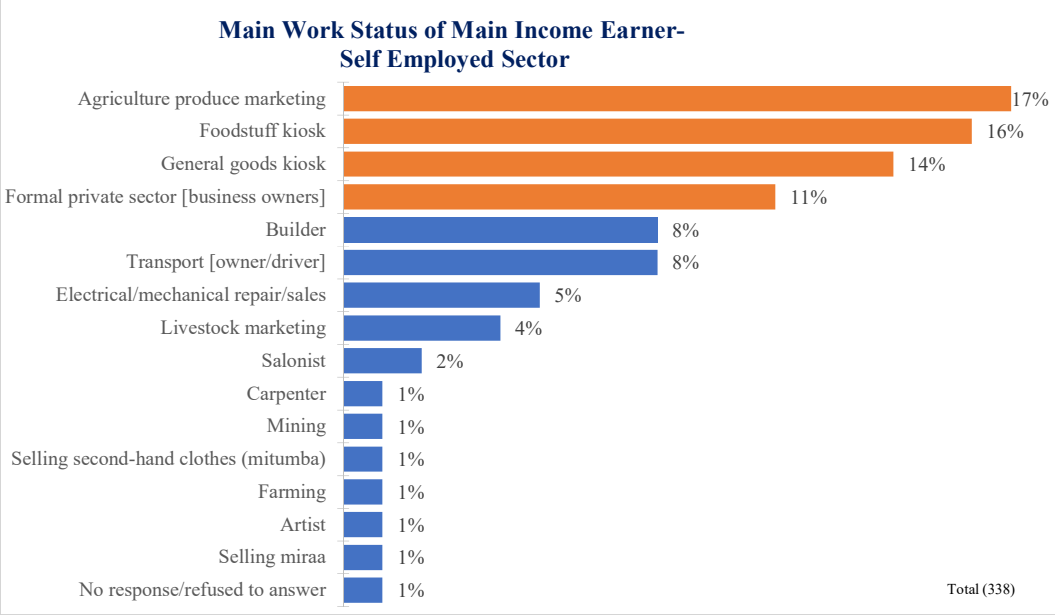
The main income earner for the household was reported to be largely either self-employed (34%) or employed in the sector (20%) as shown below.

Figure 101: Consumers- Main work status of main income earner



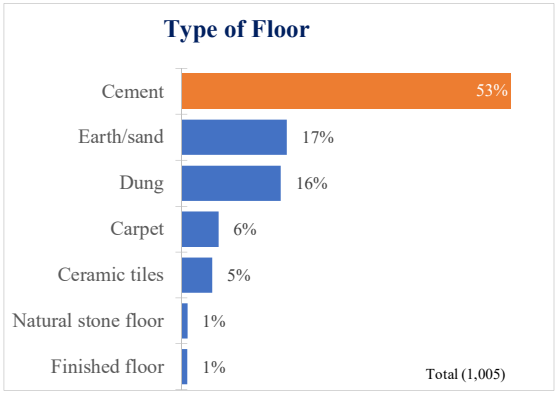
Main income earners who were self-employed were reported to be largely working in the agricultural sector (17%), running foodstuff kiosks (16%), running general goods kiosks (14%) or were in the formal sector/business owners (11%) among others as shown below.

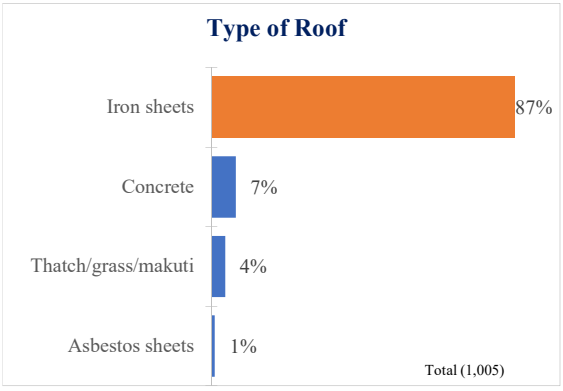
Figure 102: Consumers- Main work status of main income earner- self-employed sector



Further, consumers were found to be living in households that largely had cemented floors (53%), and were roofed with iron sheets (87%) as shown below.

Figure 103: Consumers- Type of floor and roof for the household

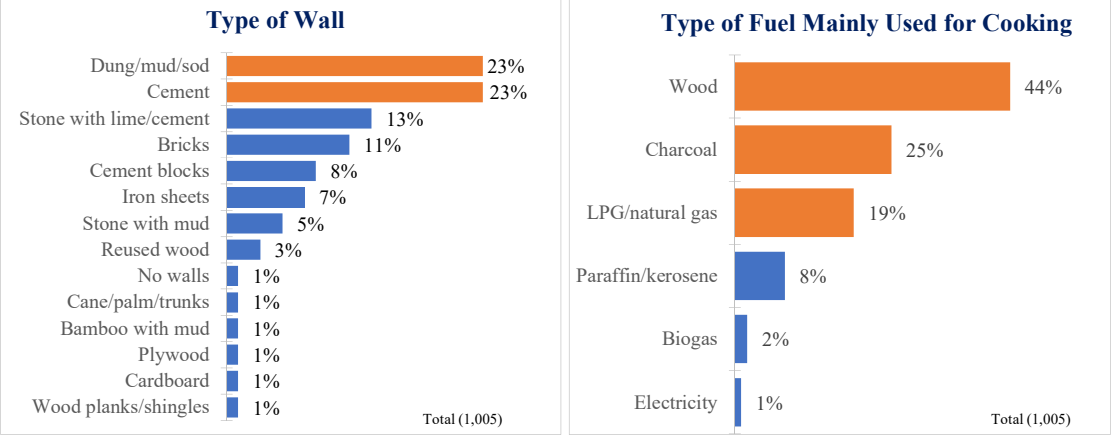




The households' walls were also largely cemented or made of dung/mud/sod (46%) as shown in the figure below. Lastly, households reported that they largely used wood

(44%), charcoal (25%) or LPG/gas (19%) as the main type of fuel for cooking in the households among other types of fuel.

Figure 104: Consumers- Type of wall and type of fuel mainly used for cooking by household



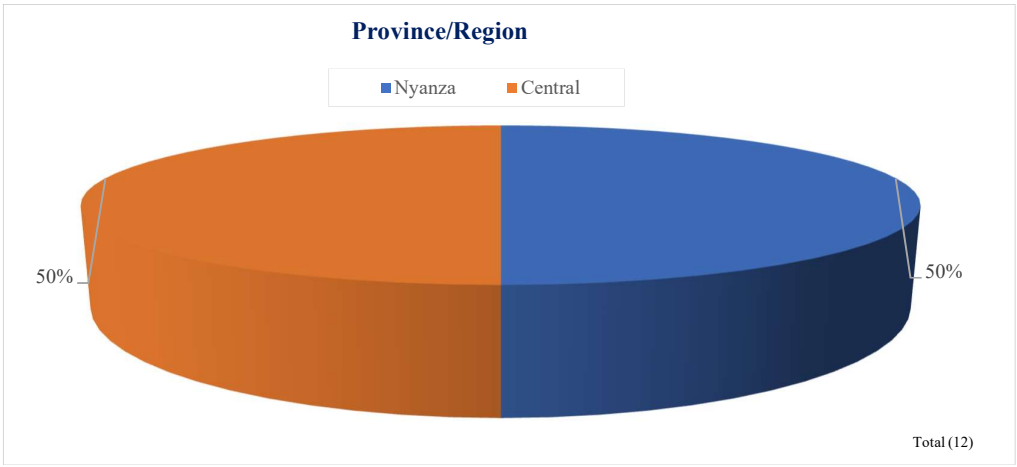
Market Players

The Market Players' segment targeted fish farms and ponds, fish retailers, processors, storage and transportation business as well as cooperatives supporting the fish industry business. The profile of participating respondents is presented below.

Fish Farmers

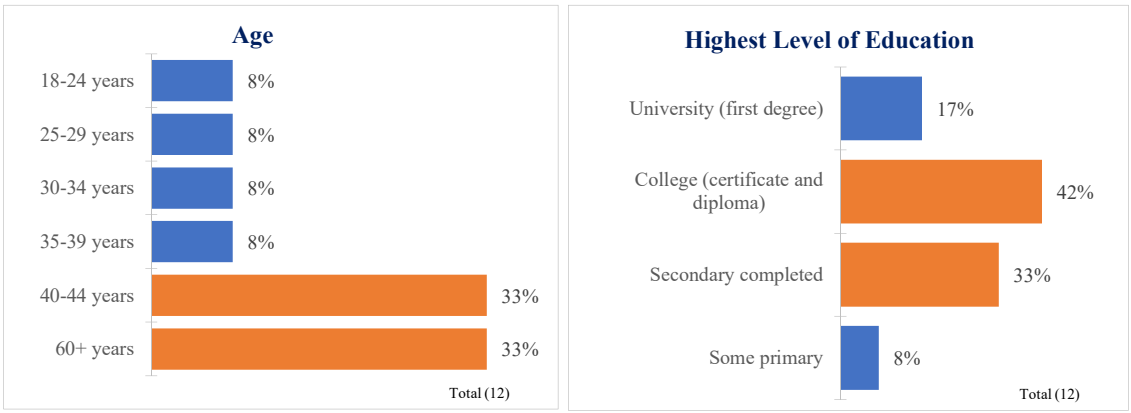
Fish farmers interviewed in this study were found in Nyanza and Central Regions as shown in the figure below.

Figure 105: Fish farmers- Region



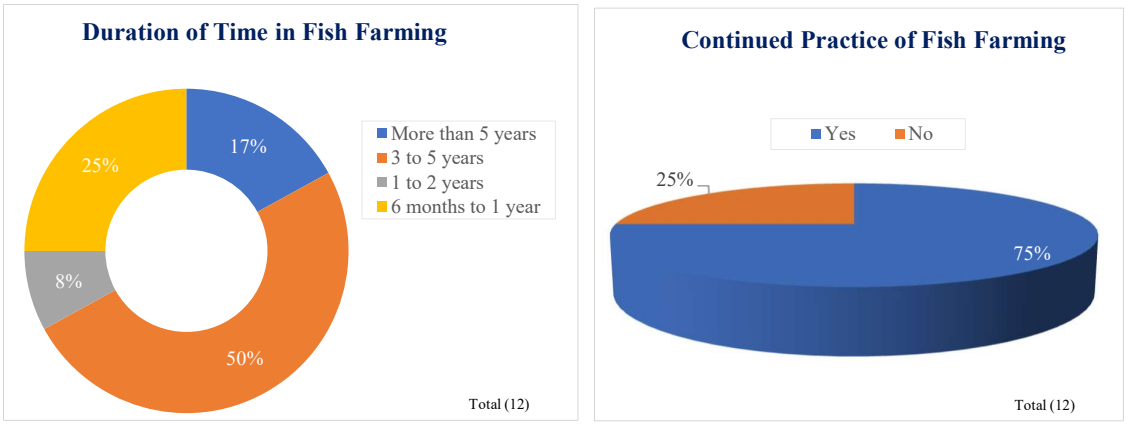
Like the other categories of market players, the owners or key decision makers in the farmers were targeted for interview. As shown in the figure below, the owners/key decision makers in this category were mainly aged 40 years and above and largely had college certification/diploma (42%) or secondary education (33%) as the highest level of formal education completed. Additionally, all the 12 interviewed owners/ key decision makers were male.

Figure 106: Fish farmers- Age/highest level of education



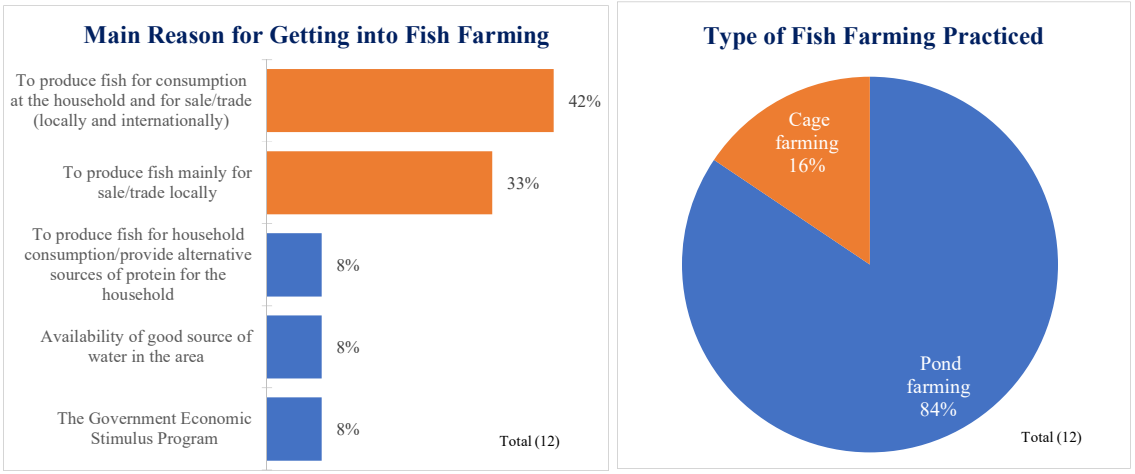
Participating fish farmers had also largely been in the business for a period of between 3 to 5 years (50%) and had continually been in the practice (75%).

Figure 107: Fish farmers- Fish farming practice



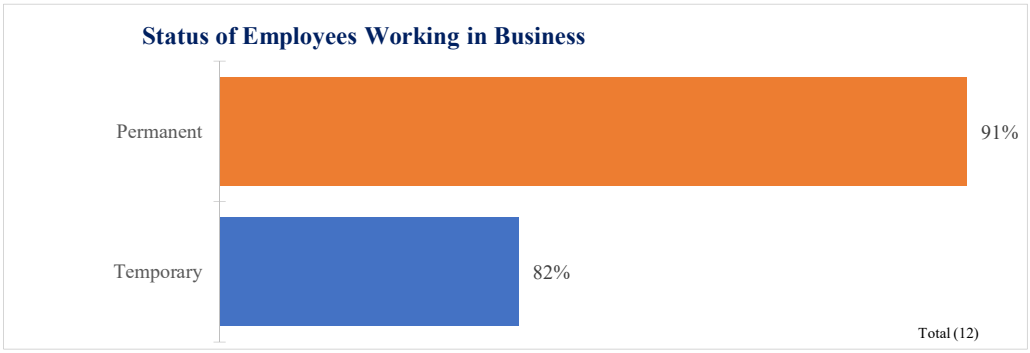
Further, it was observed that fish farmers had largely joined the business to produce fish for consumption at the household and for sale (locally and internationally) as well as to mainly produce fish for selling locally as shown in the figure below. Additionally, interviewed farmers mainly practiced pond farming as shown below.

Figure 108: Fish farmers- Motivations for fish farming and types of farming practiced



In addition, it was noted that the staff mainly working in the farmers were permanent employees of the business as shown below.

Figure 109: Fish farmers- Status of employees in business



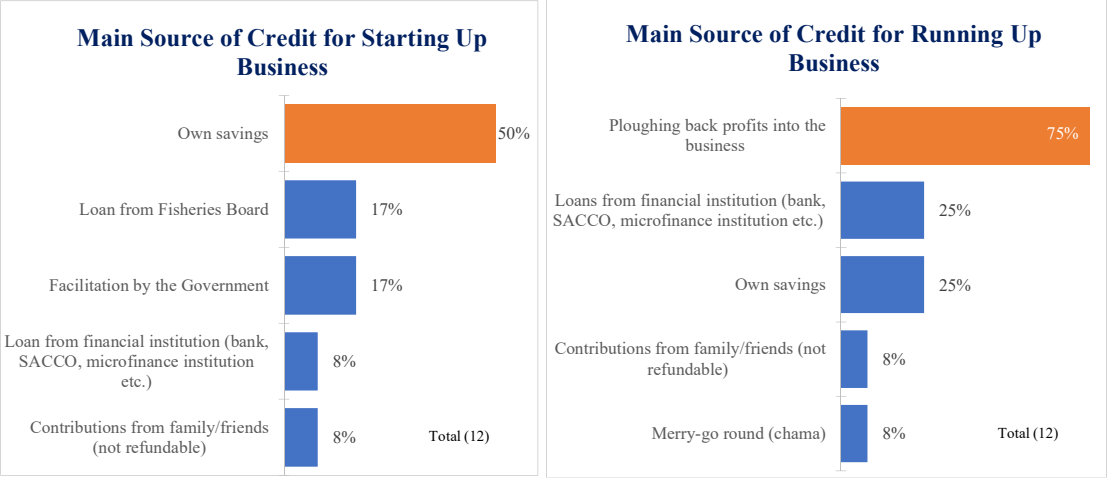
Further, an average of 2 permanent staff and 2 temporary staff were engaged in running the fish farming businesses as shown in the table below.

Table 60: Fish farmers- Number of staff working in business

Number of staff working in the business		
Total (12)		
	Permanent	Temporary
Average number of staff	2	2

Regarding the source of credit for starting and running the fish farming business, it was observed that farmers largely used their own savings to start the business among other sources of credit and mainly plough back profits to sustain the business as shown in the figure below.

Figure 110: Fish farmers- Main source of credit for starting and running business



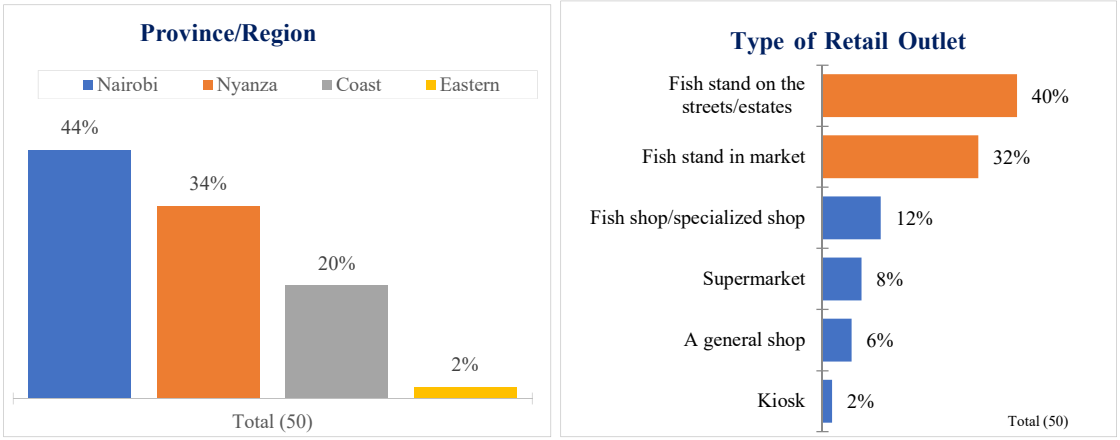
Storage and Transportation Businesses

It was observed that persons managing fish storage and transportation businesses had varying education qualifications. The more established transportation businesses were largely run by persons with university education while the small-scale businesses were run by persons with college education, secondary education and a few who had only completed primary education. Further, it was noted that the managers were largely aged between 29 years to 47 years and they were mainly male with a few female players. Additionally, the transport managers had been in the business for a period of between 3 to 10 years.

Retailers

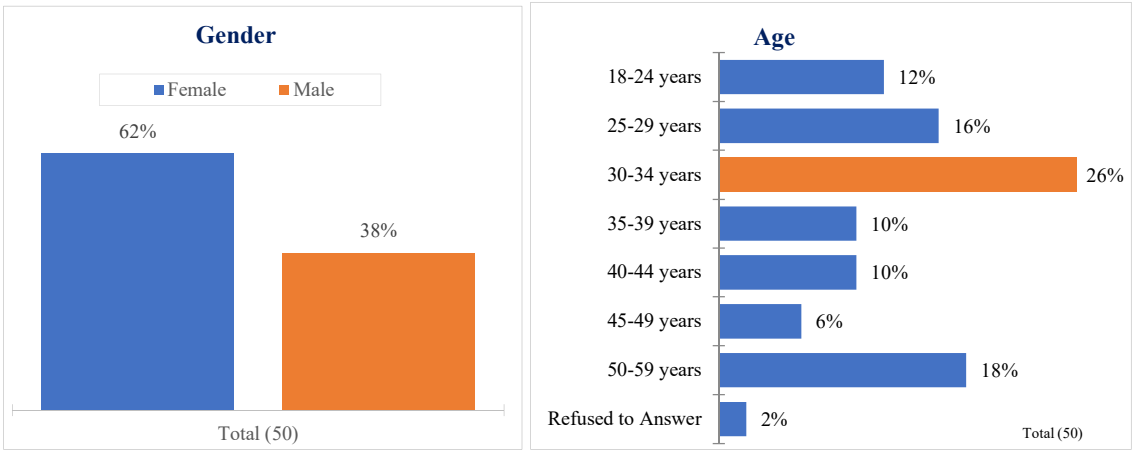
Fish retailers in this study were targeted in urban settings in Kenya and were mainly found in Nairobi (44%), Nyanza (34%) and the Coast (20%) regions as shown in the figure below. Additionally, the fish retail outlets were largely fish stands in streets/estates (40%) and in the markets (32%) among others as shown below.

Figure 111: Retailers- Region and type of outlet



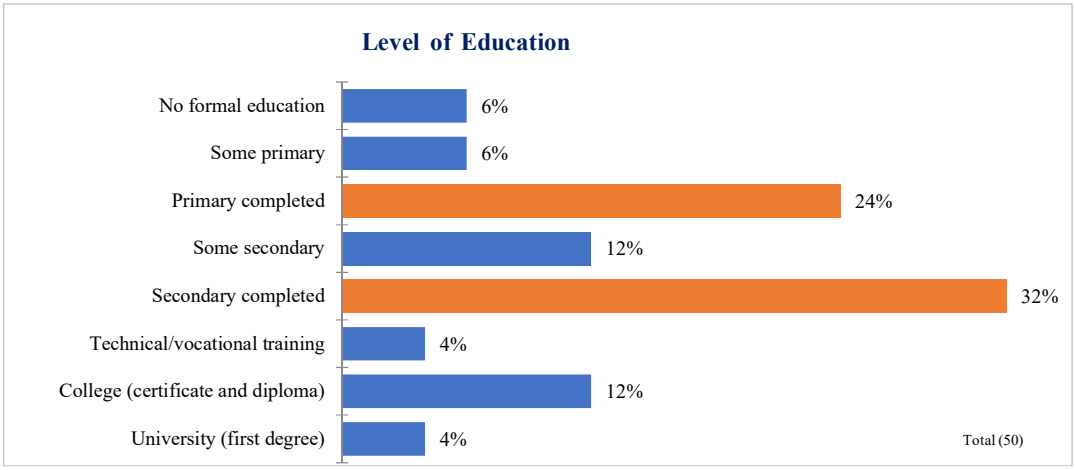
Persons interviewed in the retail outlets were either the owners of the businesses or key decision makers. As shown below, these were largely female (62%) and a significant portion (26%) was aged between 30 years and 34 years.

Figure 112: Retailers- Gender and age



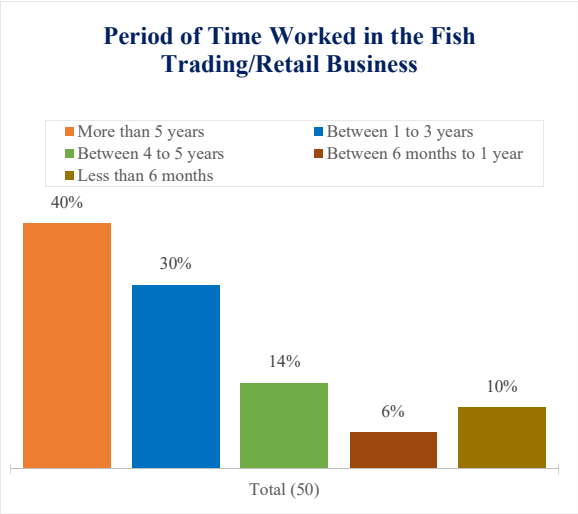
Additionally, owners/key decision makers of retail outlets had largely attained secondary education (32%) or primary education (24%) as the highest level of formal education completed as shown below.

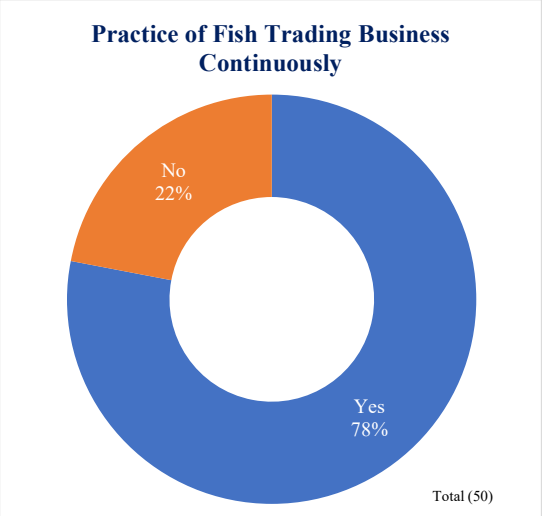
Figure 113: Retailers- Highest level of education completed



Further, it was observed that fish retailers had largely been in the fish trading business for more than 5 years (40%) as shown below. Additionally, a significant proportion (78%) had been in the business continuously since venturing into the trade.

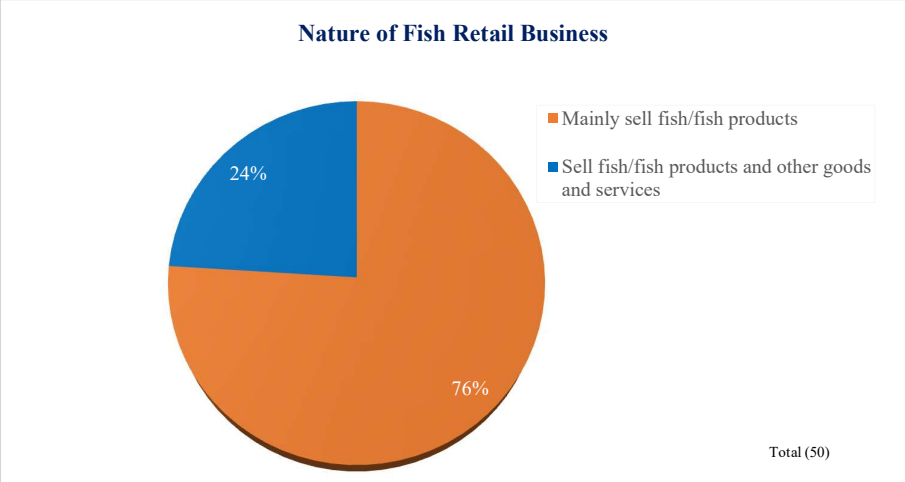
Figure 114: Retailers- Duration of time in the fish trading business





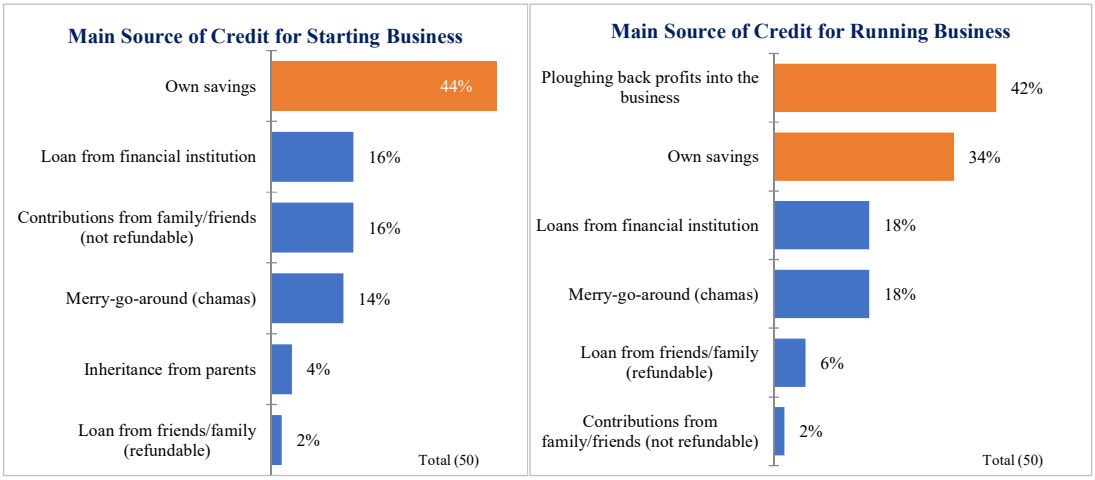
A significant proportion of participating fish retailers (76%) also indicated that they mainly engaged in the sale of fish and fish products, with a small proportion (24%) complementing this trade with the sale of other goods and services.

Figure 115: Retailers- Nature of fish trading business



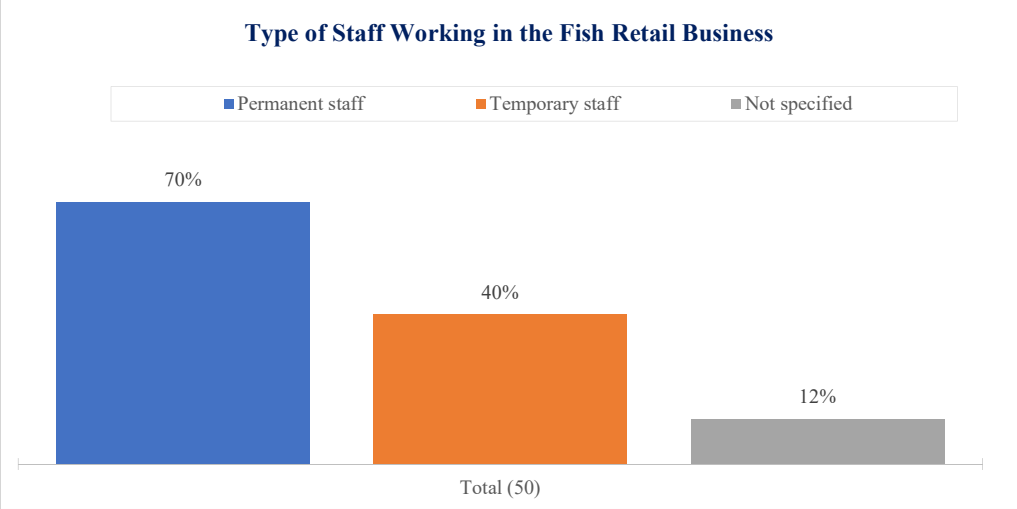
It was also observed that fish retailers had largely used their own savings (44%) to start off their trade among other channels, and had largely relied on ploughing back profits (42%) and their own savings (34%) to keep their businesses running as shown below.

Figure 116: Retailers- Main source of credit for starting and running business



Further, it was observed that fish retail businesses largely engaged a significant proportion of permanent staff (70%) with only a small proportion (40%) also engaging temporally staff as shown below.

Figure 117: Retailers- Type of staff working in the business



Additionally, fish retailers engaged an average of 2 permanent staff and 2 temporary staff to run their businesses as shown below.

Table 61: Retailers- Number of staff in business

Number of staff working in the fish retail business		
Total (50)		
	Permanent staff	Temporary staff
Average number of staff	2	2

Processors

The 3 processing factories interviewed in this study were found in Coast- Mombasa (2 factories and Nyanza- Kisumu (1 factory) regions. The former fish processor/current fish importer was based in Nairobi. Additionally, the key decision makers in the processing factories were mainly aged between 30 years and 34 years (2 decision makers) and 45 years and 50 years (2 decision makers) and had largely attained a first degree as the highest level of education completed. Further, it was observed that all fish processors interviewed in this study had worked in the decision role they were currently in for a period of between 3 to 5 years.

The main motivation for joining the industry was largely because the business was profitable/rewarding, preference (one processing factory was a family business) for responding to the current needs.

Processing factories were observed to have an average of 91 employees who comprised of permanent and temporary staff. Majority of these were observed to be male.

Table 62: Processors- Number of employees in the factory

Number of employees in processing factories					
Total (3)					
	Total Number of Employees	Full Time-Male	Full Time-Female	Temporary-Male	Temporary- Female
Average number of staff	91	59	28	2	1

One processing factory indicated that there were periods they employed more staff than the above mainly when there was an increase in the number of customers.

Cooperatives

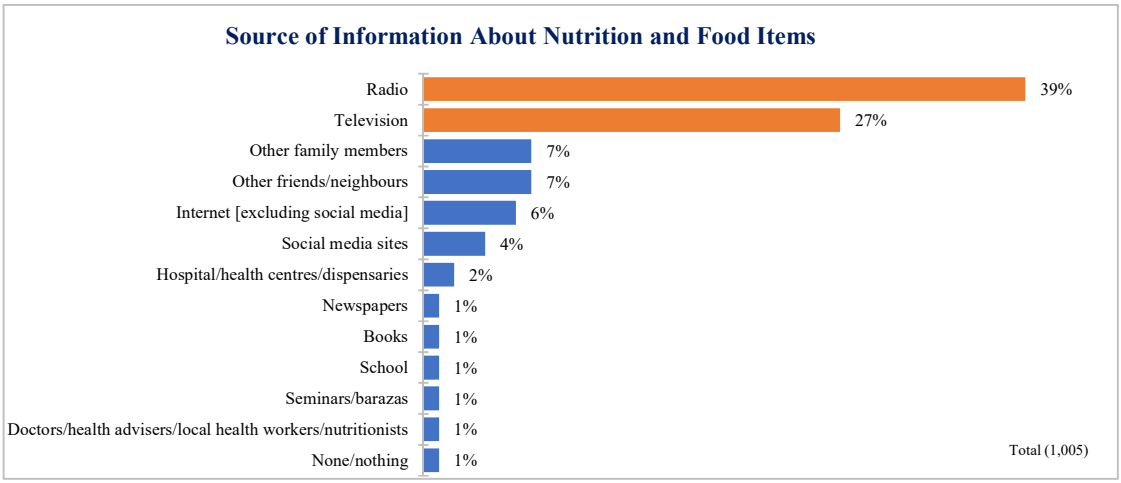
It was observed that the cooperatives' administrators had a wealth of experience in running the supporting the fish industry through running the cooperatives with some indicating that they have been working in the same role for up to 30 years. The least duration indicated was 4 years. Further, it was observed that administrators of cooperatives were mainly male and were largely aged between 29 years to 65 years. Additionally, it was observed from the cooperatives that there was a mix in terms of the educational background of the administrators in the cooperatives. In some, the management was run by persons who had only secondary level of education, while in others, they had higher levels of educational qualifications including university education.

B. Future Communication

Consumers

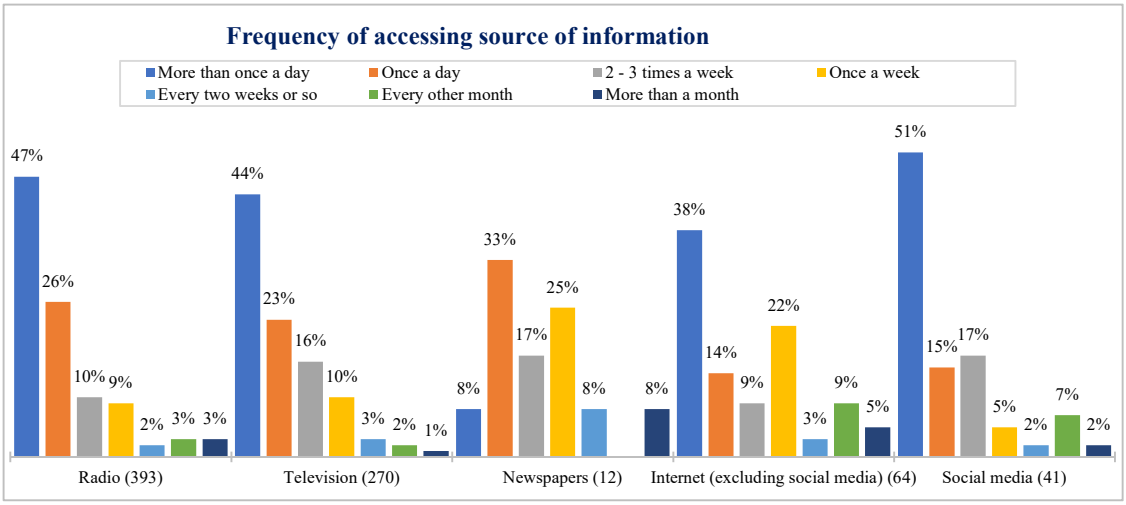
Consumers mainly accessed information about nutrition and food items from the radio and television among other sources as shown below. These would be the most appropriate channels to reach them on issues of interest.

Figure 118: Consumers- Source of information



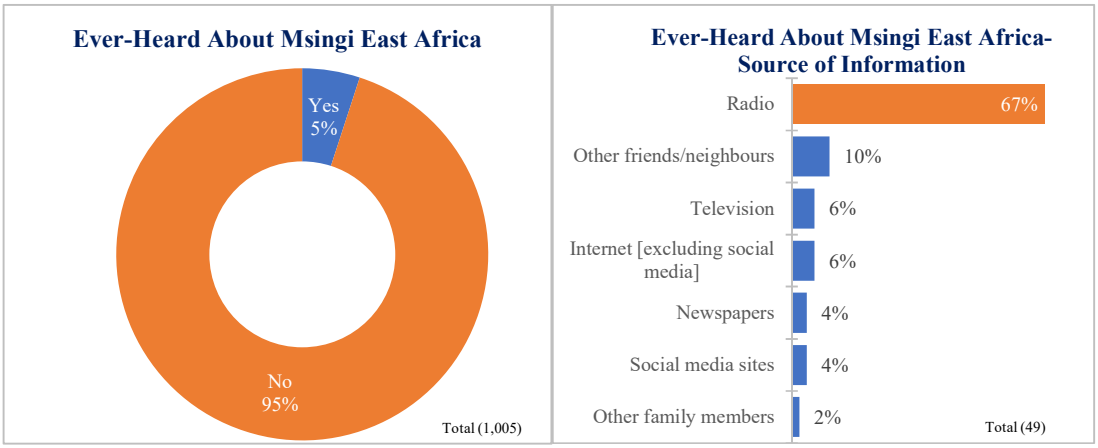
Further, consumers accessed these main sources of information largely more than once a day as shown below.

Figure 119: Consumers- Frequency of accessing sources of information



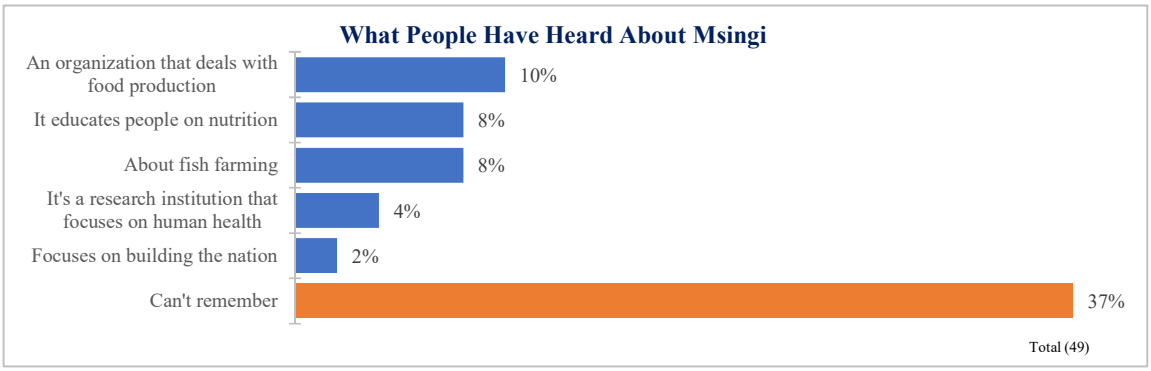
It was observed that only a small proportion of consumers (5%) had heard about Msingi East Africa prior to the study's implementation, mainly through the radio (67%).

Figure 120: Consumers- Ever heard about Msingi in the past?



A significant proportion of those that had heard about Msingi in the past could not remember the information they heard about Msingi. Those that could remember associated Msingi with food production, nutrition and fish farming among others as shown below.

Figure 121: Consumers- What people have heard about Msingi



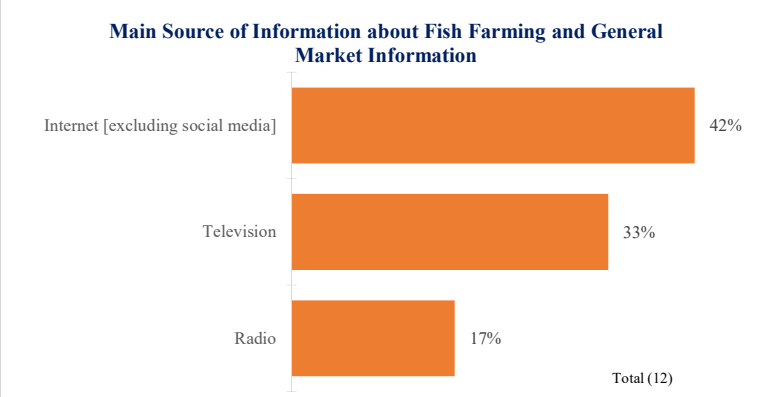
Market Players

Fish Farmers

Fish farmers indicated that their main source of information about fish farming and other general market information was through the internet (excluding social media) (42%), television (33%) and radio (17%) as shown below. These are therefore channels that can be utilized in future communication. Farmers accessed the internet mainly once a day, though few also mentioned accessing it more than once a day, once a week or 2 to 3 times a week. Additionally, farmers were accessing the television mainly more than once a day, though few indicated accessing it either once a day or 2 to 3 times a week. For

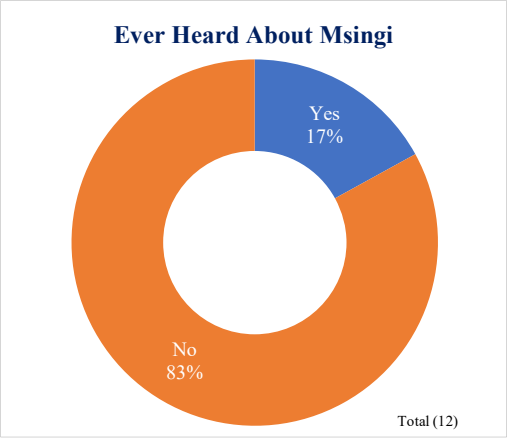
those accessing the radio on the other hand, they were mainly either accessing it once a week or every 2 weeks.

Figure 122: Fish farmers- Main source of information



Additionally, it was established that a significant proportion of farmers interviewed (83%) had not heard about Msingi East Africa before the study was implemented as shown below. Those who indicated they had heard about Msingi East Africa prior to the study (2 farmers), indicated that they had heard about it through the radio, television, newspapers or from the internet (excluding social media).

Figure 123: Fish Farmers- Awareness of Msingi



Further, it was noted that farmers had heard that Msingi supports farmers with funds, deals with fish farming, offers training, and encourages farmers to join cooperatives in equal proportions.

Storage and Transportation Businesses

It was observed that managers of storage and transportation companies utilized various sources of information to keep abreast of the industry's developments. Some of the channels mentioned which would be useful for targeting this group in programmatic work included main stream media (television, radio and newspapers), the internet, phone messaging services (SMS for subscribed services), word of mouth and networking with various players in the value chain. Further, it was noted that that the formal channels of communication were accessed daily by this group. It was noted that none of the players interviewed had heard about Msingi prior to the study's implementation.

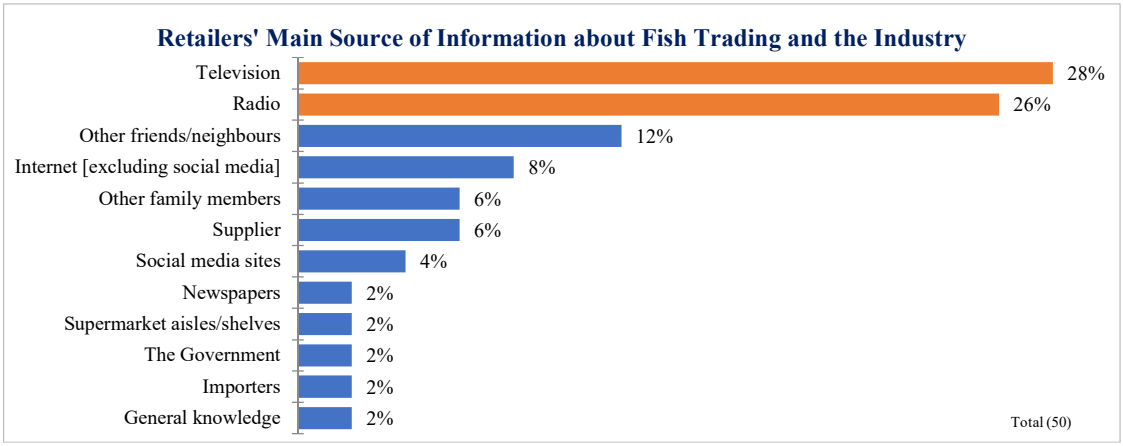
Processors

Processors mainly accessed information about fish processing and general market information from the television and the internet (excluding social media). All processors indicated that they accessed these channels more than once in a day. It was further noted that none of the processors had heard about Msingi East Africa before the data collection period.

Fish Retailers

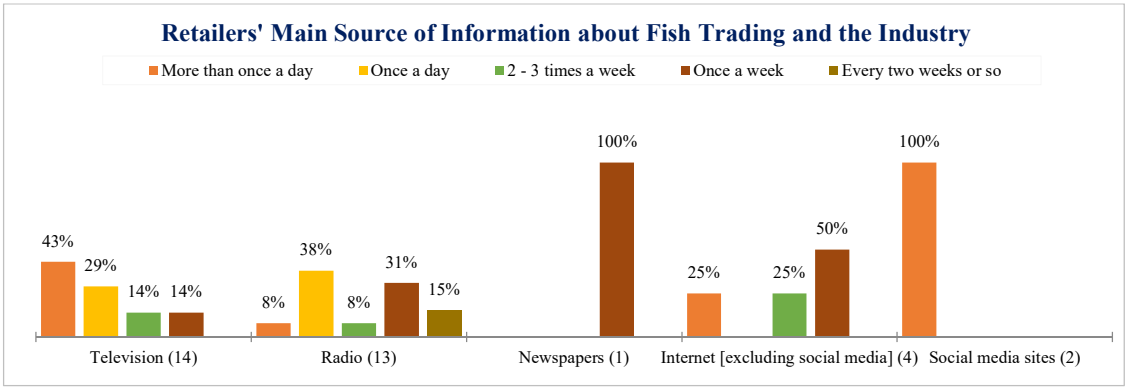
Fish retailers indicated that their main sources of information about fish trading and other general market information was largely through the television (28%) and the radio (26%) among other channels as shown below. These would therefore be viable channels to utilize to reach this category of players in the value chain.

Figure 124: Retailers- Main source of information



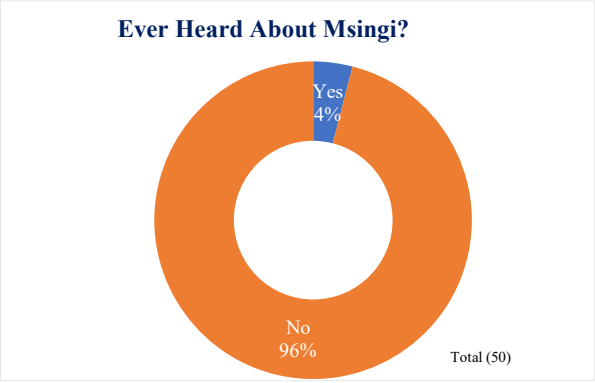
Additionally, fish retailers indicated that they largely accessed these main channels of communication (television and radio) at least once a day as shown below.

Figure 125: Retailers- Frequency of accessing main source of information



Lastly, it was observed that most fish retailers (96%) had not heard about Msingi East Africa prior to the study's implementation. The few that had heard about the organization (4% or 2 retailers) heard about it from the radio and the television and indicated that the organization deals with fish.

Figure 126: Retailers- Awareness of Msingi



Cooperatives

It was observed that most cooperative administrators accessed relevant information from the internet, social media sites and through word of mouth. Additionally, it was noted that the more organized groups were also part of relevant forums, such as Farm Africa and the World Aquaculture Society where they accessed information on industry trends. These would therefore be relevant channels to utilize in future program work targeting this group. It was noted that none of the players interviewed had heard about Msingi prior to the study's implementation.

3.2 Focus on Uganda

Lying astride the equator, Uganda is a landlocked country endowed with plentiful freshwater resources...[with] 18% [of the country] being … covered by water, including major and minor lakes, rivers, swamps, dams, valley tanks, and fish ponds[15]. Fish and fish products are reported to be Uganda's second largest export after agricultural products.[16] Fish in Uganda is important for food security…[17]. This section of the report provides insights on the fish industry in Uganda.

3.2.1 Summary of Findings

Key Findings in Uganda

Size of fish consumption and potential demand

- The current market for fish consumption (current and potential consumption) is estimated at 245,998mt.
- Fish is currently consumed by 85% of the households interviewed Uganda. High pricing and unavailability are some of the main barriers to fish consumption in Uganda.
- Whilst fish is consumed by a significantly high number of households, a significant proportion (38%) consider plant proteins as the most important source of protein for the household, followed closely by fish (32%).
- This notwithstanding, fish is considered as the most favourite type of meat (by 34% households consuming meat) followed closely by beef (25%). Pricing and availability are some of the key factors considered by households when choosing meat types to consume.
- Fish consumers in Uganda are mainly purchasing and consuming Tilapia and, Nile Perch fish varieties. Most consumers are also purchasing the Silver Cyprinid (*Dagaa/Mukene/Omena)* (54%), dried fish (53%) and fresh fish forms (49%) for consumption.
- Subsequently, only 34% of households interviewed have access to electricity, with even smaller proportions (5% or less) having access to storage equipment,

[15] http://www.fao.org/docrep/006/AD146E/AD146E01.htm
[16] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.566.9711&rep=rep1&type=pdf
[17] http://www.ugandainvest.com/uia2.php?uhpl=fish&&uhpl1=Fish. Accessed May2010

which influences fish forms purchased. Consequently, over 70% of different fish forms is purchased and consumed within the same day.

- Fish-consuming households purchase and consume an average of 3.4kgs of fish in a month, with consumption observed to be similar in urban and rural areas. Different households, however, tend to purchase and consume more or less of different types and forms of fish. Consumption is, therefore, not linear/the same across households. Consumption of prawns/other sea foods, fresh fish and frozen fish/fillet was for instance observed to be higher than other fish forms.
- Households tend to spend an average of UGX. 32,774 (an equivalent of about USD.9) in a month on fish and fish products, with some variations being observed across the regions and monthly household income bands.
- Small proportions of households (28%) are also consuming fish outside the household, with almost equal proportions between urban and rural settings.
- Most consumers believe that the fish they purchase and consume is wild fish from local sources. Interestingly, however, only small proportions perceive they can tell the difference between wild fish and farmed fish (21%) or between local and imported (8%). When prompted to do so through a fish tasting exercise, however, almost all (99%) could perceive there were differences in the wild, farmed and imported fish samples presented. To most consumers, however, it does not matter whether fish is farmed, wild, local or imported, because most of them believe all fish is the same.
- Key concerns for fish consumers include the fact that it is highly perishable and could get spoilt, and the handling of fish during purchase as it could be a source of food-borne diseases.

Fish production, processing and route to market

Fish Farming

- Most fish farmers interviewed are keeping Tilapia and Catfish species, largely because of availability of fingerlings, high demand in the market and better return in investment.
- Fish farmers are sourcing fingerlings largely from local sources (from fellow farmers and from the lakes among other sources), with a significant proportion (32%) owning a hatchery for at least 6 months.
- Farmers purchase an average of about 11,404 fingerlings of the Tilapia species and 90 fingerlings of the Catfish species per batch/lot for production. An average of 3,297kgs and 25kgs are harvested from Tilapia and Catfish respectively.
- From the total harvests made by farmers, an average of 2,994kgs are sold from the Tilapia species while none is sold from Catfish. An average cost of production

of about UGX. 352,559 (equivalent to USD.95) and UGX. 854,184 (equivalent to USD.231) is incurred for rearing each batch/lot of Tilapia and Catfish species. Factors driving the cost of production include the cost of quality feeds and the cost of fingerlings among others.

- Key challenges faced by fish farmers include the cost of farming inputs and shortage of quality feeds among others. The main challenges faced when accessing fingerlings include high prices, delays in receiving fingerlings and quality control issues among others. Most farmers are not aware about the effects of Chinese fish in the fish industry in Uganda. The few that are aware indicate that there is now more Chinese fish in the market than local fish, and that these are available at cheaper prices.
- Critical factors noted by farmers that are needed for succeeding in fish farming include availability of enough capital to run the businesses, availability of water and training of fish farming skills among others.
- Most farmers intend to construct new ponds in the future, increase their production capacities as well as increase the varieties bred among other initiatives. Key training needs include latest technologies in fish production, marketing skills and fish disease prevention, control and treatment among others.

Fish processing

- Interviewed fish processors mainly process Tilapia and Nile Perch fish varieties, which is largely wild catch and sourced locally.
- Fish is largely received in the fresh, chilled and/or frozen form for processing, and is largely processed into special cuts/fillet, frozen and packed or prepared into fish frames for sale.
- Processors indicate that they process an average of 6kgs of Tilapia and 60kgs of Nile Perch. This information, however, appears low or inaccurate, which could be attributed to fear of disclosing this information, or poor record keeping among other reasons. Further, processors indicate they sell an average of between 250kgs and 330,000 of Nile Perch but decline to provide information on Tilapia.
- Processors are currently over-utilizing their storage capacities, as the maximum daily capacity (an average of between 150kgs and 300,000kgs) is higher than the daily optimal capacity (an average of between 150kgs and 200,000kgs).
- Key challenges faced by processors include the high cost of running the businesses, low fish supplies to meet demand and poor handling of fish stocks by suppliers resulting in losses. Processors tend to cope with these challenges by improving customer service to improve profits from the business.
- To support business growth, processors have invested in training/innovations on quality control issues, maintaining hygiene standards and waste management in

the past. They desire to learn more about quality control processes, latest technologies in fish production, marketing and pricing procedures among others.

Storage and transportation

- Storage and transportation businesses mainly handle wild catch fish, specifically the Nile Perch species, which is transported or stored in the processed or unprocessed form.
- The demand for these services is perceived to have generally remained the same, or decreased in the past 2 years. Main customers for storage and transportation services largely comprise of processing firms and individuals in the communities. These are largely sourced locally and internationally- largely from Kenya, Rwanda, Burundi, Sudan and other European markets such as Britain.
- The more established entities tend to have access to modern storage equipment, while less established entities are largely improvising storage equipment by for instance using containers filled with ice.
- Key challenges faced by storage and transportation businesses include illegal fishing and seasonal/climatic changes, which affect supply, loss of fish stocks due to factors such as power outages, delays in transit, and lack of adequate storage equipment, lengthy, costly and time-consuming processes of acquiring necessary permits, and insecurity, especially during transit.
- Key recommendations made by this group include: support from the government in purchasing ideal nets to address the issue of illegal fishing and subsequently manage supply hiccups, support in accessing specialized trucks and adequate storage equipment, extension of access to electricity in areas not connected to the grid, as well as support in accessing more ice-making machines closer to landing sites.

Fish retailers

- Fish retailers in Uganda largely stock wild catch fish varieties obtained locally, with main varieties kept including Tilapia and Nile Perch among other species.
- The size, pricing and quality of the fish are some of the key factors retailers consider when making purchases of fish stocks.
- On average, retailers procure about 223kgs of Tilapia and 495 of Nile Perch fish varieties in a month, and sell an average of 177kgs and 424kgs of the same species respectively, which denotes a degree of loss in fish stocks experienced.
- Retailers mainly sell fish in the dried, live/fresh or cooked/ready for consumption states, and their main customers are individuals in the communities. Retailers largely market their businesses through word of mouth, ensuring stocks are of high quality and through offering discounts.

- Retailers perceive that the business environment has largely improved in the last 2 years, mainly because the businesses have been profitable.
- Key challenges faced by retailers include stiff competition and losses of fish stocks due to spoilage- 51% of the interviewed retailer indicated they do not have access to storage equipment. Additionally, majority of fish retailers are not trading in Chinese fish (97%). The few that are trading in Chinese fish indicated that there is low demand for local fish and the pricing of fish has changed (prices are now cheaper).
- Retailers are largely optimistic that the business environment will improve, and, most retailers therefore intend to open new outlets, hire more staff and improve sales-related services.
- Retailers are interested in learning more about pricing policies, quality requirements for fish products and competition/marketing pricing among other areas. To grow the industry, retailers largely recommend for provision of affordable credit to those willing to venture into the business. Critical factors needed for success in this line of business include enough capital and maintaining good business practices/financial discipline among others.

Fish price analysis

- Fish farmers sell a kg of the different species kept an average price of between UGX. 7,000 to UGX. 11,000 (equivalent to USD.2 to USD.3) From the average sales made from each batch/lot, farmers tend to make a mark-up/profit of about UGX. 792,150 to UGX. 24,330,000 (equivalent to about USD.222 to USD. 6,812) from different species reared per batch/lot, with some being more profitable (such as Tilapia), than others.
- Fish processors tend to sell a kg of products from the different species for an average of between UGX. 18,500 to UGX. 28,000 (equivalent to about USD.5 to USD.8) per kg when the pricing is at its highest and between UGX. 13,750 to UGX. 24,000 (equivalent to about USD. 4 to USD.7) per kg when the pricing is at its lowest. As indicated previously, processors were unwilling to share information on the average amounts sold, and from the information shared, one can deduce that processors make about UGX.3B (equivalent to about USD. 855,000) per month from processing and selling products from the Nile Perch variety when the pricing of products is highest, and about UGX.2B (equivalent to about USD. 635,000) per month when the pricing of products is lowest.
- Fish retailers procure different fish varieties for sale at an average price of between UGX. 4,000 to UGX. 11,600 (equivalent to about USD.1 to USD.3) per kg. They then re-sell at an average of between UGX. 5,600 to UGX. 16,000 (equivalent to about USD.2 to USD.5) per kg, making an average of about

UGX.700 to about UGX. 4,900 (equivalent to about USD.1 or less) from each kg sold.

Market organization/cooperatives and associations

- Most fish farmers (89%) in Uganda are not members of any cooperative or association. The 11% of farmers who are members pay a subscription fee of about UGX. 22,500 (equivalent to about USD.6) for each round paid, which tends to last for about 1 to 3 years. Some of the membership benefits accrued include: linkages to markets, access to credit and provision of business advice. Recommendations made by members for cooperatives/associations to consider include: encouraging cooperation among members, for the management to get more involved in the fish farming activities and for the membership fee to be renewable annually to sustain the associations' operations
- Few of the storage and transportation businesses interviewed (2 out of 5) are members of a cooperative or an association, which require membership subscription of about UGX. 5,000 to UGX. 10,000 (equivalent to about USD.2 to USD.3), and which is largely renewable annually. Some of the membership benefits accrued include access to loan facilities, health insurance for members as well as access to equipment and farming inputs at subsidized prices. A recommendation made by members is for cooperatives/associations' management to increase the level of engagement with members to keep everyone informed.
- The two processors interviewed are members of an association. A membership subscription fee ranging between UGX. 50,000 to UGX. 120,000 (equivalent to about USD.14 to USD.34) is payable, an indication that there could be different levels of membership in the same association. The membership subscription is payable annually for each round paid. Benefits accrued include the association being a source of good quality fish feeds, sourcing for markets for the members' products, assistance in resource management and regulation of production capacities. The processors recommended that the association should do more lobbying on areas of interest for the members to benefit and grow in their business ventures.
- Most retailers (89%) are not members of any cooperative or association. The small proportion that is part of a cooperative or association (11%) largely pay a membership subscription of about UGX. 46,917 (equivalent to about USD.13), which is renewable after 6 months to 1 year. Some of the membership benefits accrued include the cooperative/association being a source of credit, linkages to markets for retailers' products, source of quality fish stocks, discounted prices on products and being a savings option for members. Recommendations made by

members for improving the operations of cooperatives/associations include: actively lobbying for funding for managing the cooperatives/associations' affairs, efficient management of loans provided, increasing of the borrowing limits for members and lowering membership subscription fees among others.

- Cooperatives' structure in Uganda tend to vary. The more established cooperatives have membership bases as high as 315 members, while the less established ones have as few as 22 members. Some only focus on one group of players, such as fish farmers, while others comprise of fish farmers, traders, fishermen, and general farmers. Cooperatives tend to rely on membership subscriptions to run their affairs, where fees range from UGX. 2,000 (equivalent to about USD.1) for weekly contributions, while others make annual subscriptions of about UGX. 30,000 (equivalent to about USD.8). Benefits accrued by members include access to affordable credit, fish fingerlings at affordable prices, educational forums, assistance in the acquisition of required permits when setting up businesses, as well as providing savings' options for members. Key challenges faced by cooperatives include general suspicion about the running of cooperatives/associations which hindered membership growth, delays in payment of loans advanced, which affected cash flow, difficult requirements for members to comply with when setting up businesses, low return on investment for members and high cost of running the businesses, and lack of skilled labour for utilization by members. Recommendations made by cooperatives/associations include setting up of more hatcheries by the government, regulation of production of fish fingerlings by the government to guarantee quality, education of the general public on the nutritional value of fish to drive demand, as well as support of various players in the value-chain by the government to access required equipment to run their businesses.

Policy and trade regulations

- The fishing industry in Uganda is regulated by the Fish Act (Ch 197). Though there exists various policies and guidelines regulating the industry, there seems to be gaps in the level of awareness among players in the value-chain.
- Fish farmers perceive that to operate in this line of business in Uganda, one largely needs approval from the Fisheries Department, licencing form the local government and availability of capital among other requirements. A few (26%) are not aware of any requirement needed. The most difficult requirements for farmers include the approval from the Fisheries department and the licencing from the local government, as both involve lengthy processes and are costly.

- Fish processors on the other hand perceive that to operate as a processor in Uganda, staff in the processing factory need to have a medical health certification, which is renewable after a period to between 6 months to 1 year.
- Fish retailers perceive that they largely need to have capital, equipment, a business licence, health certification and a good business location to operate as a fish retailer in Uganda. The most difficult requirements to comply with include availability of capital, health certification and acquiring a business licence, as these are costly, involve lengthy processes and one can't run the business without them.

Future communication

- Consumers and potential fish consumers can be reached largely through the radio and television as these are the main channels of information about food and general nutrition. Consumers access these channels mainly on a daily basis. Only a small proportion (1%) has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Fish farmers can be reached through the radio as this is their main channel of relevant information on the fish industry. They largely access this channel once a week. None of the farmers has heard about Msingi in the past.
- Storage and transportation businesses can be reached through the internet (excluding social media) and the radio, as this is the main channel used to access relevant information in addition to other informal channels. None has heard about Msingi in the past.
- Processors can be reached through the internet (excluding social media), as they access this channel daily for relevant information. None has heard about Msingi in the past.
- Fish retailers can be reached largely through the television and the radio in addition to other informal channels of communication. They largely access these channels on a daily basis. Only 4% of the retailers has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Cooperatives' administrators can be reached through the radio, the internet and through newspapers among other channels of communication. None has heard about Msingi in the past.

3.2.2 The Size of Consumption and Potential Demand

This sub-section of the report provides insights into Uganda's estimated fish market size, consumer preferences and insights into fish non-consumption in Uganda.

A. Estimated Market Size

The estimated current size of the market for fish is 214,676 tonnes of fish in a year for Uganda- including Silver Cyprinid *(Dagaa/Mukene/Omena)* as discussed further below. The size of the under-served market (past consumers who would be willing to continue consuming) on the other hand is estimated at 26,559 tonnes, while the size of the un-served market (potential consumers) is estimated at 4,763 tonnes as shown below. The total size of the fish market in Uganda (current and potential) is therefore estimated at 245,998 tonnes as shown below.

Table 63: Estimated market size for fish per annum

Size of the market in metric tonnes (mt)	Uganda
Current consumption	214,676
Under-served (past consumers, willing to continue)	26,559
Un-served (never consumed, but would consume)	4,763
Total fish market size (current +potential)	245,998

These figures have been computed based on average consumption figures per month projected against the total population in the country. The assumption that has been made in computing the annual market size is that consumption is linear (where each household consumes the same amount of fish on average); which might not be the case. However, this provides a good proxy estimate and provides an insight on the size of the market.

As indicated above, the estimated size of the fish market in Uganda includes *Dagaa/Mukene/Omena.* When the *Dagaa/Mukene/Omena* is excluded from the computation, the estimated size of fish in Uganda is an average of 119,921 tonnes per annum, while the size of *Dagaa/Mukene/Omena* is estimated at 94,755 tonnes per annum as shown below.

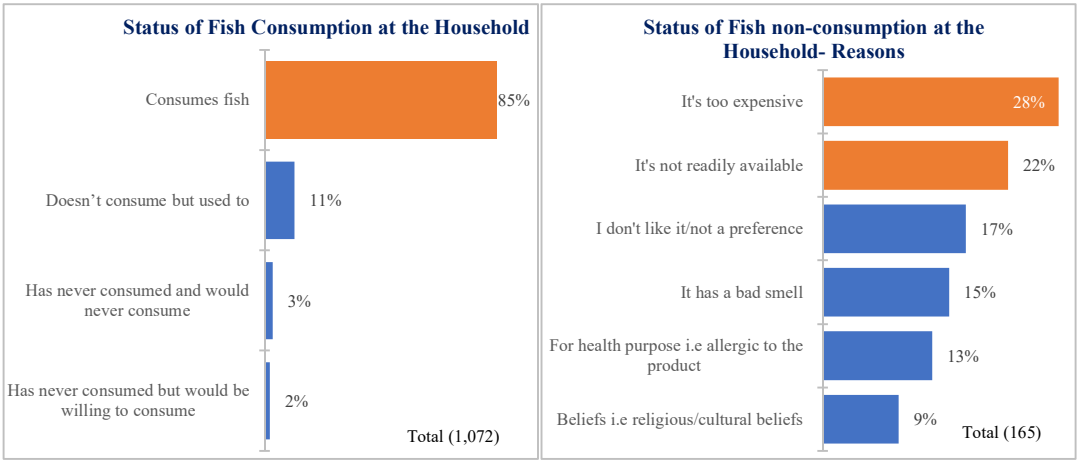
Table 64: Estimated market size for fish per annum- Region

Estimated market size for fish in tonnes						
	Total (1,072)	Central (259)	Eastern (220)	Kampala (127)	Northern (186)	Western (280)
Beef	16,338,519	1,012,529	3,671,003	4,086,496	5,090,077	2,478,414
Chicken	12,308,282	1,273,400	4,327,533	3,688,588	1,682,523	1,336,238
Fish - Overall including Silver Cyprinid (*Dagaa/Mukene/Omena*)	214,676	42,017	62,058	15,526	52,441	42,634
Fish - Excluding Silver Cyprinid (*Dagaa/Mukene/Omena*)	119,921	29,808	26,787	12,669	17,937	32,721
Fish- Silver Cyprinid (*Dagaa/Mukene/Omena*)	94,755	12,209	35,271	2,858	34,504	9,913

B. Fish Non-Consumption

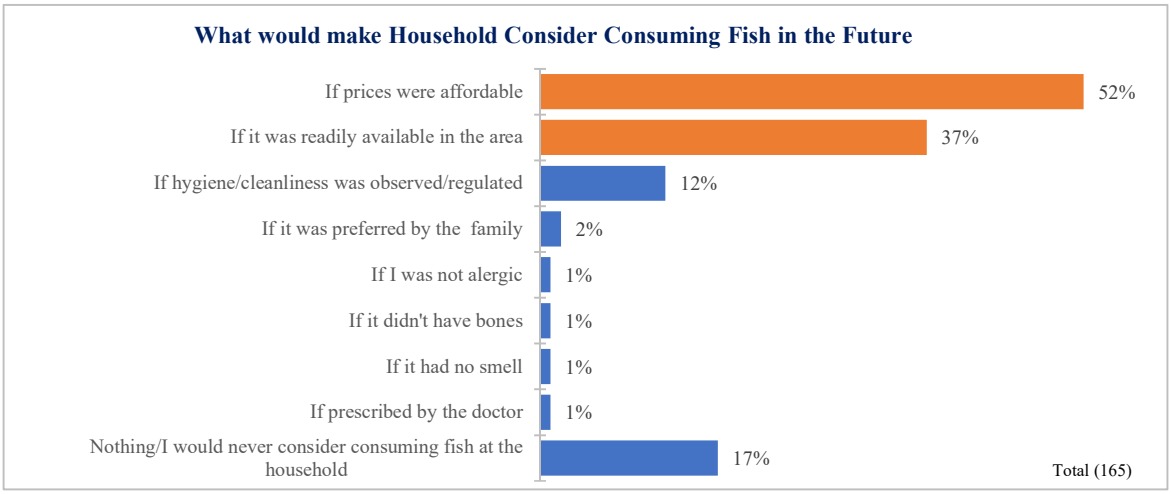
As observed in previous sections, a large proportion of households indicated they currently consumed fish (85%). Small proportions, however, indicated that they did not consume fish with the main barriers of consumption cited largely as being price (fish was considered to be too expensive) and availability of fish as shown below.

Figure 127: Status of fish consumption at the household



Consequently, for households that were not consuming fish, some of the key factors that would encourage consumption include affordability and availability as shown below.

Figure 128: Factors that would encourage fish consumption in households not consuming fish



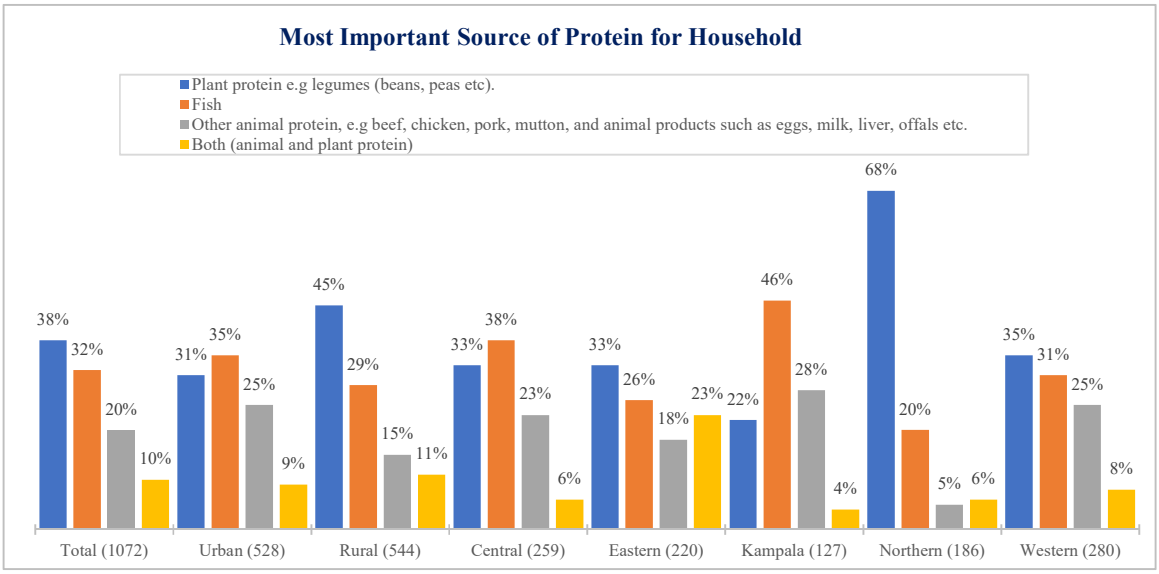
C. Consumer Preferences

This section of the report provides insights on the type of proteins consumed by households, favourite types of meats for the households, fish consumption trends and varieties purchased, frequency of purchase, preferences of wild vs. farmed species, local vs. imported species and concerns consumers have when making fish purchases.

Type of Protein Consumed at the Household

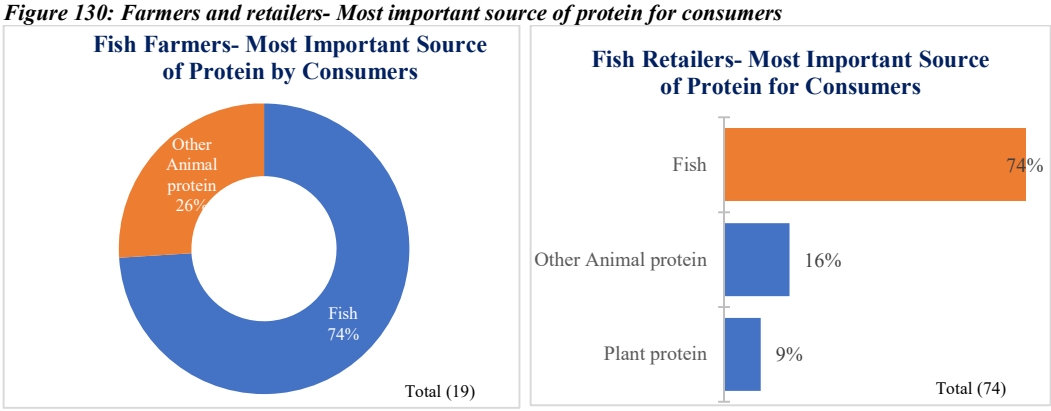
From the primary research findings, plant proteins were generally considered as the most important sources of proteins, especially in the rural setting (45%), more so in the Northern region (68%). Fish followed closely with 32% considering it as the most important source of protein for the household, more so in the urban areas (35%), especially in Kampala (46%) and Central (38%) regions of Uganda as shown in the figure below. A small proportion (20%) considered animal proteins as being most important for the household with an even smaller proportion (10%) considering both plant and animal proteins.

Figure 129: Consumers- Most important source of protein for household



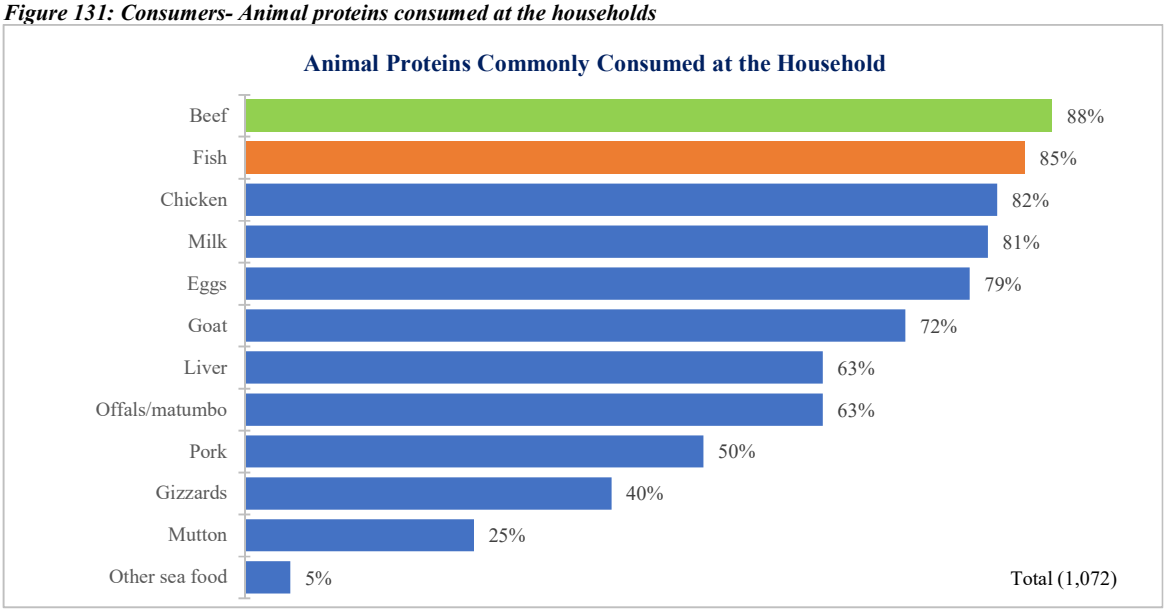
A disconnect was however observed when the same question was posed to fish farmers and fish retailers. As shown below, both groups perceived that the most important source of protein for consumers was fish (74% respectively), most likely because this was their main area of focus. A slightly higher proportion of farmers (26%) however also perceived that consumers mainly preferred other animal proteins as shown below.

Figure 130: Farmers and retailers- Most important source of protein for consumers



Further, a large proportion of consumers reported that they commonly consumed beef (88%) and fish (85%) at the households among other animal proteins as shown below.

Figure 131: Consumers- Animal proteins consumed at the households



Information from secondary sources indicate that fish is consumed on a large scale in the cities (e.g. Kampala), the Northern and North-Western districts, especially among people residing in districts bordering Lakes Victoria, Kyoga, Edward, George and Albert.[18] As shown below, fish consumption was seen to be evenly distributed, with Eastern, Central and Northern regions having higher consumption patterns and the Western region having a slightly lower proportion of consumption than other regions.

Figure 132: Consumers- Animal proteins consumed at the households- Region

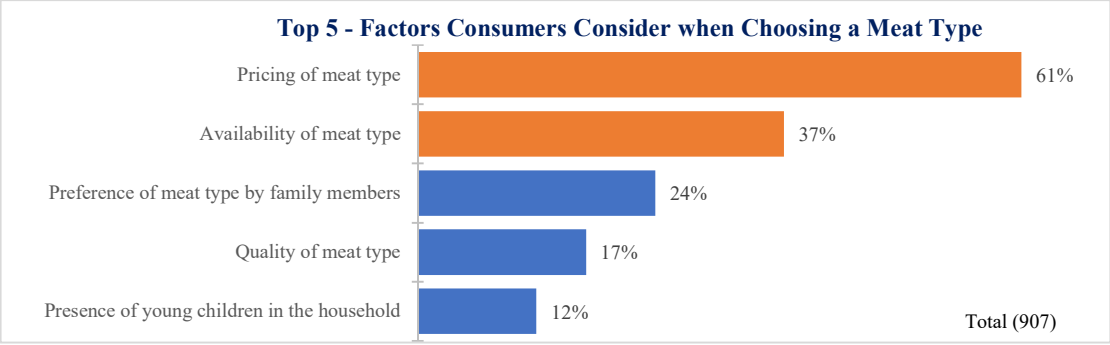
Animal proteins consumed in the household								
	Total (1,072)	Urban (528)	Rural (544)	Central (259)	Eastern (220)	Kampala (127)	Northern (186)	Western (280)
Beef	88%	90%	86%	90%	88%	90%	77%	91%
Fish	85%	87%	83%	90%	90%	80%	89%	75%
Chicken	82%	86%	78%	86%	84%	87%	75%	78%
Milk	81%	85%	77%	88%	80%	94%	61%	82%
Eggs	79%	83%	74%	88%	73%	92%	68%	76%
Goat	72%	73%	72%	64%	75%	61%	74%	82%
Liver	63%	67%	58%	71%	53%	57%	55%	69%
Offals/*matumbo*	63%	66%	60%	68%	57%	54%	60%	70%
Pork	50%	49%	50%	43%	50%	46%	49%	57%
Gizzards	40%	41%	39%	53%	36%	27%	42%	35%
Mutton	25%	23%	28%	17%	34%	12%	33%	28%
Other sea food	5%	3%	6%	2%	1%	2%	18%	2%
Others	-	1%	-	-	-	3%	-	-

[18] http://www.fao.org/docrep/t0685e/T0685E09.htm

Factors Influencing Consumer Choice for Type of Meat

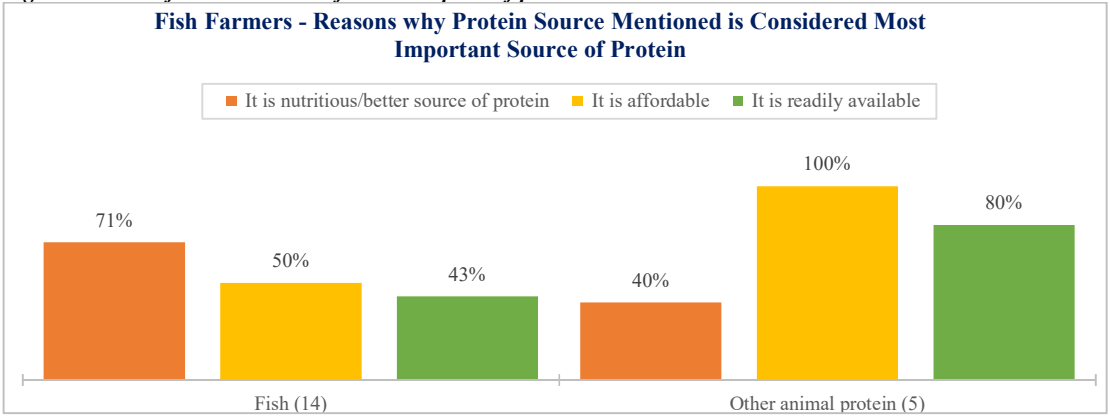
In choosing whether to purchase fish or other types of animal proteins, consumers make several considerations with the pricing of meat and availability of the meat being mentioned the most by consumers.

Figure 133: Factors consumer consider when choosing a meat type



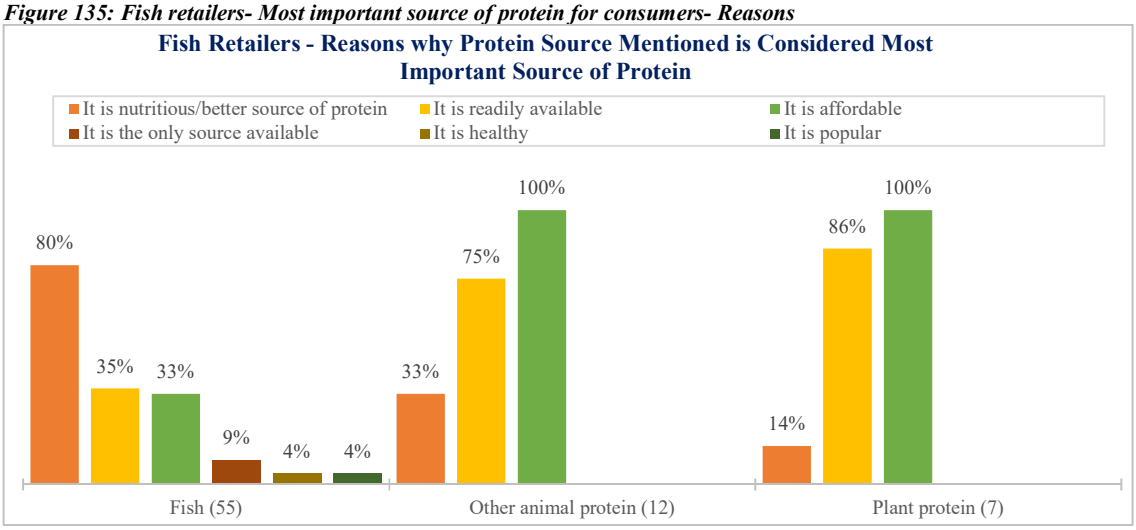
This information correlated with that obtained from the fish farmers, who mainly indicated that choices made by communities on the type of protein to consume were largely driven by affordability, availability and the nutrition status of the source of protein as shown below.

Figure 134: Fish farmers- Reasons for consumption of protein in household



Additionally, the fish retailers also largely cited the same reasons for choices made by communities on sources of proteins consumed in the households as shown below.

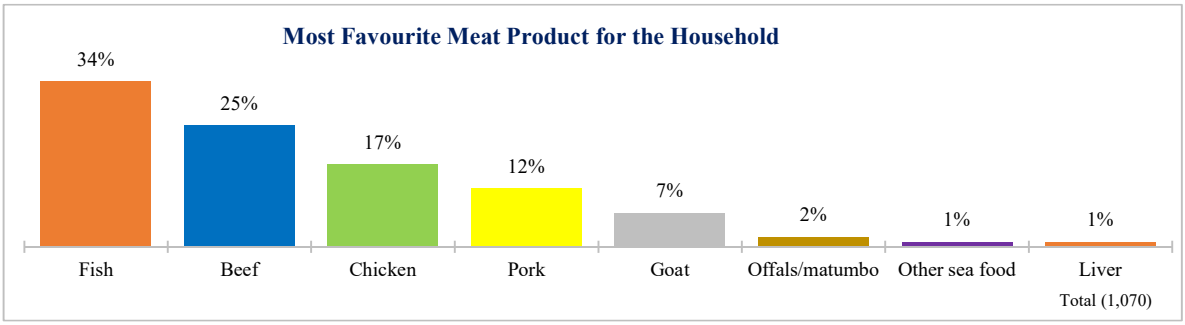
Figure 135: Fish retailers- Most important source of protein for consumers- Reasons



Favourite Types of Meat for the Household

If was observed that fish was the most favourite type of meat for household among other meat types as shown below.

Figure 136: Most favourite type of meat for household



Regional variations were however observed where for instance beef was more favoured in the Western region over fish as shown below.

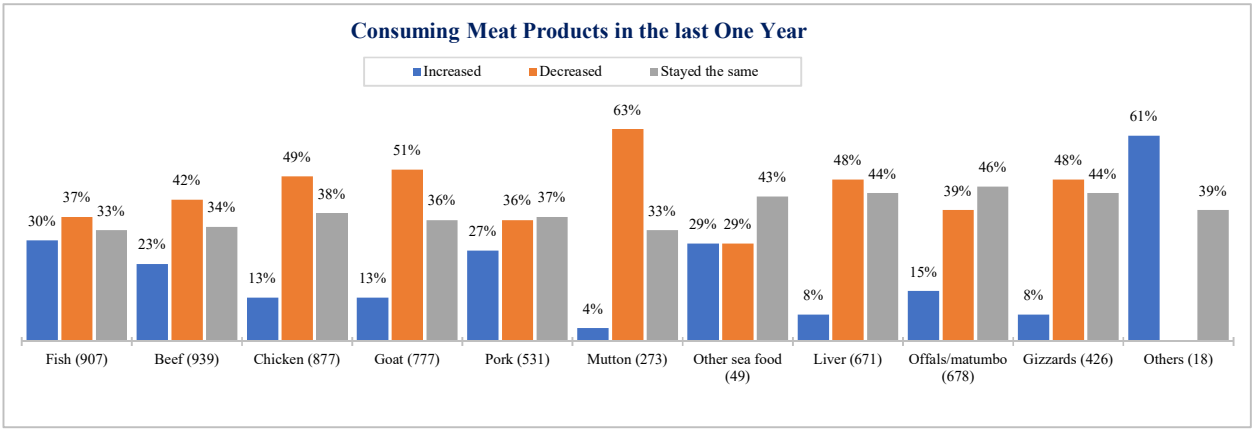
Table 65: Most favourite type of meat for household- Region

Most favorite types of meat for household						
	Total (1,070)	Central (259)	Eastern (219)	Kampala (127)	Northern (186)	Western (279)
Fish	34%	30%	37%	42%	46%	26%
Beef	25%	28%	22%	25%	15%	30%
Chicken	17%	22%	17%	13%	13%	17%
Pork	12%	11%	12%	12%	9%	15%
Goat	7%	2%	9%	2%	10%	11%
Offals/*matumbo*	2%	3%	1%	2%	3%	1%
Other sea food	1%	-	-	-	5%	-
Liver	1%	2%	1%	2%	1%	-
Milk	-	-	-	1%	-	-
Eggs	-	1%	-	-	-	-
Gizzards	-	1%	-	1%	-	-

Fish Consumption Trends

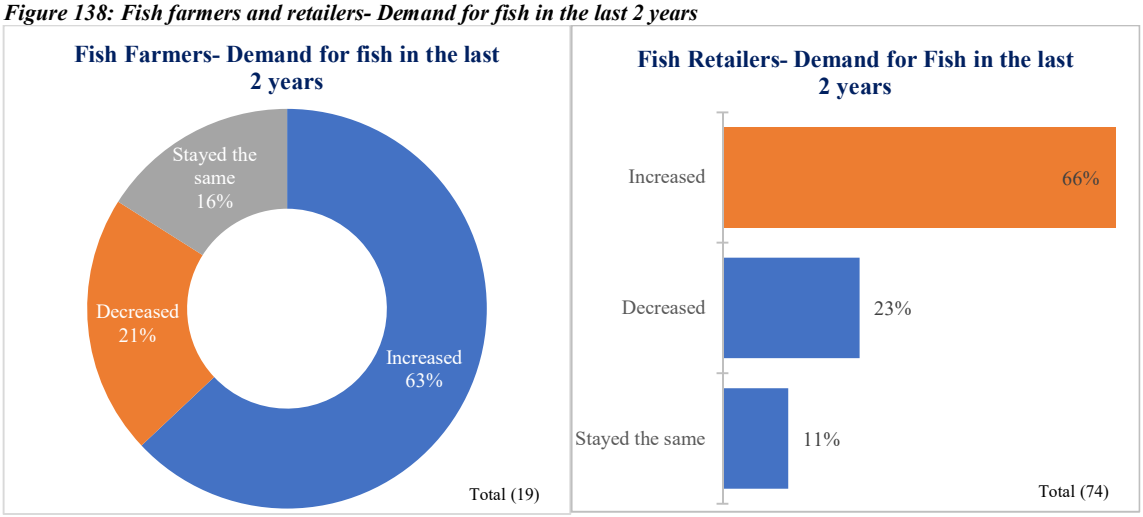
It was observed that consumption of meat in the last one year had largely decreased. Fish consumption for instance was reported to have decreased in the last one year by 37% of the households as shown below.

Figure 137: Consumers- Meat consumption patterns in the last 1 year



In contrast, fish farmers and fish retailers perceived that consumption of fish has largely increased in the last 2 years as shown below. Significant proportions however held the same views as consumers by observing that demand for fish had largely decreased.

Figure 138: Fish farmers and retailers- Demand for fish in the last 2 years

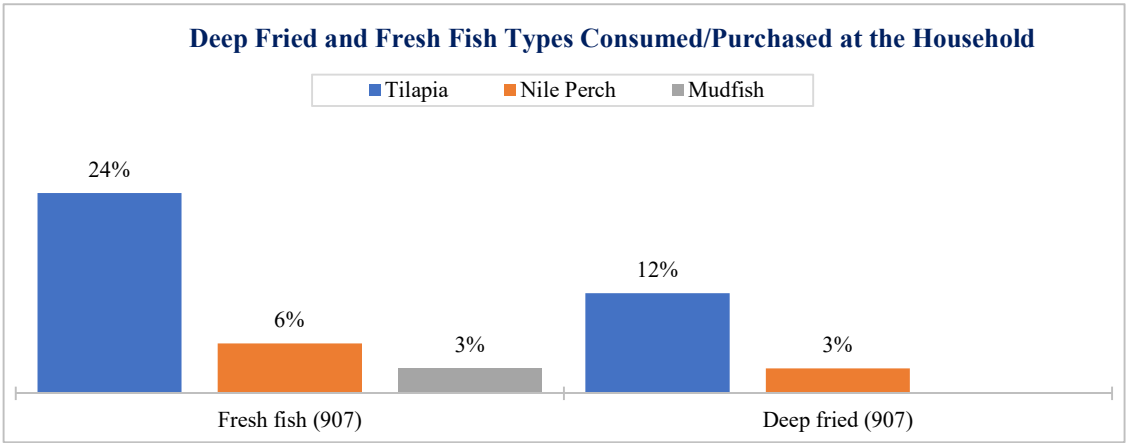


Fish Variety Purchased and Consumed at Home

Information from secondary sources indicate that different types of fish species flourish in different water sources in Uganda (wild versus farmed). Fish that are the target of most commercial and subsistence exploitation include species of *Lates* (Nile Perch),

Oreochromis (Nile Tilapia), the Herring-like *Alestes*, the Catfishes *Bagrus* and *Clarias*, *Hydrocynus* (Tiger Fish), the small Pelagic "sardine" *Rastrineobola, Protopterus* (Lungfish), and *Haplochromis*.[19] Fish consumers from the study implemented confirmed this information as the most commonly consumed varieties were Tilapia, Nile Perch and Mudfish as shown below. These were mainly purchased in the fresh or deep-fried form as shown below.

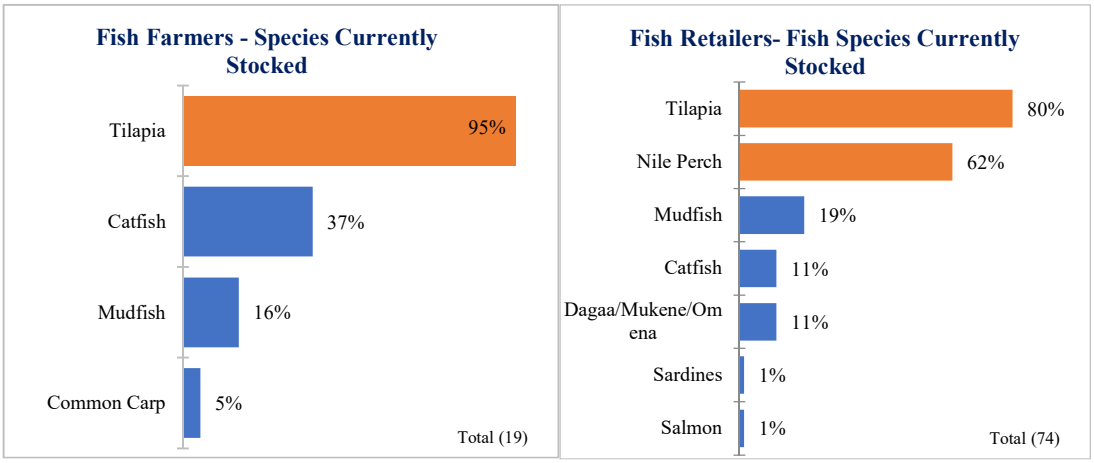
Figure 139: Consumers- Species of fish consumed



Further, a correlation was observed with fish farmers and fish retailers, where the mostly stocked species was Tilapia. Additionally, the fish retailers indicated that they were also stocking the Nile Perch variety as shown below.

[19] http://www.fao.org/docrep/006/AD146E/AD146E01.htm

Figure 140: Fish farmers and retailers- Fish species stocked



Fish farmers largely cited availability, high demand and affordability as some of the reasons they stocked the fish species as shown below.

Table 66: Fish farmers- Reasons for stocking species

Reasons for stocking species				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Readily available fingerlings	72%	71%	33%	100%
High demand in the market	67%	86%	-	-
Affordable to purchase	61%	86%	-	100%
Do well/provide better returns	50%	86%	33%	100%
Less prone to diseases	44%	57%	67%	-
Cost effective to maintain	28%	86%	100%	-
Grows faster than other species	6%	-	-	-

Fish retailers also cited availability and affordability as some of the reasons they mainly stocked the fish species, in addition to receiving better returns from the species and the species staying fresher for longer among others as shown below.

Table 67: Fish retailers- Reasons for stocking species

Reasons for stocking species						
	Tilapia (59)	Nile perch (46)	Mudfish (14)	Catfish (8)	Sardines (1)	Salmon (1)
Readily available	78%	89%	71%	63%	-	100%
Affordable to purchase	59%	52%	57%	50%	-	100%
Do well/provide better returns	56%	57%	43%	75%	100%	100%
Stay fresh longer	54%	41%	50%	75%	100%	-
I trust the source	49%	41%	29%	63%	-	-
Customers' preference	14%	11%	7%	13%	-	-
It is easy to manage	-	-	-	13%	-	-
Religious demands	2%	2%	-		-	-

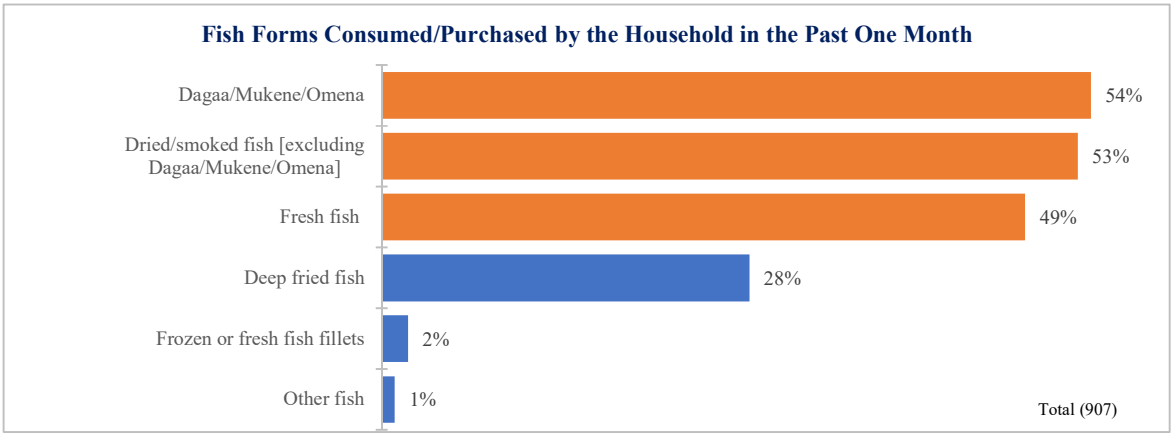
Form in Which Fish is Purchased

Information from secondary sources indicate that there is a variation in the forms that fish is mainly consumed in. Fresh fish consumption in Uganda has been estimated at

46% of total fish supply. This level may be even higher in the cities and the urban centres which are located near the major fish landing centres along Lake Victoria. The establishment of filleting plants in Uganda has resulted in a significant improvement in the quality of fresh fish supply and a resultant increase in the volume of fish distributed in the fresh state, even though the bulk of the fillets from the processing plants are exported to Europe…The popular cured fish in Uganda is smoked fish which constitutes about 40% of total fish supply. Demand for fermented and dried fish is low in Southern Uganda. In North Western Uganda, however, a lot of fermented fish is produced and consumed. Total fermented fish consumption in Uganda is estimated at about 15% of the total national fish supply. A greater proportion of the fermented fish produced is exported to Zaire and Southern Sudan where there are ready markets for the product. The most popular sun-dried partially fermented fish which is always available at the major markets is *Dagaa*...[20]

From the primary research phase, it was observed that a majority of consumers were largely purchasing and consuming *Dagaa/Mukene/Omena* (54%) and dried/smoked fish (53%) among other forms as show below. A significant proportion (49%) also mentioned purchasing and consuming fresh fish.

Figure 141: Consumers- Fish forms purchased and consumed in the households



[20] http://www.fao.org/docrep/t0685e/T0685E09.htm

Regional variations were observed where for instance *Dagaa/Mukene/Omena* was consumed largely in the Northern region while dried/smoked fish was largely consumed in the Western region. Additionally, fresh fish was largely consumed in Kampala as shown below.

Table 68: Consumers- Fish forms consumed by households- Region

Fish forms consumed/purchased by the household in the past one month								
	Total (907)	Urban (457)	Rural (450)	Central (233)	Eastern (197)	Kampala (102)	Northern (165)	Western (210)
Dagaa/Mukene/Omena	54%	52%	57%	60%	51%	52%	78%	34%
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	53%	52%	54%	39%	51%	48%	61%	68%
Fresh fish	49%	50%	47%	45%	51%	65%	35%	54%
Deep fried fish	28%	36%	21%	24%	18%	41%	19%	45%
Frozen or fresh fish fillets	2%	3%	1%	1%	1%	4%	2%	2%
Others	1%	1%	-	1%	1%	-	-	1%

Some variations were observed by levels of household income where for instance household earning a monthly income of between USD. 501- 750 reported that they consumed more of the fresh fish than the dried forms as shown below.

Table 69: Consumers- Fish forms consumed by households- Household income

Fish forms consumed/purchased by the household in the past one month							
	Total (907)	Below USD. 100 (589)	USD. 101 - 200 (194)	USD. 201 - 500 (74)	USD. 501 - 750 (8)	USD. 751 - 1000 (4)	Don't know/refused to answer (38)
Dagaa/Mukene/Omena	54%	54%	58%	57%	75%	50%	34%
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	53%	54%	55%	55%	62%	50%	32%
Fresh fish	49%	45%	55%	57%	88%	25%	55%
Deep fried fish	28%	26%	32%	32%	38%	50%	29%
Frozen or fresh fish fillets	2%	2%	2%	1%	-	-	3%
Others	1%	1%	-	3%	-	-	3%

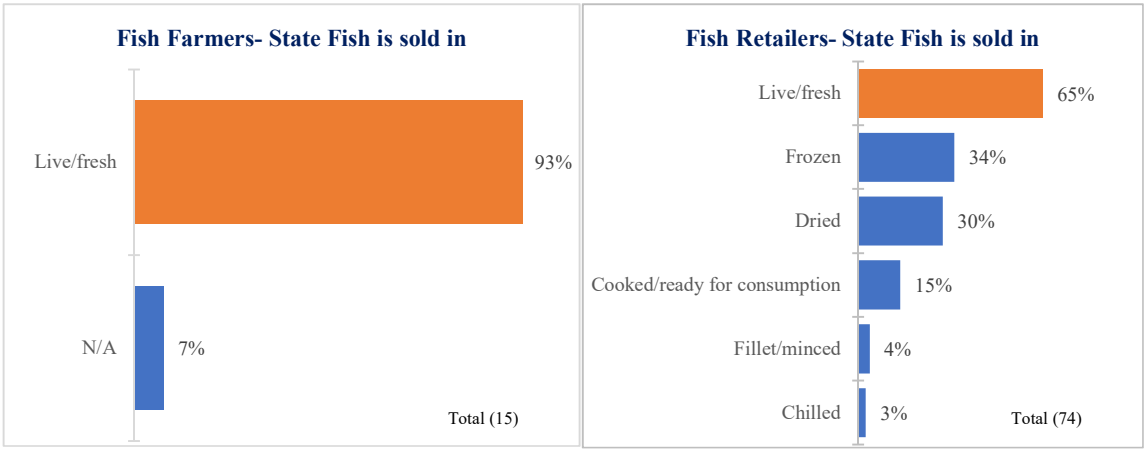
It was observed that consumers mainly preferred *Dagaa/Mukene/Omena* and dried/smoked fish because of their affordability and nutritional value, and largely preferred fresh fish because of its nutritional value. On the other hand, deep-fried fish was mainly preferred because of its readiness to cook, among other fish forms as shown below.

Table 70: Consumers- Reasons for preferring fish form

Reasons for preferring type/form of fish								
	Dagaa/ Mukene/ Omena (493)	Dried/smoked fish [excluding *Dagaa/ Mukene/Omena*] (483)	Fresh fish (441)	Deep fried fish (257)	Frozen or fresh fish fillets (16)	Prawns/ other sea food (3)	Tinned/ canned fish (2)	Others (6)
Cost effective/affordable	38%	20%	8%	6%	44%	100%	-	17%
Nutritious	30%	23%	41%	11%	6%	-	-	17%
Readily available	12%	17%	13%	16%	6%	-	-	-
Can be prepared quickly	5%	7%	4%	7%	-	-	-	-
Ready for cooking	4%	11%	7%	33%	19%	-	-	17%
Taste preferences/good taste	4%	13%	15%	17%	19%	-	50%	-
Good for health	3%	4%	3%	2%	-	-	-	-
Good for young children	2%	1%	3%	-	-	-	-	-
Has no bones	1%	1%	1%	2%	-	-	50%	-
Goes well with other foods i.e. millet	1%	-	-	-	-	-	-	-
I was brought up eating/habitual	-	1%	1%	-	-	-	-	-
Preferred by family	-	-	-	-	6%	-	-	-

Further, it was observed that fish farmers and fish retailers mainly sold fresh/live fish to their customers. As will be seen in later sections of this report, significant proportions (more than half) of farmers and retailers do not own any storage equipment and are therefore left with little choice of the state in which to present their products to their customers.

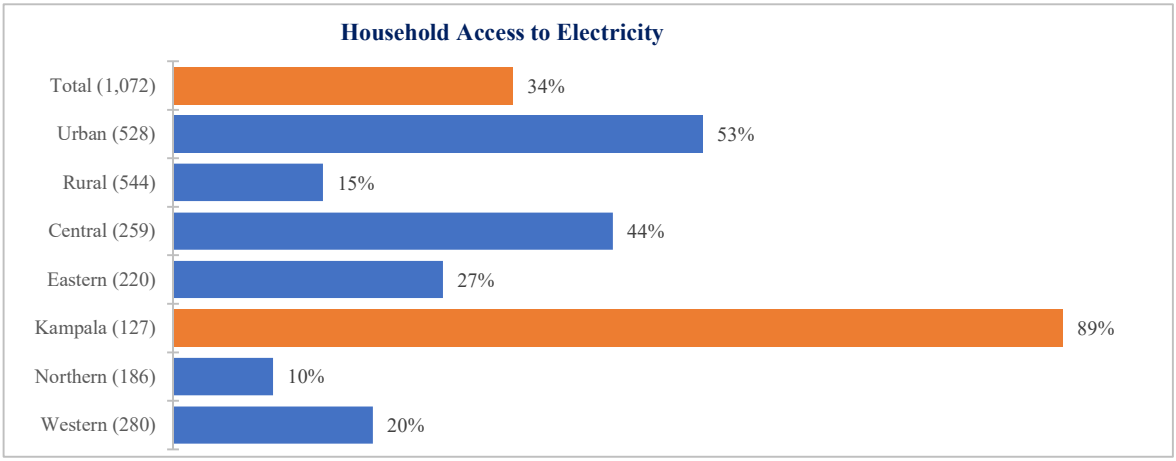
Figure 142: Fish farmers and fish retailers- State fish is sold in



Consequently, consumers were observed to be facing the same predicament where only 34% of the consumers had access to electricity, more so in the urban areas, majorly in

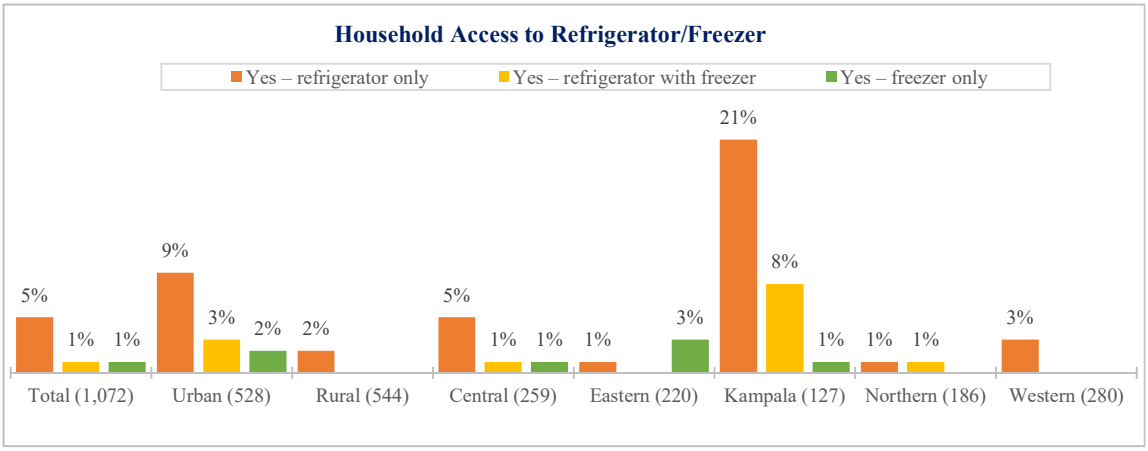
Kampala as shown below. Access to electricity would subsequently influence their access to storage equipment and forms they preferred to purchase fish in.

Figure 143: Consumers- Households' access to electricity



As expected, only small proportions of households had access to storage equipment as shown below, with higher proportions being in Kampala.

Figure 144: Households' access to storage equipment



Consequently, households mainly consumed fish on the day of purchase (within the same day) which is in line with the fact that they do not have access to storage equipment.

Figure 145: Methods of preserving fish

Methods used to preserve fish								
	Dagaa/ Mukene/ Omena (493)	Dried/smoked Fish [excluding *Dagaa/ Mukene/ Omena*] (483)	Fresh Fish (441)	Deep Fried Fish (257)	Frozen or Fresh Fish Fillets (16)	Prawns/Other sea food (3)	Tinned/ Canned Fish (2)	Others (6)
No need to preserve/consume all in a day	80%	85%	90%	93%	75%	100%	50%	67%
Drying	18%	9%	2%	2%	-	-	-	-
Smoking	2%	7%	7%	4%	12%	-	-	-
Boiling	1%	1%	-	-	-	-	-	-
Keep in a cool dry place	1%	-	-	-	-	-	-	-
Keep in refrigerator	-	-	1%	1%	-	-	50%	-
Keep in freezer	-	-	-	-	6%	-	-	-

Amount of Fish Purchased on Average for Home Consumption

It was observed that on average, households purchase/consume 3.4kgs of fish in a month. Fish consumption patterns in the urban and rural areas was observed to be similar as shown below.

Table 71: Amount of fish purchased on average- Setting

How much fish does your household consume in a month on average? (kgs)			
	Total (907)	Urban (457)	Rural (450)
Average household consumption of fish in a month (kgs)	3.4	3.4	3.4

Variations were however observed across the regions, where, for instance, fish consumption was higher in Kampala (4.7kgs) than in other regions as shown below.

Table 72: Amount of fish purchased on average- Region

How much fish does your household consume in a month on average? (kgs)						
	Total (907)	Central (233)	Eastern (197)	Kampala (102)	Northern (165)	Western (210)
Average household consumption of fish in a month (kgs)	3.4	2.6	3.6	4.7	3.8	3.1

Similarly, variations were also observed in the different household income bands, where the more affluent households were observed to largely consume more fish in a month on average as shown below.

Table 73: Amount of fish purchased on average- Household income

How much fish does your household consume in a month on average? (kgs)							
	Total (907)	Below USD. 100 (589)	USD. 101 - 200 (194)	USD. 201 - 500 (74)	USD. 501 - 750 (8)	USD. 751 - 1000 (4)	Don't know/refused to answer (38)
Average household consumption of fish in a month (kgs)	3.4	3.1	4.0	3.8	3.4	3.8	2.9

With regards to the purchase and consumption of different fish forms, it was observed that fish consumers tend to consume more of prawns/other sea food (3.0kgs), fresh fish (2.9kgs) and frozen or fresh fish fillets (2.8kgs) in a month as shown below.

Table 74: Amount of fish purchased by household in a month- Setting

Over the past month, how much of …… was purchased by the household (kgs)?			
	Total (907)	Urban (457)	Rural (450)
Deep fried fish	2.2	2.4	1.8
Fresh fish	2.9	2.8	2.9
Frozen or fresh fish fillets	2.8	2.9	2.3
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.4	2.3	2.5
Dagaa/Mukene/Omena	2.4	2.0	2.8
Prawns/other sea food	3.0	-	3.0
Tinned/canned fish	2.0	4.0	-
Others	1.0	1.5	-

Variations were observed in the different regions. For instance, deep fried fish, fresh fish and dried/smoked fish were consumed more in the Eastern region while the tinned/canned fish and frozen fish were consumed more in Kampala.

Table 75: Amount of fish purchased by household in a month- Region

Over the past month, how much of …… was purchased by the household (kgs)?						
	Total (907)	Central (233)	Eastern (197)	Kampala (102)	Northern (165)	Western (210)
Deep fried fish	2.2	1.6	3.5	2.9	1.5	1.9
Fresh fish	2.9	2.5	3.6	3.1	2.4	2.7
Frozen or fresh fish fillets	2.8	2.5	3.0	3.2	3.0	2.2
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.4	1.7	2.8	2.8	2.3	2.4
Dagaa/Mukene/Omena	2.4	1.1	4.1	1.5	3.2	2.0
Prawns/other sea food	3.0	-	-	-	3.0	-
Tinned/canned fish	2.0	-	-	4.0	-	-
Others	1.0	0.5	1.0	-	-	1.5

It was observed that there were no major variations in the consumption of fish and fish products across various household income groups.

Table 76: Amount of fish purchased by household in a month- Household income

Over the past month, how much of …… was purchased by the household (kgs)?							
	Total (907)	Below USD. 100 (589)	USD. 101 - 200 (194)	USD. 201 – 500 (74)	USD. 501 – 750 (8)	USD. 751 - 1,000 (4)	Don't know/refused to answer (38)
Deep fried fish	2.2	2.1	2.2	2.3	2.3	3.0	1.7
Fresh fish	2.9	2.8	3.0	3.4	2.6	2.0	2.4
Frozen or fresh fish fillets	2.8	2.8	3.0	4.0	-	-	1.0
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.4	2.1	2.7	3.3	5.4	1.5	2.9
Dagaa/Mukene/Omena	2.4	2.3	2.7	2.4	4.5	1.0	2.1
Prawns/other sea food	3.0	3.5	2.0	-	-	-	-
Tinned/canned fish	2.0	-	4.0	-	-	-	-
Others	1.0	1.0	-	1.0	-	-	1.0

On average, households spend about UGX. 32,774 (an equivalent of about USD.9) a month on fish and fish products, with a higher spend observed in Kampala as shown below.

Table 77: Average household spend on fish and fish products in a month- Region

On average, how much does this household spend on fish and fish products in a month? (UGX)								
	Total (907)	Urban (457)	Rural (450)	Central (233)	Eastern (197)	Kampala (102)	Northern (165)	Western (210)
Average spend	32,774	38,352	27,109	31,403	32,069	53,990	25,233	30,576

Some variations were observed on the household spend on fish and fish products across different household income categories as shown below.

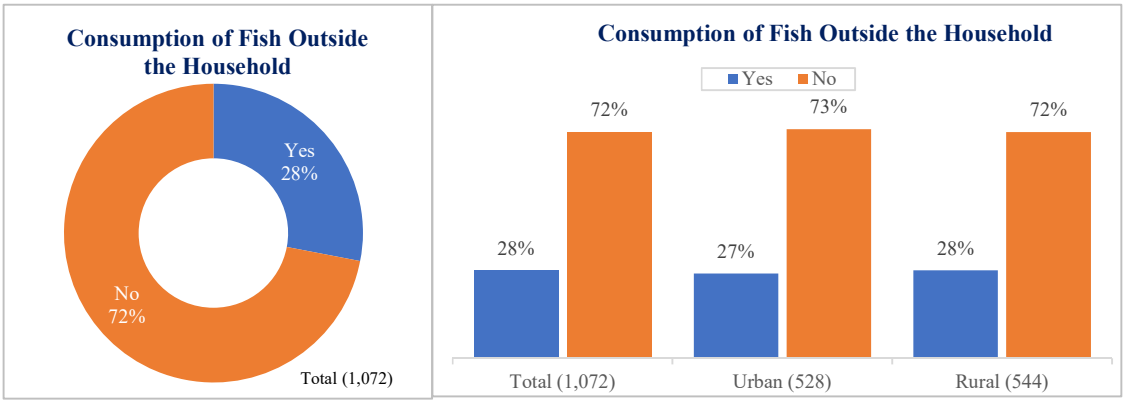
Table 78: Average household spend on fish and fish products in a month- Household income

On average, how much does this household spend on fish and fish products in a month? (UGX)							
	Total (907)	Below USD. 100 (589)	USD. 101 – 200 (194)	USD. 201 – 500 (74)	USD. 501 – 750 (8)	USD. 751 -1,000 (4)	Don't know/ refused to answer (38)
Average spend	32,774	30,663	39,016	39,230	42,125	22,625	20,158

Fish Consumption Outside the Household

It was observed that almost 30% of the consumers consume fish outside the household. Interestingly, while consumption of fish would be expected to be more in urban settings, it was noted these were almost at equal proportions, with households in rural settings being more by 1% as shown below.

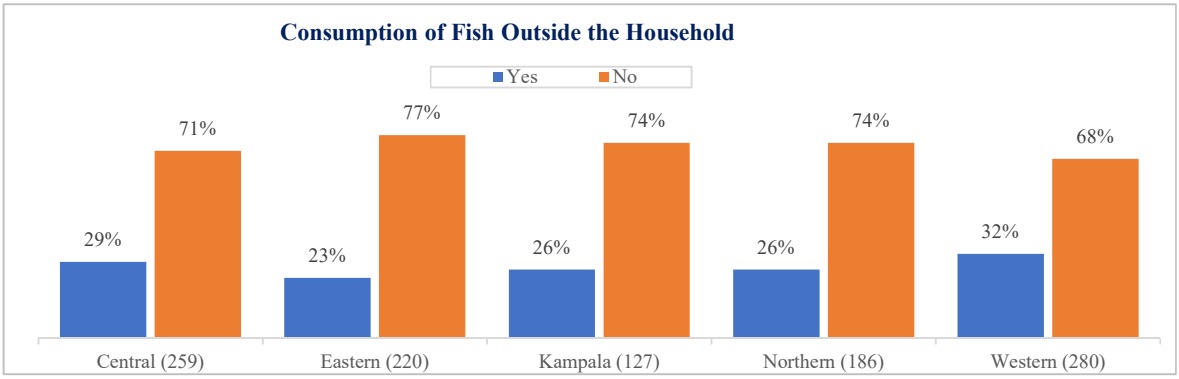
Figure 146: Consumption of fish outside the home



It was noted that households in the Western region consumed more fish outside the household than other regions. [Information from secondary sources indicate that] large quantities of smoked and sun-dried fish originating from Lake Victoria are traded -

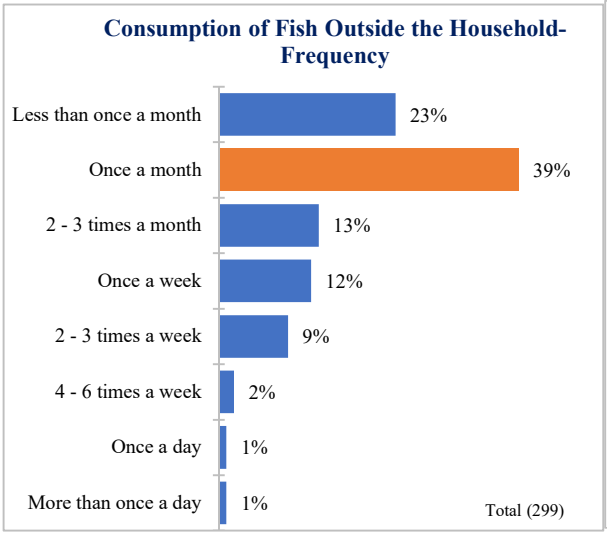
legally and illegally into Western Uganda and in the Democratic Republic of Congo.[21] This may explain the higher consumption patterns of fish outside the home in this region.

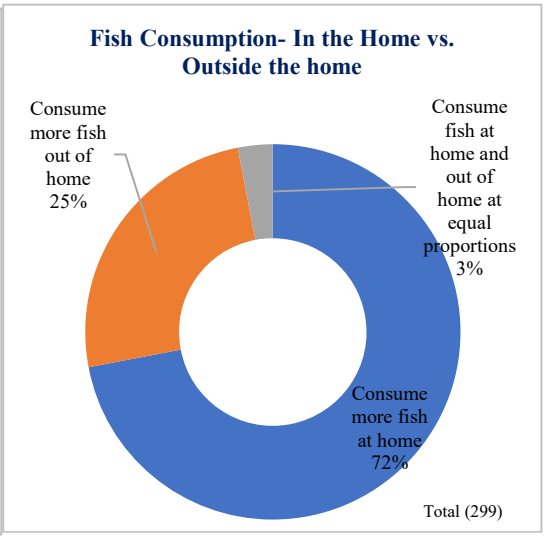
Figure 147: Consumption of fish outside the home- Region



It was observed that consumers largely consumed fish outside the home once a month. This notwithstanding, consumers tended to eat more fish at home as shown below (72%).

Figure 148: Frequency of consumption of fish outside the home





[21] http://www.fao.org/fishery/facp/UGA/en

Frequency of Fish Consumption

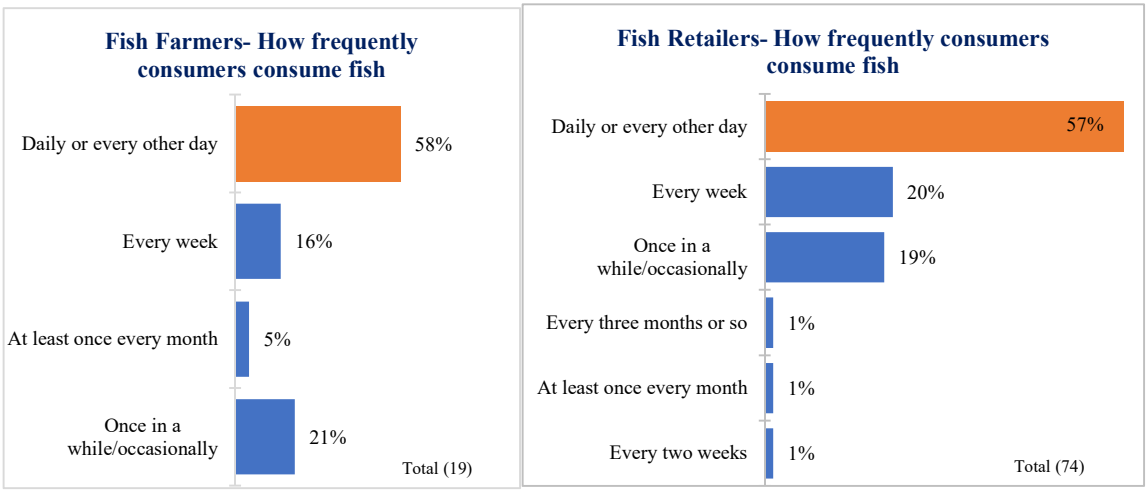
It was observed that households largely consumed the different types of fish purchased two to three times a week as shown below.

Table 79: Frequency of fish consumption in the household

Number of times fish is consumed at the household								
	Dagaa/ Mukene/ Omena (493)	Dried/smoked fish [excluding *Dagaa/Mukene/ Omena*] (483)	Fresh fish (441)	Deep fried fish (257)	Frozen or fresh fish fillets (16)	Prawns /other sea food (3)	Tinned/ canned fish (2)	Others (6)
More than once a day	-	-	1%	-	-	-	-	-
Once a day	3%	2%	1%	1%	-	-	-	-
4 to 6 times a week	12%	6%	7%	4%	6%	67%	-	-
2 to 3 times a week	41%	26%	32%	32%	38%	-	-	17%
Once a week	19%	21%	18%	19%	19%	-	50%	-
2 to 3 times a month	15%	20%	20%	13%	12%	33%	-	-
Once a month	8%	23%	16%	26%	25%	-	-	50%
Less than once a month	2%	3%	5%	5%	-	-	50%	33%

Interestingly, however, farmers and retailers had the perception that fish consumers generally consume fish daily or every other day as shown in the figure below, a perception which could be informed by their sales patterns.

Figure 149: Fish farmers and Retailers' perception of frequency of fish consumption



The Preference for Wild vs Farmed Fish

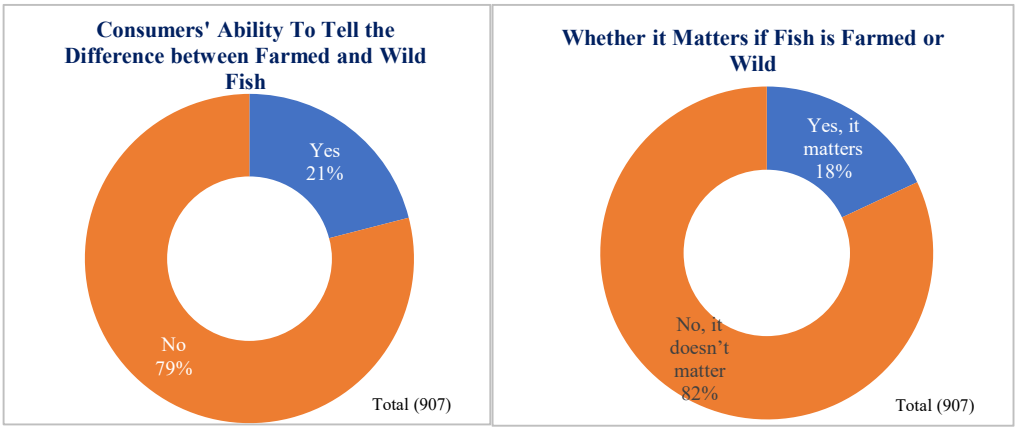
Consumers in Uganda mainly perceived that the fish they were purchasing and consuming was from local sources and was largely wild catch as shown below.

Table 80: Perceived source of fish consumed

Perceived source of fish purchased/consumed at the household								
	Deep fried fish (257)	Fresh fish (441)	Frozen or fresh fish fillets (16)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (483)	*Dagaa/ Mukene/ Omena* (493)	Prawns/ other sea food (3)	Tinned/ canned fish (2)	Others (6)
Local – wild fish [from lakes, rivers, streams, the ocean]	98%	99%	94%	99%	100%	100%	-	100%
Local – fish farms, fish cages and ponds	14%	13%	19%	7%	5%	-	50%	-
Imported – wild fish	-	2%	-	-	-	-	50%	-
Imported – fish farms, fish cages and ponds	1%	-	-	1%	-	-	-	-

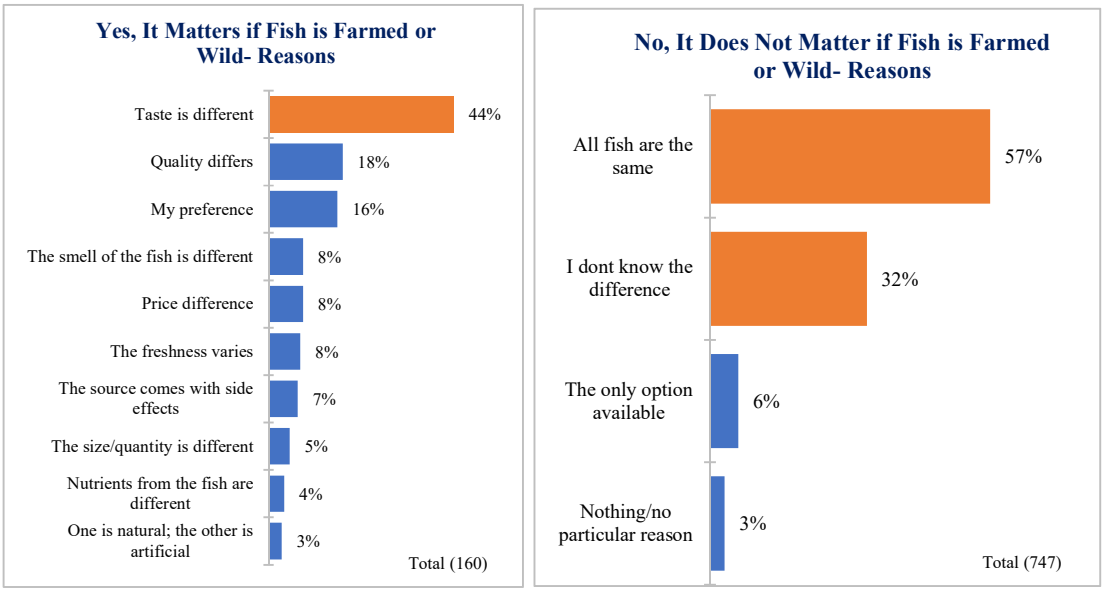
Interestingly however, only 21% could tell the difference between wild fish and farmed fish. This notwithstanding, to most consumers (82%) it did not matter whether the fish they were purchasing and consuming was wild fish or farmed fish as shown below.

Figure 150: Consumers ability to differentiate between wild and farmed species



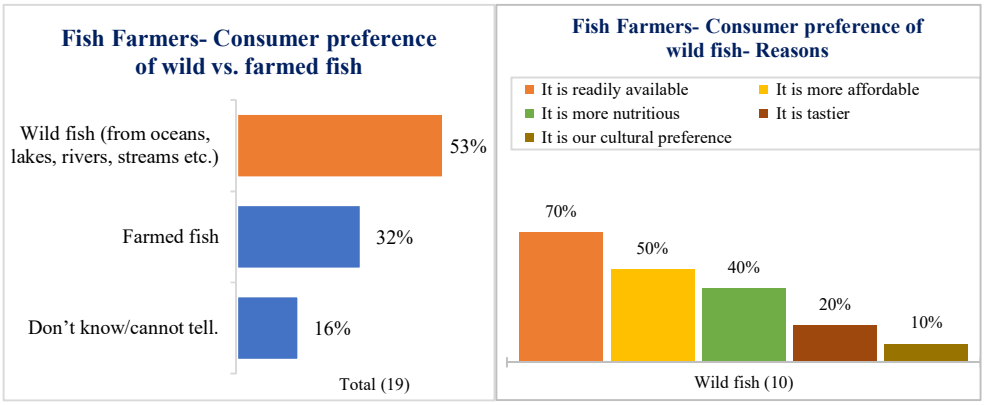
Those that noted that it mattered to them whether fish was wild or farmed, taste was largely indicated to be different between the two varieties among other reasons as shown below. For those to whom it didn't matter, the perception was largely that all fish are the same and a significant proportion also noted that they did not really know the difference.

Figure 151: Consumers' perspective on wild vs. farmed fish



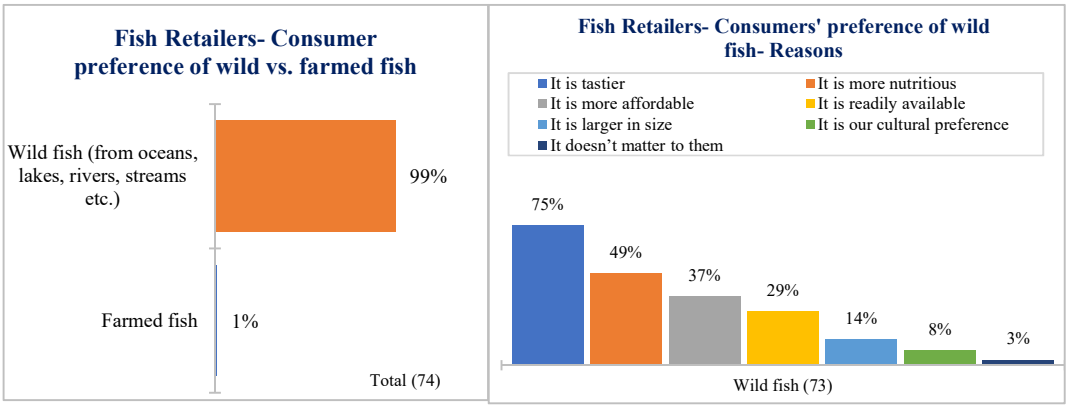
Fish farmers on the other hand agreed that consumers largely preferred wild fish largely because of its availability, affordability and nutritional value as shown below.

Figure 152: Fish farmers' perspective of consumer preferences- wild vs. farmed fish



The same trend was observed from the fish retailers' perspective where a majority perceived that consumers prefer wild fish over farmed fish, mainly because it was tastier as shown below.

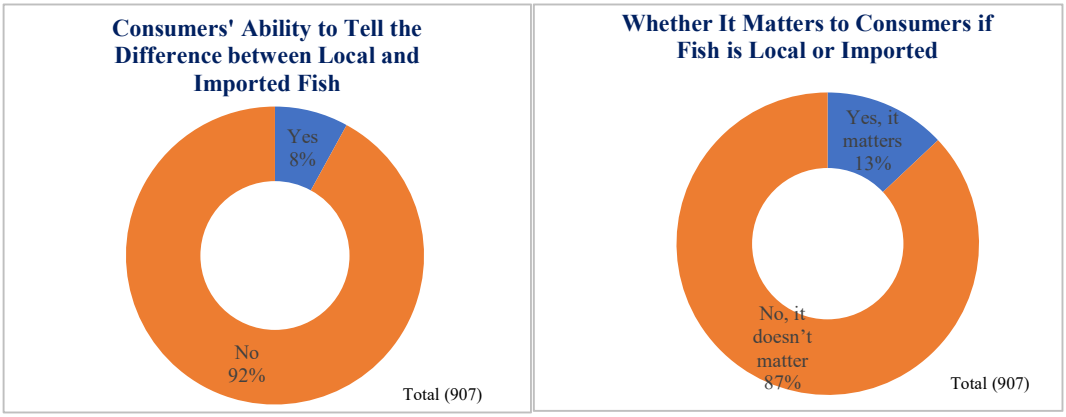
Figure 153: Fish retailers' perspective of consumer preferences- Wild vs. farmed fish



The Preference for Local vs Imported Fish

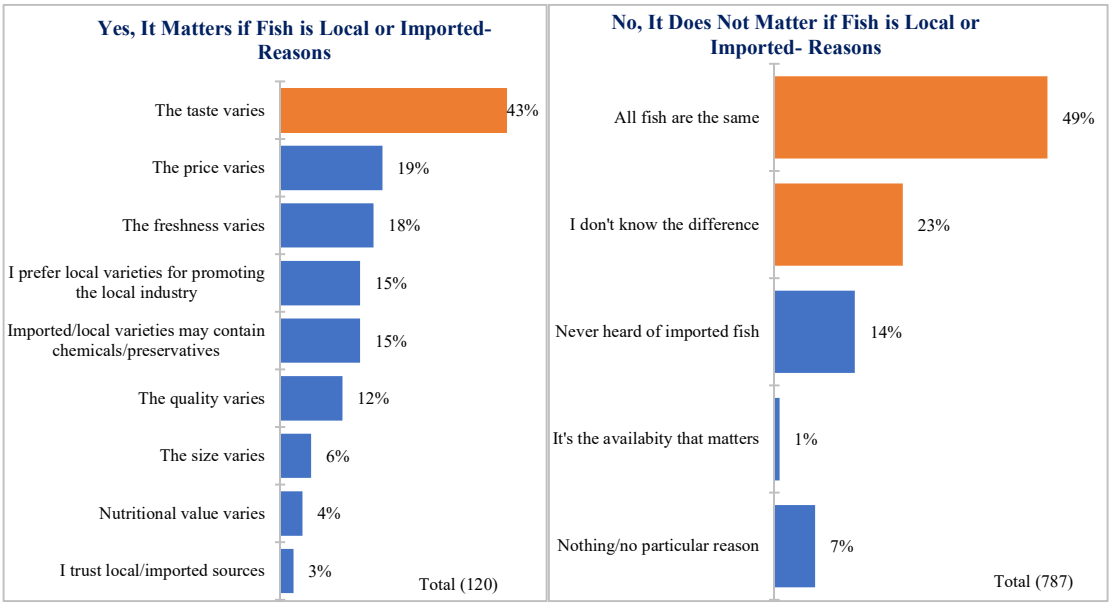
In the same breadth, most consumers (92%) are not able to tell the difference between local and imported fish varieties. However, it largely does not matter to them whether fish is from local sources or imported sources as shown below.

Figure 154: Ability of consumers to tell the difference between local and imported fish



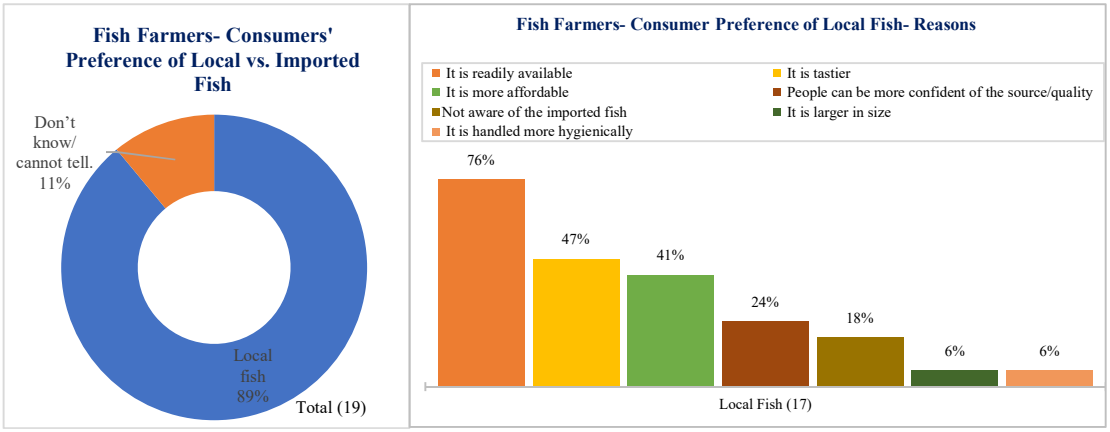
For those to whom it mattered whether fish was from local or imported sources, they largely cited that the taste varies as shown below. For consumers to whom it did not matter, all fish was perceived to be the same by a majority (49%), while a significant proportion also indicated that they did not really know the difference (23%) as shown below.

Figure 155: Consumers' perspective on local vs. imported fish



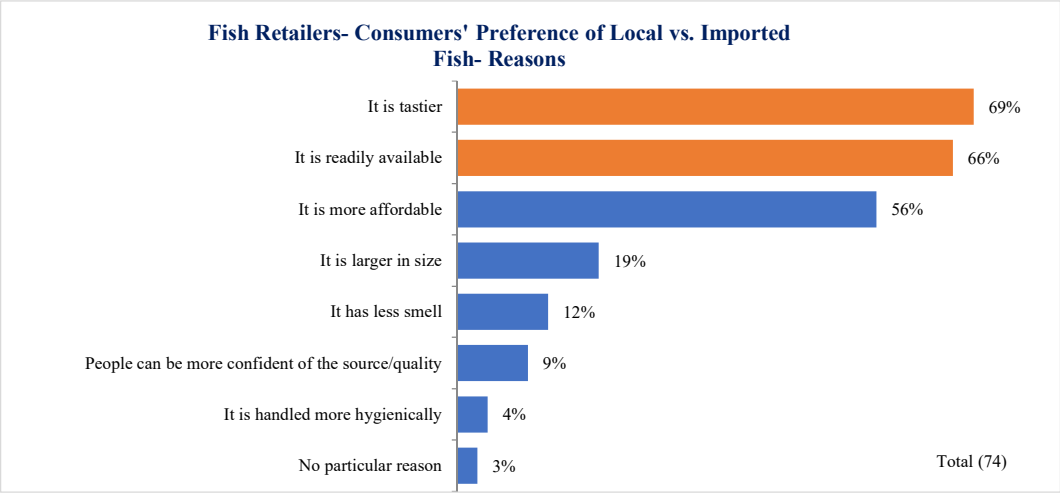
Similarly, fish farmers perceived that consumers mainly prefer local fish (89%) and largely because it is readily available (76%). Interestingly however, 11% of the farmers could not tell whether consumers prefer local or imported fish as shown below.

Figure 156: Fish farmers' perspective of consumer preferences- Local vs. imported



In the same breadth, all fish retailers interviewed perceived that consumers prefer local fish, largely because it is tastier and readily available among other reasons as shown below.

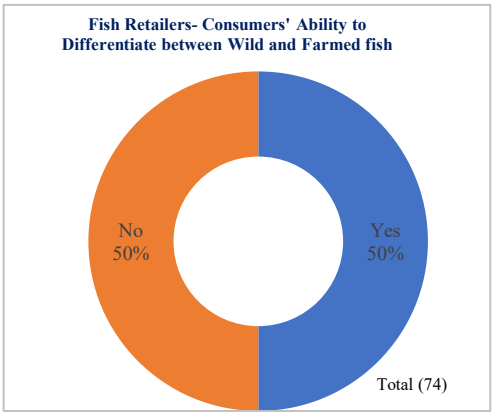
Figure 157: Fish retailers' perspective of consumer preferences- Local vs. imported

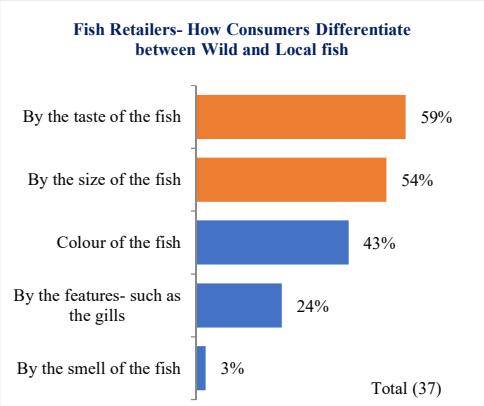


Fish Tasting Exercise

As indicated in the previous sections, consumers are largely not able to tell the difference between wild and farmed fish, or between local and imported fish. From the retailers' perspective, half of those interviewed felt that consumers are generally able to tell the difference between wild and farmed fish, largely because the taste and size of the fish varies among other reasons.

Figure 158: Fish retailers' perspective of consumers ability to differentiate between wild and farmed fish



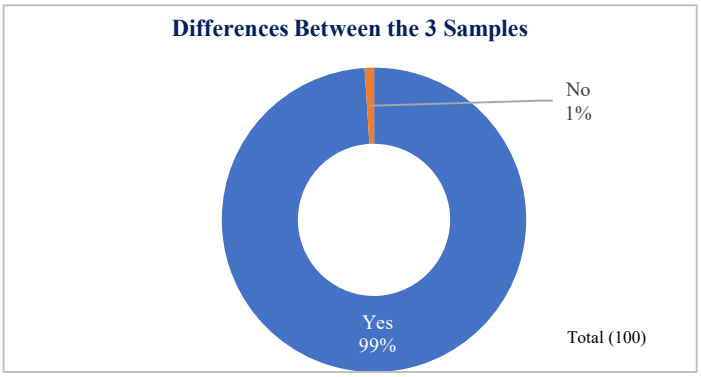


To ascertain this, a fish tasting exercise was carried with a sample of consumers of fish in Kampala (50) and Entebbe (50) where they were invited to taste three samples of fish varieties, one of which was wild, the other farmed and the other an imported variety. All fish was of the same species (Tilapia) and was prepared in a standardized way (deep-

fried). Feedback from the consumers was then sought on their perceptions of the fish after tasting each sample.

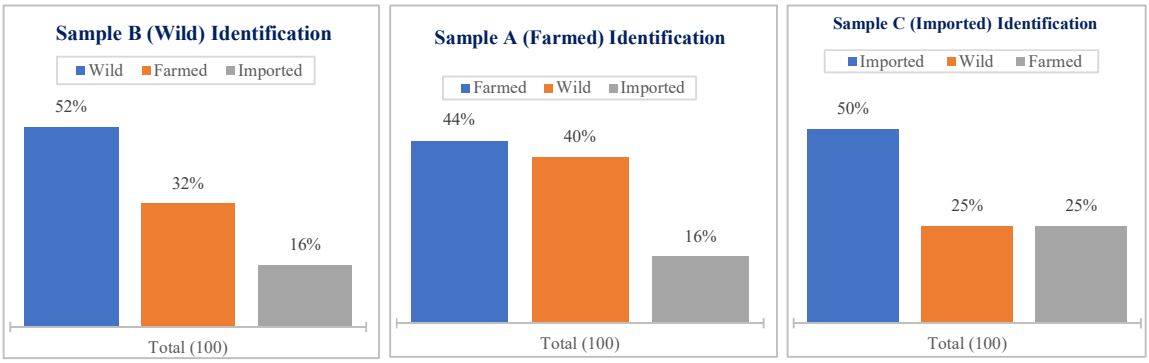
As shown, a majority of the consumers participating in the tasting exercise indicated that there were differences in the samples of fish tasted. This could be attributed to the fact that consumers were conscious/more keen of the tasting exercise and therefore discerned differences in the fish samples.

Figure 159: Consumers that claimed there were differences in the 3 fish samples



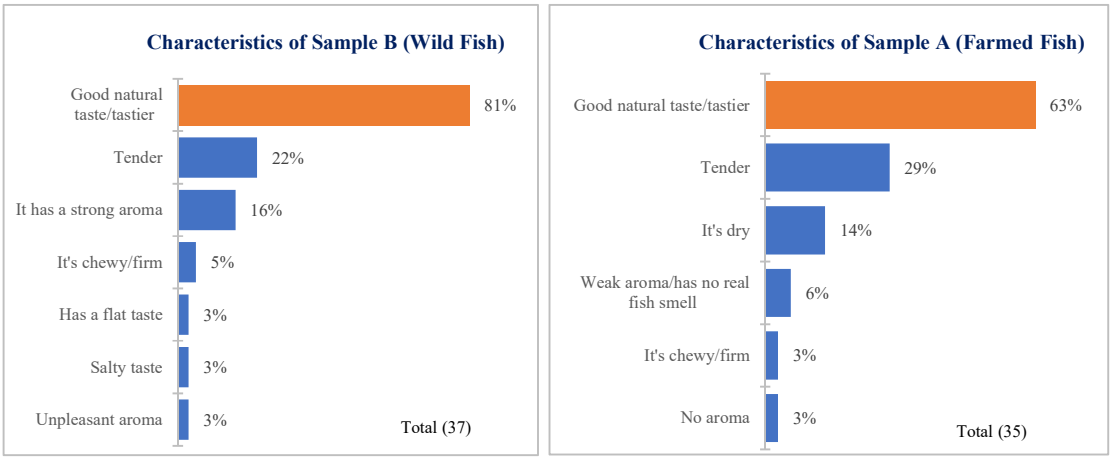
Further, 52% of the consumers correctly identified the wild fish, while a significant proportion (32%) mistook it for farmed fish. Consequently, 44% of consumers correctly identified the farmed fish variety and a significant proportion (40%) mistook it for wild fish. Additionally, half of the consumers (50%) correctly identified the imported fish while equal proportions mistook it for wild and farmed fish as shown below.

Figure 160: Fish tasting exercise results



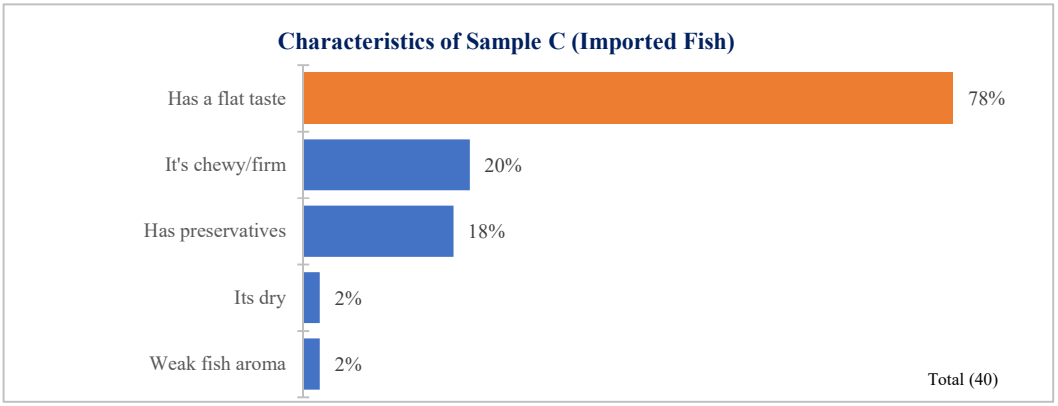
Consequently, consumers largely described the characteristics of wild and farmed fish the same way, by noting that both fish types have good natural taste among other characterics as shown below.

Figure 161: Characteristics of wild and farmed fish



Consumers that correctly identified imported fish largely indicated that this fish variety had a flat taste as shown below.

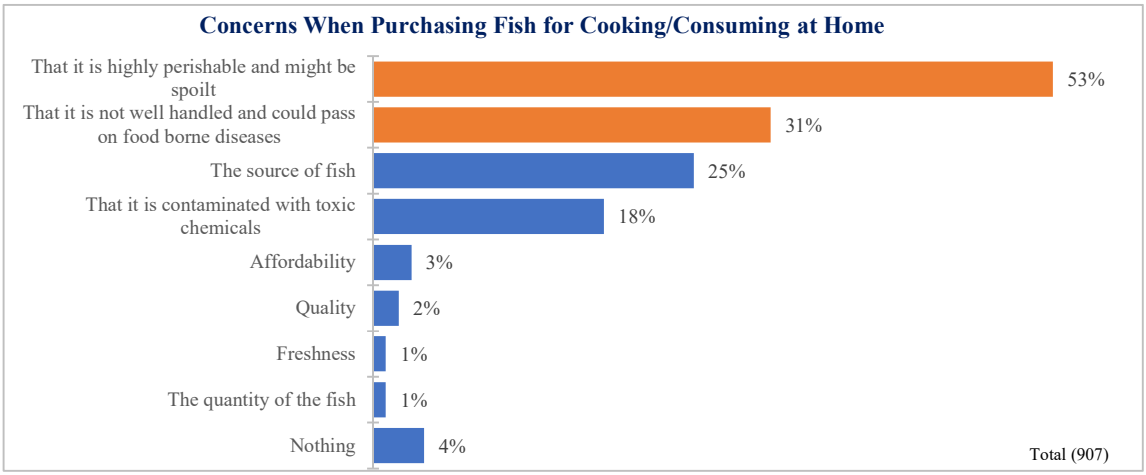
Figure 162: Characteristics of imported fish



Consumer Concerns and Perceptions

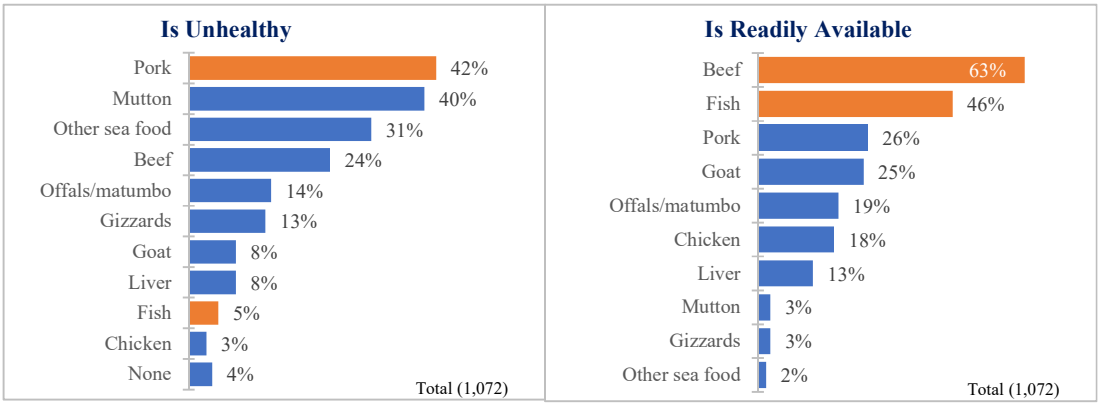
More than half of fish consumers (53%) were generally concerned that fish purchased for consumption at home would get spoilt as it is a perishable commodity. As cited in previous sections of this report, only small proportions of consumers have access to electricity and subsequent storage equipment. Additionally, there was a concern about the handling of the commodity among a significant proportion of consumers (31%) and there was fear that food borne diseases could occur as a result of the handling by the suppliers.

Figure 163: Concerns consumers have when purchasing fish for cooking/consuming at home



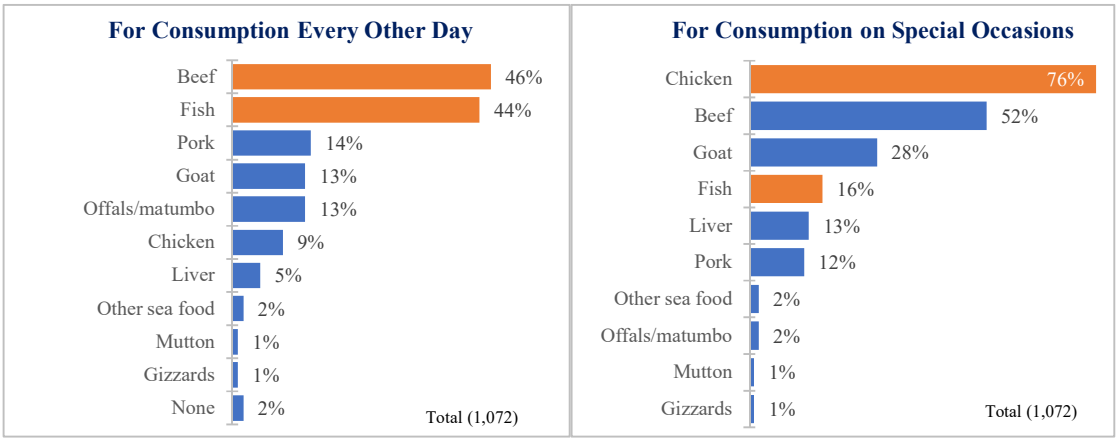
The study further explored consumers' perceptions around various attributes on meat and meat products. It was observed that pork was largely considered to be unhealthy while beef and fish were considered to be readily available as shown below. Only a small proportion (5%) considered fish to be unhealthy.

Figure 164: Type of meat considered to be unhealthy and meat considered to be available



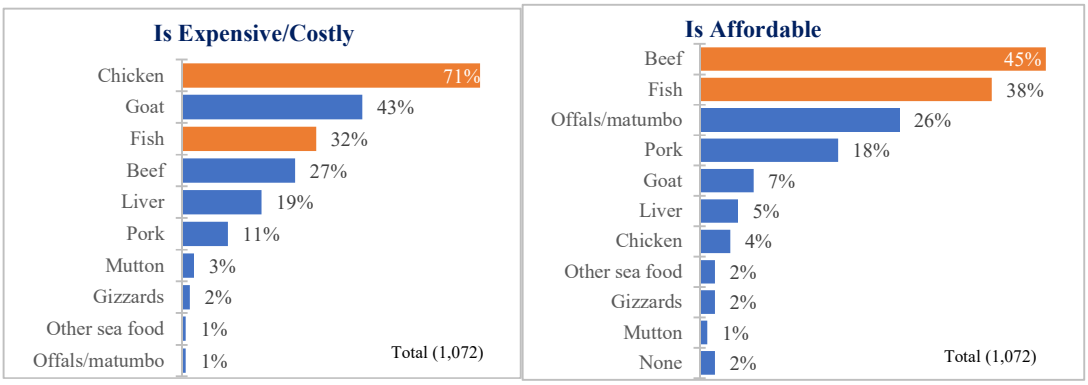
Further, beef and fish were also largely considered as types of meats for consumption every other day while chicken was considered for consumption on special occasions. Fish was considered by a small proportion (16%) as being a type of meat for consumption on special occasions.

Figure 165: Type of meat for consumption every other day and on special occasions



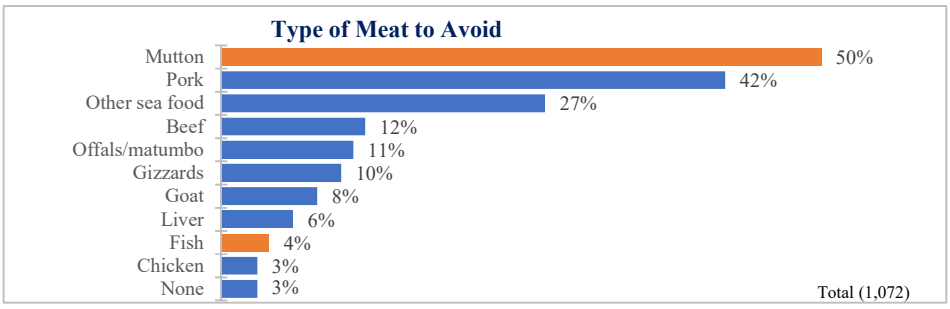
Additionally, chicken was considered to be expensive by most of the meat consumers (71%) while a significant proportion (32%) also considered fish to be expensive. Beef and fish were on the other hand considered to be affordable by significant proportions of the meat consumers (45% and 38% respectively).

Figure 166: Type of meat considered to be costly and type considered to be affordable



Lastly, mutton was considered as a type of meat to avoid by half of the meat consumers as shown. Only 4% of the meat consumers considered fish as a type of meat to avoid.

Figure 167: Type of meat to avoid



From a longer list of attributes about fish, it was observed that fish consumption can easily be driven up by packaging it as a product that is nutritious for young children, quick and easy to prepare, and which can be prepared at home. However, the perception that fish is expensive would need to be addressed to drive demand, obviously by moderating the pricing. Additionally, the issue of availability would need to be addressed as more consumers are willing to consume more fish if it was readily available to them. Also, there is a need to package farmed fish as an ideal alternative that is as good as wild fish, as significant proportions perceive that wild fish is more 'natural'.

Figure 168: Perceptions around various attributes about fish

Perceptions on various attributes (Total - 907)				
	Agree	Neither Agree nor Disagree	Disagree	Average Differences
Fish is nutritious for young children	91%	6%	4%	87%
Fish is quick and easy to prepare	90%	7%	3%	87%
I would be willing to consume more fish products if the price went down	88%	9%	4%	84%
Fish is a healthier source of protein than other sources	89%	6%	6%	83%
Wild fish is more "natural"	86%	12%	3%	83%
I feel comfortable buying and preparing fish at home	87%	8%	4%	83%
Everyone should eat fish once a week	83%	10%	7%	76%
Generally, fish is too expensive	84%	6%	10%	74%
I would be willing to consume more fish products if it was available near me	82%	10%	8%	74%
Wild fish is safer/free from chemicals or artificial boosters than farmed fish	62%	30%	8%	54%
Local fish is of higher quality than imported fish	57%	36%	6%	51%
It is easy to judge the freshness of fish and other sea food	53%	39%	7%	46%
People in this location traditionally eat fish	58%	23%	20%	38%
Frozen fish is tasteless	45%	44%	11%	34%
Wild fish is more expensive than farmed fish	45%	40%	15%	30%
Farmed fish spoils quickly even when frozen, it turns green	38%	53%	10%	28%
Fish fillet is mainly consumed by children	49%	27%	23%	26%
Farmed fish is fragile/breaks apart when being cut and fried	32%	58%	9%	23%
Fish sold in the supermarkets is not good quality fish	31%	50%	19%	12%
Imported fish is larger in size than local fish	23%	64%	13%	10%
Farmed fish is larger in size than wild fish	30%	46%	24%	6%
Farm raised fish is of the same quality as wild fish from the rivers, lakes and the sea.	27%	51%	23%	4%
Fish sold in this area is not handled hygienically	39%	23%	37%	2%
Fish from China is more affordable than fish from other sources	11%	72%	18%	-7%
Fish from China is tastier than fish from other sources	8%	74%	17%	-9%
Farmed fish is tastier than wild fish	24%	40%	36%	-12%
In rural areas, fish is never consumed	28%	19%	53%	-25%

Consequently, only small proportions of consumers perceive that farmed fish is of the same quality as wild fish, a factor which would needs to be addressed to drive the uptake of farmed fish for sustainability. Additionally, there may be a need to address the perception that fish sold in supermarkets is not of good quality as this is one of the channels of distribution that can help in driving demand for fish. If imported fish

(including Chinese fish) is to be considered as an alternative source of fish to manage demand, there will be a need to manage perceptions around it as it currently has negative perceptions on issues of pricing and taste.

3.2.3 Fish Production, Processing and Route to Market

This section of the report provides insights on the supply side of the fish industry in Uganda, including fish farming, retailing, storage and transportation, and organization of the market into cooperatives/associations.

A. Fish Farming Trends

Aquaculture in Uganda is reported to have started in the early 1940s following the introduction of the Kajjansi Fish Experimental Station by colonial authorities. It has since flourished and is reported to contribute significantly to the fish industry in the country. According to the FAO, Uganda produces approximately 15,000 tonnes of fish from aquaculture, including production from small-scale fish farmers, emerging commercial fish farmers and stocked community water reservoirs and minor lakes.[22]

Several fish species are farmed in Uganda with the most common ones including Nile Tilapia *(Oreochromis niloticus),* North African Catfish *(Clarias gariepinus),* Common Carp *(Cyprinus carpio),* Giant River Prawn *(Macrobrochuim rosenbergii)* and the Red Swamp Crawfish *(Procambarus Clarkii).* Nile Tilapia was transplanted from Lake Albert to restock Lakes Victoria and Kyoga and several of their surrounding minor lakes and adjoining river systems. Through restocking programs and aquaculture, it has been planted in virtually all Uganda waters including shared/transboundary water bodies... The North African Catfish [on the other hand] is found in all waters of Uganda, especially those linked to swamps, and it has traditionally been a primary target for a good segment of the fishing community…The Common Carp… was first introduced from Israel in 1941 with the aim of stocking the fingerlings in the relatively colder waters of Lake

[22] http://www.fao.org/fishery/legalframework/nalo_uganda/en

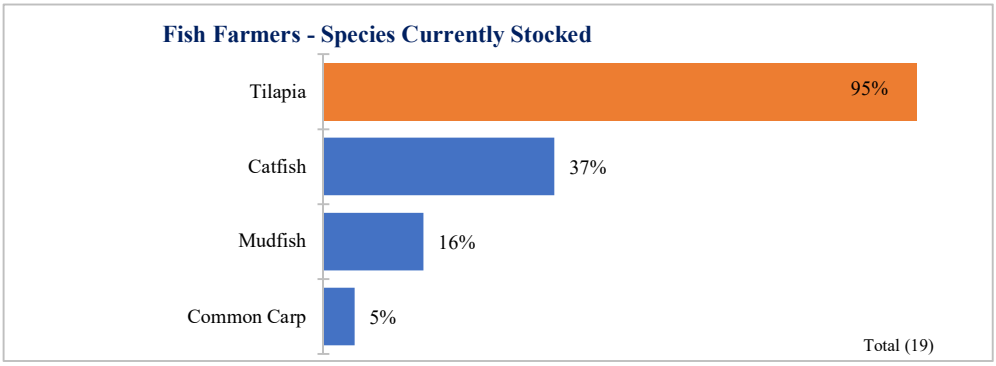
Bunyonyi in southwestern Uganda…It is currently abundant in some parts of the country, but only as a minor component… *Tilapia Zilli* and *Oreochromis Leucostictus* were transplanted from Lake Albert along with Nile Tilapia and Nile Perch from the 1940s in an attempt to augment the fisheries of Lakes Kyoga and Victoria. Although the two species were successfully propagated and distributed, they have not been as successful as Nile Tilapia in either natural waters or in fish ponds… [The Giant River Prawn] is only maintained in the country by regular importation of larvae for culture, while [the Red Swamp Crawfish] has established reasonable populations in Lake Bunyonyi and at Kajjansi… [23]

Considering the above, the study sought to speak to owners/decision makers of fish farmers in Uganda to understand the sector from their perspective. A sample of 14 was targeted, but a total of 19 were successfully interviewed.

Fish Species Farmed

It was observed that fish farmers mainly stock Tilapia (95%) and Catfish (37%) fish species as shown below.

Figure 169: Species farmed and stocked by fish farmers



[23] http://www.fao.org/fishery/countrysector/naso_uganda/en

Main reasons cited for stocking Tilapia (most commonly stocked) included availability of fingerlings, high demand in the market for the species, affordability and better return on investment as shown below.

Table 81: Reasons for stocking species- Fish farmers

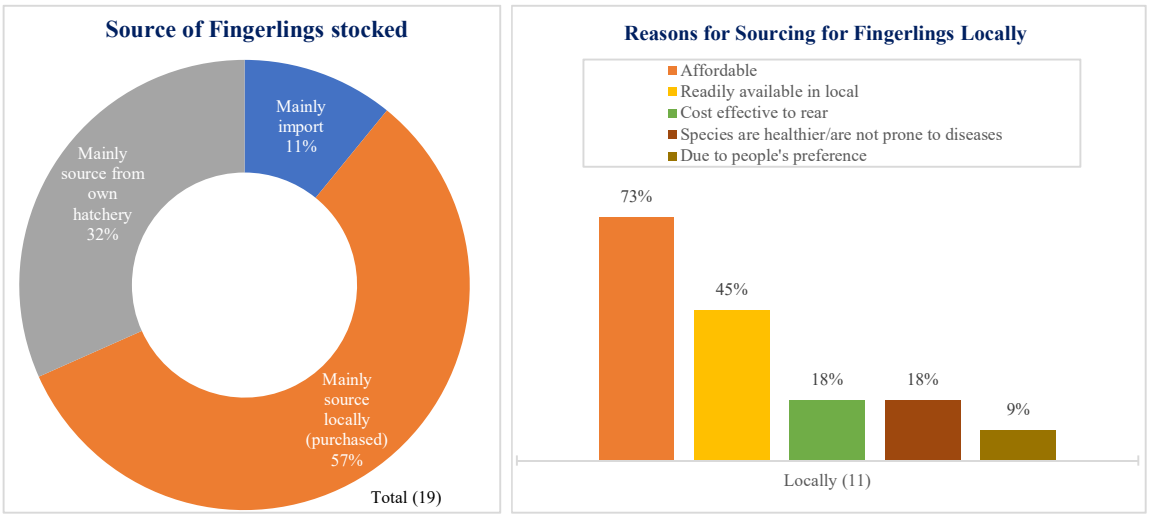
Reasons for stocking species				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Readily available fingerlings	72%	71%	33%	100%
High demand in the market	67%	86%	-	-
Affordable to purchase	61%	86%		100%
Do well/provide better returns	50%	86%	33%	100%
Less prone to diseases	44%	57%	67%	-
Cost effective to maintain	28%	86%	100%	-
Grows faster than other species	6%	-	-	-

Similar reasons were cited by farmers keeping other species as shown above, with the 3 farmers stocking Mudfish also adding that the species was less prone to diseases and was cost effective to maintain.

Sources of Fingerlings

Fish farmers interviewed indicated that they mainly sourced their fingerlings locally as shown below, largely because it was affordable to do so.

Figure 170: Fish farmers- Source of fingerlings and reasons



As shown in the figure above, a significant proportion (6 farmers) indicated they owned their own hatchery for fish production. It was noted that these farmers had owned a hathchery for at least 6 months, with 2 of the farmers indicatign that they had owned it for a period of between 3 to 5 years.

Farmers who sourced their fingerlings from local sources, on the other hand, indicated that they sourced them largely from other farmers in the area, and from Lake Victoria among other sources as shown below.

Table 82: Sources of fingerlings stocked by fish farmers

Source of fingerlings currently stocked				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
From other farmers/ponds in the area	39%	43%		100%
From the lake e.g., Victoria	28%	14%		
Hatcheries	17%	14%	67%	
From Kaijansi	11%	14%		
From the Government	6%			
From Jinja	6%		33%	
Mubuku irrigation scheme	6%			
From Tororo		14%		

Number of Fingerlings Purchased and Amount of Fish Harvested

From the study findings, it was observed that on average, farmers purchased about 11,404 fingerlings of Tilapia, 90 fingerlings of Catfish, 653 fingerlings of Mudfish and 150 fingerlings of Common carp per batch/lot as shown below.

Table 83: Number of fingerlings purchased per batch/lot

Number of fingerlings purchased per batch/lot				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Average number of fingerlings purchased	11,404	90	653	150

Further, it was observed that farmers harvest an average of about 3,297kgs of Tilapia, 25kgs of Catfish, 1,017kgs of Mudfish and 100kgs of Common Carp as shown. Other than the Mudfish species which appears to be doing well (most likely it is cost effective to maintain as mentioned by all farmers stocking it), farmers appear to be experiencing losses when the kgs harvested are compared to the number of fingerlings purchased. Another reason could be an issue of record keeping which could be leading to underestimations or overestimations in the number of fingerlings purchased vs. number of kgs acquired from the different species.

Table 84: Fish farmers- Kgs harvested per batch/lot

Number of kgs harvested per batch/lot				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Average number of kgs harvested	3,297	25	1,017	100

Additionally, farmers appear to be selling an average of 2,994kgs of harvested Tilapia while no Catfish appears to be sold from the batch/lot harvested. An average of 339kgs

of Mudfish was also indicated as having been sold, while all the 100kgs of Common Carp harvested was reported as having been sold for each batch/lot.

Table 85: Fish farmers- Kgs sold per batch/lot

Number of kgs sold per batch/lot				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Average number of kgs sold	2,994	-	339	100

Similarly, farmers could either be making losses from the fish harvested (95% of the farmers interviewed indicated that they do not own any storage equipment as will be seen in sections below) or their record keeping skills could be limited leading to under-estimations or over-estimations.

Average Cost of Production

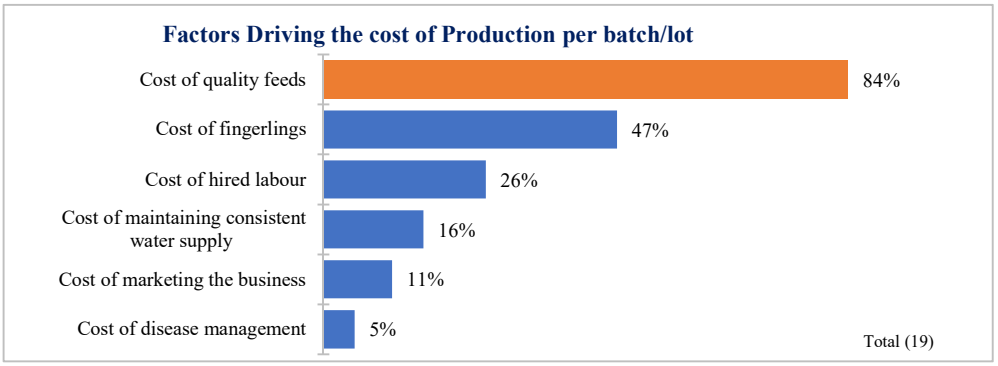
With regards to the cost of production, it was noted that farmers on average spend between UGX. 76,000 to UGX. 855,000 (equivalent to about USD.21 to USD.240) to rear different fish species as shown in the table below.

Table 86: Total cost of production for fish farmers

Total cost incurred in Production (UGX)				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Average cost of production of fish per batch/lot	352,559	854,184	76,600	307,850

It was observed that the cost of quality feeds was the main factor driving the cost of production in the fish farming business among other items as shown below.

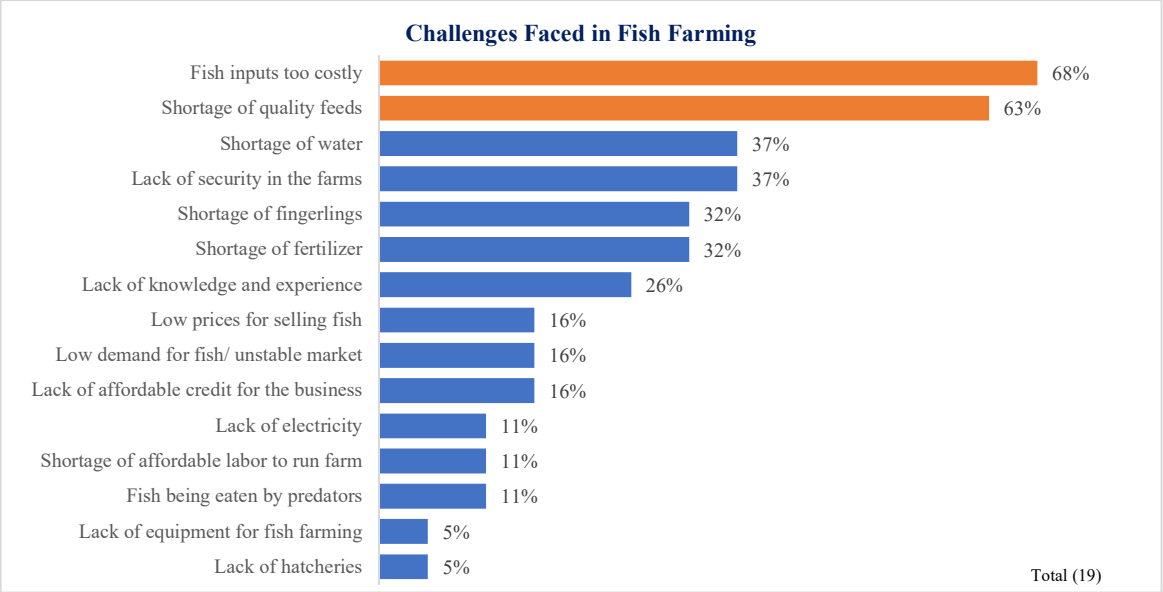
Figure 171: Fish farmers- Factors driving cost of production



Challenges and Bottlenecks

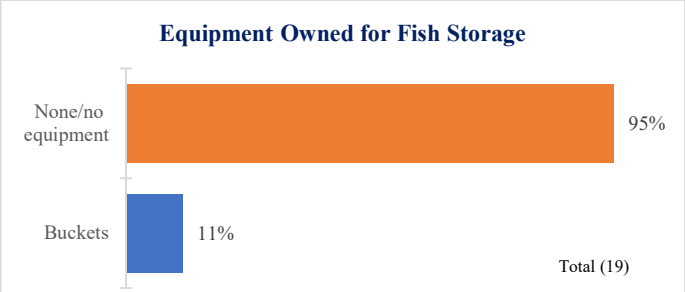
It was observed that fish farmers face several challenges when running their businesses. Some of the most pressing ones included the cost of fish farming inputs (68%) and the shortage of quality feeds (63%) as shown below.

Figure 172: Challenges faced in fish farming



Further, as noted in the previous sections, farmers were observed as not getting better returns on their investment in terms of the quantities sold after the harvest of fish. It was observed that majority of the farmers (95%) did not own any storage equipment, and this could be a major obstacle in the effective management of harvests made, since fish is a highly perishable commodity.

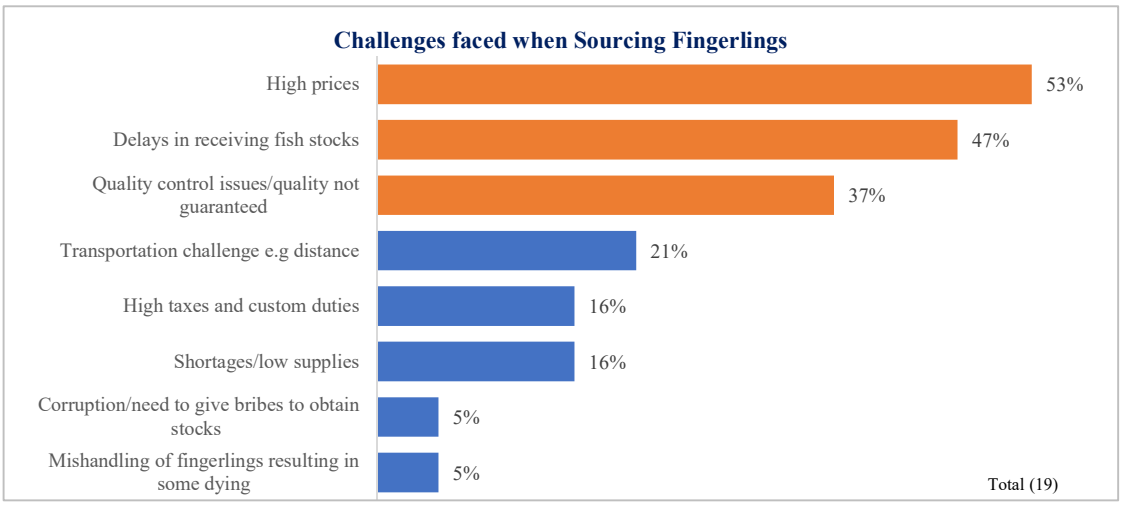
Figure 173: Fish farmers- Ownership of fish storage equipment



Additionally, it was observed that the access of quality fingerlings for fish farming was a challenge to the farmers, and key issues cited included the high pricing (53%), delays

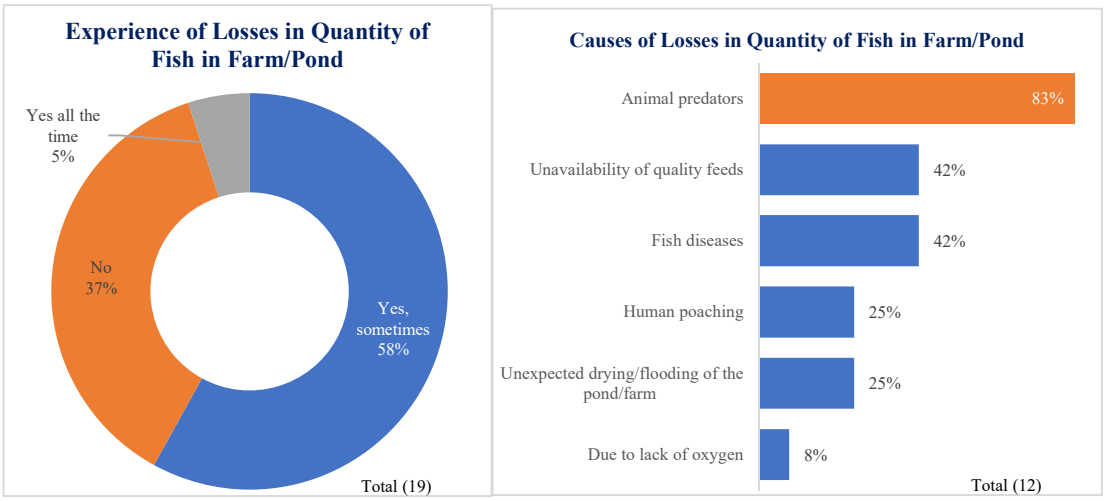
in receiving stocks (47%) and quality control issues (37%) among others as shown below.

Figure 174: Fish farmers- Challenges in accessing fingerlings



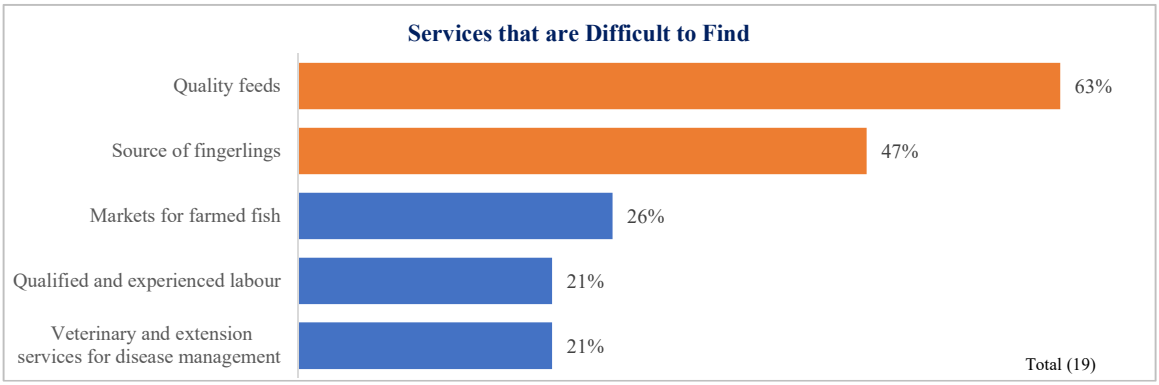
Further, more than half of farmers indicated that they experienced losses in the quantity of fish they kept in the farmers (63%). This was mainly because of animal predators (83%) among other reasons as shown below.

Figure 175: Losses in the quantity of fish in farmers



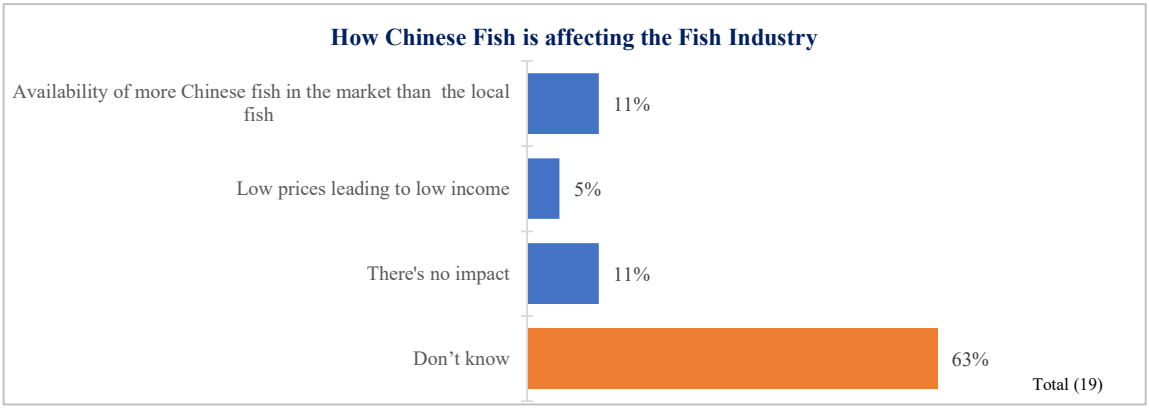
Consequently, farmers indicated that accessing quality feeds (63%) and sourcing for fingerlings (47%) were some of the most difficult services to access in their areas as shown below.

Figure 176: Accessibility of services by fish farmers



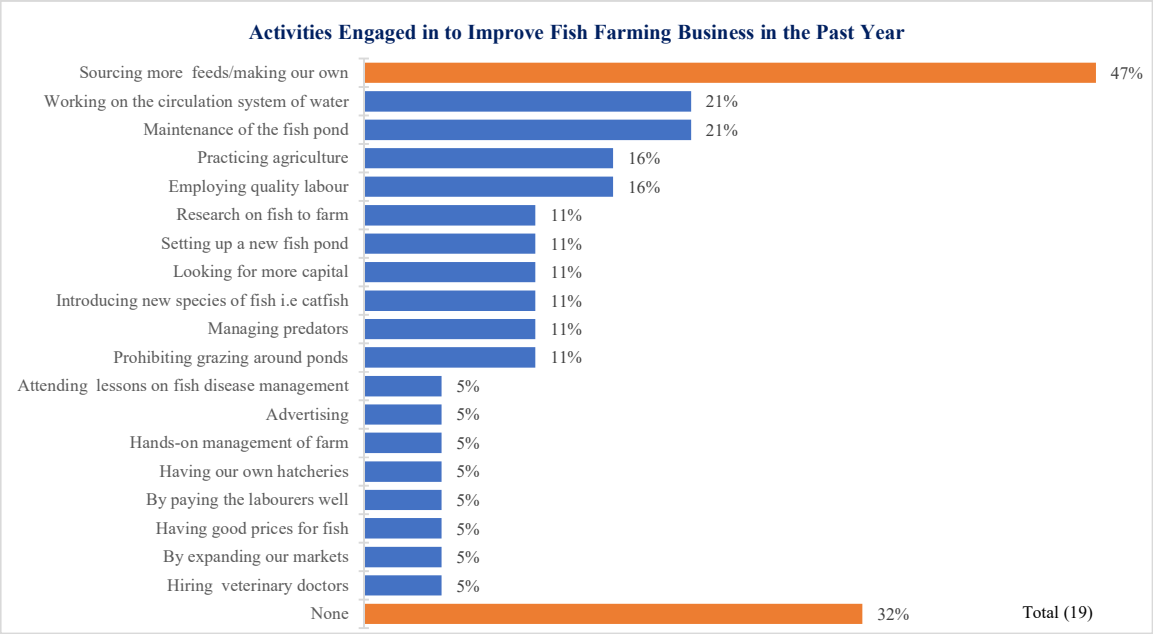
Additionally, it was observed that more than half (63%) of the fish farmers could not tell the impact that the imported Chinese fish was having on the industry and subsequently their lines of business. This would imply a low level of awareness on the developments in the industry. A few of them however indicated that the imported Chinese fish was now more available in the local scene than the local species (11%), and that the pricing of the commodity had been lowered (5%) which resulted in low income. A few also cited that the imported Chinese fish had no impact on the industry (11%) as shown below.

Figure 177: Fish farmers- Impact of Chinese fish



To overcome challenges in the business of fish farming and to remain competitive, it was observed that close to half of the fish farmers (47%) had begun sourcing for more feeds/making their own feeds in the past year. This would be expected since one of the key challenges cited by farmers was access to quality feeds as indicated in the sections above. A significant proportion however (32%) indicated that they had not engaged in any activity to improve their businesses in the past year.

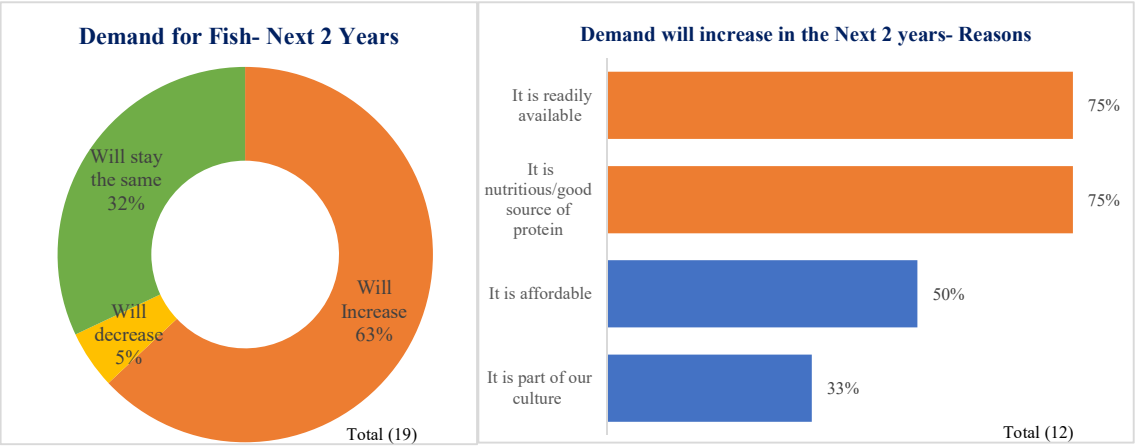
Figure 178: Fish farmers- Activities engaged in to improve fish farming business in the past year



Future Fish Farming Opportunities

Fish farmers were optimistic about the future of the industry; 63% felt that the demand for fish is likely to increase in the next 2 years, mainly because fish is available (75%) and also because fish is a good source of protein (75%).

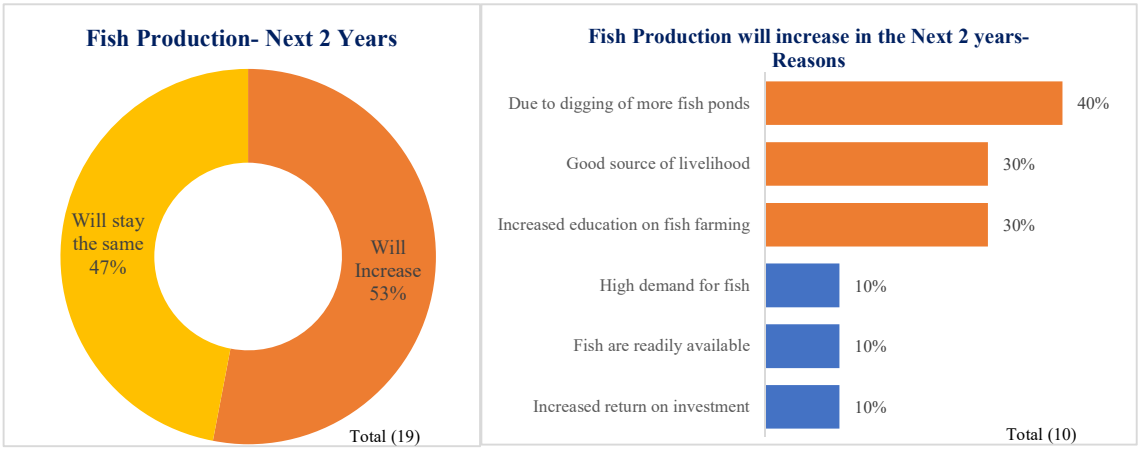
Figure 179: Fish farmers- Demand for fish in the next 2 years



Consequently, more than half of the fish farmers interviewed (53%) were also optimistic that the production of fish will increase in the next 2 years, mainly because more people have been digging fish ponds (40%), perception that fish farming is a good source of

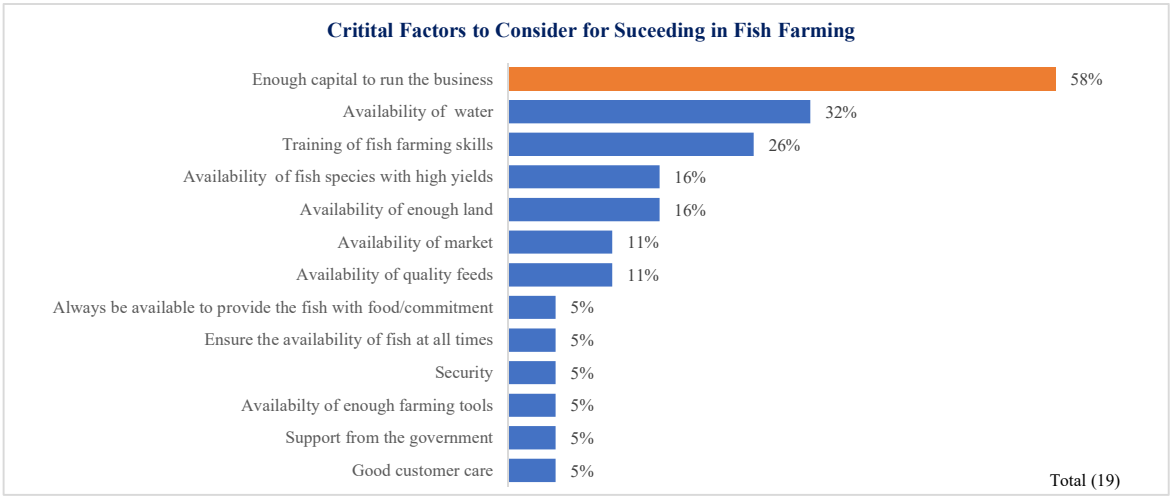
livelihood (30%) and because there has been increased efforts to educate people on fish farming (30%) among other reasons.

Figure 180: Fish farmers- Fish production in the next 2 years



In anticipation of growth in the industry, farmers indicated that some of the critical factors needed for successful fish farming businesses included access to adequate capital to run the business (58%) among other factors. This would imply that there is a gap in the access to affordable credit to support the growth of fish farming businesses in Uganda, a factor which would need to be addressed for encouraging fish farming in the country.

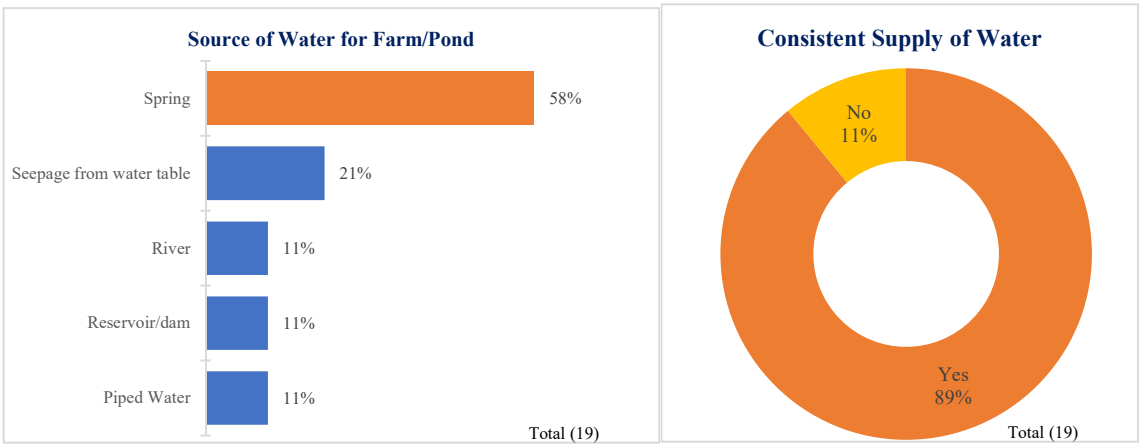
Figure 181: Fish farmers- Critical factors for success



Further, as cited above, availability of water is also critical in fish farming. From the study, it was observed that farmers mainly accessed water from springs (58%), and that

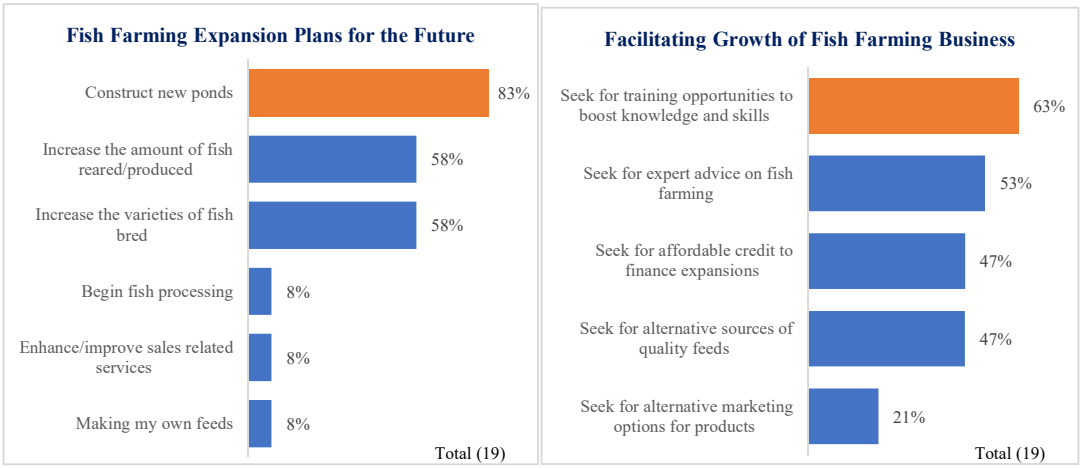
a significant proportion (11%) did not have a consistent supply of water as shown below. This would also be an area of focus for ensuring the fish farming businesses thrive.

Figure 182: Fish farmers- Availability of water



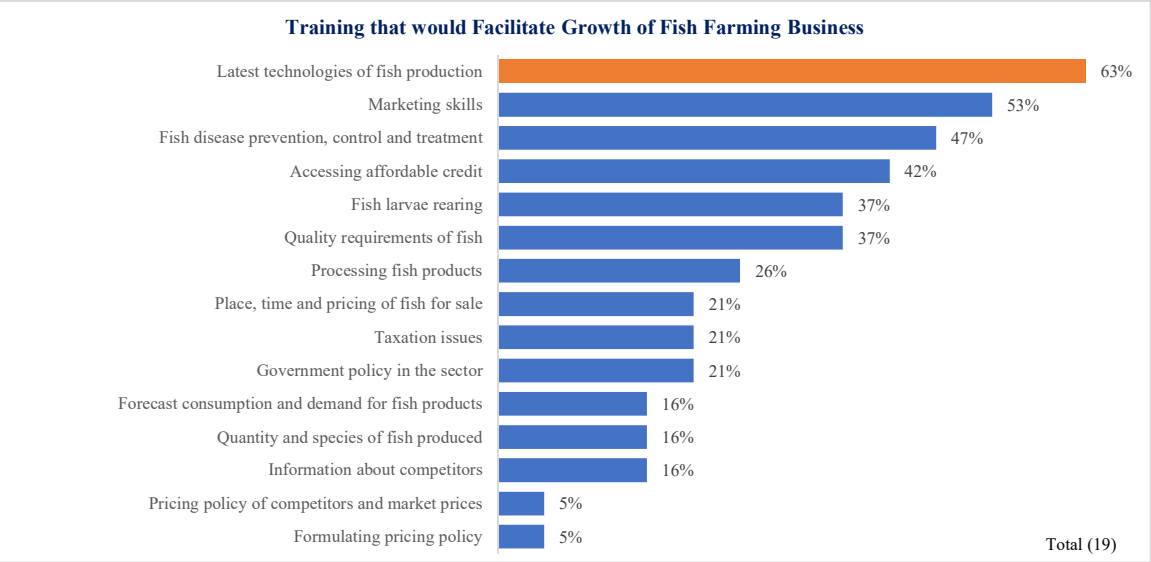
With regards to plans for business expansions, it was observed that most farmers intend to construct new fish ponds (83%) among other activities as shown below. The quest for knowledge to improve on skills (63%) to successfully run the businesses was cited as one of the key areas of focus that would facilitate business expansion plans in the future as shown below.

Figure 183: Fish farmers- Business expansion plans



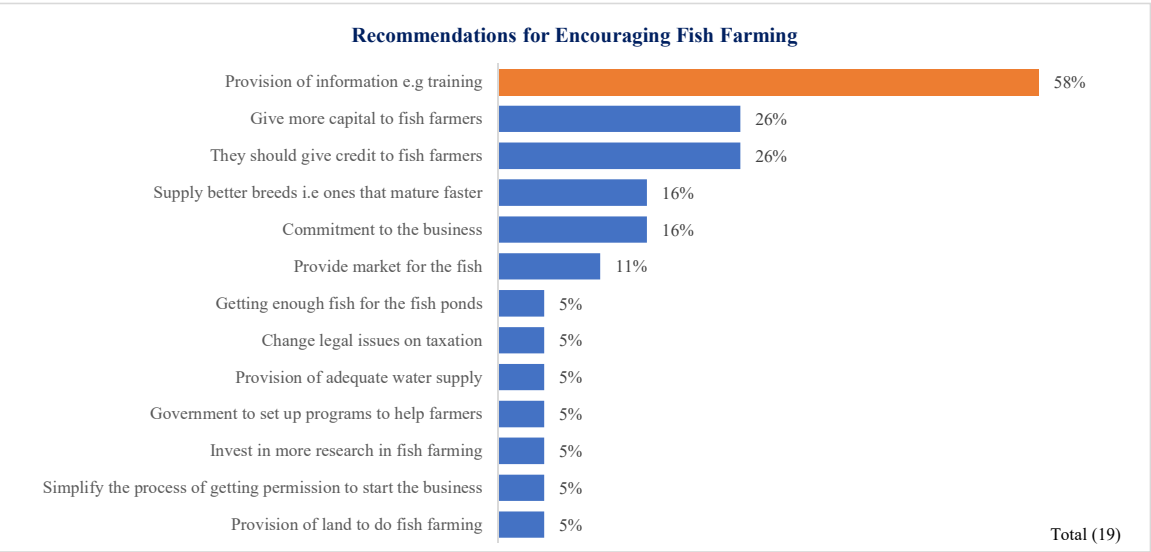
Subsequently, it was observed that some of the training needs that fish farmers were interested in included latest technologies in fish production (63%) among others as shown below.

Figure 184: Fish farmers- Training to facilitate growth of business



Provision of information, through training and other channels, appears to be a major gap among fish farmers, as it was recommended by more than half of the farmers interviewed (58%) among other recommendations, for encouraging the uptake of fish farming in the country as shown below.

Figure 185: Fish farmers- Recommendations for encouraging fish farming



B. Fish Processing

As indicated in the study design section of this report, the processors category was the most difficult to achieve successful interviews because several factories had closed and at the time of writing this report, only two fish processors had agreed to participate in the interviews for this study. Presented in this section are insights that were gleaned from them.

Species Processed

From the study findings, it was observed that the 2 interviewed processors were both processing the Tilapia and the Nile Perch species. Further, it was noted that the main suppliers of the Tilapia and Nile Perch fish species were fishermen, and both species were mainly wild catch from local sources. Additionally, it was noted that the main motivations for the processors to process these varieties were because of high demand (Tilapia) and availability (Nile Perch).

It was also noted that both the Tilapia and Nile Perch species were mainly received for processing in their fresh form or while chilled, while the Nile Perch species was also received in the frozen form for processing. Both fish varieties were mainly processed into special cuts (filleting), frozen and packed, or prepared into fish frames.

Amount Processed and Sold

It was observed that the interviewed processors produced an average of 6kgs of Tilapia and an average of 60kgs of Nile Perch in a month. The figures reported however appeared low which could be attributed to poor record keeping, fear of disclosing this information or a decrease in volumes processed overtime. Indeed, one of the processor indicated that the volumes processed had decreased in the last 2 years while the other felt that the amount of fish processed had stayed the same over the same period.

Processors indicated that they sold an average of between 250kgs and 330,000kgs of Nile Perch processed products while the average number of kgs sold for the Tilapia fish species in a month was not provided. The figures provided contradicted the amounts produced as indicated in the above, which was an indication that processors were

unwilling to disclose information around the capacity they handled or sold. On the other hand, it could also be an issue of record keeping.

Sales and Marketing

It was observed that customers of processed fish products included wholesale fish traders and exports to European markets, and these were also cited as the main purchasers. Further, it was observed that processers delivered products to their customers, mainly by using specialized trucks with cold storage and by air. Efficiencies achieved in minimizing losses and timely delivery of products was indicated as the main advantages of using these modes of transport. The main methods of preservation used during transportation of products included freezing and chilling, and these were largely the methods preferred by the customers. Additionally, regarding competition, one processor perceived that their competition was no more than 5, while the other perceived that they had between 5 to 10 competitors. None of the processors could however estimate the sales volumes of their competition. It was also observed that there was some form of collaboration with other processors, largely through information sharing on matters of interest.

Fish Supply

It was observed that the fish processors had numerous fish suppliers as these were indicated to be between 20 to 25 on average. Criteria used to select fish suppliers included the reputation of the supplier, the reliability of the supplier, ease of accessing the supplier, the pricing of the fish, the quality of the products, the size of the fish supplied, certification of the supplier and maintenance of hygiene standards.

It was observed that supply of fish was largely highest in the months of November and December and was largely lowest in the months of June, July and August. Reasons cited for the low supplies included climatic changes and transportation challenges. During low fish supply periods, processors indicated that they largely reduced production capacity, reduced the number of staff and offered suppliers better prices to maintain their supplies.

Fish Handling by the Processors

Fish processors indicated that they usually checked on the freshness of the fish to determine its quality for processing. They noted that they usually experienced spoilage largely during transportation into the firm, out of the firm and during processing. Processors further noted that an average of 20% of the fish was spoilt during transportation into and out of the factory while an average of 60% was spoilt during processing of the fish. Poor handling was cited as a reason for the fish spoilage into and out of the processing factory while power outages largely contributed to the spoilage during processing. Processors indicated that the suppliers usually went back with fish supplied while spoilt while other fish spoilage was handled by trading off in the local markets. Further, it was noted that the by-products from the fish processing included skeletons, scales, fins, fish heads and fish fat/oil. These by-products were mainly sold off in the local markets for other uses.

Fish Storage Status

Participating processors indicated that they had access to electricity and a back-up generator for use during power outages. Additionally, they also indicated that they had access to a refrigerator, a freezer, an ice box and refrigerated rooms to store their fish supplies.

With regards to storage capacity it was observed that the maximum storage capacity for the processors ranged between 150kgs and 300,000kgs in a day. There appeared to be an overutilization of the storage capacity by one of the processors as the optimum storage capacity was indicated as ranging between 150kgs and 200,000kgs in a day. One of the processors however indicated that there were plans to boost the storage capacity in the future, and this was projected to increase sales by 20%. The main limiting factor towards making this investment was indicated as being the low supply of fish.

Challenges and Bottlenecks that Fish Processors Face

Participating processors indicated that some of the challenges faced in their businesses included low fish supplies to meet demand, poor handling of fish stocks from suppliers resulting in losses, high prices of fish stocks, seasonal/climatic changes which affected

supply of fish stocks, high market entry registration fees (business licenses), high business taxes, stiff industry regulations, high costs of running the business, poor infrastructure, stiff competition and high interest rates on credit options. The most pressing challenge was the high cost of running the business. The processors indicated that one of the ways they were overcoming this challenge was by improving customer service, which was projected to improve their returns for supporting the business. Interestingly however, processors in Uganda did not perceive the presence of imported fish (from China) as having any impact on their businesses. One of the processors however felt that there was a need to regulate fish importation while the other one felt regulation of fish imports was not necessary.

Available Opportunities for Fish Processing

One of the processors perceived that the demand for fish had increased in the last 2 years while the other felt the demand had stayed the same. The processor who perceived that the demand had increased indicated that there had been an increase in the number of customers, while the processor who felt the demand had stayed the same indicated that there had been fluctuation of prices in the market which affected an increase in demand. Consequently, one of the processors felt that the demand would increase in the next 2 years, because of the same reason; an increase in the number of customers, while the other felt that the demand would stay the same, also because of the fluctuation of prices, which was likely to affect demand.

Processors indicated that they had participated in training on quality control issues, maintaining hygiene standards and waste management in the last 2 years to support the growth of their businesses. They indicated that this had helped them improve their business operations over time. Additionally, processors desired to learn more about quality control processes, latest technologies in fish processing, marketing strategies and pricing procedures, how to forecast quantities of fish supplies including species and information government and policies' procedures affecting the fish industry, and specifically their businesses. Information/training on these areas would help the processors run their businesses more effectively and competitively, and increase their

customer bases in the long-run, and help them comply with the required government regulations to avoid penalties.

In the next 2 years, processors indicated that they intended to buy more equipment for storage, improve on their business management operations to make savings from the businesses, and work on their competitive edge to increase their market share.

C. Fish Storage and Transportation

This subsection looks at the fish storage and transportation operations, challenges and recommendations made by the players. A total of 7 fish storage and transportation businesses were targeted for interview, however, 5 agreed to participate in this study. Presented below are insights gleaned from them.

Business Operations

It was observed that the storage and transportation companies mainly handled wild catch fish, specifically, the Nile Perch fish species. The fish was largely transported and stored in the processed and unprocessed forms. This was largely driven by demand and consumer preferences. The fish storage and transportation players observed that the demand for their services had largely remained the same, or had decreased over the last 2 years, because no improvements had been made in the industry. Furthermore, the pricing of fish was observed to have increased over time, but there had not been an increase in the demand for fish. Additionally, it was observed that the supply of fish had largely decreased due to overfishing. A few players, however, felt that the demand for transport and storage services had increased over time, largely because the hygiene standards by fish handlers had been improved, leading to an increased demand for fish.

Further, it was observed that small-scale players largely used containers with ice to store fish, while the more established firms relied on cold rooms for preserving fish. During transportation, specialized trucks with refrigeration were largely used, while a few of the players also used boats (with iced containers) to transport fish across islands. With regards to quantities handled, it was observed that the minimum storage and transportation companies handled was 2 tonnes per day, while the maximum handled was 15 tonnes per day.

It was observed that the main customers for fish storage and transport services were sourced locally and internationally (Kenya, Rwanda, Burundi, Sudan, Britain and other European markets). Customers were largely processing factories for the large-scale players, while the small-scale players were largely servicing individual players in the communities.

Challenges Faced

It was observed that several challenges were faced by storage and transportation firms. Firstly, it was noted that illegal fishing (fishing of immature fish) had contributed to inconsistent supply of fish, and this affected business operations. Further, seasonal/climatic changes also contributed to the low supply of fish.

Secondly, players cited the loss of fish stocks as one of the challenges they faced, which was lowering their return on investment. This was resulting from factors such as power outages, where for instance, Fresh Perch Limited, a fish storage company, estimated that for every 6 tonnes of fish stored, 200kgs would be lost due to spoilage resulting from power outages. Some of the established entities also added that they were not able to produce their own ice blocks during power outages, which resulted in additional business costs when purchasing ice blocks for preserving their stocks. Further, delays in transit when delivering fish stocks was also resulting in losses, especially when specialized trucks were not used during transportation. The ice in the containers would melt leading to fish spoilage, which in turn, caused buyers to reject the bad fish, or purchase it at lower prices. Poor infrastructure was cited as being one of the major contributors to the delays experienced when delivering fish stocks. Small-scale players who were transporting fish using boats also cited frequent boat accidents that would lead to losses in the fish stocks.

Thirdly, players indicated that to operate in the transportation and storage businesses, one needed to have several permits, lack of which, attracted penalties from the Fisheries Department. Acquisition of these permits was cited as being costly, tedious and time consuming. About UGX. 50,000 (equivalent to about USD.14) was for instance required for every transit. Additionally, valid medical forms and health clearance forms were required in areas of offloading fish from boats and storage areas, as well as inspection of

storage areas/facilities before use. Complying with these processes was reported as being tedious, time consuming and costly.

Fourthly, the less established entities indicated that accessing preservation equipment was challenging due to lack of affordable credit for investing in their businesses. The entities indicated that they were forced to clear their stocks immediately most of the time to avoid losses, and were therefore at the mercy of the buyers who often offered low prices for the fish stocks.

Fifthly, insecurity was cited as a challenge, where robbery attacks were experienced frequently, especially during transit. Stealing of fishing nets was also indicated as being rampant.

Despite these challenges experienced, transport and storage businesses were optimistic that the demand for their services would increase in the next 2 years. It was noted that the Government was keen on supporting the industry, by for instance fighting illegal fishing to sustain supply. Additionally, it was noted that the demand for fish and fish products in Uganda had increased over time, and this increase was likely to continue in future. Furthermore, more companies were adopting the use of modern transportation and storage facilities, which was in turn guaranteeing the quality of fish supplied, and subsequent sustenance of demand for products and services.

Available Opportunities

Storage and transportation companies made several recommendations for consideration in assisting them to function better. Firstly, it was recommended that the Government needed to support players in the industry to purchase ideal fishing nets, to address the issue of illegal fishing. This would reduce supply hiccups that were frequently experienced.

Secondly, it was recommended that players in the industry needed support in accessing specialized trucks for use in the transportation of fish to reduce fish spoilage. Subsequently, storage and transportation companies indicated that there was the need for all players in the value chain to have adequate storage equipment to reduce losses; most island suppliers for instance were cited to lack storage equipment, which was leading to

low supplies. Storage and transportation companies recommended that there was a need to set up cold rooms, which did not necessarily need access to electricity, at fishing sites to support fishermen.

Lastly, storage and transportation companies recommended the need for the Government to extend electricity access to areas not connected to the grid, since electricity was vital in the preservation of fish. Further, there was a recommendation for setting up more ice making machines closer to landing sites for ease of access of ice blocks from the fishing points.

D. Fish Retail Market

This sub-section provides insights gleaned from retailers. A total of 50 retailers were targeted but 74 were successfully interviewed.

Main Purchase Point for the Consumers

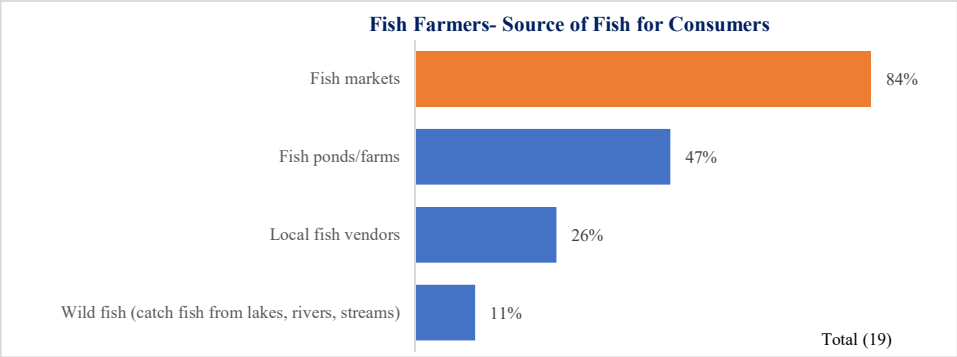
From the study findings, it was observed consumers largely purchased fish for consumption from the general markets, while significant proportions also purchased from street vendors as shown below.

Table 87: Customers- Point of purchase of various fish forms

Where/source of fish purchased and consumed at the household								
	Dagaa/Mukene/ Omena (493)	Dried/smoked fish [excluding *Dagaa/Mukene/ Omena*] (483)	Deep fried fish (257)	Fresh fish (441)	Frozen or fresh fish fillets (16)	Prawns/ other sea food (3)	Tinned/ canned fish (2)	Others (6)
From the general market	58%	67%	53%	57%	88%	100%	50%	67%
From a street vendor/local fish fryer	32%	23%	32%	27%	12%	-	-	33%
From other fish vendor	7%	6%	7%	9%	-	-	-	-
From the fish market e.g. Busega fish market	2%	2%	7%	4%	-	-	-	-
From a fish shop	2%	-	1%	1%	-	-	-	-
From the supermarket	-	-	1%	-	-	-	50%	-
From a fish farm/pond	-	-	-	1%	-	-	-	-

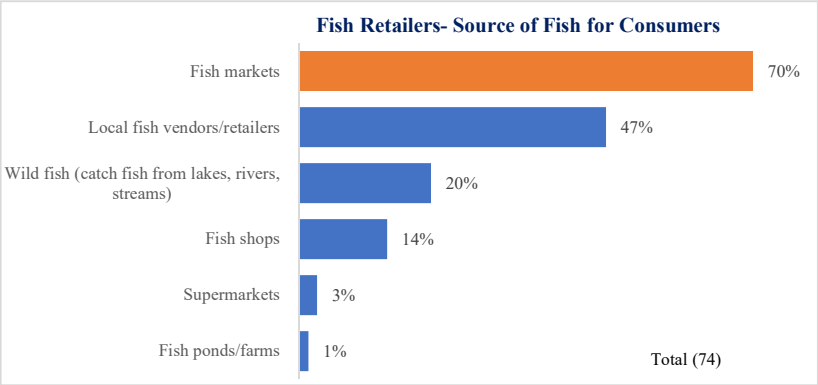
Fish farmers on the other hand however perceived that consumers largely sourced fish for consumption from fish markets (84%), among other sources as shown below.

Figure 186: Fish farmers- Perceived source of fish by consumers



Fish retailers also held this perception where a majority (70%), indicated that consumers sourced their fish from fish markets among other sources as shown below. This was an indication that fish farmers and fish retailers were most likely not positioning themselves well to meet the demand for fish. As shown above, only less than 10% of consumers were sourcing their fish from fish markets. On the other hand, and as shown in sections below, retailers were mostly sourcing their stocks from fish markets and could be assuming that consumers also do the same.

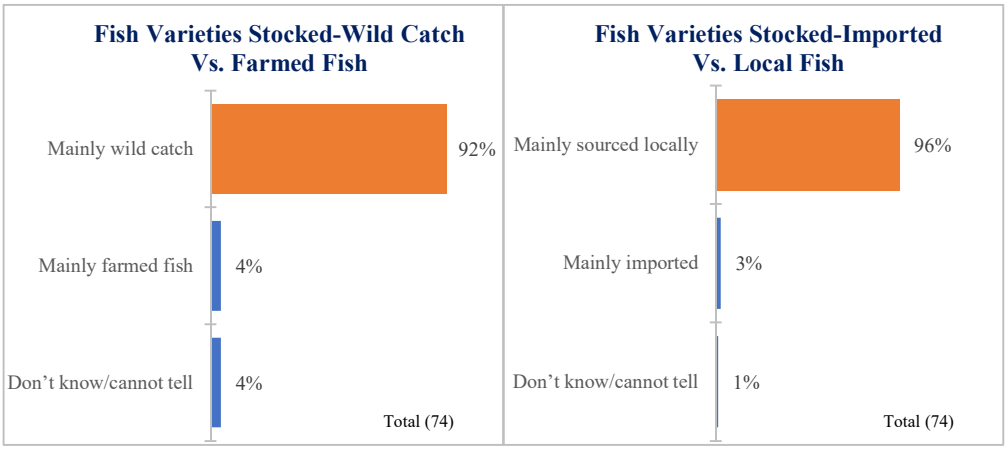
Figure 187: Fish retailers- Perceived source of fish by consumers



Type of Fish Stocked by Retailers

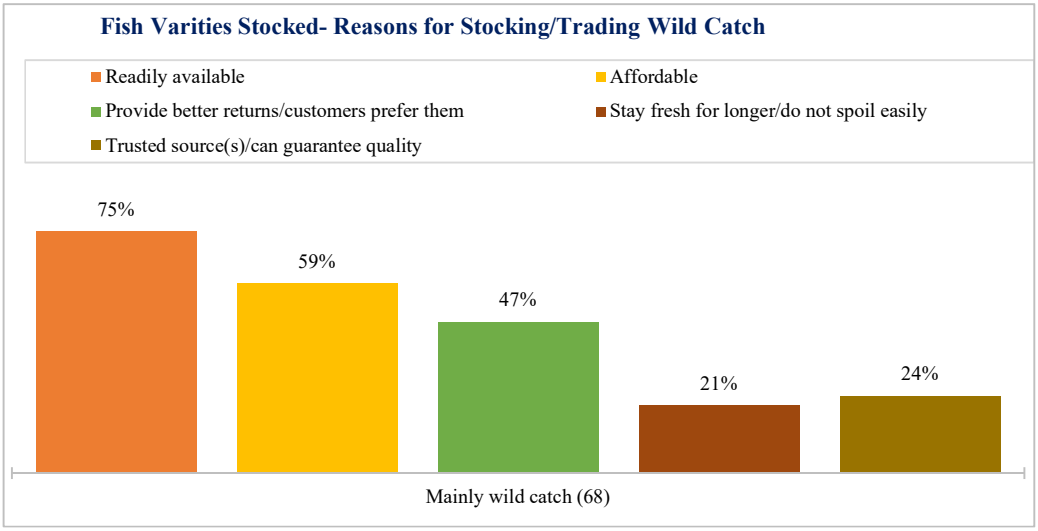
Fish retailers indicated that they mainly stocked wild catch fish varieties (92%) and these were largely sourced locally (96%). Interestingly however, 2% of the fish retailers could not tell whether the fish they stocked was wild catch or farmed fish, while 1% could not tell whether it was from local or imported sources as shown below.

Figure 188: Fish retailers- Varieties of fish stocked



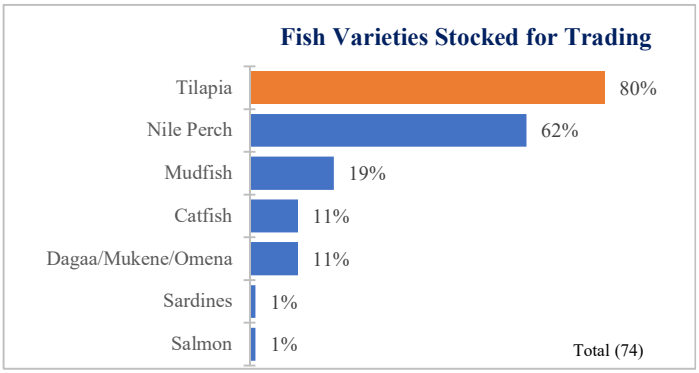
It was observed that fish retailers largely preferred to stock wild catch varieties due to their availability, affordability, and customer preferences which lead to better returns as shown below.

Figure 189: Fish retailers- Reasons for stocking fish varieties



Tilapia (80%) and Nile Perch (62%) fish varieties were the main ones stocked by fish retailers for trading among others as shown below.

Figure 190: Fish retailers- Fish varieties stocked for trading



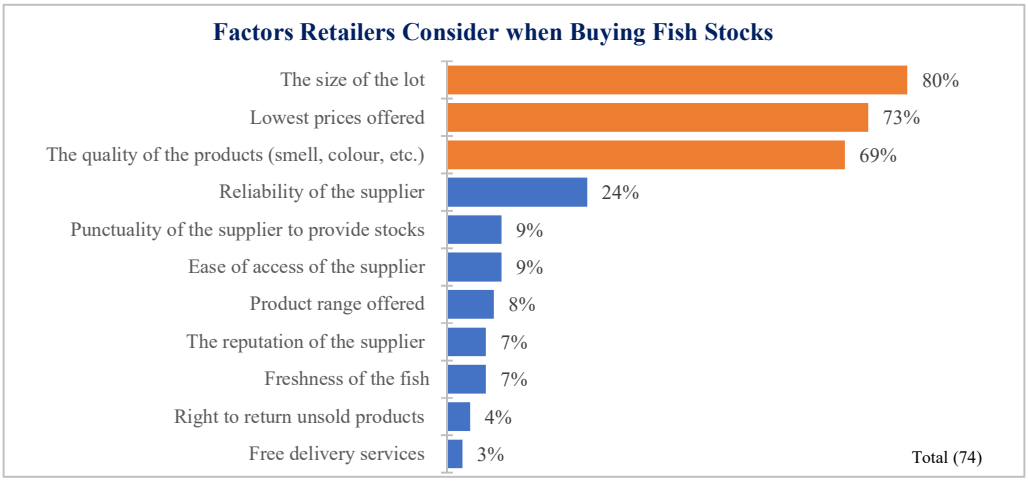
Additionally, fish retailers largely sourced their stocks from the fish markets, from the lake sides and from landing sites among other sources as shown below.

Table 88: Fish retailers- Source of fish stocked for trading

Source of fish							
	Tilapia (59)	Nile Perch (46)	Mudfish (14)	Catfish (8)	Sardines (1)	Salmon (1)	Others (8)
Fish market	42%	37%	21%	50%	-	-	63%
Lake e.g. Lake Victoria	36%	26%	21%	25%	-	-	-
Landing site	22%	33%	21%	25%	-	-	-
From rivers	7%	-	29%	-	100%	100%	-
From wholesalers	5%	4%	-	-	-	-	25%
From fish pond	2%	2%	-	-	-	-	-
From fishermen	2%	4%	-	-	-	-	-
From the retailers	2%	-	7%	-	-	-	13%

Fish retailers indicated that when making purchase decisions, they largely looked at the size of the lot (80%), the pricing of the products (73%) and the quality of the products (69%) among other parameters shown below.

Figure 191: Fish retailers- What retailers look for when buying fish stocks



Average Amount of Fish Stocked and Resold

On average, fish retailers stocked/purchased about 223kgs of Tilapia and 495kgs of Nile Perch (species stocked by most retailers) for each batch/lot purchased per month. Average amounts stocked for other fish species are shown below.

Table 89: Fish retailers- Estimated kgs purchased per batch/lot in a month

Kgs of fish stocks purchased per month						
	Tilapia (59)	Nile Perch (46)	Mudfish (14)	Catfish (8)	Sardines (1)	Salmon (1)
Average amount purchased per month	223	495	182	70	45	80

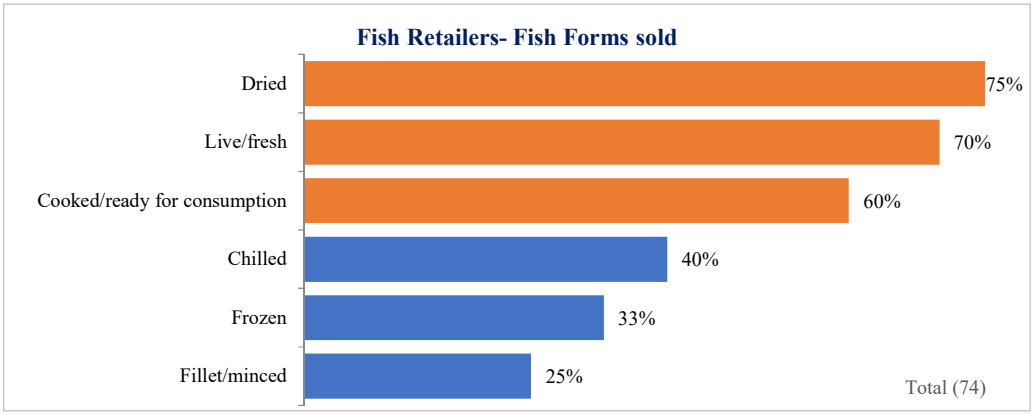
It was observed that from the fish stocks purchased, retailers sold off an average of 177kgs of Tilapia and an average of 424kgs of Nile Perch among other fish varieties as shown below. This alluded to the fact that the retailers were possibly making losses in their fish stocks. Alternatively, fish retailers who reported to have access to storage equipment (discussed further below) could be storing their stocks for sale over an extended period of time.

Table 90: Fish retailers- Estimated kgs sold per batch/lot in a month

Kgs of fish stocks sold per month						
	Tilapia (59)	Nile Perch (46)	Mudfish (14)	Catfish (8)	Sardines (1)	Salmon (1)
Average amount sold per month	177	424	123	68	26	20

Further, fish retailers indicated that proportions of sales made through selling dried fish (75%), live fish (70%) and cooked/ready for consumption fish (60%) were higher than other forms as shown below.

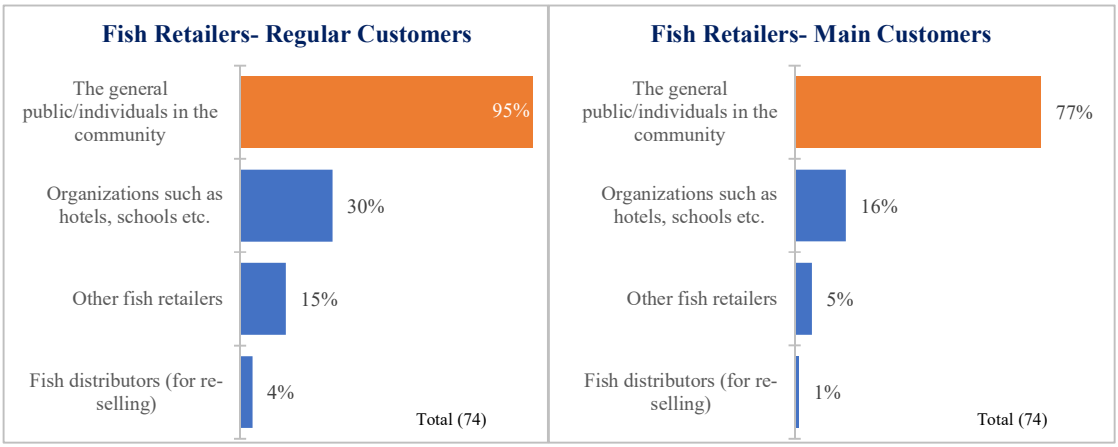
Figure 192: Fish retailers- Proportion of sales in fish states



The Main Customers for the Retailers

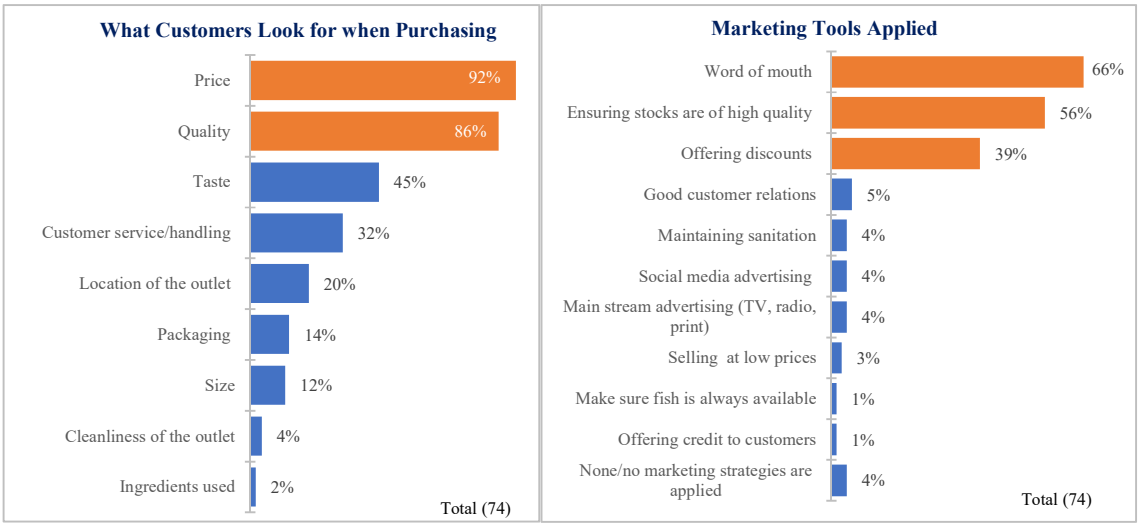
Fish retailers' customers were largely individuals in the communities where the retailers operated in, and these were also cited as being the main customers as shown below. Significant proportions also cited selling their products to organizations/institutions which alluded to significant volumes being sold at this level of the value chain.

Figure 193: Fish retailers- Regular and main customers



Additionally, fish retailers perceived that their customers largely looked at the pricing (92%) and the quality (86%) of the products among other things as shown below. Consequently, retailers largely used word of mouth (66%) to push their products, as well as ensuring their products were of high quality (56%) and offering discounts (39%) among other techniques as shown below.

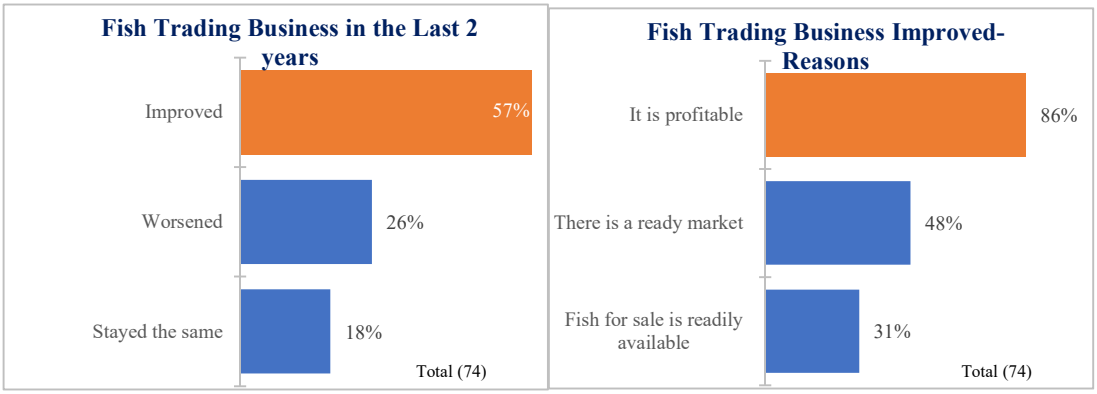
Figure 194: Fish retailers- What customers look for and marketing tools applied



Challenges and Bottlenecks that Retailers Face

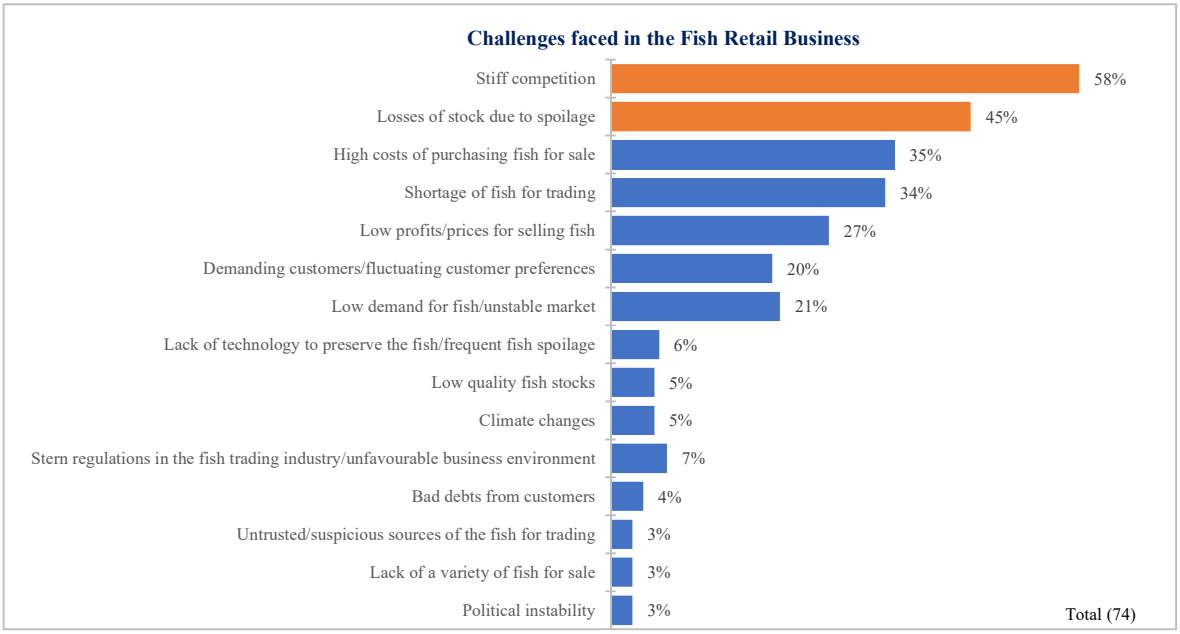
Fish retailers observed that the fish trading business had largely improved in the last 2 years (57%), mainly because the business had been profitable (86%) as shown below. This could allude to an increase in the pricing of products by retailers, which would have an impact on consumers' purchase patterns. As noted in the previous sections, consumers indicated that their consumption of fish had largely decreased in the last year.

Figure 195: Fish trading business in the last 2 Years



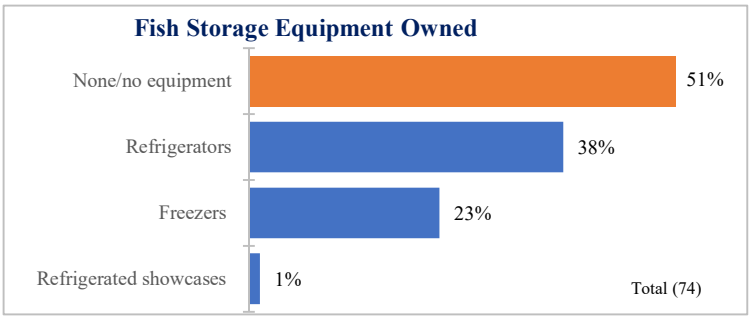
Several challenges had however been faced over time, with the most pressing ones including stiff competition (58%) and losses of stocks due to spoilage (45%) among others as shown below.

Figure 196: Fish retailers- Challenges faced



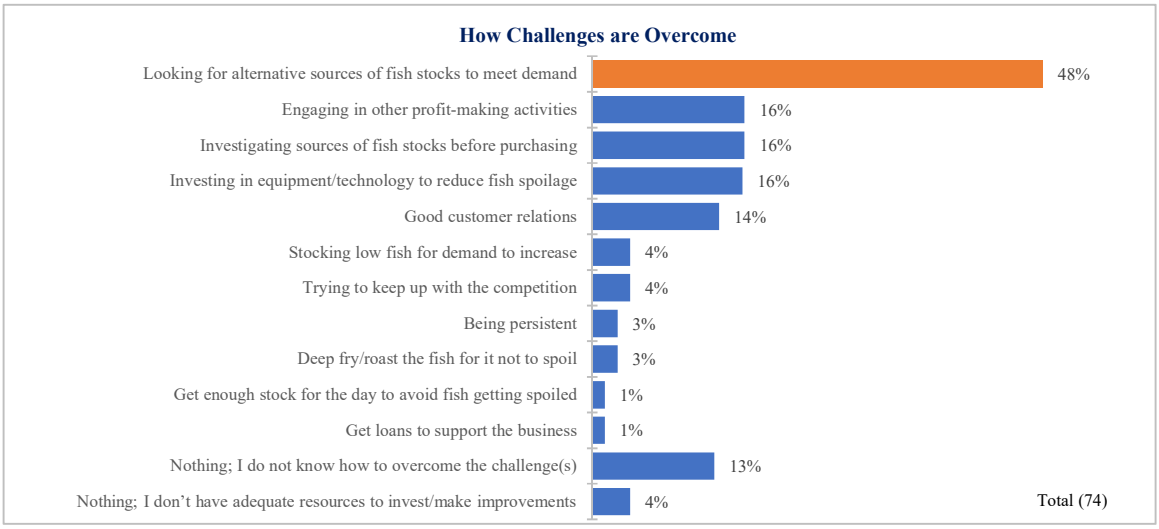
It was observed that more than half of the interviewed fish retailers (51%) did not own any storage equipment for use in their businesses, and could be one of the main contributors of losses incurred due to spoilage as cited above.

Figure 197: Fish retailers- Storage equipment owned



As indicated above, some of the major challenges experienced in the fish retailing business included stiff competition (cited by 58% of the retailers), which translated to more players in the market who were of course purchasing stocks for their trade. Indeed, shortage of fish stocks was also cited by a significant proportion of the retailers (34%). As a result, one of the main ways that fish retailers indicated they overcame various challenges faced in the business was through looking for alternative sources of fish stocks to meet demand (48%) as shown below.

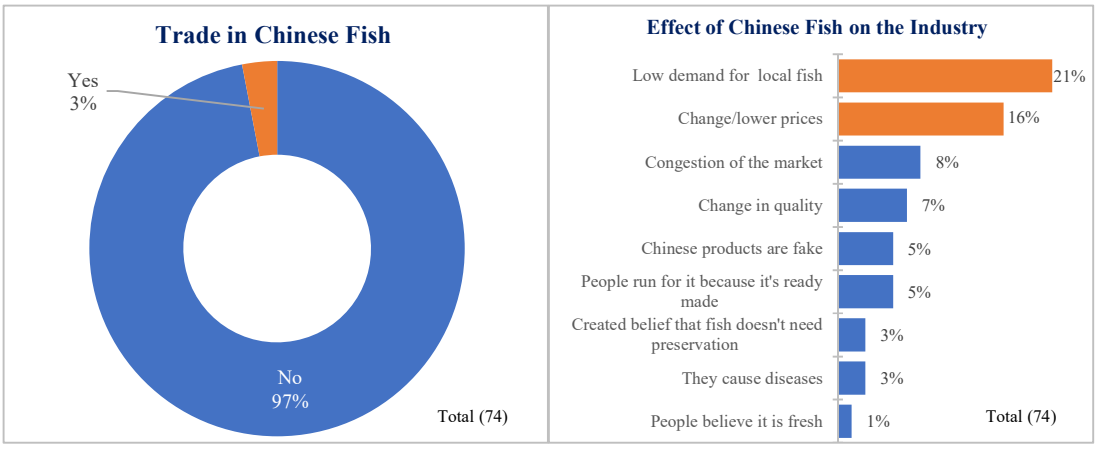
Figure 198: Fish retailers- How challenges are overcome



With regards to fish importation in Uganda, it was observed that most of the fish retailers (97%) were not trading imported Chinese fish. However, retailers acknowledged that the

Chinese fish had impacted the business environment with some of the main effects indicated including lower demand for local fish varieties (21%), and lower prices for the commodities (16%) among others as shown below.

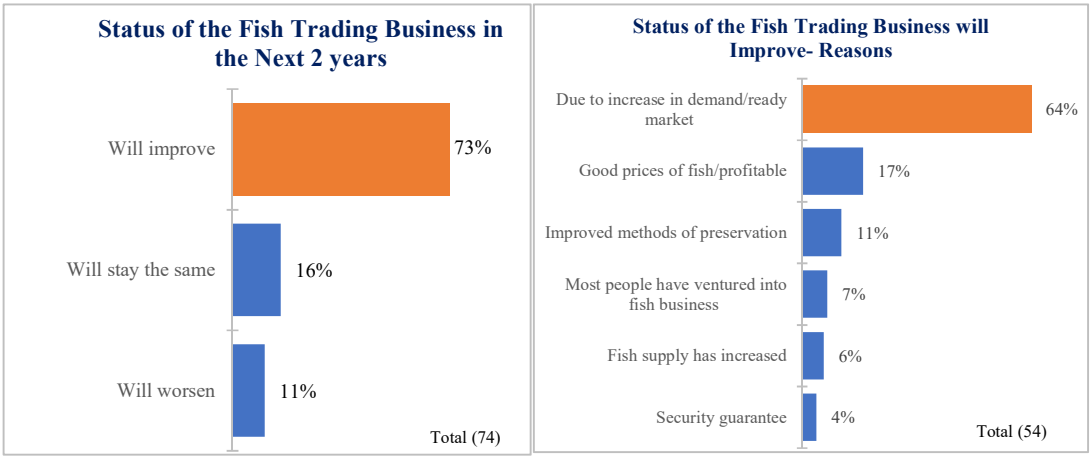
Figure 199: Fish retailers- Trade in Chinese fish and impact on industry



Available Opportunities for Fish Retailing

Despite the challenges faced in the business, fish retailers were optimistic that the business environment for fish trading would improve (73%) largely due to the increased demand for fish and fish products in the market (64%) as shown below.

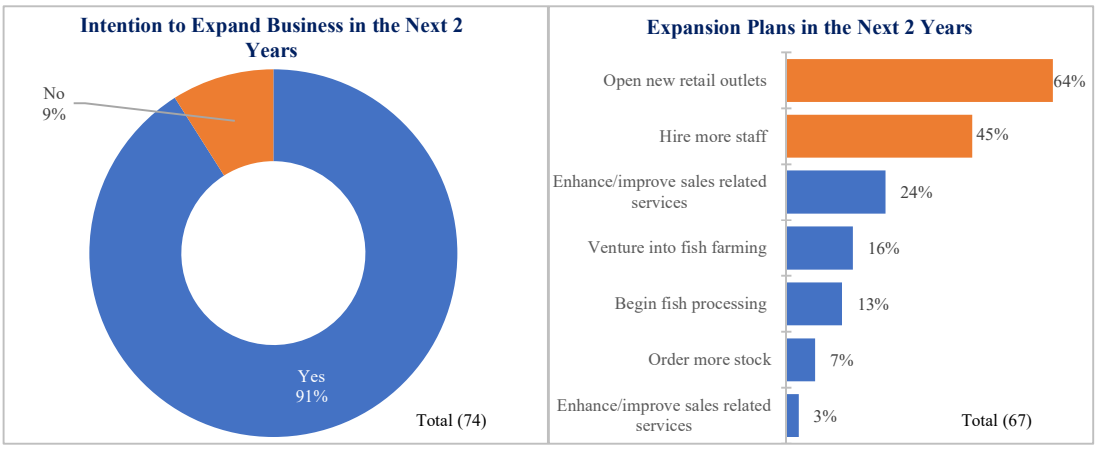
Figure 200: Fish retailers- Business environment status in the next 2 years



In readiness for the future, most of the fish retailers (91%) indicated that they had intentions to expand their businesses in the next 2 years, with some of the expansion plans including opening new retail outlets (64%) and hiring more staff (45%) among others as shown below. As noted in the sections above, one of the most pressing

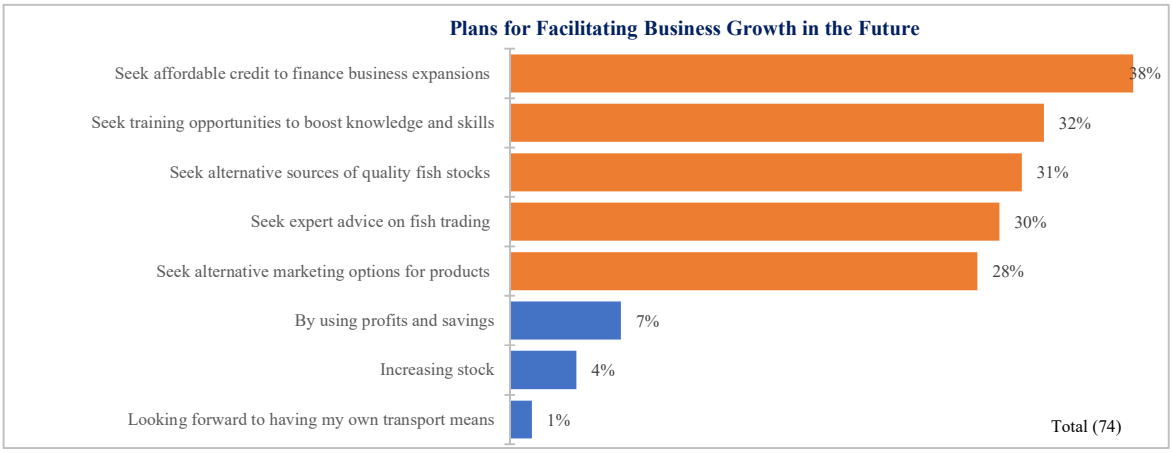
challenges was fish spoilage; however, investing in cold storage was not a priority for the retailers.

Figure 201: Fish retailers- Business expansion plans- Next 2 years



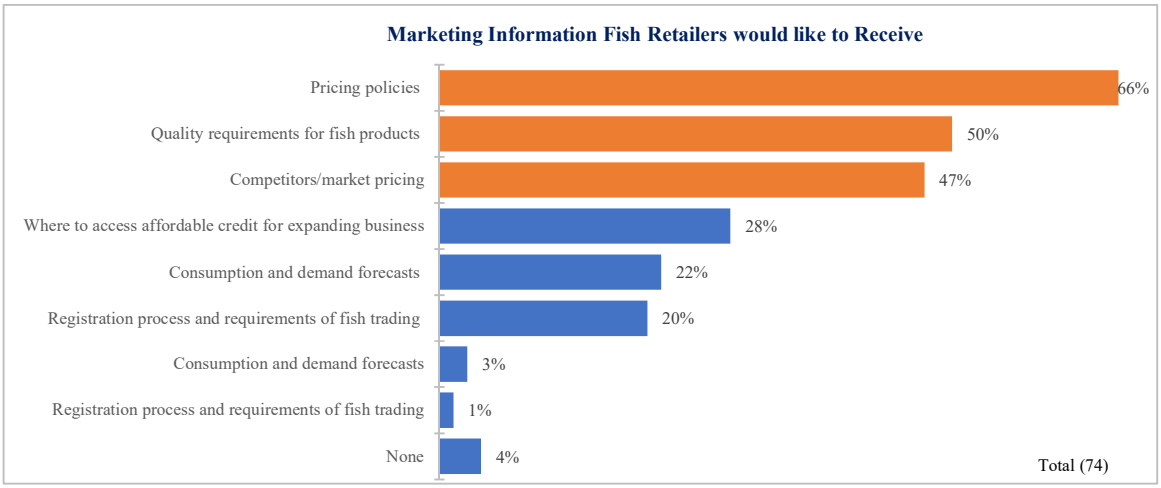
To facilitate business expansion plans in the future, fish retailers indicated that they intended to seek affordable credit (38%), training opportunities (32%), alternative sources of quality fish stocks (31%), expert advice (30%), as well as alternative marketing options for their products (28%) among other initiatives as shown below.

Figure 202: Fish retailers- Plans to facilitate business growth in the future



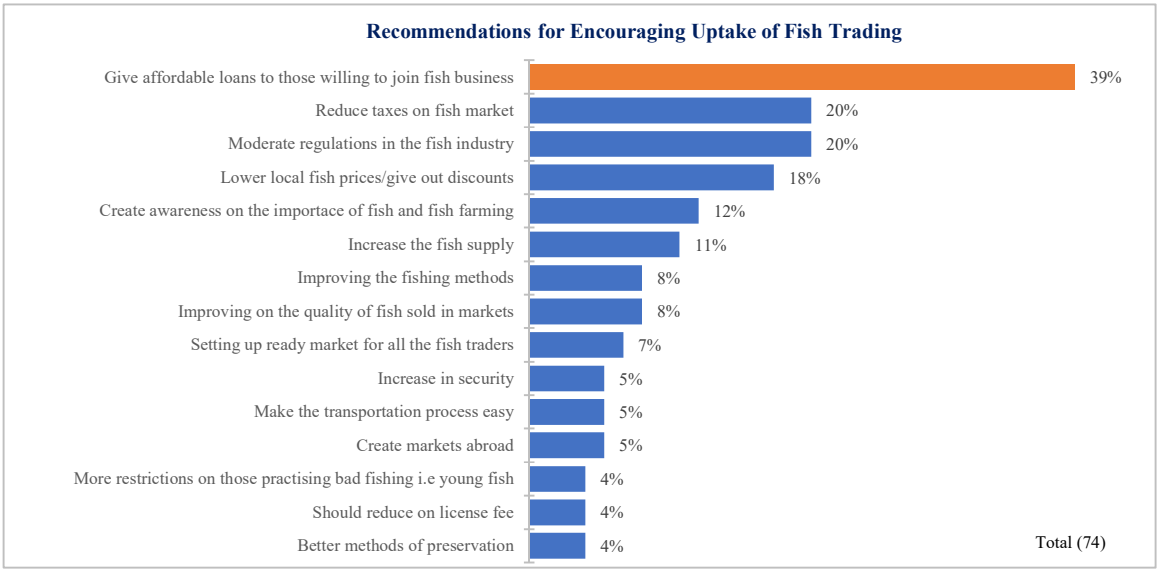
To facilitate growth in their businesses, fish retailers indicated that they would largely be interested in receiving information about pricing policies (68%), quality requirements for fish products (50%) and competitors/market pricing (47%) among others as shown below.

Figure 203: Market information retailers would be interested in



To encourage the uptake of the fish trading business, fish retailers largely recommended the provision of affordable credit (39%) to those wishing to join in the venture as shown below.

Figure 204: Fish retailers- Encouraging uptake of the fish trading business



To succeed in this trade, fish retailers advised that having enough capital for the business (39%) was key for success, among other critical factors as shown below.

Figure 205: Recommendations for succeeding in fish trading

3.2.4 Fish Price Analysis

This section presents insights on the prices of fish in the value chain as well as the mark-ups added before the fish reaches the end consumer.

Fish Prices from Farmer, Processor, Retailer to Consumer

Fish Farmers

Fish farmers indicated that they sold a kilogram of different fish species at an average price of UGX. 7,000 to UGX. 11,000 (equivalent to USD.2 to USD.3) as shown in the table below.

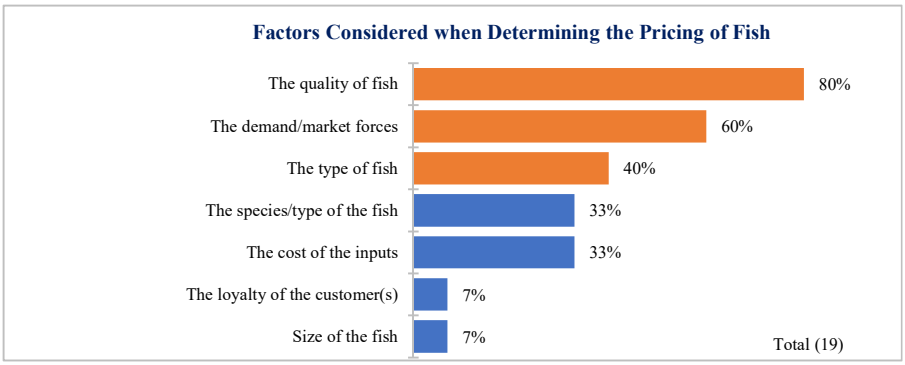
Table 91: Fish farmers- Average selling price of fish per kg

Cost of fish per kg (UGX)				
	Tilapia (18)	Catfish (7)	Mudfish (3)	Common Carp (1)
Average selling price per kg	8,244	7,786	7,333	11,000

It was observed that all fish sold by fish farmers was in the live/fresh form and this form therefore made up 100% of the fish farmers' sales.

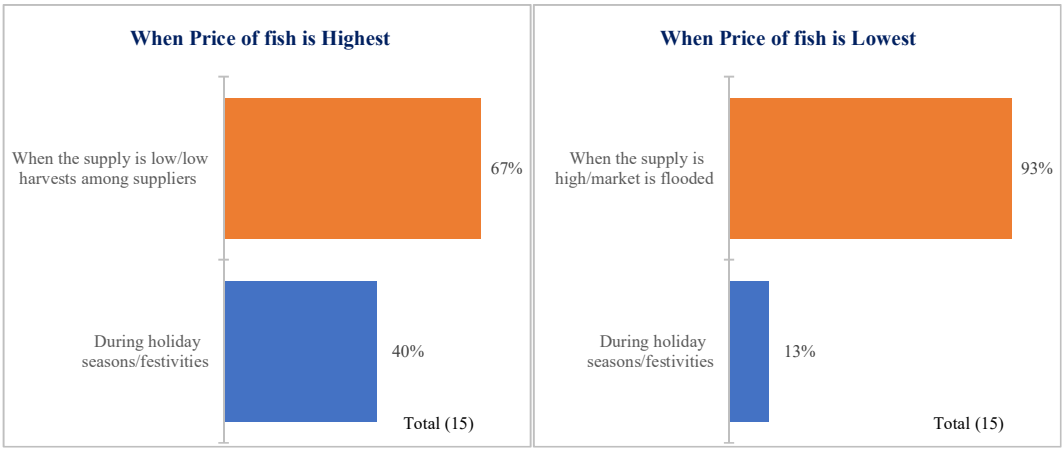
Regarding the pricing model and marketing rationale of fish by fish farmers, it was observed that farmers mainly considered the quality of the fish (80%), demand (60%) and the type of fish (40%) among other considerations.

Figure 206: Fish farmers- Factors considered when determining pricing of fish



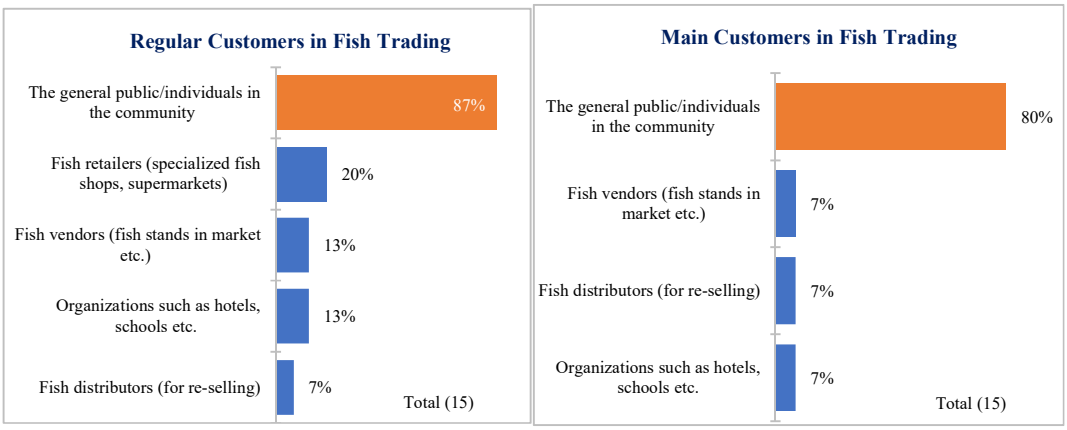
Further, fish prices were observed to be generally high when the supply was low (67%) and largely lowest when the supply was high (93%) as shown below.

Figure 207: Fish farmers- Factors affecting pricing



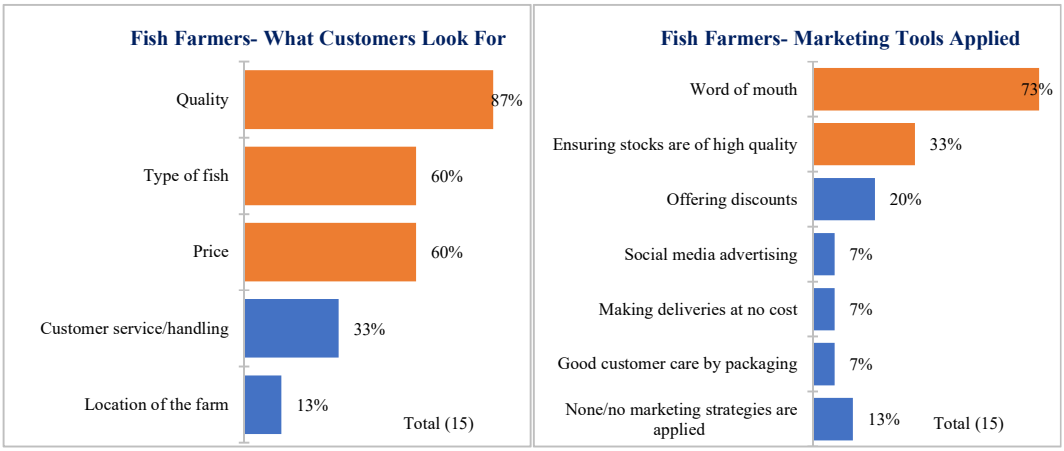
Regular customers for the fish farmers were mainly individuals in the communities (87%) and these were also cited as the main customers by 80% of the interviewed farmers.

Figure 208: Fish farmers- Fish customers



Additionally, fish farmers indicated that their customers largely look out for quality when purchasing products (87%), the type of fish and its pricing (60% respectively) among other attributes. Farmers largely used word of mouth (73%) to market their products and ensured that their stocks were of high quality (33%) among other things to market their products.

Figure 209: Fish farmers- Customer preferences and marketing tools applied



Fish Processors

It was noted that fish processors sold Tilapia products for an average of UGX. 28,000 (equivalent to about USD.8) per kg when the pricing was at its highest and UGX. 24,000 (equivalent to about USD.7) per kg when the pricing was at its lowest. The Nile Perch products on the other hand were sold for an average of UGX. 18,500 (equivalent to about USD.5) per kg when the price was highest, and UGX. 13,750 (equivalent to about

USD.4) per kg when the price was lowest. Additionally, it was observed that processors largely sold their products two or three times in a week.

Fish Retailers

For fish retailers on the other hand, it was observed that they bought the different fish species at an average of UGX. 4,000 to UGX. 11,600 (equivalent to about USD.1 to USD.3) per kilogram as shown in the table below.

Table 92: Fish retailers- Average fish buying price

Fish retailers- Average buying price per kg (UGX.)						
	Tilapia (59)	Nile Perch (46)	Mudfish (14)	Catfish (8)	Sardines (1)	Salmon (1)
Average buying price per kg	9,587	10,585	7,050	11,667	4,000	8,900

Additionally, it was observed that fish retailers sold a kilogram of the different fish species kept at an average price of between UGX. 5,600 to UGX. 16,000 (equivalent to about USD.2 to USD.5) per kg as shown in the table below. This infers that retailers make an average profit of about UGX. 3,300 (equivalent to about USD.1) for each kg of Tilapia and Nile Perch among other species.

Table 93: Fish retailers- Average fish selling price per kg

Fish retailers- Average selling price per kg (UGX.)						
	Tilapia (59)	Nile Perch (46)	Mudfish (14)	Catfish (8)	Sardines (1)	Salmon (1)
Average selling price per kg	12,977	13,982	7,750	16,000	5,600	13,800

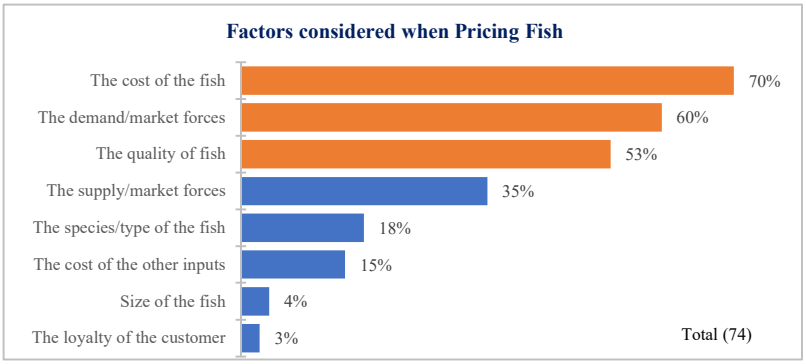
It was further observed that fish retailers were spending an average of UGX. 557,550 (equivalent to about USD.156) per month to run their businesses as shown below. The more established entities were observed to be spending more while the less established entities were observed to be spending less in a month to run their businesses. The factors driving the cost of running the business included the cost of rent, electricity, water, hired labour, and the cost of marketing the business.

Table 94: Fish retailers- Average cost of running the business in a month (UGX)

Total cost of running the business per month	
Total (74)	
Average cost of running the business per month	557,550
Maximum cost of running the business per month	4,550,000
Minimum cost of running the business per month	10,000

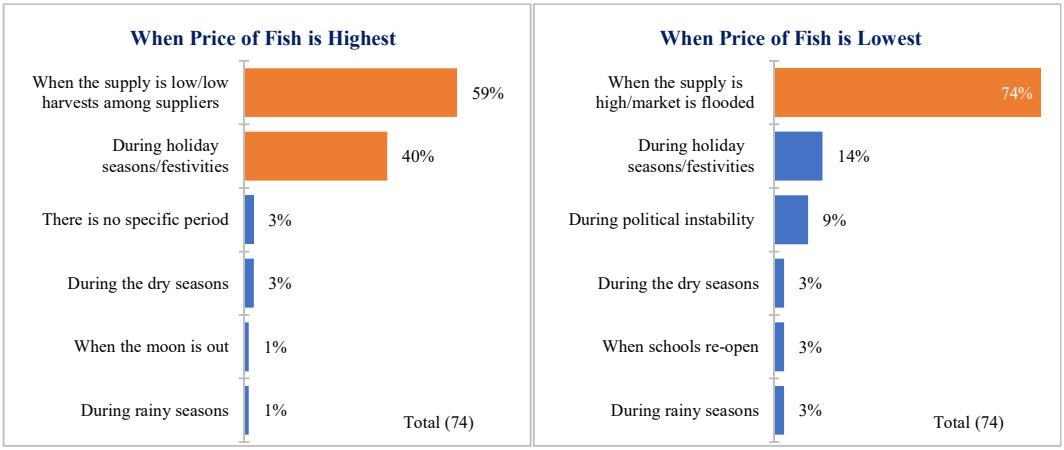
In terms of determining the sales price for fish, the retailers indicated that they largely considered the cost of the fish (70%), the demand for the fish (60%) and the quality of the fish (53%) among other factors as shown below.

Figure 210: Fish retailers- Factors considered when pricing fish



Fish retailers observed that prices for their products were usually at their highest when the supply was low (59%) and during holiday seasons (40%) and lowest when the supply was highest/market was flooded (74%) among other periods as shown below.

Figure 211: Fish retailers- Price fluctuations



From a consumer perspective, and as discussed previously, households tend to consume an average of 3.4kgs of fish in a month. As noted earlier however, consumers tend to purchase more than one variety or form of fish, with more consumers purchasing *Dagaa/Mukene/Omena,* dried/smoked fish and fresh fish. The aggregated amount of fish and fish products purchased/consumed at the households is therefore higher.

As shown in the table below, *Dagaa/Mukene/Omena* (purchased/consumed by 54% fish consumers) costs an average of UGX. 4,035 (equivalent to about USD.1) per kg, while dried/smoked fish (purchased/consumed by 53% of fish consumers) costs an average of UGX. 8,087 (equivalent to about USD.2) per kg. Fresh fish (consumed by a significant proportion- 49%) on the other hand costs an average of UGX. 9,348 (equivalent to about USD.3) per kg. Prawns/other sea food were observed to cost the least; an average of UGX. 2,667 (equivalent to about USD.1) per kg.

Noting that the average price of fish from the retailers is slightly higher than the average prices reported by consumers (at UGX. 9,587- equivalent to about USD.3- for kg of Tilapia and UGX. 10,585-also equivalent to about USD.3- for a kg of Nile Perch, which were fish varieties commonly stocked by retailers), the price difference could be attributed to several factors: firstly, fish retailers were only interviewed in the urban setting where prices tend to be higher. The consumers on the other hand were interviewed at a national level (urban and rural settings). Prices of products in the rural settings tend to be lower, and this influences the average pricing of products reported by consumers. Secondly, pricing would also be affected by regional variations as well as an influx of fish from other sources such as those obtained from the imports, whose prices vary. Some consistency is however observed, where, for instance rural households mentioned that they purchase fresh fish at UGX. 8,472 (equivalent to about USD.2) per kg, and earlier, the average price of fresh fish at the farms was noted as being UGX. 8,244 (equivalent to about USD.2) per kg. Further, the price of fish is observed to be higher in the urban settings than in the rural settings as shown below.

Table 95: Consumers- Average purchase price per kg (UGX.)- Setting

Average price per kg (UGX.)			
	Total (1,072)	Urban (528)	Rural (544)
Deep fried fish	9,814	10,119	9,277
Fresh fish	9,348	10,160	8,472
Frozen or fresh fish fillets	10,313	10,654	8,833
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	8,087	8,361	7,818
Dagaa/Mukene/Omena	4,035	3,951	4,112
Prawns/other sea food	2,667	-	2,667
Tinned/canned fish	20,000	40,000	-
Other fish	6,833	7,750	5,000

Variations were also observed across the regions, where for instance, the cost of *Dagaa/Mukene/Omena* was highest in the Eastern and Northern Regions and lowest in Western Region, while the cost of dried/smoked fish was highest in Central Region and lowest in Northern and Eastern Regions as shown below.

Table 96: Consumers- Average purchase price per kg (UGX.)- Region

Average price per kg (UGX.)						
	Total (1,072)	Central (259)	Eastern (220)	Kampala (127)	Northern (186)	Western (280)
Deep fried fish	9,814	12,436	8,057	11,833	5,316	9,516
Fresh fish	9,348	10,691	8,939	11,829	5,702	8,854
Frozen or fresh fish fillets	10,313	9,500	10,000	10,750	12,375	8,375
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	8,087	9,330	7,508	8,537	7,436	8,018
Dagaa/Mukene/Omena	4,035	3,871	4,807	3,589	4,564	2,667
Prawns/other sea food	2,667	-	-	-	2,667	-
Tinned/canned fish	20,000	-	-	40,000	-	-
Other fish	6,833	3,500	13,000	-	-	4,000

Fish Prices- Mark-up

This section provides an indication of the average mark-up/profit made by various players in the value-chain.

Fish Farmers

It was noted that fish farmers in Uganda were making an average mark-up of about UGX. 792,150 to UGX. 24,330,000 (equivalent to about USD.222 to USD. 6,812) per batch/lot of different fish varieties reared. It was observed that the Tilapia fish species was the most profitable while the Catfish was the least profitable as shown below.

Table 97: Fish farmers- Average mark-up (UGX)

Average mark-up price per batch/lot (UGX)					
	Average number of kgs sold per batch/lot	Average selling price per kg	Total sales per batch/lot (UGX)	Average cost of production per batch/lot (UGX.)	Average mark-up/profit per batch/lot (UGX)
Tilapia (18)	2,994	8,244	24,682,536	352,559	24,329,977
Catfish (7)	-	7,786	-	-	-
Mudfish (3)	339	7,333	2,485,887	76,600	2,409,287
Common Carp (1)	100	11,000	1,100,000	307,850	792,150

As observed in the previous sections, however, the number of kgs reported as sold by fish farmers appeared low, which affects the average mark-up/profit indicated in the table above. For instance, as observed earlier, farmers rearing the Catfish species had harvested 25kgs, though none of it was reported to have been sold.

Fish Processors

As noted in the previous sections, information obtained from fish processors regarding the amount of fish processed and sold in a month was limited. This therefore affects the computation of the average mark-up/profit made by this group. From the information obtained and as shown below, processors appear to be making an average of about UGX.3B (equivalent to about USD. 855,000) per month from processing and selling products from the Nile Perch variety when the pricing of products is highest, and about UGX.2B (equivalent to about USD. 635,000) per month when the pricing of products is lowest. Average sales from Tilapia products could however not be computed because processors were unwilling to provide information on the average number of kgs sold in month. The computed figures from the Nile Perch varieties are gross profits, which do not factor in the cost of running the business. This would be an area worth exploring in future studies for a more accurate picture of the mark-up/profit made by this group. Concerted efforts from various stakeholders would however be needed to encourage this group to participate in research studies for identification of areas of support needed to grow businesses in this level of the value-chain.

Table 98: Fish processors- Average mark-up (UGX)

Average mark-up/profit per month (UGX)					
	Average price per kg when price is highest (UGX)	Average kgs sold in a month	Total average sales in a month (UGX) when pricing is highest	Average price per kg when price is lowest (UGX)	Total average sales in a month (UGX) when pricing is lowest
Tilapia (2)	28,000	-	-	24,000	-
Nile Perch (2)	18,500	165,125	3,054,812,500	13,750	2,270,468,750

Fish Retailers

It was noted that fish retailers were making an average of UGX.700 to about UGX. 4,900 (equivalent to about USD.1 or less) per kg from the sale of different fish species stocked as shown below. It was observed that the Mudfish species was the least profitable while Salmon was the most profitable for retailers stocking these varieties.

Table 99: Fish retailers- Average mark-up per kg (UGX)

Average mark-up price (UGX)			
	Average buying price per kg	Average selling price per kg	Average mark-up/profit per kg
Tilapia (59)	9,587	12,977	3,390
Nile Perch (46)	10,585	13,982	3,397
Mudfish (14)	7,050	7,750	700
Catfish (8)	11,667	16,000	4,333
Sardines (1)	4,000	5,600	1,600
Salmon (1)	8,900	13,800	4,900

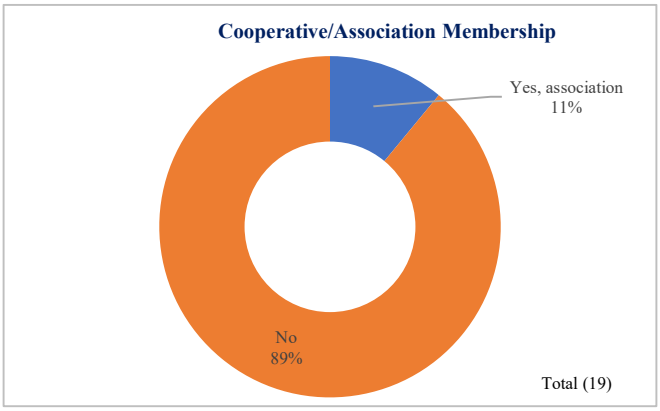
3.2.5 Market Organization/Cooperatives and Associations

This section of the report provides insights on market organization across different players in the value-chain.

Fish Farmers

It was observed only a small proportion of fish farmers (11%) were members of an association to boost their business practices. The mentioned associations that this proportion of farmers were members of were cited as Kwefufa and Church Fish Farmers associations. It was noted that one of the associations was registered while the other was not.

Figure 212: Fish farmers/ponds- Association membership



Further, both associations were noted as charging members a subscription fee which was an average of UGX. 22,500 (equivalent to about USD.6) as shown below. Additionally, it was observed that the subscription fee for one of the associations lasted for one year, while the other lasted for a period of 3 years.

Table 100: Fish farmers/ponds- Association membership subscription fee

Associations' membership fee subscription (UGX.)	
Average membership fee	22,500
Minimum subscription fee	20,000
Maximum subscription fee	25,000

Membership subscription in these associations was indicated as accruing benefits such as market sourcing for members, being a source of credit and provision of business advice to the members. The performance of these associations was rated by members as generally being good.

Some of the improvements members recommended to the associations included encouraging cooperation among members, for the management to get more involved in the fish farming activities and for the membership fee to be renewable annually to sustain the associations' operations.

Fish Storage and Transportation Businesses

It was noted that 2 of the 5-interviewed storage and transportation businesses were members of cooperatives. Cooperatives that the 2 storage and transportation companies were members of were noted as WAFICOS (Walimi Fish Farmers Cooperative Society) and Kamu Kamu Fish Cooperative. Both cooperatives were reported as being registered, and they both required membership subscription of about UGX. 5,000 to UGX. 10,000 (equivalent to about USD.2 to USD.3), which was largely renewable annually. Some of the benefits members enjoyed included access to loan facilities, health insurance for members as well as access to equipment and farming inputs at subsidized prices. Members indicated that the cooperatives were performing well (the performance was rated as good) and recommended that the management of the cooperatives should increase the level of engagement with members to keep everyone informed.

Fish Processors

With regards to the 2 processors interviewed in this study, it was observed that both were members of the Uganda Fish Processors and Exporters Association (UFPEA), which was indicated as being a registered entity. Further, the processors indicated that they paid a membership subscription fee which ranged between UGX. 50,000 to UGX. 120,000 (equivalent to about USD.14 to USD.34), an indication that there could be different

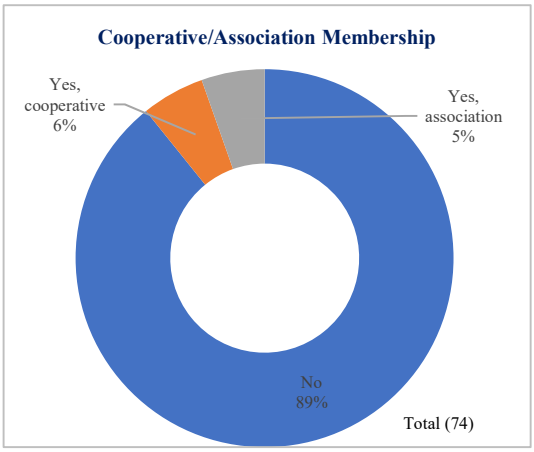
levels of membership in the same association. The membership subscription was cited as being payable annually for each round paid.

Some of the membership benefits cited included the association being a source of good quality fish feeds, sourcing for markets for the members' products, assistance in resource management and regulation of production capacities. The association was rated as performing averagely on all benefits offered to its members. The processors recommended that the association should do more lobbying on areas of interest for the members to benefit and grow in their business ventures.

Fish Retailers

Similar to fish farmers, it was observed that only a small proportion of fish retailers (11%) were in organized groupings in the form of cooperatives or associations to support their business operations as shown below. Some of the cited cooperatives and associations included Bonabagagawale Kalinabiri Sacco, Fish Mongers Association, Wandegeya Vendors Cooperative and Uganda Commercial Fish Farmers Association.

Figure 213: Fish retailers- Association membership



Further, it was observed that most cooperatives/associations (5 out of 8) were registered. Interestingly, 2 of the retailers could not tell whether their cooperative/association was registered or not, which could be an indication of gaps in information sharing in the cooperatives/associations.

Further, it was noted that most cooperatives/associations (6 out of the 8 mentioned) charged a membership subscription fee. Retailers in cooperatives/associations that

charged this fee paid an average of UGX. 46,917 (equivalent to about USD.13) for each round of membership subscription paid for as shown below. It was noted that membership subscription fees varied, where for instance, the lowest payable fee noted was UGX. 15,000 (equivalent to about USD.4) and the highest fee payable was noted as UGX. 100,000 (equivalent to about USD.28) for each round paid as shown below.

Table 101: Retailers- Cooperative/association membership subscription fee

Cooperatives/associations membership subscription fee (UGX.)	
Average Subscription Fee	46,917
Maximum Subscription fee	100,000
Minimum Subscription fee	15,000

It was observed that the duration of the time that the membership subscription in cooperatives/associations lasted for each round paid for ranged between 6 months and 1 year. Additionally, the membership benefits accrued included the cooperatives/associations being a source of credit, linkages to markets for retailers' products, being a source of quality fish stocks, discounted prices on products and being a savings option for members. Overall, members rated cooperatives/associations as performing well (good) on benefits such as sourcing for quality fish stocks and linking them to markets for their products, while benefits such as offering discounts on products and being a source of credit for members were rated as being average.

Consequently, recommendations made to cooperatives and associations by the members included actively lobbying for funding for managing the cooperatives/associations' affairs, managing loans provided to members more efficiently for sustainability, increasing the borrowing limits for members, lowering membership subscription fees to encourage growth of the membership base, increasing meeting days for members for more interaction, treating members equally, improving leadership and coordination and opening of more branches for accessibility.

Cooperatives' Administrators' Perspective

In addition to speaking from the members of cooperatives, this study sought insights from the administrators of cooperatives providing support to various players in the value chain. A total of 7 cooperatives supporting the fish industry were targeted for interview.

However, 6 agreed to be interviewed and presented below is the qualitative feedback gleaned from them.

Cooperative Structure

It was observed that the structure of cooperatives supporting the fish industry varied. Some cooperatives interviewed for instance, exclusively supported fish farmers, while others supported fish farmers, traders, fishermen and general farmers. It was observed that most cooperatives were established to mainly provide credit services to their members, acquire information about the fish farming industry, market the members' businesses, and assist their members in procuring equipment for running their businesses. Membership bases were noted to vary, where for instance, the least number of cooperative members was noted to be 22 members, while the more established cooperatives had a maximum of 315 members. It was noted that some cooperatives owned assets such as fish nets, refrigerators, fish boxes and freezers which were accessible to members for use in their businesses.

Funding Model

It was observed that cooperatives largely relied on membership subscriptions and contributions to sustain their operations. Membership subscriptions were noted to vary, where for instance, members in some cooperatives made weekly contributions of about UGX. 2,000 (equivalent to about USD.1), while others made annual subscriptions of about UGX. 30,000 (equivalent to about USD.8). Additionally, cooperatives also indicated that they lobbied for funding from other organizations to support their operations.

Benefits of Membership

It was observed that cooperative members were enjoying several benefits. For instance, some cooperatives would let their members save with them, and members would subsequently access loan services for supporting their businesses. Members were granted loans with interest rates ranging from 10% to 20% per month. Further, members could access equipment and other services at discounted rates from the cooperatives, while

some cooperatives also acted as guarantors in banks/financial institutions to enable their members access loan services to develop their businesses.

Additionally, cooperatives indicated that they assisted their members in purchasing fish fingerlings at negotiated rates (through making bulk purchases) as well as advising their members on places where they could access quality fish seeds. Most cooperatives also assisted their members in marketing their products.

Further, some cooperatives also brought their members together in educative forums. The Uganda Cooperative Atanaziraba Development Association, for instance, had its members as part of Powesa, a project introduced by CBS FM, which aimed to teach people on how to develop themselves through savings and acquisition of small loans, as well as setting up income generating activities. Additionally, the Powesa initiative taught attendees about how to effectively manage loan services offered to members of different entities.

Also, it was noted that some cooperatives assisted their members to acquire permits when setting up their businesses- such as certificates from NEMA, clearance from water bodies and the Fisheries Department. Additionally, some of the cooperatives educated their members on how to build cages and ponds, types of nets to purchase, ideal number of fish stocks, how to feed the fish and how to 'sample' the fish (checking on the fish's weight and feeding them accordingly), among other kind of education.

Lastly, some cooperatives made investments using membership subscriptions and would share the profits among members based on the proportion of shares owned. Most cooperatives also supported their members in making personal savings with them for purpose of paying school fees among other personal goals, where they could access their money anytime they needed it. Some of the cooperatives also had a component of welfare where they could support their members when bereaved.

Trade Regulations and Policy Issues

It was observed that for cooperatives to be in operation, they had to have at least 15 members aged 18 years and above when registering with the Cooperative Development

Organizations (CDO). The CDO oversaw the issuing of operation licenses to the cooperatives, which was renewable every year, and which was compulsory for cooperatives to operate. Other requirements included registering with the Company Registrar, acquisition of licenses from the main court, acquisition of a certificate of incorporation and a memorandum of association, remittance of taxes to the Uganda Revenue Authority and registration through the Ministry of Trade.

For the cooperative members on the other hand, there were standardized sizes of boats required before licences to fish were issued. The Government was also keen on arresting individuals that fished young and immature fish. The fish farmers were also required to have permits from NEMA to ensure quality supply of water in the fish ponds.

Challenges Faced by the Cooperatives

Cooperative administrations cited that there was generally a lot of suspicion regarding the operation of cooperatives and people feared losing their money. This discouraged the growth of cooperative membership bases. Administrators indicated that it was especially difficult to lobby for membership subscription when the cooperatives were starting up, since, the awareness levels on cooperatives among potential members was still very low.

Further, it was noted that some cooperative members delayed on paying loans advanced to them or defaulted altogether, and largely interfered with the operation of the cooperatives. Cooperatives also indicated that attempts to reach out to the Government and other agencies for funds to supplement membership subscriptions in the running of their affairs had largely been futile. Lack of budget allocations to support the sector was largely the reasoning provided by entities approached to support cooperatives.

Cooperatives also indicated that the legal requirements needed to set up and offer support to members were difficult to comply with. For instance, equipment needed for supporting fish farming, specifically, cage farming, was cited as being costly and difficult to access. Some of the equipment also needed to be imported, which attracted high taxation.

Additionally, cooperatives noted that there had been an influx of imported fish in the country over time, which was not being regulated. The imported fish had attracted

demand in the market as it was available at lower prices, and this was resulting in low demand for local varieties. Low profits were especially discouraging fish farmers from investing in the venture. Cooperatives also indicated that there were frequent price fluctuations of products in the market, largely due to lack of regulation.

Further, cooperatives indicated there was a challenge of members accessing fish seeds for fish farming. The procedures of obtaining fish seeds from the Government regulated sources required licences/approvals which were difficult to acquire. As a result, fish farmers were depending on importation of fish seeds, which was noted as being of low quality (resulted in stunted growth and/or low yields).

Also, cooperatives indicated that their members were incurring high costs during transportation of fish, largely due to poor infrastructure. Poor infrastructure was also leading to losses as delays would be experienced in transit. Losses in fish stocks were compounded by the lack of adequate storage facilities for use, either at the members' facilities, or during transportation of products.

Lastly, it was observed that access to skilled labour in the construction of modern ponds was difficult. Most fish farmers were engaging manual/unskilled labourers in the construction of ponds, which was resulting in low standards being observed during construction.

Recommendations for the Future

Cooperatives recommended that the Government should set up more hatcheries for the production of fish seeds/fingerlings to reduce the high cost of accessing these from imported sources. Regulating the production of fish fingerlings by the Government would also guarantee quality, which would in turn lead to high yields for the farmers.

Additionally, cooperatives noted that they needed support in accessing fish feeds processing machines to reduce the cost of production for members. Another approach recommended was the verification and certification of companies manufacturing fish feeds and ensuring that these were available to members at affordable prices.

Empowering fish farmers/members with the knowledge and skills of producing their own fish feeds was noted as being another approach that could be pursued.

Further, cooperatives emphasised that there was the need to educate the general public on the nutritional value of fish to increase demand for fish and fish products. Cooperatives observed that demand could be easily increased through value addition, where for instance, fish could be grinded to powered form for sale. Powered fish, the cooperatives noted, did not require too much effort to preserve, and would also be easy for young children to consume. This would be attractive to customers, both locally and internationally.

Cooperatives also recommended that there was a need to support farmers in the access of storage facilities to reduce loss of fish stocks. Cooperatives indicated that they were also lobbying for the establishment of fish collection centres with storage equipment, which would also work towards reducing losses of fish stocks.

Additionally, the need for price regulation was emphasised, where it was observed that middlemen would purchase fish at very low prices from the farmers and end up selling it at very high prices to the end consumers. This was leading to low business profits for the farmers who were incurring most of the costs during production.

Lastly, cooperatives indicated that there as the need to promote fish farming to encourage more people to take up the venture. To support fish farming, cooperatives recommended that there was the need to make the equipment and skilled labour available at affordable pricing.

3.2.6 Policy and Trade Regulations

This section of the report explores the currently existing standards regulating the fish industry in Uganda including suppliers/market players' awareness of, and adherence to, existing regulations.

Current Status

Uganda is a landlocked country and mainly relies on its mainland water sources for fishing. The main piece of legislation governing fisheries in Uganda is the Fish Act (Ch

197) that regulates the sector. It creates the office of honorary fisheries officers but fails to give guidelines of what their role entails. It mainly places restrictions on basket fishing in Lake Edward, Lake George and the Kazinga Channel for which permits need to be obtained. It also provides for the licensing of vessels operating in its waters for fishing. In Section 6, it provides for the restrictions on fishing and processing of fish, a section that might affect aquaculture since it involves the handling and processing of fish. It states that one must have a valid specific license if one engages in the processing of fish and fish products, or engages in the marketing and sale of fish. It also controls the use of various fishing methods, and restricts fishing in dams without a permit.

What might however be relevant for aquaculture are the provisions in Section 12 that prohibits the introduction or transfer of fish or their eggs into Uganda without consent from the chief fisheries officer. It however fails to make direct provisions to guide aquaculture in Uganda.

However, the Fish (Aquaculture) Rules of 19 May 2003 (No.81 of 2003), which are subsidiary rules made under the Act set forth the different permits that are required to engage in aquaculture, their modalities of issuance and the prescribed offences and penalties under the Rules. It creates an office of the Aquaculture Inspector, who has the power to enter, inspect and search any aquaculture establishment if there is a reason to believe that there has been a contravention. He can take samples and information relating to fish and other aquatic animals, chemicals, feeds, drugs, hormones, fertilisers and any other aquatic material found in an aquaculture establishment. He is empowered to seize any items that he deems unfit for aquaculture. He is also tasked with advising the Fisheries Officer on the approval of fish breeders, transfer of fish and the approval of aquaculture in natural and transboundary aquatic systems. All aquatic establishments are required to be approved if they are intensive or semi-intensive – but fails to elaborate on what intensive or semi-intensive means. It however requires anyone practising aquaculture to guarantee the confinement of the fish to prevent escape from the establishment. It also stipulates that establishment of transboundary fish farms will comply with International Codes and Protocols recognised by all riparian countries. For

one to produce fish, distribute fish, and carry out fish seed production, one needs to have an aquaculture certificate as stipulated by the rules. It also places restrictions on the importation and exportation of live fish without approval. It further goes on to require fish farmers to ensure that such ventures don't degrade the environment without mitigation, prohibit the introduction of new species apart from those approved for an area, and demands that they must ensure the safety of food fish. With regards to aquaculture inputs, these are also regulated, with the requirement that all persons engaged in the production for sale and distribution, importation of inputs including fish feeds, aquaculture fertilisers, hormones, antibiotics and other items for aquaculture use be certified. It also regulates the release of all new genetic material intended for aquaculture and demands that those who do so, conform to the National Bio-safety Guidelines set by the Uganda National Council of Science and Technology. The same goes for aquaculture research which requires that any living modified organism should be placed under quarantine and only released with the written consent of the Chief Fisheries Officer.

Beyond this, there is the National Development Plan and the Agriculture Sector Development Strategy and Investment Plan that contains several objectives to improve the fisheries sector and the strategies to reach these objectives, such as creating an enabling environment for competitive investment in agriculture, and the strategy plans to improve the capacity for quality assurance, regulation, food and safety standards for fisheries, as well as ensure sustainable management of environmental resources and minimize degradation through the promotion of compliance with environmental laws and regulations.[24]

Consumer education and demand promotion activities include: educational activities to encourage better dietary practices amongst the general populace are conducted to some

[24] http://www.fao.org/fishery/legalframework/nalo_uganda/en

extent in primary and secondary schools and by the Ministry of Health through ante-natal clinics, village dispensaries, and the public media. The FAO is engaged in a nutrition education project through the Department of Food Science and Technology at Makerere University, with the aim of developing a training syllabus for teaching institutions of all descriptions, from primary to university and technical school level. Formal education at all levels from primary through university has done much to alter the food preferences amongst the young over the last several decades. Students not only are taught about the nutritional value of fish but are often served with it at school meals. The health authorities must some extent enhance the appreciation of fish consumption amongst the populace as a means to alleviate malnutrition, especially in small children. In some cases, crushed and powdered *Haplochromis* and *Rastrineobola* mixed with soybean meal or maize flour have been used in hospitals for the treatment of malnourished children.

The Uganda Government, through the Export Policy and Analysis Unit of the Ministry of Economic Planning and Development, is giving high priority to the overseas marketing of non-traditional export commodities, including Nile Perch and Tilapia products. Industrial investors are being encouraged to expand the processing sector and are being given incentives in the form of liberal profit repatriation arrangements and streamlined import and export procedures. But by and large Ugandans do not need to be persuaded to eat fish: they are already enthusiastic consumers.[25]

Challenges and Bottlenecks

The primary research phase of the study explored the awareness levels among players in the value chain on legal standards required to operate in the industry as well as the major hurdles faced in running business operations. This section presents the awareness levels

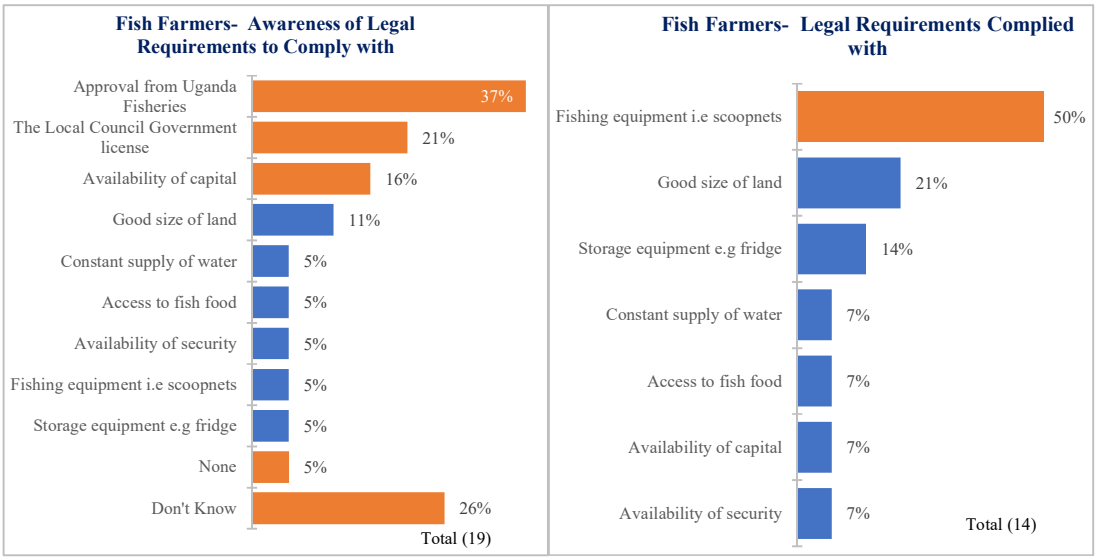
[25] http://www.fao.org/docrep/006/AD146E/AD146E02.htm MARKETING AND CONSUMPTION OF FISH IN UGANDA

on legal standards in the industry from each category on the supply side as well as perceived constraints in encouraging compliance.

Fish Farmers

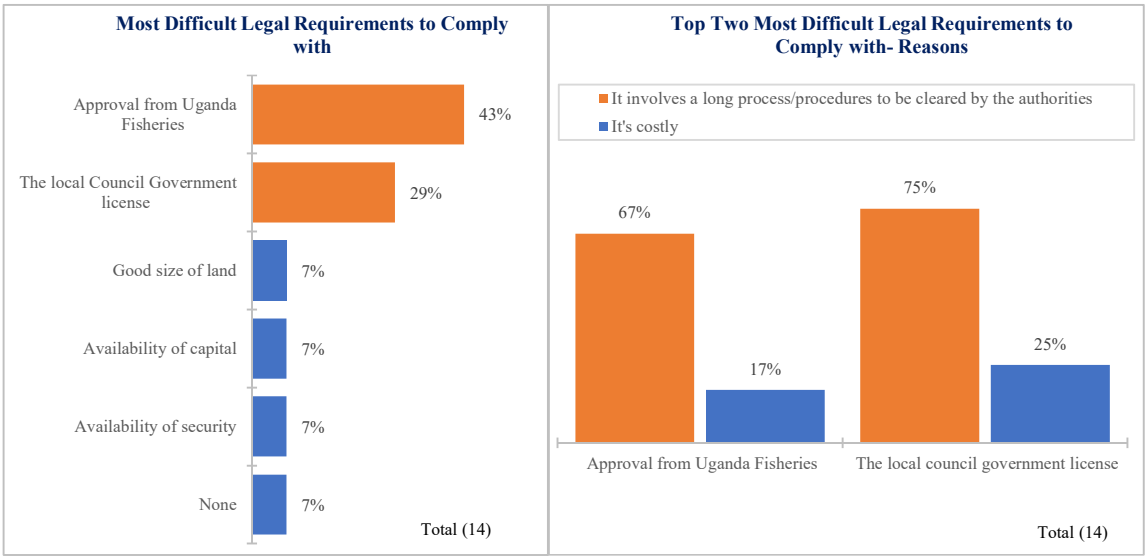
Fish farmers indicated that to start and run a successful fish farming business in Uganda, one largely needed to get approval from the Fisheries Department (37%), a government licence from the local council (21%), and to have capital (16%) among other requirements as shown below. Interestingly, a significant proportion (26%) did not know which legal requirements were needed for starting and running a fish farming business, while 5% indicated that no legal requirement was needed, depicting knowledge gaps among this group. With regards to requirements complied with, a significant proportion (50%) indicated that they had acquired fishing equipment among others as shown below.

Figure 214: Fish farmers- Awareness of and compliance with legal requirements to run business



Further, it was observed that the most difficult legal requirements to comply with were largely government approvals from the Fisheries Department (43%) and government licenses from the local government (29%). The main hurdle with these two requirements was observed to be the lenghthy process required to acquire them as shown below.

Figure 215: Fish Farmers- Most difficult legal requirements



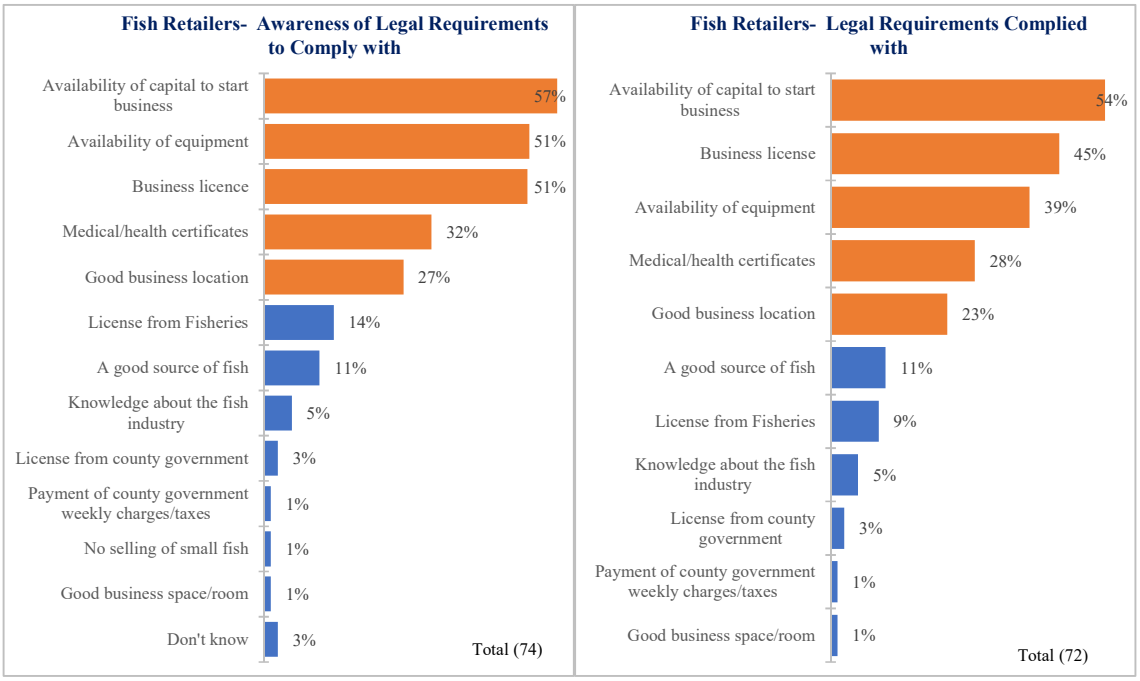
Processors

Fish processors indicated that to operate a fish processing business, one needed to have undergone medical health tests and be provided with a medical health certification. This certification was indicated as being important because it ensured that staff were qualified to handle food products. All staff working in the processing factories were reported as having the medical health certification, and that it was both a government requirement as well as a requirement of the processing factories. Processors noted that staff were required to undergo health checks after a period of between 6 months and 1 year.

Fish Retailers

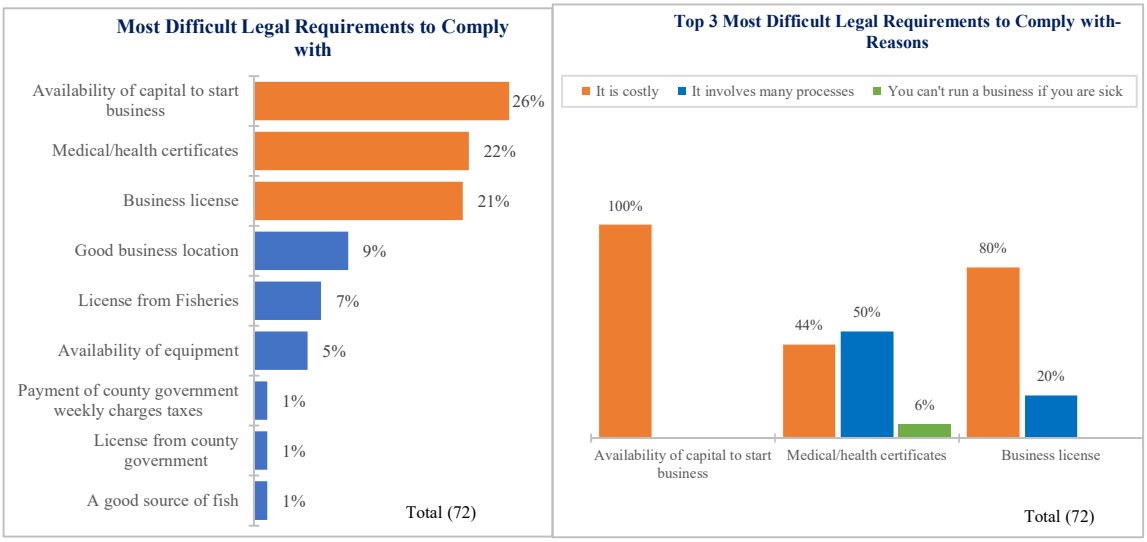
Fish retailers indicated that to start and run a fish retailing business, one mainly needed to have capital to start the business (57%), the needed equipment (51%), a business license (51%), medical/health certificates (32%) and a good business location (27%) among other requirements as shown below. These were the requirements the retailers cited they had largely complied with as shown below.

Figure 216: Fish retailers- Awareness of and compliance with legal requirements to run business



Further, retailers indicated that the most difficult legal requirements to comply with among the above included access to capital (26%), acquiring medical/health certification (22%) and business licences (21%) among others as shown below. The main barriers included the cost implication and lengthy processes among others as shown below.

Figure 217: Fish retailers- Most difficult legal requirements to comply with



3.2.7 Demographic Information and Future Communication Insights

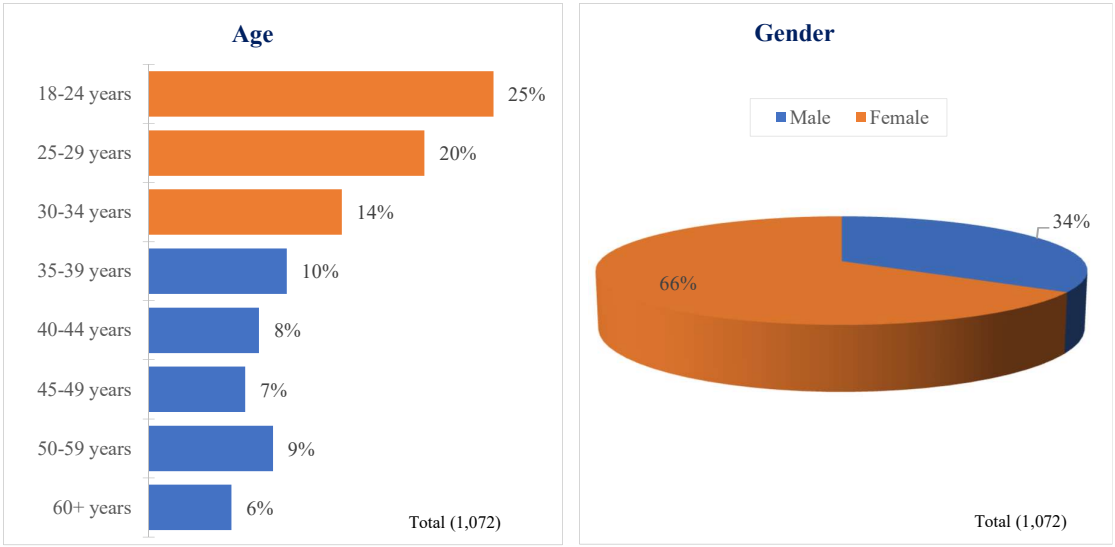
This study targeted consumers as well as market players in the fish industry. Presented below is the demographic information/profile of participating respondents as well as channels of communication that can be utilized for future programming.

A. Demographic Information

Consumers

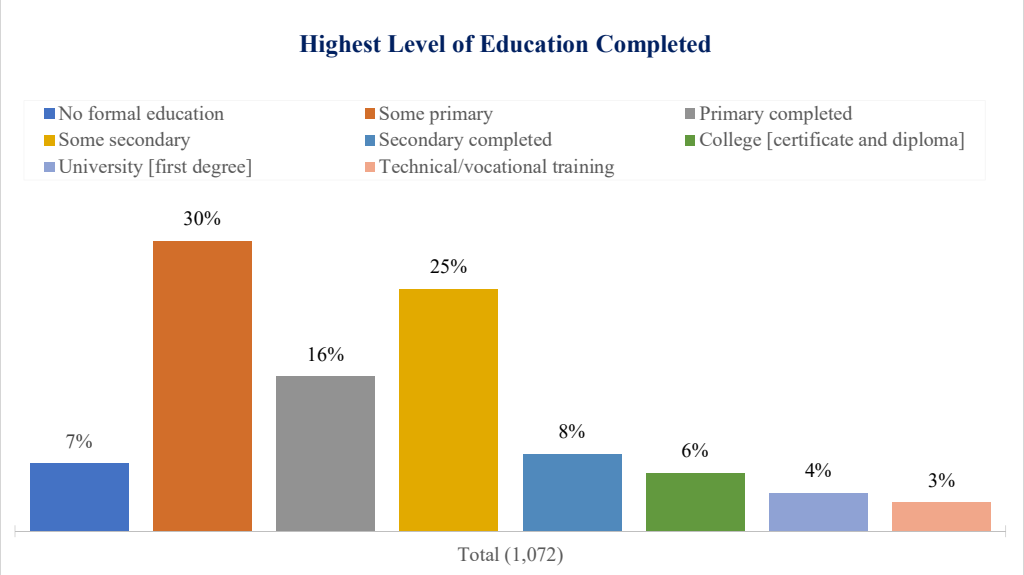
The consumer study targeted persons aged 18 years (adults) and above in Uganda at the households. Interviewed persons in selected households were key decision makers of food items purchased in the household. As shown in the figure below, key decision makers of food items purchased in the households were largely aged between 18 years and 34 years (45%) who were mainly female (66%).

Figure 218: Consumers- Age and gender



Further, key decision makers on food items purchased in the households had largely attained some primary school (30%) and some secondary school (25%) as their highest level of education completed as shown below. A significant portion (16%) had also completed primary school as their highest level of education.

Figure 219: Consumers- Level of education



Additionally, households interviewed had an average of 5 people as shown in the table below. This trend was observed across the regions with Eastern, Kampala, Northern and Western regions having a slightly higher number of people living in the households. In addition, rural setting was also observed to have a higher number of people living in the household.

Table 102: Consumers- Number of people in the household

Number of people in the household								
	Total (1,072)	Urban (528)	Rural (544)	Central (259)	Eastern (220)	Kampala (127)	Northern (186)	Western (280)
Average number of people in the household	5	4	5	4	5	4	6	5

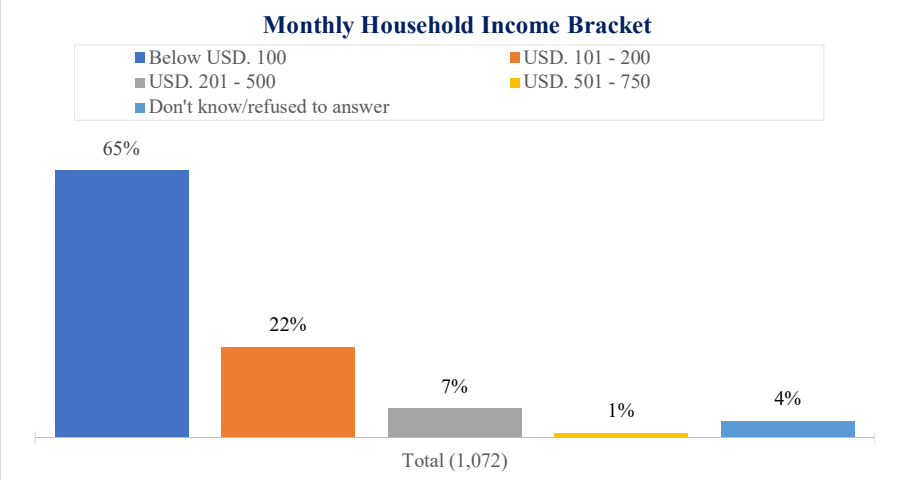
It was observed that the people living in the households were mainly adults (aged 18 years and above) with an average of 2 persons falling under this category as shown in the table below.

Table 103: Consumers- Number of people in the household (age brackets)

Number of people living in the household						
	Adults [18 years and above, including servants if they share the same cooking pot]	Children [12 but less than 18 years]	Children [6 but less than 12 years]	Children [2 years but less than 6 years]	Children [6 months but less than 2 years]	Children [under 6 months]
Average number of people	2	1	1	1	-	-

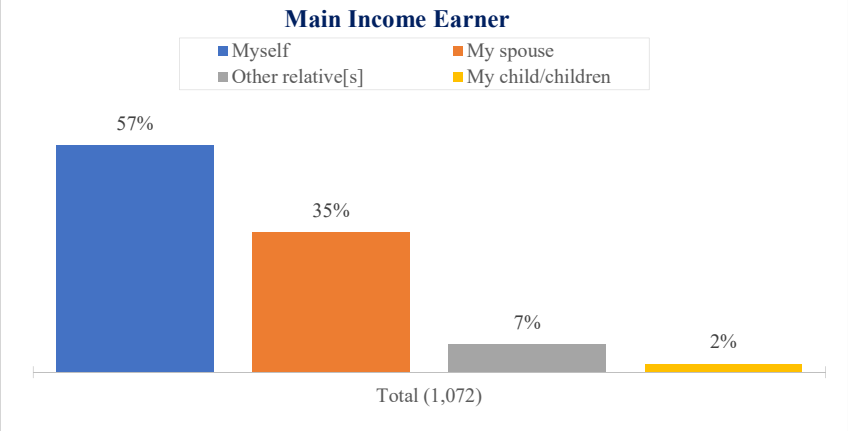
Additionally, a significant number of households (65%) reported that their monthly income was below USD. 100 as shown below. An equally significant portion also, (22%) reported that their monthly household income was between USD. 101 to USD. 200 as shown in the figure below. About 4% of those interviewed either refused to provide this information despite re-assurances on confidentiality, or indicated that they did not know this information.

Figure 220: Consumers- Monthly household income bracket



The main income earner in the household was also reported to be mainly either the key decision maker of food items purchased in the household (person interviewed/self) (57%) or their spouse (35%) as shown below.

Figure 221: Consumers- Main income earner



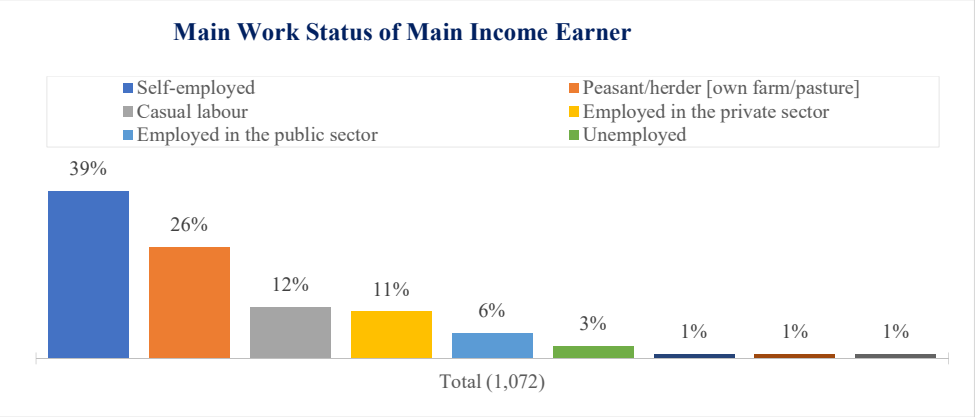
In addition, it was observed that on average, 2 persons earned an income in the household and contributed to the household's income and expenditure as shown below. The more affluent households tended to have more people earning an income and contributing to the household income as shown below.

Table 104: Consumers- Number of people in the household contributing to income and expenditure

Number of persons in household earning an income and contributing to household income and expenditure								
	Total (1,072)	Below USD. 100 (699)	USD. 101 - 200 (231)	USD. 201 - 500 (79)	USD. 501 - 750 (10)	USD. 751 - 1,000 (4)	Above USD. 1,500 (1)	Don't know/ refused to answer (48)
Average number of people	2	2	2	2	3	1	3	2

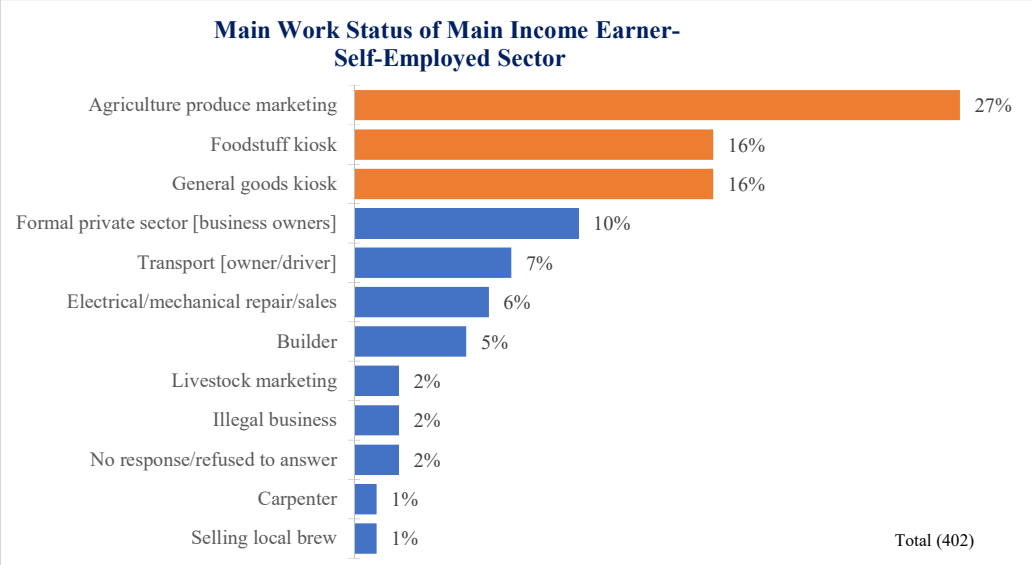
The main income earner for the household was reported to be largely either self-employed (39%) or peasant/herder [own farm/pasture] (26%) as shown below.

Figure 222: Consumers- Main work status of main income earner



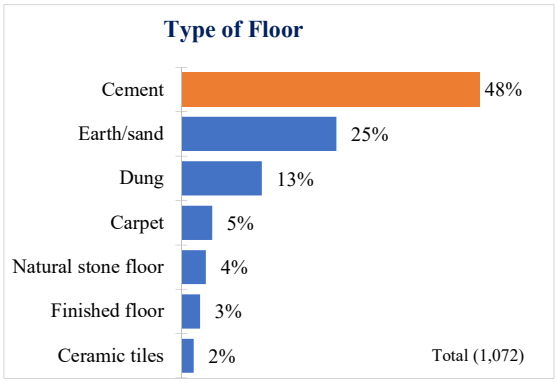
It was observed that the main income earners who were self-employed were largely working in the agriculture sector (27%), running foodstuff kiosks (16%), running general goods kiosks (16%).

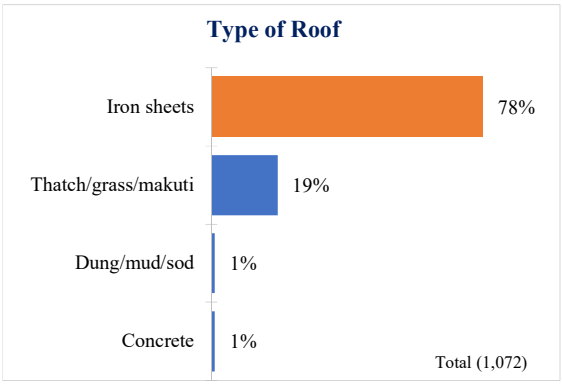
Figure 223: Consumers- Main work status of main income earner (Self-employed sector)



Further, consumers were found to be living in households that largely had cemented floors (48%), and were roofed with iron sheets (78%) as shown below.

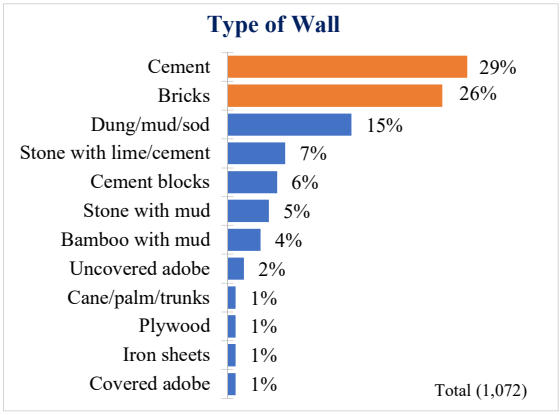
Figure 224: Consumers- Type of floor and roof for the household

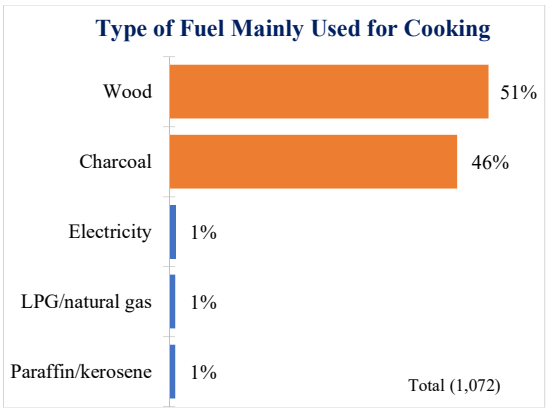




The households' walls were also largely cemented (29%) and made up of bricks (26%) as shown in the figure below. Lastly, households reported that they largely used wood (51%) or charcoal (46%) as the main type of fuel for cooking in the households among other types of fuel.

Figure 225: Consumers- Household's type of wall and type of fuel mainly used for cooking



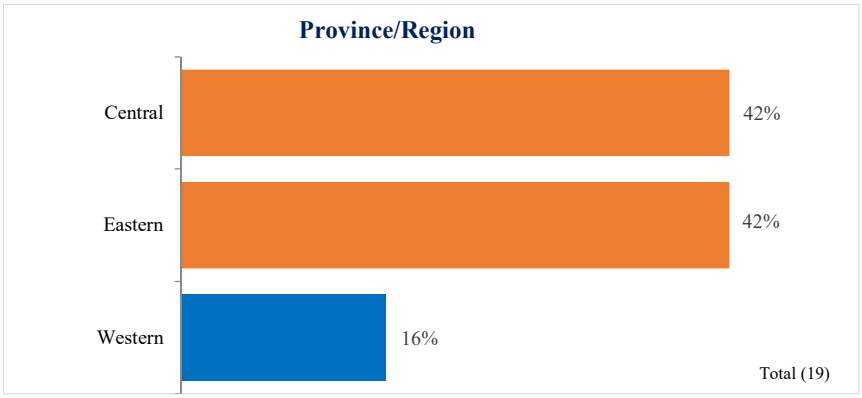


Market Players

Fish Farmers

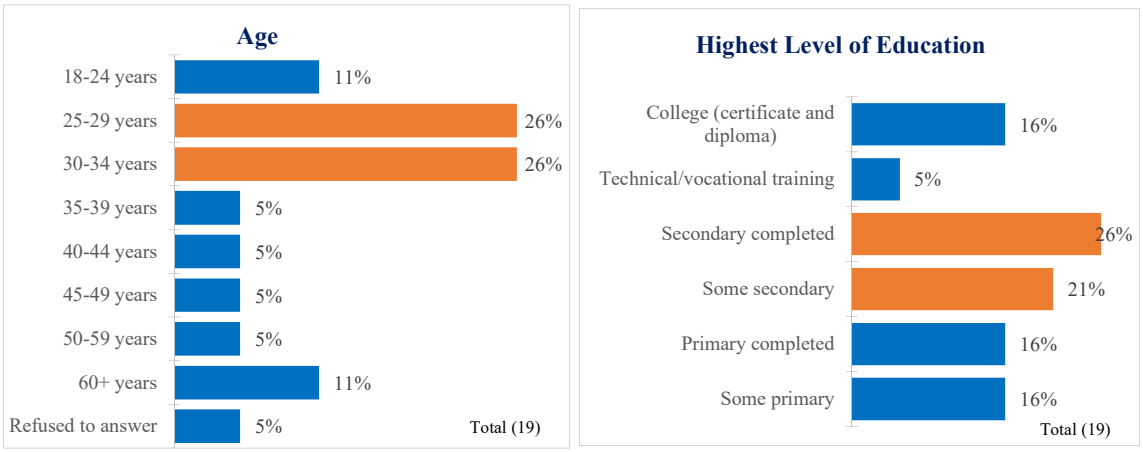
Fish farms and ponds for this study were mainly found in Central, Eastern and Western as shown in the figure below.

Figure 226: Fish farmers- Region



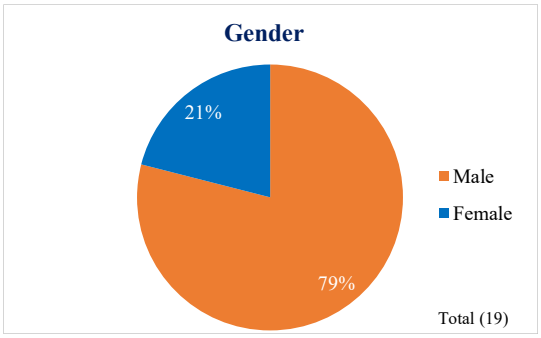
The owners or key decision makers in the farmers were targeted for interview. As shown in the figure below, the owners/key decision makers in this category were mainly aged between 25 years and 34 years (52%) and most farmers had completed secondary education (26%) or some secondary education (21%) as the highest level of formal education completed.

Figure 227: Fish farmers- Age and level of education



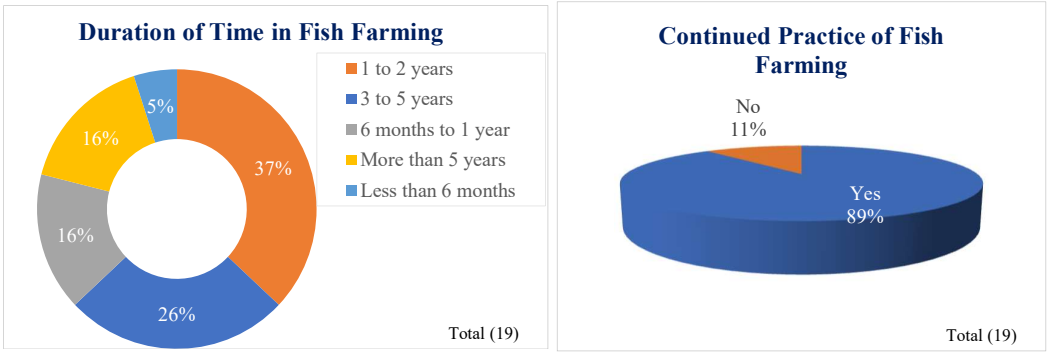
Additionally, it was observed that a significant number of the interviewed owners/key decision makers were male (79%).

Figure 228: Fish farmers- Gender



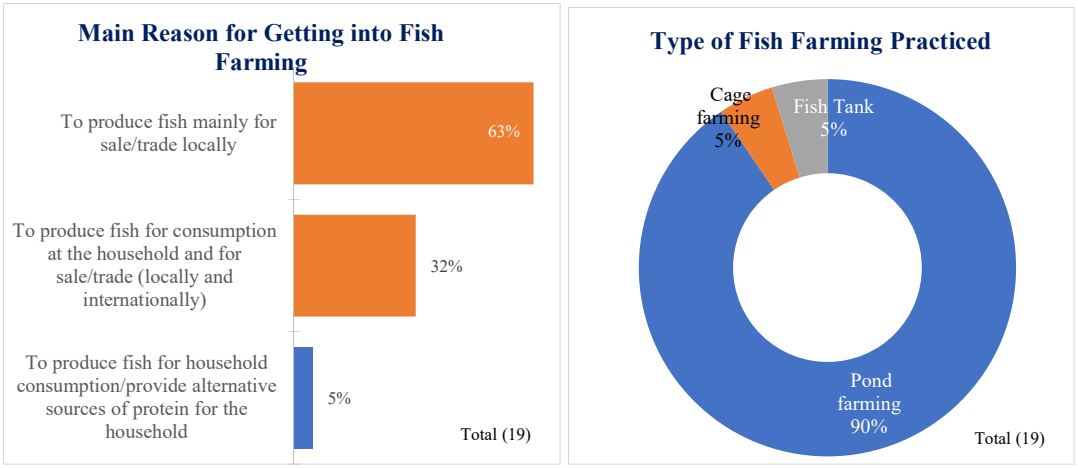
Participating fish farmers had also largely been in the business for a period of between 1 to 2 years (37%) and had continually been in the practice (89%).

Figure 229: Fish farmers- Fish farming practice



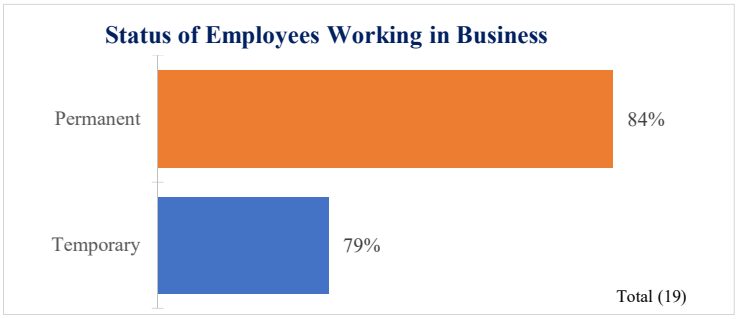
Further, it was reported that fish farmers had largely joined the business to produce fish for consumption at the household and for sale (locally) (63%) as shown in the figure below. Additionally, most of the interviewed farmers practiced pond farming (90%).

Figure 230: Fish farmers- Motivations for fish farming and types of farming practiced



In addition, it was noted that the staff mainly working on the farmers were permanent employees of the business as shown below (84%).

Figure 231: Fish farmers- Status of employees in business



It was noted that an average of 4 permanent staff and 4 temporary staff were engaged in running the fish farming businesses as shown in the table below.

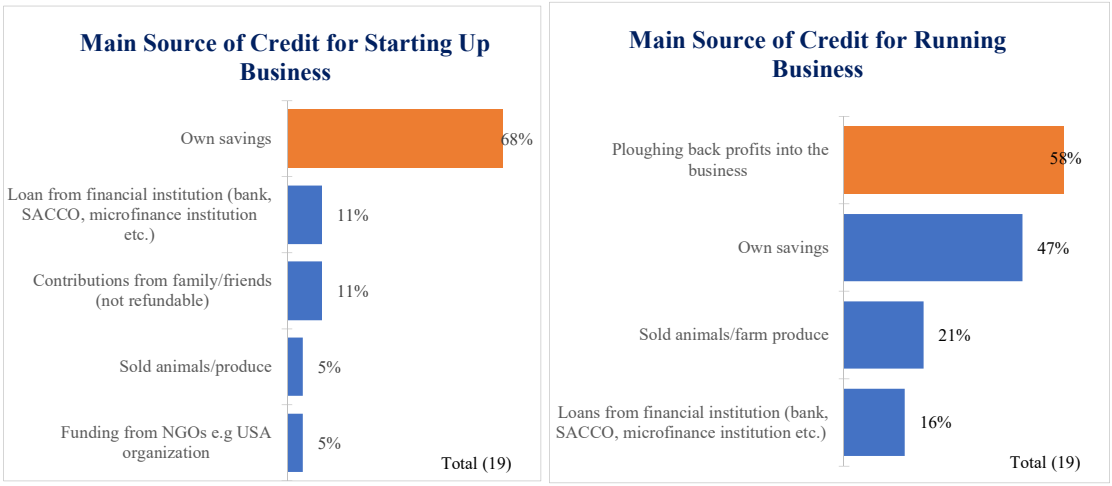
Table 105: Fish farmers- Number of staff working in business

Number of staff working in the business- Total (19)		
	Permanent	Temporary
Average number of staff	4	4

Regarding the source of credit for starting and running the fish farming business, it was observed that farmers largely used their own savings to start the business (68%) among

other sources of credit while ploughing back profits (58%) was the main source of credit to sustain the business as shown in the figure below.

Figure 232: Fish farmers- Main source of credit for starting and running business



Storage and Transportation Businesses

It was observed that the 5 key decision makers managing fish storage and transportation businesses had varying education qualifications. The highest level of education noted was secondary education, while one of the storage and transportation businesses was ran by a key decision maker with no formal education. Further, all the fish storage and transport companies were run by persons aged above 40 years, and were all of them were male. Additionally, the storage and transport managers had been in the business for a period of not less than 15 years.

Processors

The 2 processing factories interviewed in this study were found in Central Region. Additionally, the key decision makers in the processing factories were aged between 35 years and 44 years and had attained a university degree (masters or PhD) and first degree as the highest level of education respectively. Further, it was observed that all fish processors interviewed in this study had worked in the decision-making role they were currently in for a period of between 3 to 5 years.

The main motivation for joining the industry was because the line of business was a preferred by the respondents. Processing factories were observed to have an average of 240 employees who comprised permanent and temporary staff. A majority of these were observed to be male.

Table 106: Processors- Number of employees in firm

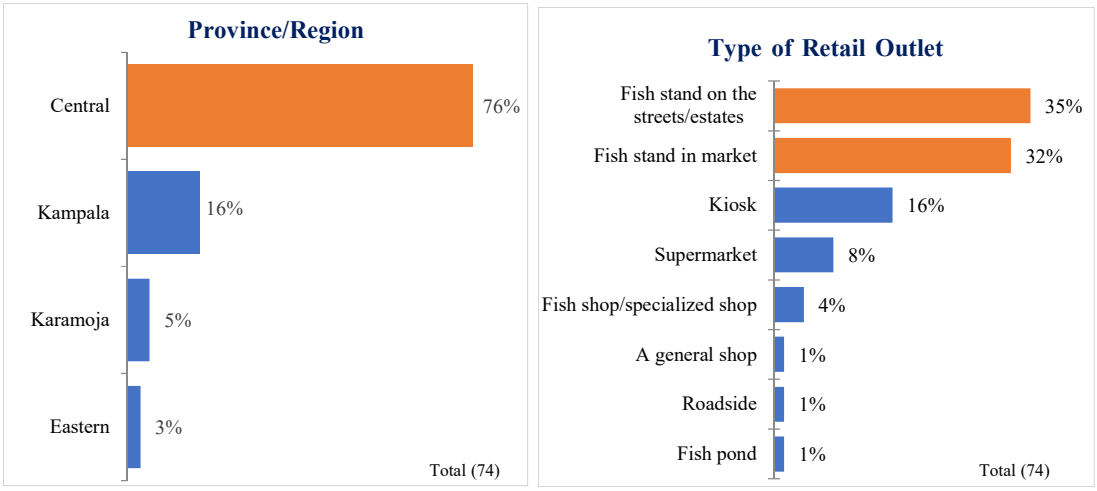
Number of employees in processing factories					
Total (2)					
	Total number of employees	Full time-male	Full time-female	Temporary-male	Temporary-female
Average number of staff	240	125	75	15	25

One fish processor indicated that there were periods when there was a need to employ more staff than the above and the main reason for increasing the number of staff was when there was an increase in the number of customers. The other fish processor reported that they did not employ other staff.

Retailers

Fish retailers in this study were targeted in urban settings in Uganda and were mainly found in Central Region (76%), Kampala (16%), Karamoja (5%) and Eastern (3%). In addition, the fish retail outlets were largely fish stands in streets/estates (35%) and in the markets (32%) as shown below.

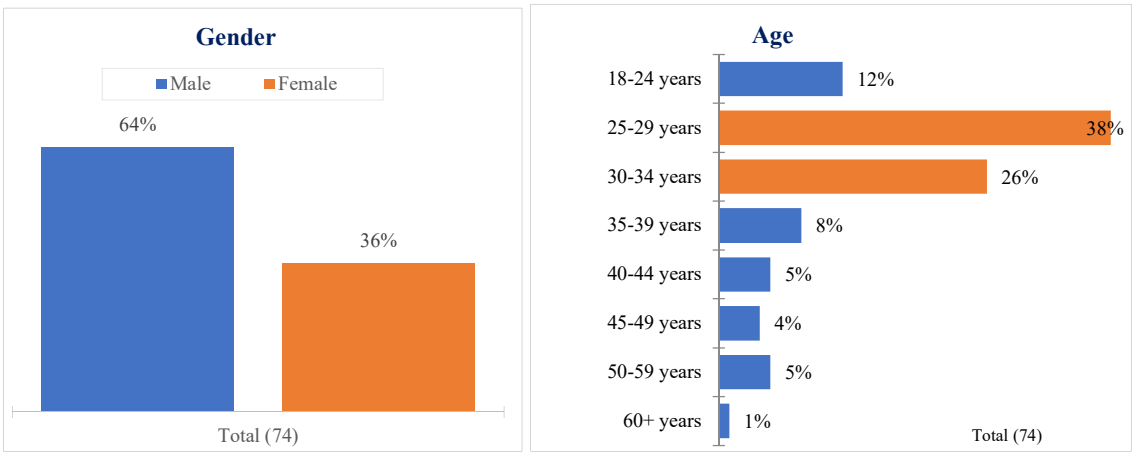
Figure 233: Retailers- Region and type of outlet



Persons interviewed in the retail outlets were either the business owners or the key decision makers of the business. Also, as shown below, these were largely male (64%)

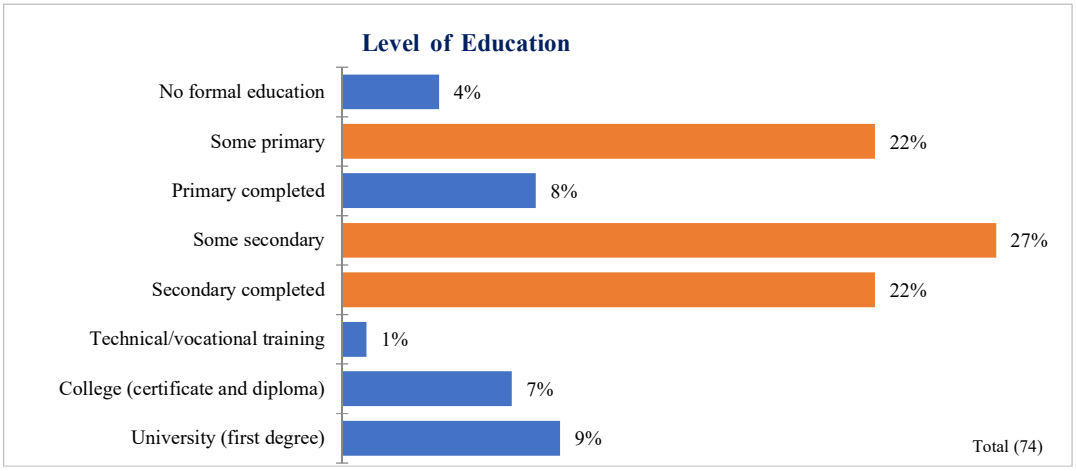
and significant portions (38%) were aged between 25 years to 29 years and 30 years to 34 years (26%).

Figure 234: Retailers- Gender and age



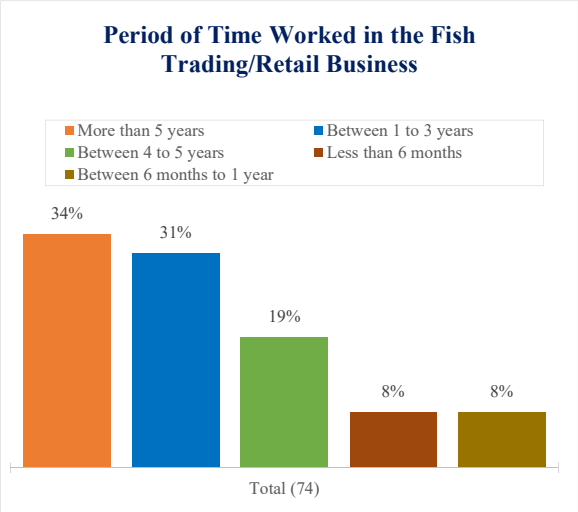
Additionally, owners/key decision makers of retail outlets had largely attained some secondary education (27%), some primary education (22%) or completed secondary school (22%) as the highest level of formal education completed as shown below.

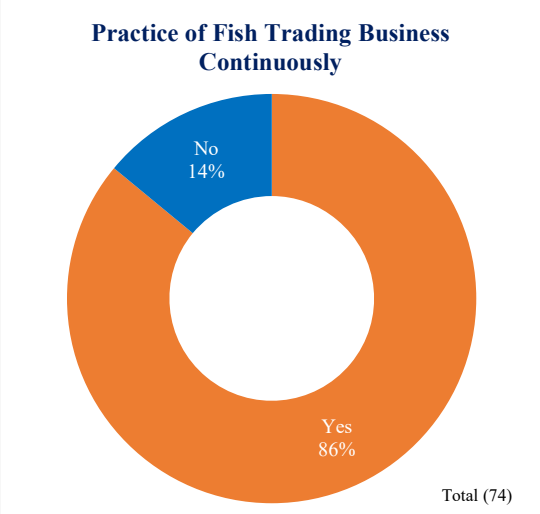
Figure 235: Retailers- Highest level of education completed



It was observed that fish retailers had largely been in the fish trading business for more than 5 years (34%) as shown below. Additionally, a significant proportion (86%) had been in the business continuously since venturing into the trade.

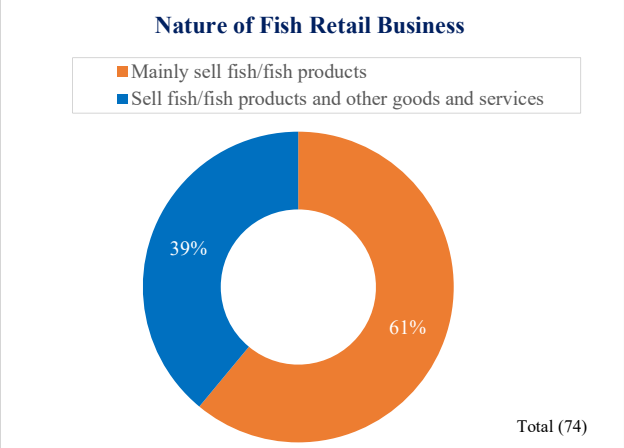
Figure 236: Retailers- Duration of time in the fish trading business





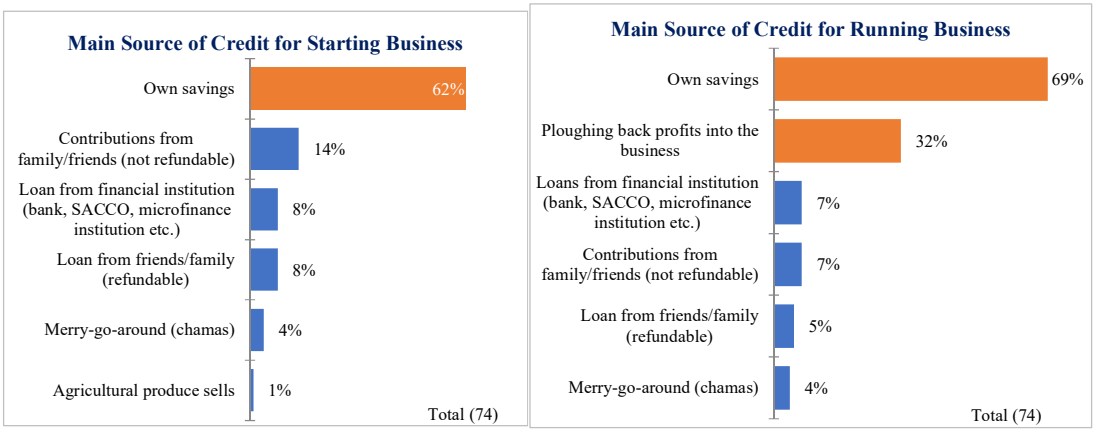
Majority of participating fish retailers (61%) indicated that they mainly engaged in the sale of fish and fish products, with a small proportion (39%) complementing this trade with the sale of other goods and services.

Figure 237: Retailers- Nature of fish trading business



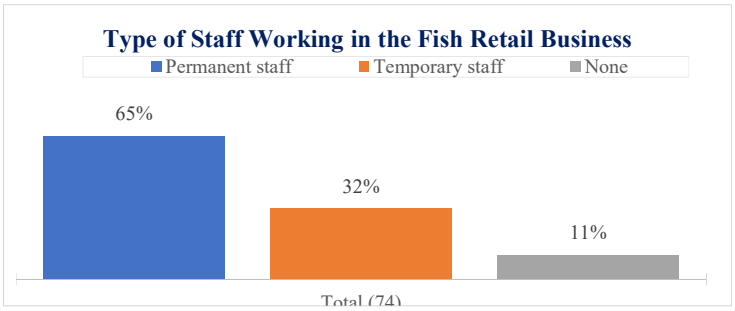
It was also observed that a significant proportion of fish retailers had largely used their own savings (62%) to start off their business among other channels, and still largely relied on their own savings (69%) for running of their businesses as shown below.

Figure 238: Retailers- Main source of credit for starting and running business



Further, it was reported that fish retail businesses mostly engaged permanent staff (65%) while only a small proportion (32%) also engaged temporary staff as shown below.

Figure 239: Retailers- Type of staff working in the business



Additionally, fish retailers engaged an average of 2 permanent staff and 1 temporary staff to run their businesses as shown below.

Table 107: Retailers- Number of staff in business

Number of staff working in the fish retail business		
Total (74)		
	Permanent staff	Temporary staff
Average number of staff	2	1

Cooperatives

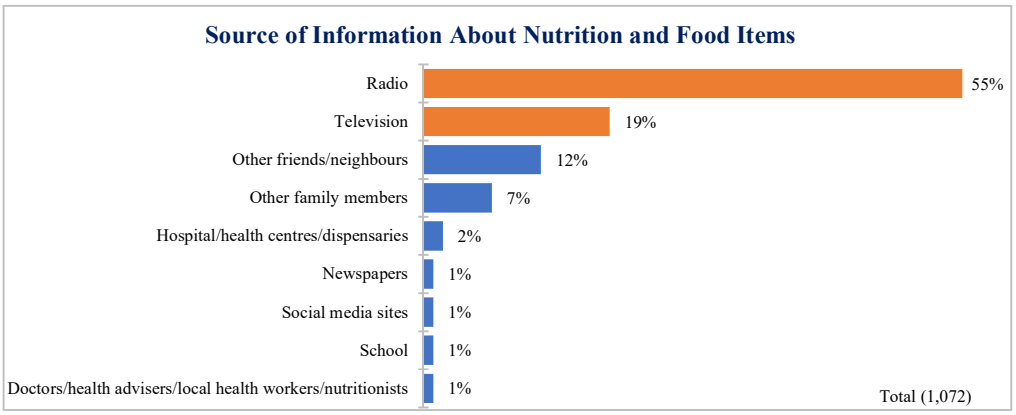
It was observed that administrators of cooperatives were mainly male with age ranging from 27 years to 58 years. Additionally, the highest level of education completed by administrators of cooperatives was post-graduate level, while the least was secondary education.

B. Future Communication

Consumers

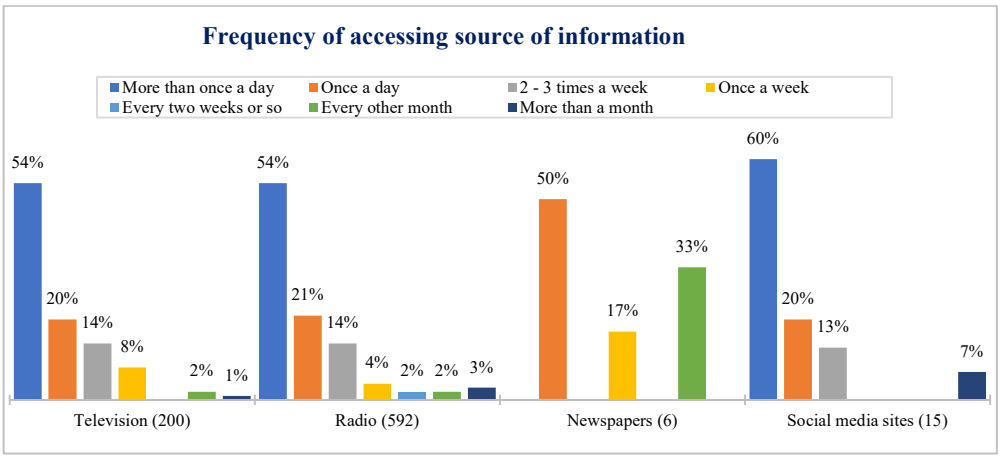
Consumers reported that the main channel of communication about nutrition and food items was from the radio (55%), and television (19%) among other sources as shown below. These would be the most appropriate channels to reach them on issues of interest.

Figure 240: Consumers- Source of information



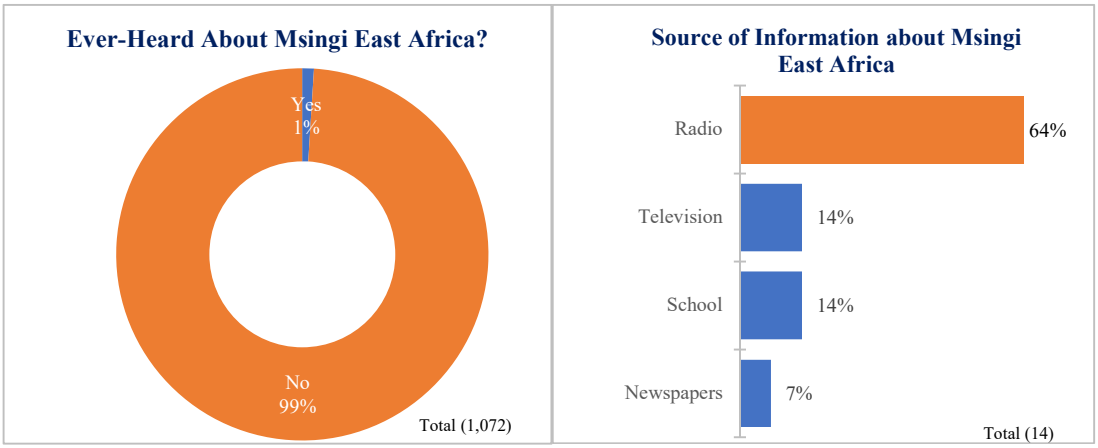
Further, consumers accessed these main sources of information (radio and television) largely more than once a day as shown below.

Figure 241: Consumers- Frequency of accessing sources of information



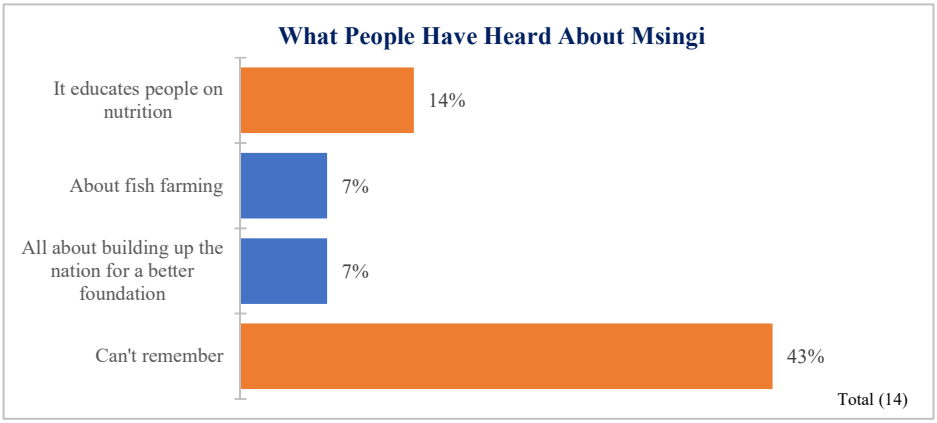
It was observed that only a small proportion of consumers (1%) had heard about Msingi East Africa prior to the study's implementation, and this was done mainly through the radio (64%).

Figure 242: Consumers- Ever heard about Msingi in the past?



A significant proportion of consumers that had heard about Msingi in the past could not remember the information they heard about Msingi (43%). Those that could remember associated Msingi with providing education on nutrition, and fish farming among others as shown below.

Figure 243: Consumers- What people have heard about Msingi



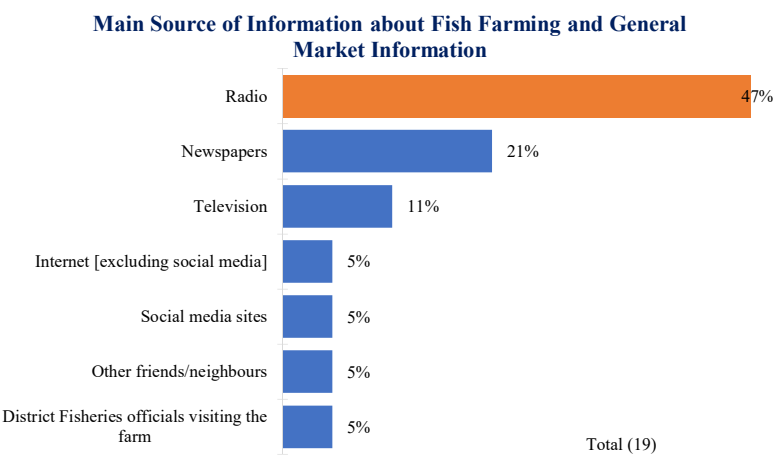
Market Players

Fish Farmers

Fish farmers indicated that their main source of information about fish farming and other general market information was through the radio (47%), newspapers (21%) and television (11%) among other channels as shown below, and these are therefore channels that can be utilized in future communication. Farmers accessed the radio mainly more than once a day, though a few of them indicated they accessed it once a day or once a

week. Those relying on newspapers as a source of information, mainly accessed this source once a week, while those relying on the television as a source of information mainly accessed it once a week, with few accessing it more than once a day or once a day. Those accessing the internet or social media sites on the other hand indicated they accessed these sources once a day.

Figure 244: Fish farmers- Main source of information



Additionally, it was established that all the farmers interviewed had not heard about Msingi East Africa before the study was implemented.

Storage and Transportation Businesses

It was observed that key decision makers of the 5-interviewed storage and transportation companies utilized various sources of information to keep them informed on the industry's developments. Communication channels mentioned included the internet and the radio. It was for instance noted that there was a program about the fish sector that aired on Akaboozi FM that these players were keen on listening to. Other sources of information mentioned included word of mouth from fellow businessmen at the landing sites or at the market. It was observed that none of the players had heard about Msingi in the past.

Processors

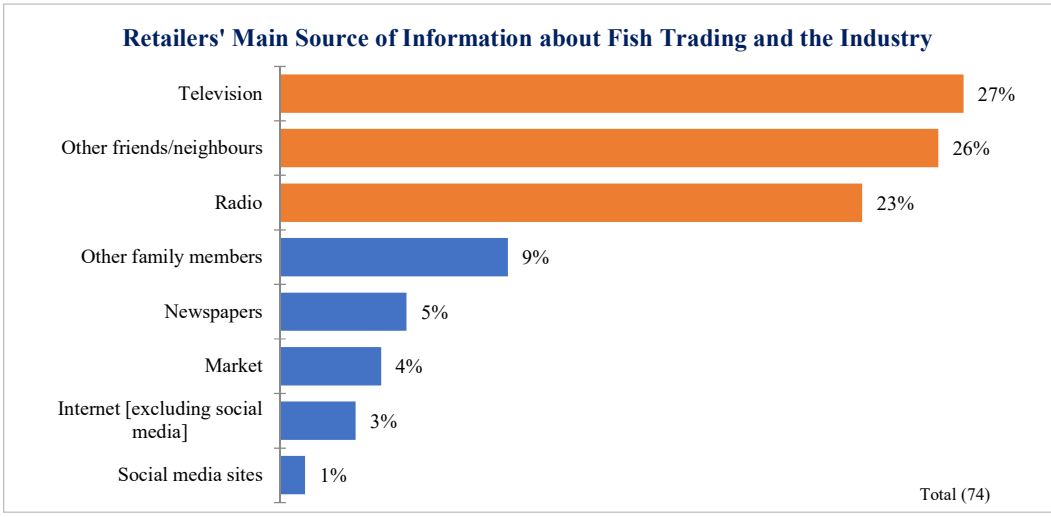
All the processors reported that they accessed information about fish processing and general market information from the internet (excluding social media). In addition, all the processors indicated that they accessed these channels more than once a day.

It was reported that none of the processors had heard about Msingi East Africa before the data collection period.

Fish Retailers

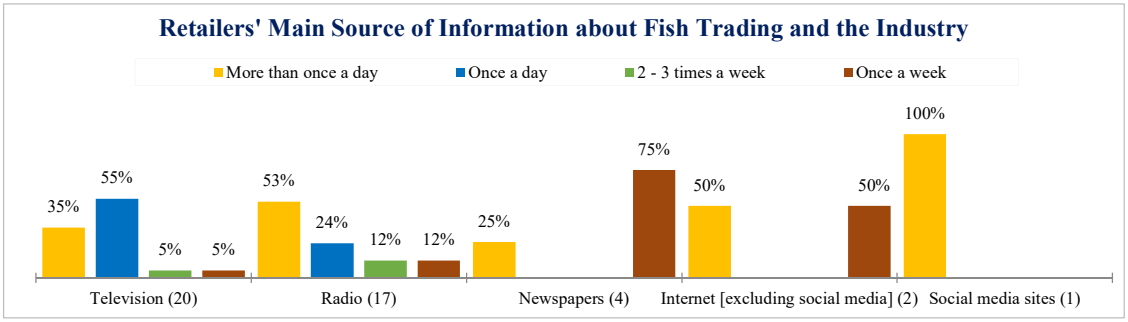
Fish retailers indicated that their main sources of information about fish trading and other general market information was largely through the television (27%), from their friends/neighbours (26%) and the radio (23%) among other channels as shown below.

Figure 245: Retailers- Main source of information



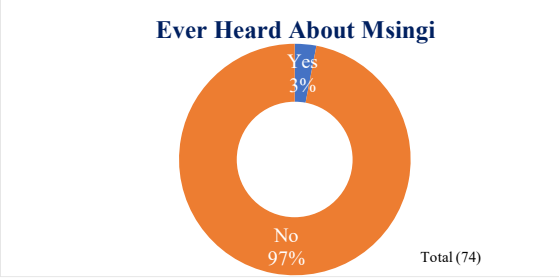
Additionally, fish retailers indicated that they largely accessed the television once a day (55%) and the radio was largely accessed more than once a day (53%) as shown below.

Figure 246: Retailers- Frequency of accessing main source of information



Lastly, it was observed that most of fish retailers (97%) had not heard about Msingi East Africa prior to the study's implementation. The few that had heard about the organization (2 retailers) had largely gotten information through the television, where they heard that the organization had provided fish in the market for sampling, and that it promoted promotes aquaculture in East Africa.

Figure 247: Retailers- Ever heard about Msingi?



Cooperatives

It was observed that most cooperative administrators (from the 6 interviewed) accessed relevant information from the radio, television, internet, text books and newspapers. Those who accessed information on the fish sector through the radio were for instance keen on listing to CBS FM and Akaboozi FM, while those who accessed relevant information through the television were keen on watching Bukedde TV and BBS TV. Administrators of cooperatives also indicated that they accessed relevant information through word of mouth from clients, fish farmers and officials on the Fisheries Agency among others. It was observed that none of the cooperative administrators had heard about Msingi in the past.

3.3 Focus on Tanzania

Over the last decade, Tanzania's fisheries production has been in the range of 325,000 to 380,000 tonnes per annum, of which, about 85% is from inland fisheries, 14% from marine fisheries and just 1% from aquaculture.[26] Fish consumption…contributes to about 30% of the total animal protein intake; and with a population growing at 2.7% annually, increased supplies are required just to maintain this limited contribution to the diet.[27] This section of the report provides insights on the fish industry in Tanzania.

3.3.1 Summary of Findings

Key Findings in Tanzania

Size of fish consumption and potential demand

- The current market for fish consumption (current and potential consumption) is estimated at 629,238mt.
- Fish is currently consumed by 87% of the population in Tanzania. High pricing and unavailability are some of the main barriers to fish consumption in Tanzania.
- Fish is considered as the most important source of protein for the households, followed closely by plant proteins (28%). Subsequently, fish is the most favourite type of meat (46% of households consuming meat), followed by beef (30%). Pricing and availability are some of the key factors considered by households when choosing meat types to consume.
- Fish consumers in Tanzania are mainly purchasing and consuming Nile Perch, Tilapia, and the Indian Mackerel fish varieties. Most consumers are also purchasing fish in the deep-fried form (61%), purchasing the Silver Cyprinid (*Dagaa/Mukene/Omena)* (44%) and fresh fish (42%) for consumption.
- Subsequently, only 46% of households interviewed have access to electricity, with even smaller proportions (13% or less) having access to storage equipment, which influences fish forms purchased. Consequently, over 50% of different fish forms is purchased and consumed within the same day.

[26] The Tanzanian fisheries sector; Challenges and Opportunities, September 2016, by the Ministry of Agriculture, Livestock and Fisheries.

[27] Ibid

- Fish-consuming households purchase and consume an average of 5.8kgs of fish in a month, with consumption observed to be higher in the urban areas. Different households, however, tend to purchase and consume more or less of different types and forms of fish. Consumption is, therefore, not linear/the same across households. Consumption of fresh fish was for instance observed to be higher than other fish forms.
- Households tend to spend an average of TZS. 36,114 (equivalent to about USD.16) in a month on fish and fish products, with some variations being observed across the regions and monthly household income bands.
- Small proportions of households (39%) are also consuming fish outside the household, more so, in the urban areas, though, consumption is largely higher in the households.
- Most consumers believe that the fish they purchase and consume is wild fish from local sources. Interestingly, however, only small proportions perceive they can tell the difference between wild fish and farmed fish (24%) or between local and imported (14%). When prompted to do so through a fish tasting exercise, however, most (90%) could perceive there were differences in the wild, farmed and imported fish samples presented. To most consumers, however, it does not matter whether fish is farmed, wild, local or imported, because most of them believe all fish is the same.
- A key concern that fish consumers have is the fact that fish is highly perishable and could get spoilt among other concerns.

Fish production, processing and route to market

Fish Farming

- Most fish farmers interviewed are keeping Tilapia and Catfish species, largely because of availability of high demand in the market.
- Fish farmers are sourcing fingerlings largely from local sources (largely from fellow farmers), with 2 out of the 9 interviewed farmers owning a hatchery for a period of between 6 months and 1 year.
- Farmers purchase an average of about 52,000 fingerlings of the Tilapia species and 3,500 fingerlings of the Catfish species per batch/lot for production. An average of 4,103kgs and 3,408kgs are harvested from Tilapia and Catfish respectively.
- From the total harvests made by farmers, an average of 3,936kgs are sold from the Tilapia species while 3,406kgs is sold from Catfish. An average cost of production of about TZS. 362,222 (equivalent to about USD.159) and TZS. 251,111(equivalent to about USD.110) is incurred for rearing each batch/lot of

Tilapia and Catfish species. Factors driving the cost of production include the cost of quality feeds and hired labour among others.

- Key challenges faced by fish farmers include shortage of quality feeds and fingerlings, and lack of knowledge and experience in fish farming among others. The main challenges faced when accessing fingerlings include the high cost of the fingerlings, high taxation costs incurred when importing fingerlings, and delays in receiving fingerlings among others. Most farmers (4 out of 9) felt that the Chinese fish had no impact in the fish trading business. A few (3 out of 9), however, felt that the Chinese fish has largely lowered the pricing of products in the market.
- Critical factors noted by farmers that are needed for succeeding in fish farming include availability of water, proper maintenance of fish ponds and access to training among other factors.
- Most farmers intend to construct new ponds in the future, and improve on sales related services among other initiatives. Key training needs include latest technologies in fish production, sources of accessible credit, marketing skills, and forecasting consumption and demand among others.

Fish processing

- Interviewed fish processors mainly process Nile Perch, Tuna and Siganids, fish varieties, which are largely wild catch and sourced locally.
- Fish is largely received in the fresh form for processing, and is processed into frozen or minced and packed for sale.
- Processors indicate that they process an average of 241,021kgs of Nile Perch, 5,000kgs of Tuna and 10,000kgs of Siganids among other varieties. Processors sell an average of 158,625kgs of Nile Perch, 653kgs of Tuna and 1,003kgs of Siganids in a month, which could imply a degree of loss, or that all processed fish in a month is not all sold out.
- Processors are currently under-utilizing their storage capacities, as the maximum daily capacity is 153,967kgs while the average optimum storage capacity in a day was observed to be about 220, 275kgs.
- Key challenges faced by processors include high taxes, high prices of fish supplies, lack of diversity in fish products and stiff competition among others. Processors tend to cope with these challenges by venturing into fish rearing to manage the cost of running the businesses.
- To support business growth, processors have invested in training/innovations on fish production in the past. They desire to learn more about sources of fish, quality issues and marketing strategies among other areas.

Storage and transportation

- Storage and transportation businesses mainly handle wild catch and farmed fish, specifically Tilapia, Sardines, and Nile Perch fish varieties.
- The demand for these services is perceived to have generally decreased in the past 2 years. Main customers for storage and transportation services largely comprise of processing factories, hotels, supermarkets, and individuals in the communities. These are largely sourced locally and internationally- largely from Burundi, Malawi, Rwanda and Zambia.
- The more established entities tend to have access to modern storage equipment, while less established entities are largely improvising storage equipment by for instance using insulated bins covered with ice.
- Key challenges faced by storage and transportation businesses include power outages which lead to spoilage, lack of modern storage and transportation equipment for use, limited storage capacities, and harassment by tragic officials during transit.
- Key recommendations made by this group include: improvements in the Energy sector to reduce power outages, support for players to access modern equipment at affordable pricing, education of players on existing laws and support to help them abide with the laws, regulation of fish importation to support the local industry and improvement of infrastructure.

Fish retailers

- Fish retailers in Tanzania largely stock wild catch fish varieties obtained locally, with main varieties kept including Nile Perch and Tilapia and among other species.
- The quality, pricing and size of the fish are some of the key factors retailers consider when making purchases of fish stocks.
- On average, retailers procure about 193kgs of Nile Perch and 125kgs of Tilapia fish varieties in a month, and sell an average of 174kgs and 92kgs of the same species respectively, which implies a degree of loss in fish stocks experienced or that all stocks purchased in a month are not sold off within the same period.
- Retailers mainly sell fish in the live/fresh or cooked/ready for consumption states, and their main customers are individuals in the communities. Retailers largely market their businesses through ensuring stocks are of high quality, through word of mouth, and through offering discounts.
- Retailers perceive that the business environment has largely worsened in the last 2 years, mainly because there is no ready market.
- Key challenges faced by retailers include stiff competition, high costs of purchasing fish stocks, shortage of fish for sale and fluctuating customer preferences among others. Additionally, majority of fish retailers are not trading

in Chinese fish (86%). The few that are trading in Chinese fish indicated that there is largely a change of prices, where these are now cheaper.

- Retailers largely perceive that the business environment will stay the same in the next 2 years, and, most retailers therefore intend to open new outlets, and improve sales-related services.
- Retailers are interested in learning more about competition/marketing pricing and pricing policies among others. To grow the industry, retailers largely recommend for awareness creation on fish and fish farming, and provision of affordable credit to those willing to venture into fish retailing. Critical factors needed for success in this line of business include good customer relations, good business practices/financial discipline and having enough capital among others.

Fish price analysis

- Fish farmers sell a kg of the different species farmed for TZS. 7,000 to TZS. 7,944 (equivalent to about USD.3 to USD.4). From the average sales made from each batch/lot, farmers tend to make a mark-up/profit of about TZS. 23,590,889 to TZS. 30,905,362 (equivalent to about USD. 10,380 to USD. 13,598) from each batch/lot of different species reared.
- Fish processors sell a kg of the various fish types for an average of TZS. 4,900 to TZS. 18,700 (equivalent to about USD.2 to USD.8) when the price is highest, and an average of TZS. 4,500 to TZS. 13,700 (equivalent to about USD.2 to USD.6) per kg when the price is lowest. Processors are making an average of about TZS.3.7M to about TZS. 2.1B (equivalent to about USD. 1,650 to USD. 955,350) in a month from processing and selling of different fish varieties.
- Fish retailers procure different fish varieties for sale at an average price of between TZS. 3,000 to TZS. 8,200 (equivalent to about USD.1 to USD.4) per kg. They then re-sell at an average of between TZS. 4,000 to TZS. 9,800 (equivalent to about USD.2 to USD.4) per kg, making an average of about TZS.600 to TZS. 3,390 (equivalent to less than USD.1 to USD.2) from each kg sold.

Market organization/cooperatives and associations

- A considerable proportion of fish farmers (7 out of 9) are not members of any cooperative or association. The 2 farmers who are members pay a subscription fee of about TZS. 16,000 (equivalent to about USD.7) for each round paid, which is largely paid monthly. Some of the membership benefits accrued include: provision of fish storage, support in constructing ponds, sourcing for markets and access to affordable credit. Members recommend that the association should facilitate their members to participate in exchange programs.

- Few of the storage and transportation businesses interviewed (2 out of 5) are members of a cooperative. One of the cooperatives requires a one-off membership joining fee of TZS. 300,000 (equivalent to about USD.132), while the other requires members to pay a monthly contribution fee of TZS. 10,000 (equivalent to about USD.4). Some of the membership benefits accrued include linkages to market opportunities and provision of information on the developments in the industry. A recommendation made by members is that cooperatives should support members to access modern equipment, as well as implement the convening of regular meetings to keep members updated.
- Only 2 out of the 6 interviewed processors are members of an association. They pay a membership subscription fee of between TZS. 10,000 to TZS. 100,000 (equivalent to about USD.4 to USD.44) and enjoy benefits such as provision of support to construct the fish ponds, provision of storage after fish harvesting and sourcing of markets for fish. The processors recommend that the association should have better equipment for fishing.
- Most retailers (92%) are not members of any cooperative or association. The small proportion that is part of a cooperative or association (8%) largely pay an average membership subscription of about TZS. 7,750 (equivalent to about USD.3), where the highest paid fee is cited as TZS. 15,000 (equivalent to about USD.7), and the lowest is TZS. 500 (equivalent to less than USD.1). This fee is largely not renewable/is a one-off fee. Membership benefits accrued include linkages to markets for their products, source of affordable credit and discounted prices on their products. Members recommend that cooperatives/associations should work on improving team work in projects, lowering the registration fee and improving the customer care services.
- Cooperatives' structure in Tanzania tend to vary. The more established cooperatives have membership bases as high as 600 members, while the less established ones have as few as 21 members. Cooperatives comprise of a variety of players, including fish farmers, fishermen, fish experts, fish processors and traders. Cooperatives tend to rely on membership subscriptions to run their affairs, where some charge as low as TZS. 20,000 (equivalent to about USD.20), while others charged as high as TZS. 250,000 (equivalent to about USD.110) as joining fees. Some cooperatives also charge monthly contributions which range from TZS. 5,000 to TZS. 10,000 (equivalent to about USD.2 to USD.4). Membership benefits accrued include regulation of selling prices, regular updates on industry developments, loan facilities and access to inputs at negotiated prices among others. Key challenges faced by cooperatives include low awareness levels on the benefits of cooperative membership, low

awareness levels on laws regulating the fishing industry by members, leading to some paying hefty penalties for breaking the rules, high pricing of equipment and inputs needed for members to function, lack of skills and general knowledge by members to function in various levels in the value-chain, and inaccessibility of skilled labour in the market. Cooperative administrators recommend for partnerships in the industry with financial institutions for members to access affordable credit, education of the public on available opportunities in the fish farming sector to encourage growth, review of existing laws in the fish farming sector to encourage uptake, support of players in the industry to the access of modern equipment, and skills transfer to players in the industry to enable them to function.

Policy and trade regulations

- The fishing industry in Tanzania is regulated by the Ministry of Agriculture, Livestock and Fisheries (MALF). Though there exists various policies and guidelines regulating the industry, there seems to be gaps in the level of awareness among players in the value-chain.
- Fish farmers perceive that to operate in this line of business in Tanzania, one largely needs to comply with the environmental impact assessment provision from the National Environment Management Council (NEMC), have a business permit and have approval from Tanzania Fisheries among other requirements. The most difficult requirement to comply with is the NEMC provision, mainly because the requirement involved long process to acquire due to bureaucracy.
- Fish processors on the other hand perceive that to operate as a processor in Tanzania, staff in the processing factory need to have a medical health certification, which is renewable after a period to between 2 months to 3 years.
- Fish retailers perceive that they largely need to have a medical health certification and a business licence among other requirements to operate as a fish retailer in Tanzania. These two requirements are largely perceived as the most difficult to comply with, largely because of the cost element and the lengthy processes involved in acquiring them.

Future communication

- Consumers and potential fish consumers can be reached largely through the radio and television as these are the main channels of information about food and general nutrition. Consumers access these channels mainly on a daily basis. Only a small proportion (1%) has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Fish farmers can be reached through the internet (excluding social media), social media sites and the radio as these are their main channels of relevant

information on the fish industry. They largely access these channels daily or weekly. Only one farmer indicated he had heard about Msingi in the past, with information heard about the organization being largely inaccurate.

- Storage and transportation businesses can be reached through updates from fishing officers or through attending international fish shows among other channels and these would be ideal channels for use in future programmatic work. None has heard about Msingi in the past.
- Processors can be reached through newspapers, the television, the internet and through social media sites. They largely access these channels daily. None has heard about Msingi in the past.
- Fish retailers can be reached largely through informal sources such as friends and neighbours and the market. Significant proportions also access the television and the radio on a daily basis. Only 8% of the retailers has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Cooperatives' administrators can be reached through television, radio, social media, magazines and books among other publications. None has heard about Msingi in the past.

3.3.2 The Size of Consumption and Potential Demand

This sub-section of the report provides insights on Tanzania's estimated fish market size, consumer preferences and insights on fish non-consumption in the country.

A. Estimated Market Size

The estimated current size of the market for fish is 556,942 tonnes of fish in a year for Tanzania- including Silver Cyprinid *(Dagaa/Mukene/Omena)* as discussed further below. The size of the under-served market (past consumers who would be willing to continue consuming) on the other hand is estimated at 63,968 tonnes, while the size of the un-served market (potential consumers) is estimated at 8,328 tonnes as shown below. The total size of the fish market in Tanzania (current and potential) is therefore estimated at 629,238 tonnes as shown below.

Table 108: Estimated market size for fish per annum

Size of the market in metric tonnes (mt.)	Tanzania
Current consumption	556,942
Under-served (past consumers, willing to continue)	63,968
Un-served (Never consumed, but would consume)	8,328
Total fish market size (current +potential)	629,238

These figures have been computed based on average consumption figures per month projected against the total population in the country. The assumption that has been made in computing the annual market size is that consumption is linear (where each household consumes the same amount of fish on average); which might not be the case. However, this provides a good proxy estimate and provides an insight on the size of the market.

As indicated above, the estimated size of the fish market in Tanzania includes *Dagaa/Mukene/Omena.* When the *Dagaa/Mukene/Omena* is excluded from the computation, the estimated size of fish in Tanzania is an average of 441,109 tonnes per annum, while the size of *Dagaa/Mukene/Omena* is estimated at 115,833 tonnes per annum as shown below.

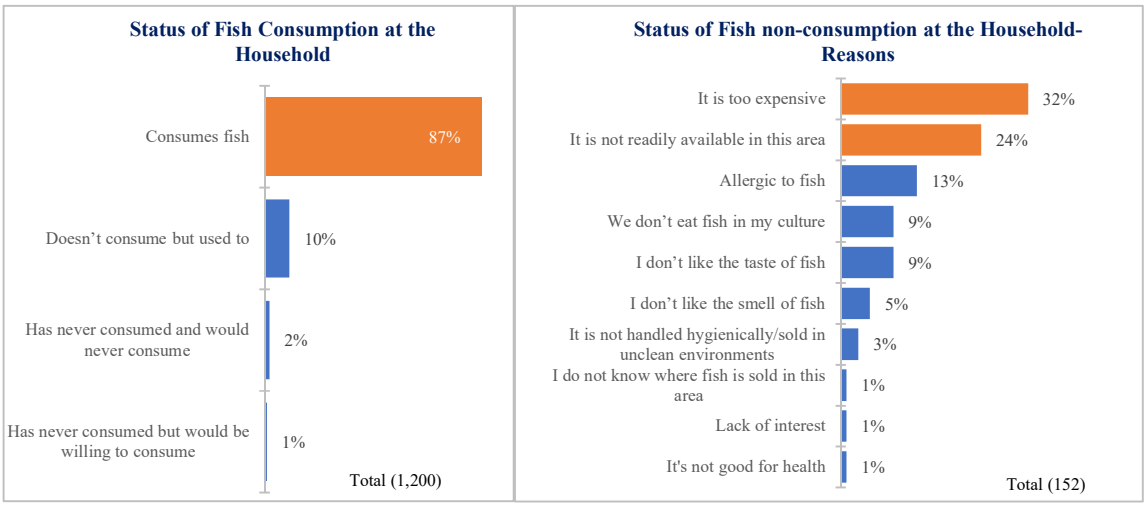
Table 109: Estimated market size for fish per annum- Region

Estimated market size for fish in tonnes								
	Total (1,200)	Central (130)	Coastal (360)	Lake (260)	Northern (170)	Southern Highlands (180)	Western (60)	Zanzibar (40)
Beef	392,913	49,250	101,886	79,450	76,852	65,632	12,083	7,760
Chicken	203,984	26,293	48,594	41,035	28,221	39,502	14,557	5,782
Fish - Overall including Silver Cyprinid (*Dagaa/Mukene/Omena*)	556,942	44,294	150,075	152,886	80,497	55,323	26,164	47,704
Fish - Excluding Silver Cyprinid (*Dagaa/Mukene/Omena*)	441,109	20,832	130,556	104,284	70,500	8,280	19,790	46,867
Fish - Silver Cyprinid (*Dagaa/Mukene/Omena*)	115,833	23,462	19,519	48,60	9,997	7,043	6,375	837

B. Fish Non-Consumption

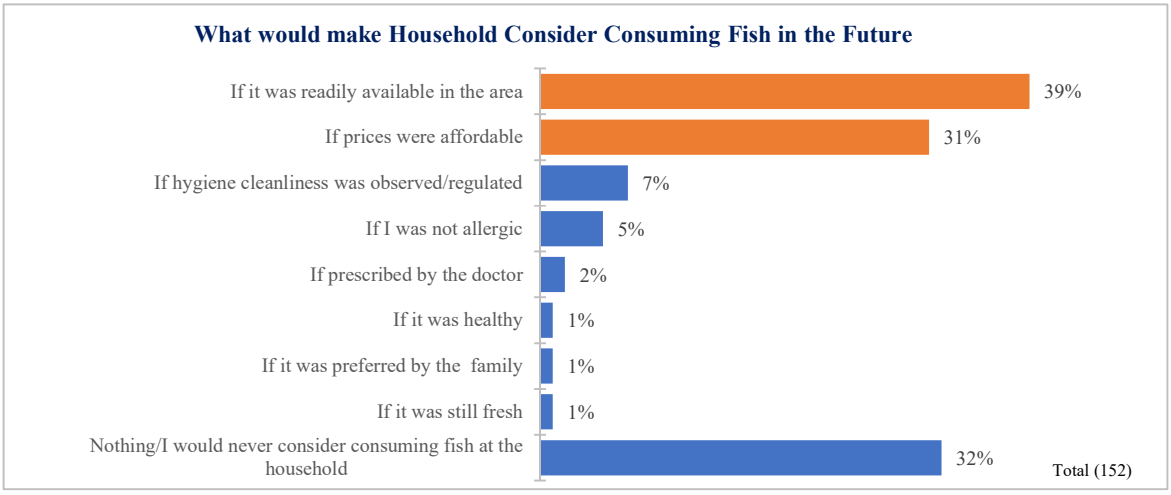
A large proportion of households indicated they currently consumed fish (87%) in Tanzania. Small proportions however indicated that they did not consume fish with the main barriers of consumption cited largely cited as being pricing and availability among other reasons as shown below.

Figure 248: Status of fish consumption at the household



Consequently, for households that were not consuming fish, moderate pricing and availability are some of the key factors that would encourage consumption as shown below.

Figure 249: Factors that would encourage fish consumption in households not consuming fish



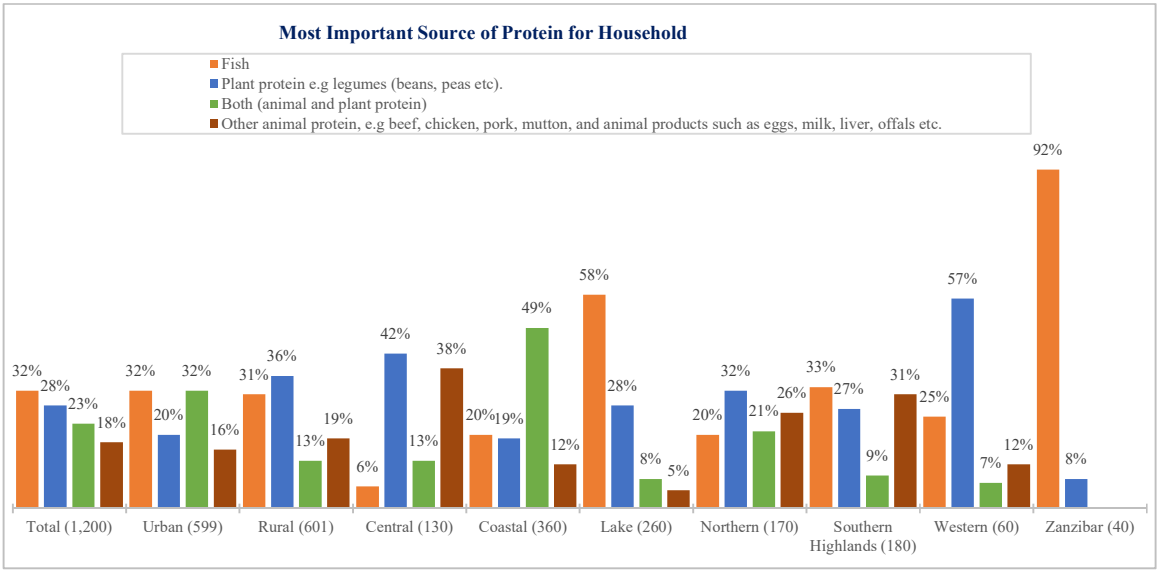
C. Consumer Preferences

This section provides insights on the type of proteins consumed by households, favourite types of meats for the households, fish consumption trends and varieties purchased, frequency of purchase, preferences of wild vs. farmed species, local vs. imported species and concerns consumers have when making fish purchases.

Type of Protein Consumed at the Household

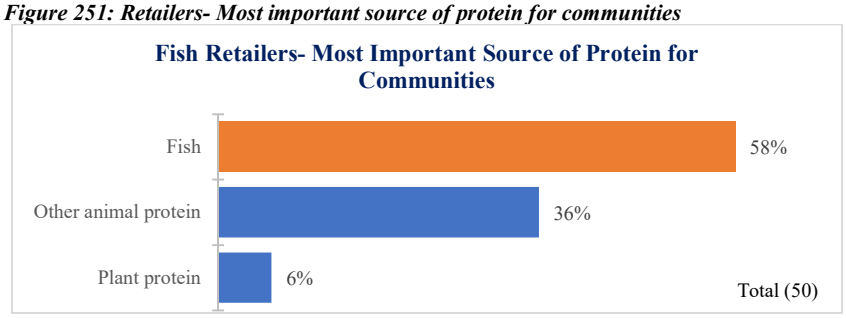
It was observed that in Tanzania, fish (32%) is generally considered as the most important source of protein, more so in the urban setting (32%) especially in Zanzibar (92%) and Lake Regions (58%). Significant proportions also considered plant proteins as being the most important sources of protein (28%), more so in the rural setting (36%), especially in the Western (57%) and Central (42%) Regions. Significant proportions also considered both plant and animal proteins (23%) and other animal proteins (18%) as shown below.

Figure 250: Consumers- Most important source of protein for household



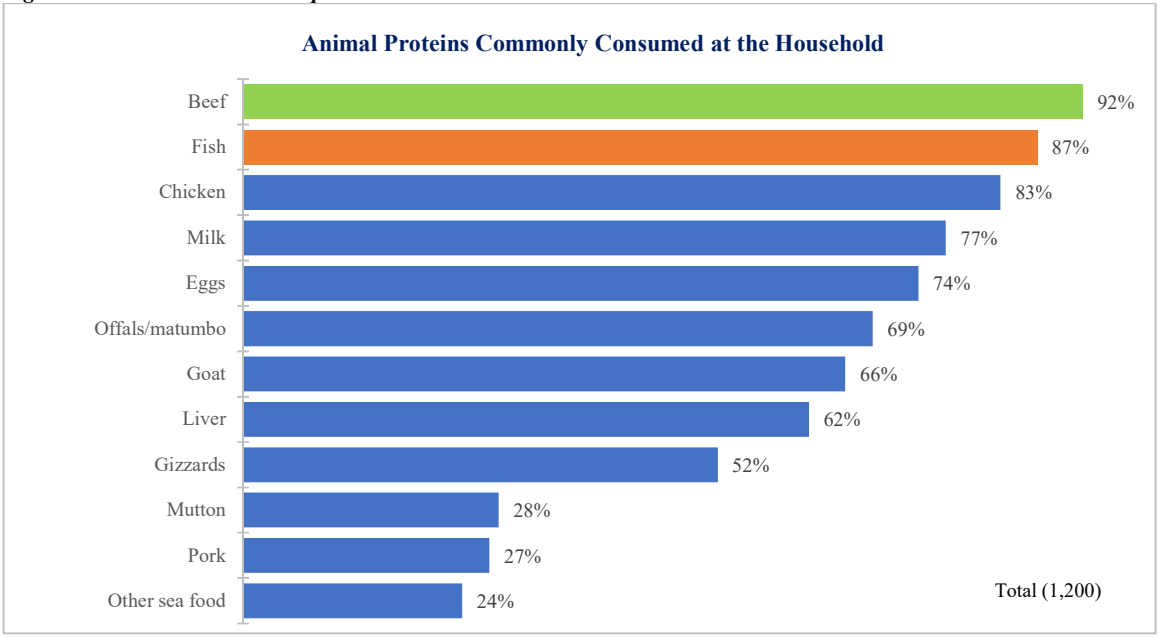
Consistency was observed with the perceptions held by fish farmers and fish retailers, where all interviewed fish farmers cited fish as the most important source of protein for the communities, and more than half of the fish retailers (58%) also indicated that fish was the most important source of protein as shown below.

Figure 251: Retailers- Most important source of protein for communities



Further, a large proportion of consumers reported that they commonly consumed beef (92%) and fish (87%) at the households among other animal proteins as shown below.

Figure 252: Consumers- Animal proteins consumed at the households



Fish consumption patterns across the regions was observed to be largely even, with higher consumption rates being observed in Zanzibar (100%) and Coastal regions (90%) as shown below.

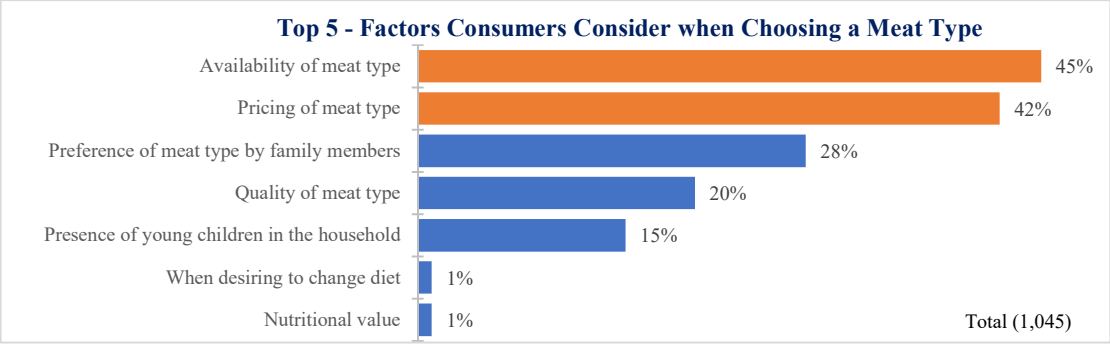
Figure 253: Consumers- Animal proteins consumed at the households- Region

	Total (1,200)	Urban (599)	Rural (601)	Central (130)	Coastal (360)	Lake (260)	Northern (170)	Southern Highlands (180)	Western (60)	Zanzibar (40)
Beef	92%	92%	91%	95%	93%	88%	96%	89%	93%	85%
Fish	87%	88%	86%	86%	90%	86%	85%	87%	82%	100%
Chicken	83%	80%	87%	94%	86%	83%	68%	84%	92%	78%
Milk	77%	77%	77%	85%	82%	78%	66%	76%	77%	60%
Eggs	74%	70%	79%	81%	80%	71%	59%	84%	78%	45%
Offals/*matumbo*	69%	70%	69%	72%	79%	68%	47%	71%	82%	52%
Goat	66%	57%	76%	76%	66%	72%	56%	61%	88%	45%
Liver	62%	62%	61%	72%	72%	52%	49%	63%	75%	30%
Gizzards	52%	53%	52%	59%	66%	42%	34%	57%	60%	22%
Mutton	28%	21%	35%	42%	24%	28%	25%	22%	47%	28%
Pork	27%	25%	28%	31%	19%	22%	21%	55%	42%	-
Other sea food	24%	30%	18%	8%	54%	7%	15%	6%	7%	55%

Factors Influencing Consumer Choice for Type of Meat

In choosing whether to purchase fish or other types of animal proteins, consumers make several considerations with availability and pricing of the meat being mentioned most by meat consumers.

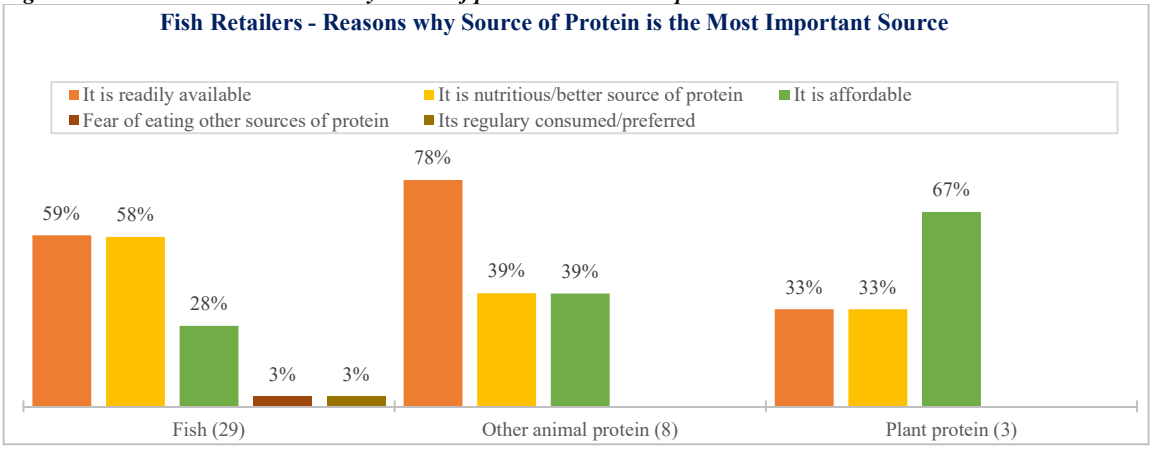
Figure 254: Factors consumer consider when choosing a meat type



This information correlated with that obtained from the fish farmers, who had cited that fish was the most preferred source of protein for consumers. Farmers noted that this was the case because fish was readily available, nutritious, and affordable.

Fish retailers also largely cited the same reasons for choices made by meat consumers, with availability, nutritional value and affordability being mentioned the most as shown below.

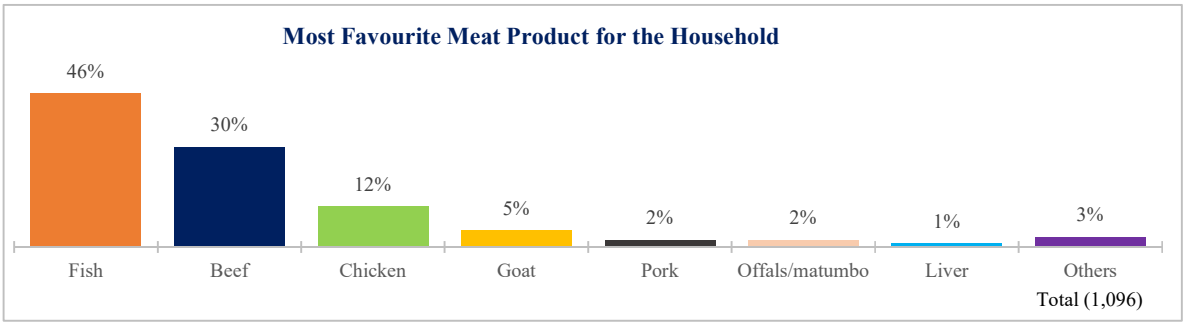
Figure 255: Fish retailers- Reasons why source of protein is the most important



Favorite Types of Meat for the Household

If was observed that fish was the most favourite type of meat for household among other meat types as shown below.

Figure 256: Most Favourite type of meat for household



Regional variations were however observed where for instance beef was more favoured in the Northern region over fish as shown below.

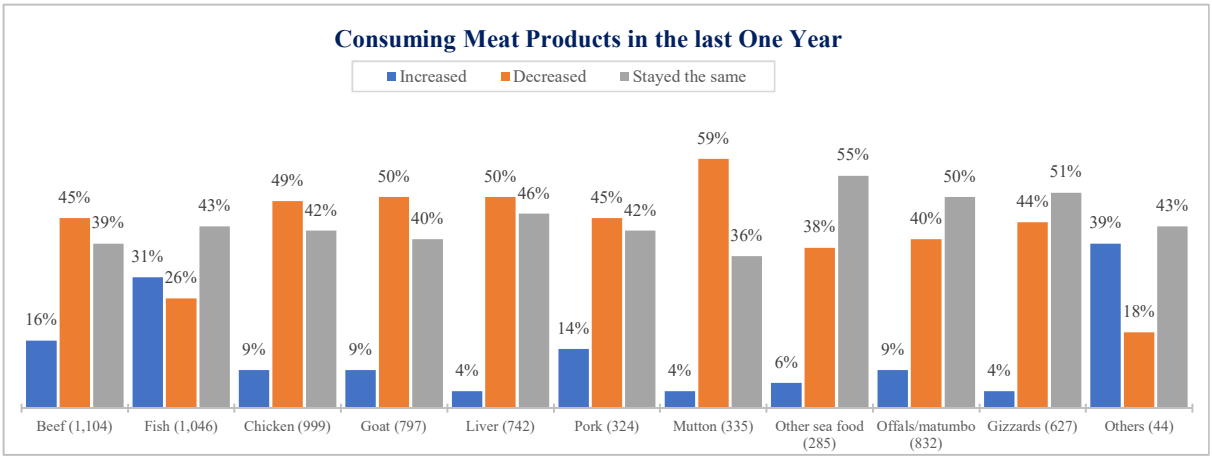
Table 110: Most favourite type of meat for household- Region

	Total (1,196)	Urban (597)	Rural (599)	Central (129)	Coastal (359)	Lake (259)	Northern (169)	Southern Highlands (180)	Western (60)	Zanzibar (40)
Fish	46%	53%	38%	22%	48%	55%	40%	41%	38%	100%
Beef	30%	31%	29%	49%	28%	19%	51%	26%	22%	-
Chicken	12%	9%	14%	16%	14%	7%	5%	18%	20%	-
Goat	5%	1%	9%	6%	4%	3%	4%	6%	15%	-
Pork	2%	1%	3%	3%	1%	-	-	7%	2%	-
Offals/*Matumbo*	2%	2%	2%	3%	-	6%	-	1%	2%	-
Liver	1%	1%	1%	1%	2%	1%	-	1%	2%	-
Others	3%	1%	4%		1%	10%	-	1%	-	-

Fish Consumption Trends

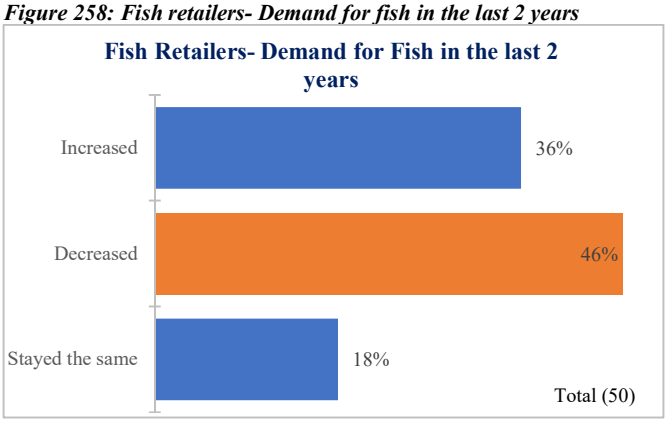
It was observed that consumption of various types of meat in the last one year had largely decreased. The consumption of fish was however observed to have largely stayed the same (43%) over the last year as shown below.

Figure 257: Consumers- Meat consumption patterns in the last 1 year



Fish farmers, however, percieved that the demand for fish had largely increased (reported by 7 out of 9 faremers) over the last 2 years, probably because they engaged in the sale of fish after some time (as fish matured after a period of about 6 months). Consistency of the feedback obtained from consumers was, however, observed with fish retailers, who largely felt that demand for fish had decreased (46%) as shown below.

Figure 258: Fish retailers- Demand for fish in the last 2 years



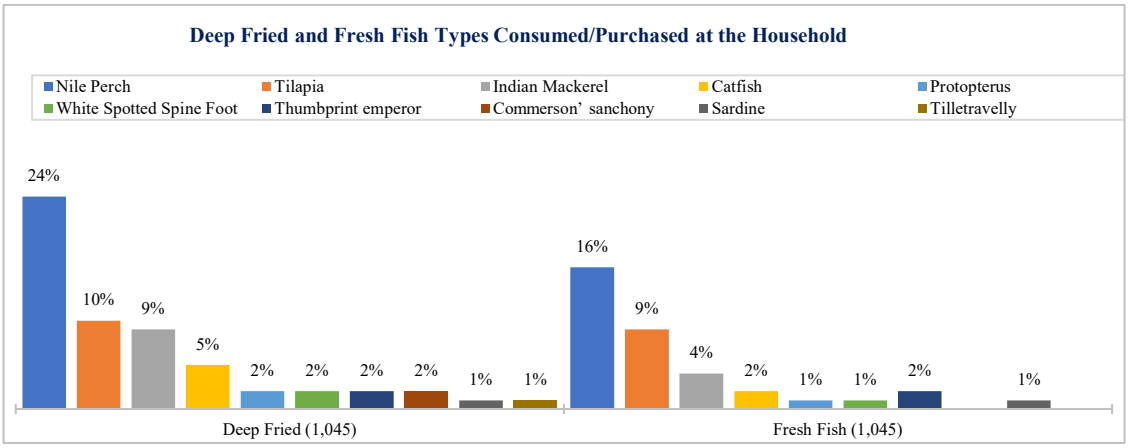
Fish Variety Purchased and Consumed at Home

According to the FAO, the coastal marine areas often produce small Pelagics (Scads, Herring and Anchovy) and medium Pelagics (Spanish Mackerel, Bonito, Barracuda, Mackerel and Wolf Herring), Demersal Fish (Shark, Ray, Skate, Sole, Catfish, and Shrimp) in deep water and coral reef fish (Emperors, Snappers, Sweetlips, Parrotfish, Surgeonfish, Rabbitfish, Groupers and Goatfish), and lagoons and intertidal species (Octopus, Squid, Crabs and a variety of Bivalves), in addition to artisanal fishery targeting Tuna and Tuna-like species.[28]

From the study implemented, it was observed that fish consumers in Tanzania largely consumed Nile Perch, Tilapia and the Indian Mackerel among other species as shown below. These were largely purchased in their fresh form or deep-fried form for consumption among other forms (other forms presented further below).

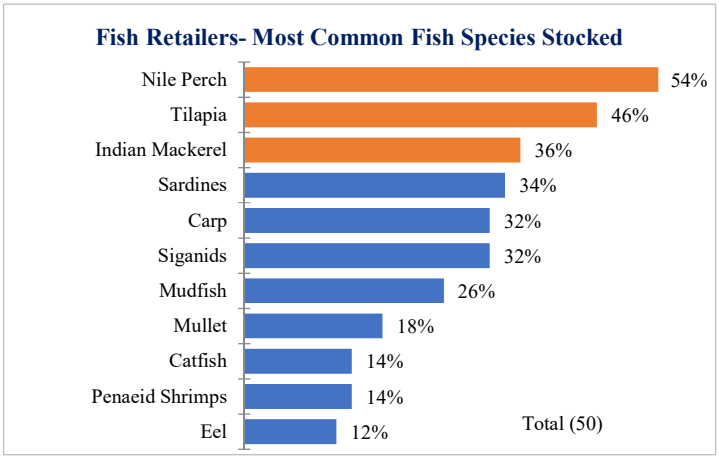
[28] Fisheries in the ESA-IO Region: Profile and Trends, Country Review, 2014.

Figure 259: Consumers- Species of fish consumed



A correlation was observed with fish farmers, where it was noted that they mainly reared Tilapia and Catfish. Fish retailers were also stocking Nile Perch and the Indian Mackerel among other species as shown below.

Figure 260: Fish retailers- Fish species stocked



Fish farmers cited high demand, availability of fingerlings, affordability, cost effectiveness, the less susceptibility of species to diseases and better returns as the reasons why they kept these species.

Table 111: Fish farmers- Reasons for stocking species

Reasons for stocking species		
Total (9)		
	Tilapia (9)	Catfish (5)
High demand in the market	100%	100%
Readily available fingerlings	67%	40%
Affordable to purchase	67%	80%
Cost effective to maintain	56%	60%
Less prone to diseases	56%	60%
Do well/provide better returns	44%	40%

Fish retailers on the other hand cited affordability, trustworthiness of the source of fish stocks, better returns and availability as some of the reasons for stocking the fish species as shown below.

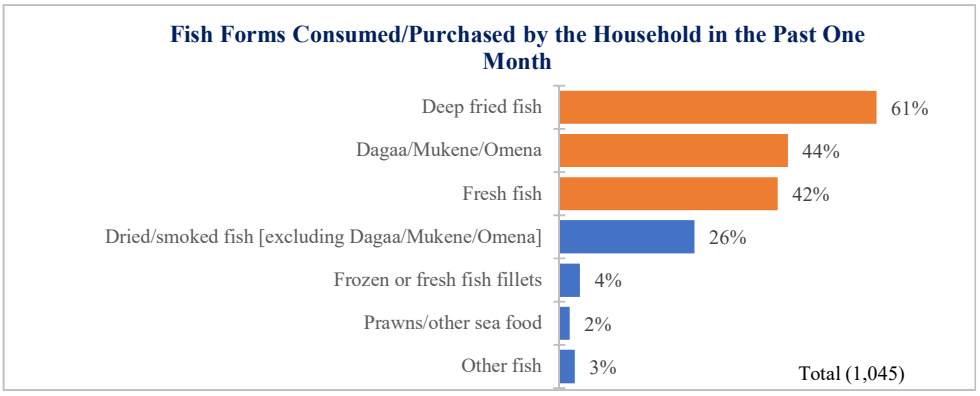
Table 112: Fish retailers- Reasons for stocking species

Reasons for Stocking Species											
Total (50)											
	Nile Perch (27)	Tilapia (23)	Indian Mackerel (18)	Carp (16)	Sardines (17)	Mudfish (13)	Catfish (7)	Penaeid Shrimps (6)	Mullet (9)	Siganids (16)	Eel (6)
Affordable to purchase	67%	17%	50%	53%	53%	62%	29%	43%	22%	19%	33%
I trust the source	59%	61%	50%	33%	53%	31%	43%	57%	67%	50%	100%
Do well/provide better returns	56%	52%	72%	40%	65%	38%	57%	57%	67%	50%	50%
Readily available	37%	48%	33%	20%	71%	23%	43%	57%	67%	38%	50%
Stay fresh longer	26%	43%	22%	33%	18%	38%	43%	14%	22%	13%	17%
Customers' preference	11%	9%	11%	20%	6%	15%	-	-	-	13%	

Form in which Fish is Purchased

According to the FAO, fish in Tanzania (both Mainland and Zanzibar), is mainly consumed fresh or in a traditionally processed form - either smoked, sun-dried and salted-sun dried products.[29] From the study's findings however, fish consumers were observed to be purchasing fish for consumption largely in the deep-fried form (61%). Significant proportions were however also purchasing *Dagaa/Mukene/Omena* (44%) and fresh fish (42%) among other forms as shown below.

Figure 261: Consumers- Fish forms purchased and consumed in the households



[29] Fisheries in the ESA-IO Region: Profile and Trends, Country Review, 2014.

Regional variations were observed where for instance deep-fried fish was consumed by larger proportions in Central and Coastal regions, while *Dagaa/Mukene/Omena* was consumed by larger proportions in the Lake region over other forms. The highest consumption of fresh fish and prawns/ other sea food on the other hand was in Zanzibar as shown below.

Table 113: Consumers- Fish forms consumed by households- Region

Fish forms consumed/purchased by the household in the past one month										
	Total (1,045)	Urban (528)	Rural (517)	Central (112)	Coastal (322)	Lake (222)	Northern (144)	Southern Highlands (156)	Western (49)	Zanzibar (40)
Deep fried fish	61%	66%	56%	79%	73%	46%	65%	52%	39%	42%
Dagaa/ Mukene/ Omena	44%	38%	50%	77%	38%	61%	25%	33%	47%	18%
Fresh fish	42%	52%	31%	13%	48%	44%	43%	30%	49%	92%
Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*]	26%	24%	29%	7%	37%	25%	10%	42%	29%	2%
Frozen or fresh fish fillets	4%	6%	2%	4%	4%	3%	2%	3%	2%	12%
Prawns/other sea food	2%	2%	2%	1%	4%	-	2%	-	-	15%
Tinned/canned fish	-	-	-	-	-	-	-	1%	-	-
Other fish	3%	1%	4%	1%	-	9%	1%	3%	-	2%

Some variations were observed by levels of household income where for instance household earning a monthly income of between USD. 201- USD.500 reported that they consumed more of the deep-fried fish than any other form as shown below.

Table 114: Consumers- Fish forms consumed by households- Household income

Fish forms consumed/purchased by the household in the past one month								
	Total (1,045)	Below USD. 100 (554)	USD. 101 - 200 (281)	USD. 201 - 500 (123)	USD. 501 - 750 (23)	USD. 751 - 1,000 (4)	Above USD. 1,500 (10)	Don't know/ refused to answer (50)
Deep fried fish	61%	59%	61%	70%	57%	50%	60%	62%
Dagaa/Mukene/Omena	44%	48%	42%	37%	57%	75%	30%	26%
Fresh fish	42%	33%	55%	46%	52%	100%	20%	50%
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	26%	29%	24%	17%	26%	-	50%	28%
Frozen or fresh fish fillets	4%	3%	4%	6%	22%	-	-	2%
Prawns/other sea food	2%	2%	2%	3%	4%	-	-	2%
Other fish	3%	4%	2%	1%	-	-	-	-

It was observed that consumers largely preferred deep-fried fish, fresh fish, *Dagaa/Mukene/Omena* and frozen fish largely because of availability among other

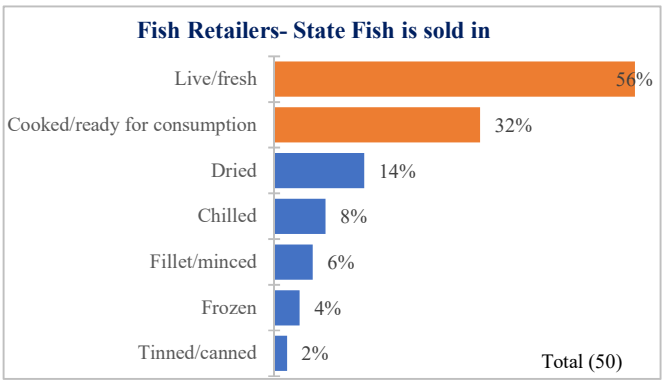
reasons, while prawns/other sea food were largely preferred because of their affordability among other reasons as shown below.

Table 115: Consumers- Reasons for preferring fish form

Reasons for preferring type/form of fish							
	Deep fried fish (636)	Fresh fish (437)	*Dagaa/ Mukene/ Omena* (462)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (276)	Frozen or fresh fish fillets (39)	Prawns/other sea food (22)	Other fish (30)
Readily available	37%	32%	40%	43%	31%	14%	57%
Ready for cooking	22%	4%	6%	14%	3%	-	7%
Taste preferences/good taste	14%	14%	4%	8%	5%	32%	3%
Cost effective/affordable	11%	12%	32%	18%	26%	27%	17%
Nutritious	5%	18%	6%	5%	15%	14%	3%
Has no bones	3%	3%	3%	1%	-	5%	
Can be prepared quickly	3%	2%	2%	3%	3%	5%	
Good for health	3%	8%	2%	4%	13%	5%	3%
Good for young children	2%	4%	2%	1%	-	-	
I was brought up eating/habitual	-	2%	1%	1%	-	-	3%
It's handled hygienically	-	-	-	-	3%	-	
Easy to preserve	-	-	-	1%	-	-	

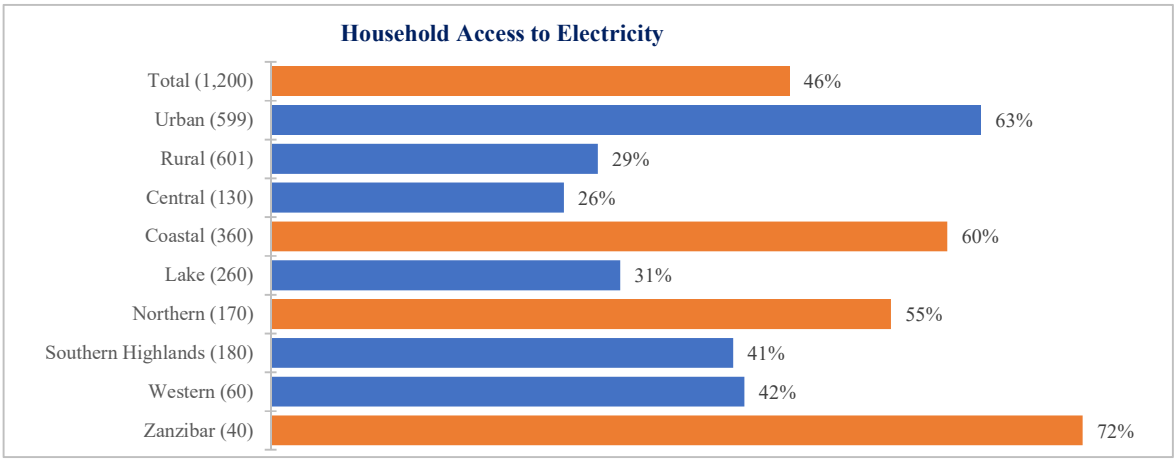
Further, it was observed that fish farmers mainly sold fish in its live/fresh form. One farmer also indicated that he sold cooked/ready for consumption fish. Fish retailers also mainly sold live/fresh fish and cooked/ready for consumption fish among other forms as shown below.

Figure 262: Fish retailers- State fish is sold in



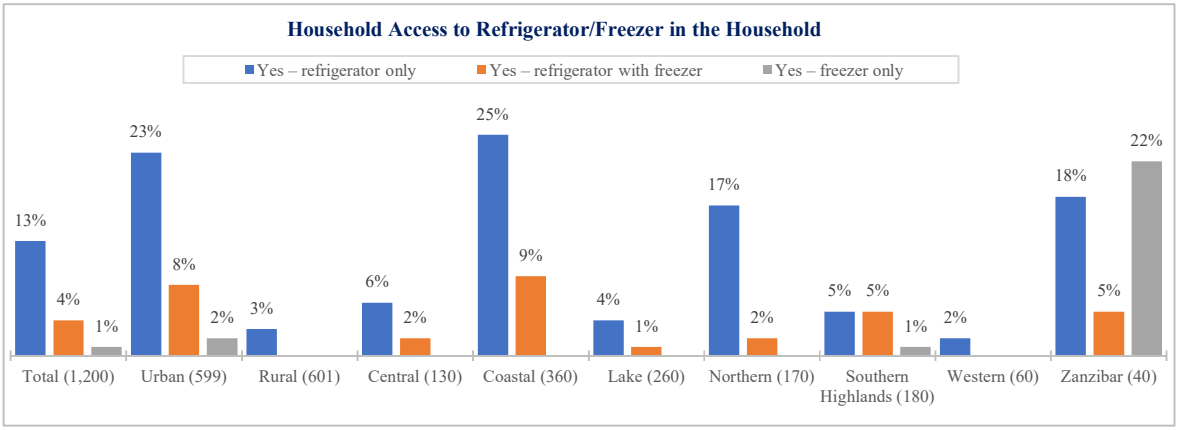
Consequently, consumers were observed to be facing the same predicament where only 46% of the consumers had access to electricity, more so in the urban areas, majorly in the Coastal, Northern and Zanzibar regions as shown below. Access to electricity would subsequently influence their access to storage equipment and forms they preferred to purchase fish in.

Figure 263: Consumers- Households' access to electricity



As expected, only small proportions of households had access to storage equipment as shown below, with higher proportions being in the Costal, Northern and Zanzibar regions.

Figure 264: Households access to storage equipment



Consequently, households mainly consumed fish within the same day which would imply that they largely do not have access to storage equipment.

Figure 265: Consumers- Methods of preserving fish

Methods used to preserve fish							
	Deep fried fish (636)	Fresh fish (437)	*Dagaa/ Mukene/ Omena* (462)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (276)	Frozen or fresh fish fillets (39)	Prawns /other sea food (22)	Other fish (30)
No need to preserve/consume all in a day	85%	75%	83%	86%	54%	82%	87%
Keep in refrigerator	6%	15%	1%	3%	21%	14%	3%
Keep in freezer	1%	3%		1%	18%	5%	
Smoking	2%	2%		1%	3%	5%	
Drying	8%	11%	12%	7%	18%	5%	3%
Put in a container/wrap and cover it	-	-	-	3%	-	-	
Keep in cupboard	-	-	-	1%	-	-	
Leave in a paper bag	-	-	2%	1%	-	-	
Keep in a sack	-	-	1%	-	-	-	
Special device for storage with ventilations	-	-	1%	-	-	-	

Amount of Fish Purchased on Average for Home Consumption

It was observed that on average, households purchase/consume 5.8kgs of fish in a month. Fish consumption was observed to be higher in the urban setting than in the rural setting as shown below.

Table 116: Amount of fish purchased by household in a month- Setting

How much fish does your household consume in a month on average? (kgs)			
	Total (1,045)	Urban (528)	Rural (517)
Average household consumption of fish in a month (kgs)	5.8	6.7	5.0

Variations were also observed across the regions, where, for instance the average fish consumption in a month was highest in Zanzibar (15.7kgs) as shown below.

Table 117: Amount of fish purchased by household in a month- Region

How much fish does your household consume in a month on average? (kgs)								
	Total (1,045)	Central (112)	Coastal (322)	Lake (222)	Northern (144)	Southern Highlands (156)	Western (49)	Zanzibar (40)
Average household consumption of fish in a month (kgs)	5.8	3.9	5.8	7.1	5.4	3.5	5.6	15.7

Across the various income brackets, the average fish consumption in a month was observed to be higher among affluent households as shown below.

Table 118: Amount of fish purchased by household in a month- Household income

How much fish does your household consume in a month on average? (kgs)								
	Total (1,045)	Below USD. 100 (554)	USD. 101 - 200 (281)	USD. 201 - 500 (123)	USD. 501 - 750 (23)	USD. 751 - 1,000 (4)	Above USD. 1,500 (10)	Don't know/refused to answer (50)
Average household consumption of fish in a month (kgs)	5.8	5.1	6.9	7.4	6.1	14.8	5.1	3.3

With regards to the purchase and consumption of different fish forms, it was observed that fish consumers tend to consume more of fresh fish (5.7kgs) in a month on average than other fish forms as shown below.

Table 119: Amount of fish purchased by household in a month- Setting

Over the past month, how much of …… was purchased by the household (kgs)?			
	Total (1,045)	Urban (528)	Rural (517)
Deep fried fish	3.9	4.3	3.5
Fresh fish	5.7	5.8	5.6
Frozen or fresh fish fillets	3.5	3.7	2.8
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.7	2.6	2.8
Dagaa/Mukene/Omena	2.6	2.5	2.8
Prawns/other sea food	3.3	2.6	4.2
Tinned/canned fish	1.0	1.0	-
Other fish	4.3	2.0	5.0

Variations were observed in the different regions. For instance, deep-fried fish and fresh fish was consumed more in Zanzibar, while frozen or fresh fish fillets were consumed more in Coastal, Central and Western Regions. Dried fish on the other hand was consumed more in the Lake region while *Dagaa/Mukene/Omena* was consumed more in Central and Northern regions.

Table 120: Amount of fish purchased by household in a month- Region

Over the past month, how much of …… was purchased by the household (kgs)?								
	Total (1,045)	Central (112)	Coastal (322)	Lake (222)	Northern (144)	Southern Highlands (156)	Western (49)	Zanzibar (40)
Deep fried fish	3.9	3.0	3.4	5.9	4.2	3.1	3.6	6.3
Fresh fish	5.7	3.2	3.9	6.9	5.3	3.9	7.0	13.2
Frozen or fresh fish fillets	3.5	4.0	4.1	3.0	2.3	2.2	4.0	3.8
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.7	2.9	2.3	4.3	3.9	1.9	2.1	2.0
Dagaa/Mukene/Omena	2.6	2.7	2.0	3.7	2.7	1.3	2.9	1.6
Prawns/other sea food	3.3	8.0	1.9	-	4.3	-	-	4.7
Tinned/canned fish	1.0	-	-	-	-	1.0	-	-
Other fish	4.3	1.0	-	5.3	3.5	1.0	-	4.0

The more affluent households were observed to be largely consuming more fish as shown below.

Table 121: Amount of fish purchased by household in a month- Household income

Over the past month, how much of …… was purchased by the household (kgs)?								
	Total (1,045)	Below USD. 100 (554)	USD. 101 - 200 (281)	USD. 201 - 500 (123)	USD. 501 - 750 (23)	USD. 751 - 1000 (4)	Above USD. 1,500 (10)	Don't know/refused to answer (50)
Deep fried fish	3.9	3.4	4.2	5.2	3.5	12.5	4.7	3.4
Fresh fish	5.7	5.1	6.6	6.2	5.8	5.8	2.0	3.6
Frozen or fresh fish fillets	3.5	3.1	2.4	6.9	3.2	-	-	1.0
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2.7	2.6	2.6	3.9	2.0	-	4.6	1.5
Dagaa/Mukene/Omena	2.6	2.7	2.7	2.5	2.3	1.7	3.7	1.6
Prawns/other sea food	3.3	3.5	1.3	7.0	-	-	-	1.0
Tinned/canned fish	1.0	1.0	-	-	-	-	-	-
Other fish	4.3	4.7	3.4	-	-	-	-	-

On average, households spend about TZS. 36,114 (equivalent to about USD.16) in a month on fish and fish products, with a higher spend observed in Zanzibar, obviously due to the high consumption of fish in this region as indicated in previous sections.

Table 122: Average household spend on fish and fish products in a month- Region

On average, how much does this household spend on fish and fish products in a month? (TZS.)										
	Total (1045)	Urban (528)	Rural (517)	Central (112)	Coastal (322)	Lake (222)	Northern (144)	Southern Highlands (156)	Western (49)	Zanzibar (40)
Average Spend	36,114	42,338	29,759	20,336	37,902	34,864	36,427	23,691	30,306	127,288

Some variations were observed across different household income categories, with the more affluent households tending to spend slightly more on fish and fish products as shown below.

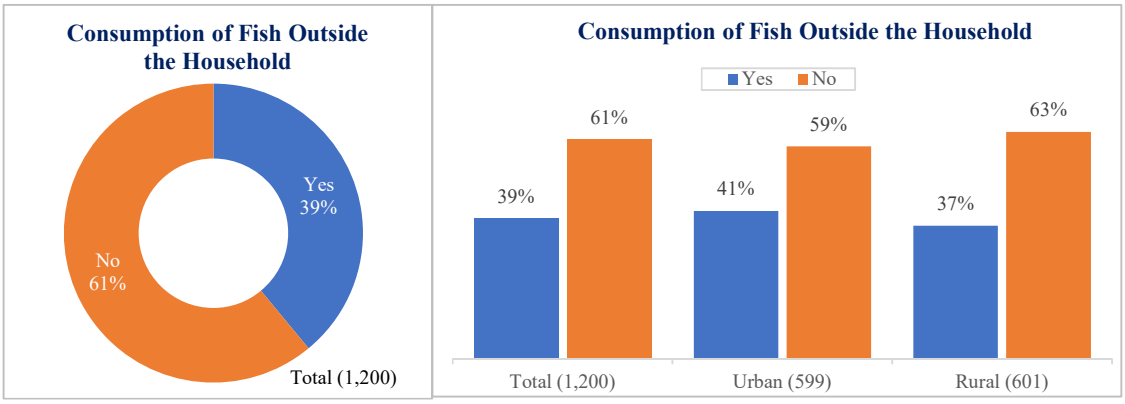
Table 123: Average household spend on fish and fish products in a month- Household income

On average, how much does this household spend on fish and fish products in a month? (TZS.)								
	Total (1,045)	Below USD. 100 (554)	USD. 101 - 200 (281)	USD. 201 - 500 (123)	USD. 501 - 750 (23)	USD. 751 -1,000 (4)	Above USD. 1,500 (10)	Don't know/ refused to answer (50)
Average Spend	36,114	29,292	44,472	46,740	53,414	69,000	39,503	27,330

Fish Consumption Outside the Household

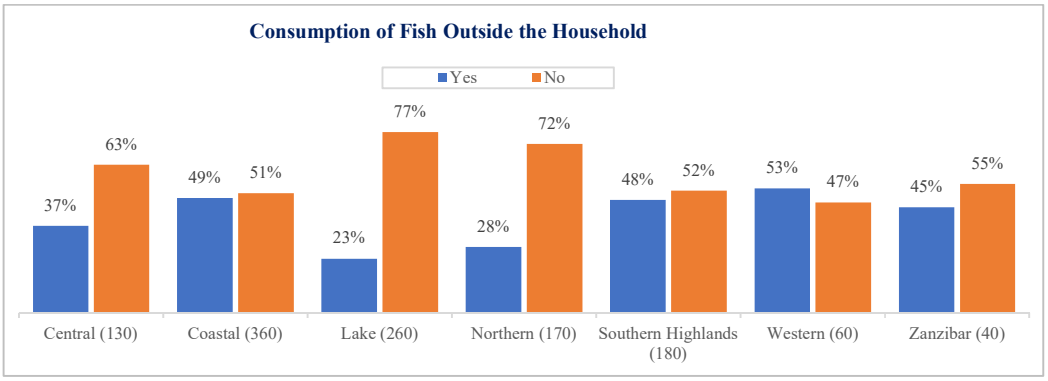
It was observed that almost 40% of the consumers consume fish outside the household. Additionally, consumption of fish outside the home was noted to be slightly higher in the urban areas than in the rural areas as shown below.

Figure 266: Consumption of fish outside the home



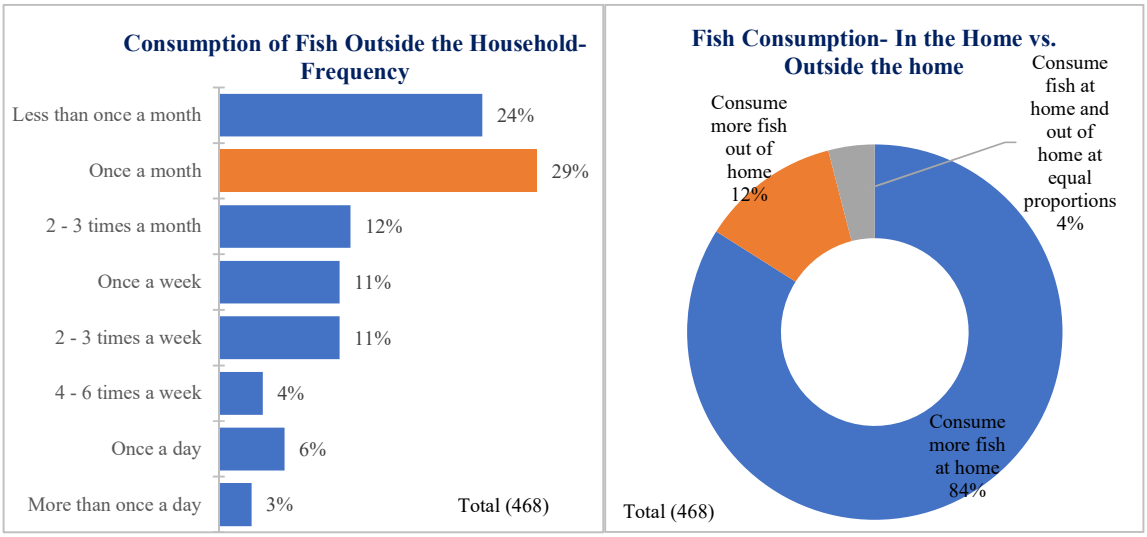
It was noted that fish consumption outside the home was slightly higher in the Western region than in the other regions as shown below.

Figure 267: Consumption of fish outside the home- Region



It was observed that consumers largely consumed fish outside the home once a month. This notwithstanding, consumers tended to eat fish more fish at home as shown below (84%).

Figure 268: Frequency of consumption of fish outside the home



Frequency of Fish Consumption

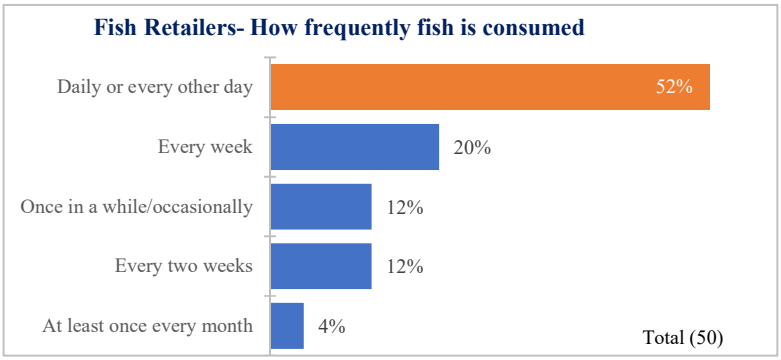
It was observed that households largely consumed the different types of fish purchased two to three times a week as shown below.

Table 124: Frequency of fish consumption in the household

Number of times fish is consumed at the household	Deep fried fish (636)	Fresh fish (437)	*Dagaa/ Mukene/ Omena* (462)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (276)	Frozen or fresh fish fillets (39)	Prawns /other sea food (22)	Tinned Fish (1)	Other fish (30)
More than once a day	2%	6%	2%	2%	5%	-	-	3%
Once a day	5%	12%	7%	5%	10%	-	-	7%
4 to 6 times a week	21%	17%	23%	14%	5%	14%	-	3%
2 to 3 times a week	38%	34%	35%	42%	23%	41%	-	37%
Once a week	9%	13%	13%	12%	18%	18%	-	10%
2 to 3 times a month	14%	9%	12%	18%	13%	-	-	27%
Once a month	8%	8%	7%	6%	15%	14%	-	7%
Less than once a month	2%		2%	2%	10%	14%	100%	7%

Interestingly, however, most farmers (4 out of 9 farmers) perceived that fish consumers in the communities consumed fish every two weeks, while others perceived that consumers purchased and consumed daily or every other day (3 out of 9 farmers) or every week (2 out of 9 farmers). More than half of the fish retailers (52%) also held the perception that fish was consumed daily or every other day as shown below, probably because of their sales patterns.

Figure 269: Fish retailers- Perception on frequency of fish consumption



The Preference for Wild vs Farmed Fish

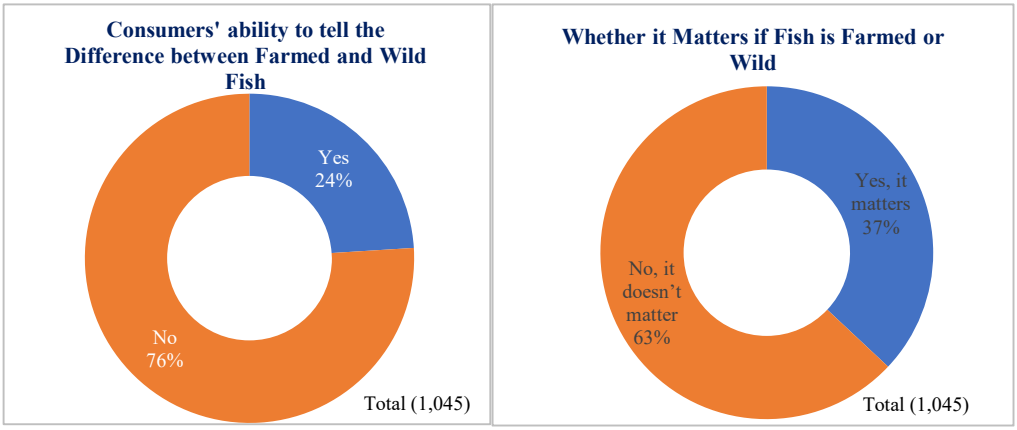
Consumers in Tanzania mainly perceived that the fish they were purchasing and consuming was from local sources and was largely wild catch as shown below.

Table 125: Perceived source of fish consumed

Perceived source of fish purchased/consumed at the household								
	Deep fried fish (636)	Fresh fish (437)	*Dagaa/ Mukene/ Omena* (462)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (276)	Frozen or fresh fish fillets (39)	Prawns /other sea food (22)	Tinned Fish (1)	Other fish (30)
Local – wild fish [from lakes, rivers, streams, the ocean]	92%	97%	96%	93%	87%	100%	100%	97%
Local – fish farms, fish cages and ponds	5%	4%	2%	7%	13%	-		-
Imported – wild fish	1%	2%	1%	2%	5%	5%		3%
Imported – fish farms, fish cages and ponds	8%	3%	4%	4%	-	-		-

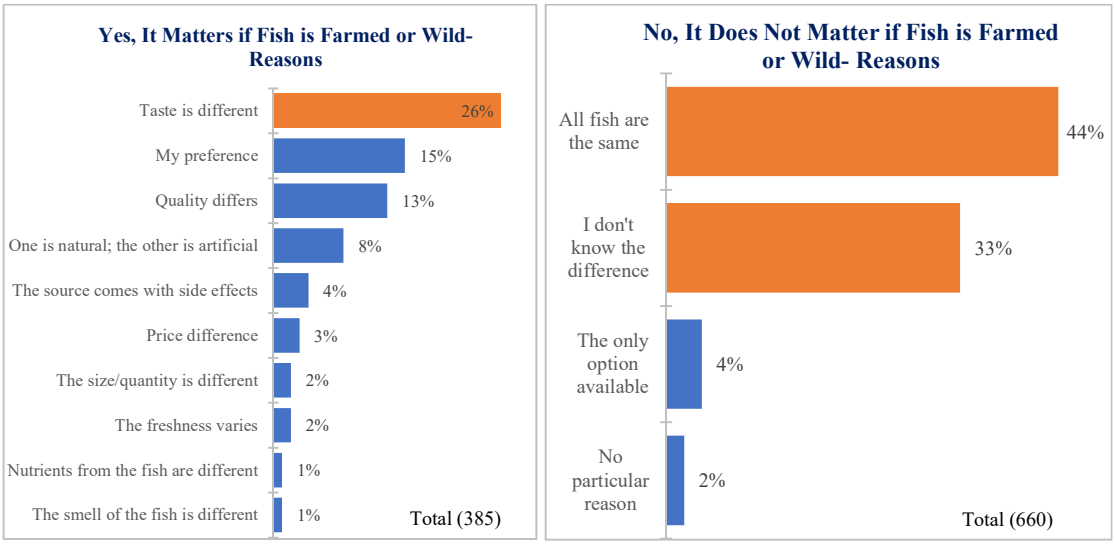
Interestingly however, only 24% could tell the difference between wild fish and farmed fish. This notwithstanding, to most of the consumers (63%) it did not matter whether the fish they were purchasing and consuming was wild fish or farmed fish as shown below.

Figure 270: Consumers ability to differentiate between wild and farmed species



Those that noted that it mattered to them whether fish was wild or farmed, taste was largely indicated to be different between the two varieties among other reasons as shown below. For those that it didn't matter, the perception was largely that all fish are the same and while a significant proportion also noted that they did not really know the difference.

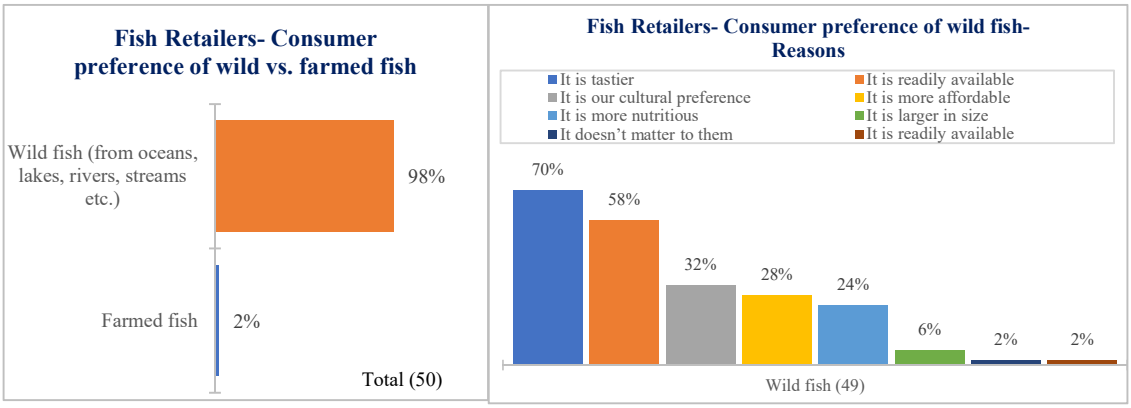
Figure 271: Consumers' perspective on wild vs. farmed fish



A significant proportion of fish farmers (5 out of 9 farmers) perceived that consumers prefered farmed fish because of its availability, cultural preference, taste, its size, nutritional value. Interestingly, despite being in the fish farming business, 4 out of 9 farmers perceived that consumers preferred wild fish, because it was a cultural preference and it was readily available.

Fish retailers, however, held the same perspective as consumed where majority (98%) perceived that consumers prefer wild fish over farmed fish, mainly because it was tastier and readily available among other reasons as shown below.

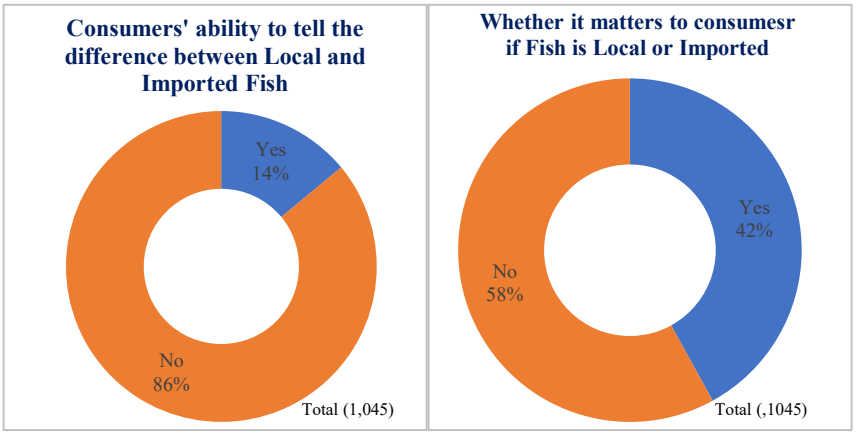
Figure 272: Fish retailers' perspective of consumer preferences- Wild vs. farmed fish



The Preference for Local vs Imported Fish

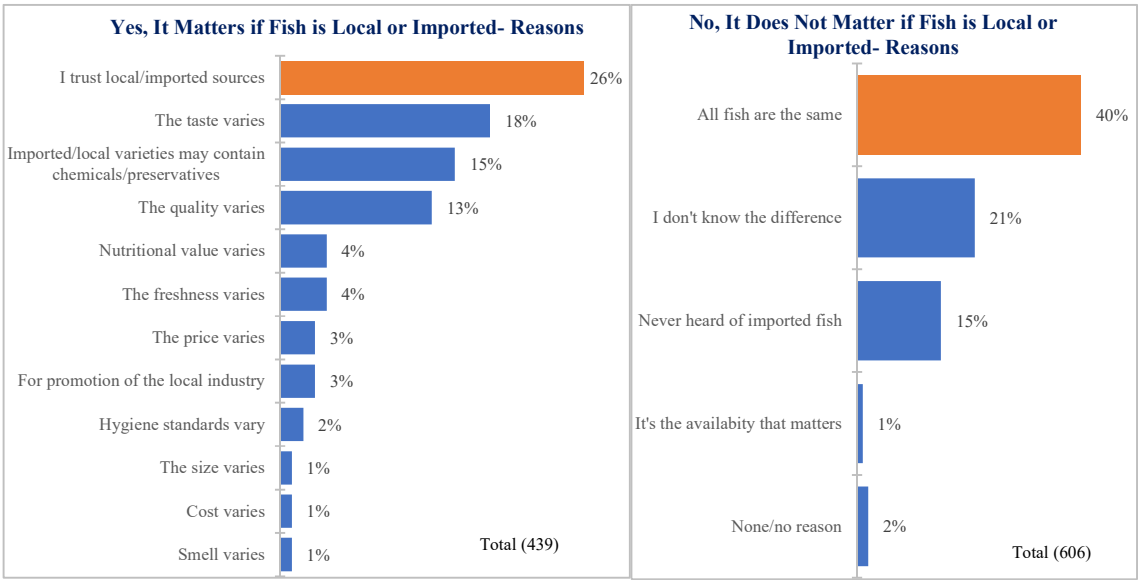
In the same breadth, majority of consumers (86%) are not able to tell the difference between local and imported fish varieties. To more than half of the consumers however (58%), it does not matter to them however whether fish is from local sources or imported sources as shown below.

Figure 273: Ability of consumers to tell the difference between local and imported fish



For those to whom it mattered whether fish was from local or imported sources, they largely cited that they trusted fish from local/ imported sources among other reasons as shown below. For consumers to whom it did not matter, a significant proportion (40%) indicated that, to them, all fish are the same as shown below.

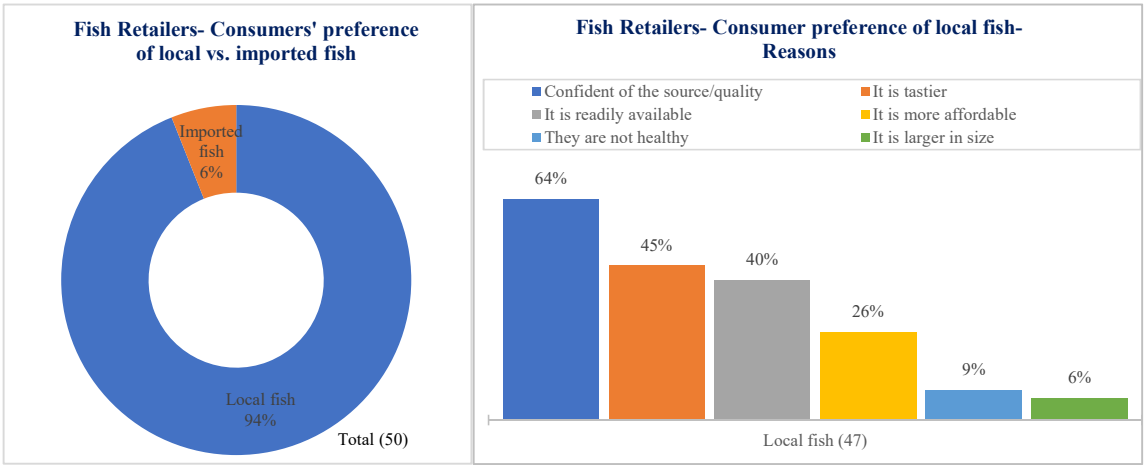
Figure 274: Consumers' perspective on local vs. imported fish



Similarly, fish farmers perceived that consumers mainly prefer local fish (8 out of 9 farmers), because people can be more confident of the source/quality, because it is readily available, affordable, tastier and has less (fish) smell. One of the farmers could, however, not tell whether fish consumers preferred local or imported fish.

In the same breadth, 94% of the fish retailers interviewed perceived that consumers prefer local fish, largely because consumers could be confident of the source/quality among other reasons as shown below.

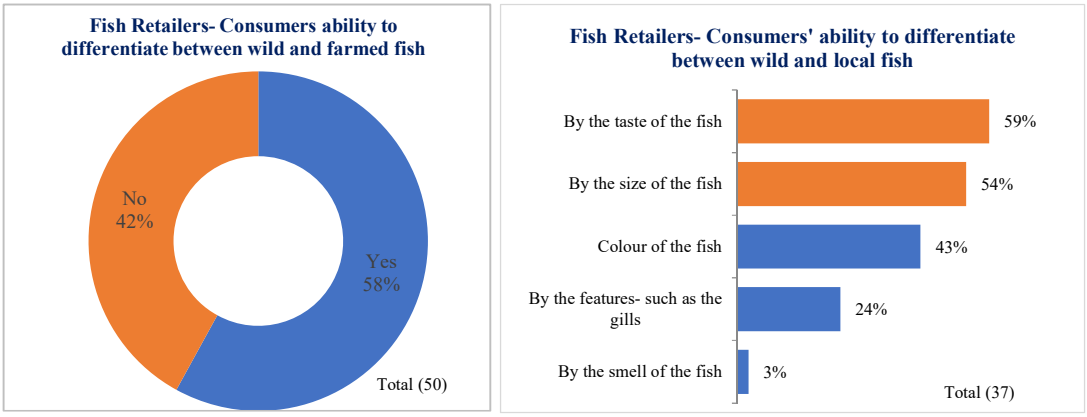
Figure 275: Fish retailers' perspective of consumer preferences- local vs. imported



Fish Tasting Exercise

As indicated in the previous sections, consumers are largely not able to tell the difference between wild and farmed fish, or between local and imported fish. From the retailers' perspective, however, more than half of those interviewed (58%) felt that consumers are generally able to tell the difference between wild and farmed fish, largely because the taste and size of the fish varies among other reasons.

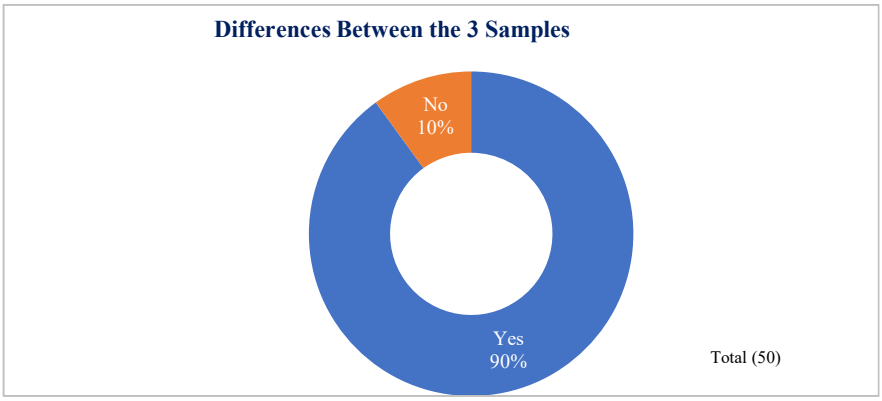
Figure 276: Fish retailers' perspective of consumers ability to differentiate between wild and farmed fish



To ascertain this, a fish tasting exercise was carried with a sample of consumers of fish in Dares Salaam (50), where they were invited to taste three samples of fish varieties, one of which was wild, the other farmed and the other an imported variety. All fish was of the same species (Tilapia) and was prepared in a standardized way (deep-fried). Feedack from the consumers was then sought on their perceptions of the fish after tasting each sample.

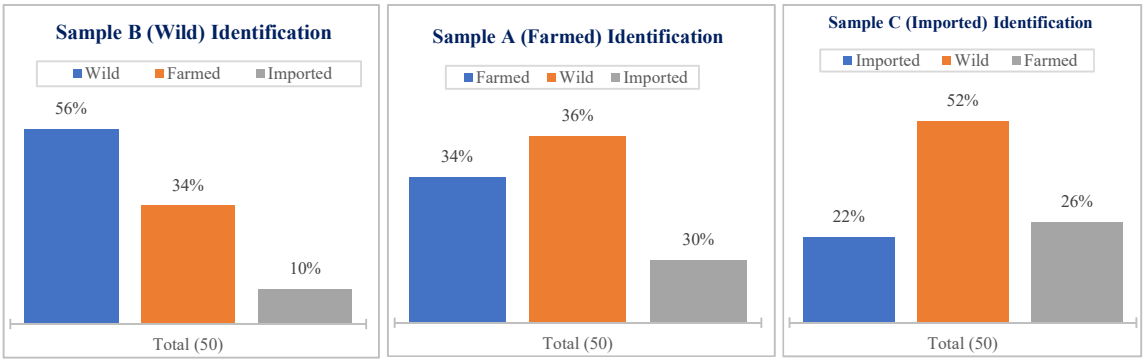
As shown, majority of the consumers participating in the tasting exercise indicated that there were differences in the samples of fish tasted. This could be attributed to the fact that consumers were conscsious/more keen of the tasting exercise and therefore discerned differences in the fish samples.

Figure 277: % of fish consumers that claimed there were differences in the 3 fish samples



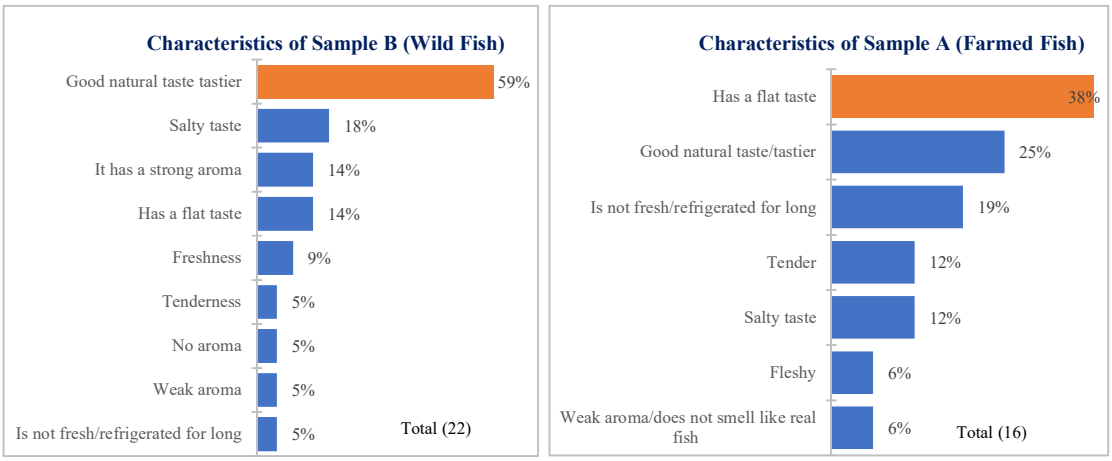
Further, 56% of the consumers correctly identified the wild fish, while a significant proportion (34%) mistook it for farmed fish. Consequently, 34% of consumers correctly identified the farmed fish variety and a significant proportion (36%) mistook it for wild fish. Additionally, only a small proportion (22%) correctly identified the imported fish while more than half of the consumers (52%) mistook it for wild fish as shown below. This would imply that the imported fish was from wild/natural sources (the original source of the imported fish was not established).

Figure 278: Fish tasting exercise results



Consequently, consumers largely described the wild fish as having an good natural taste while the farmed fish was largely described as having a flat taste as shown below.

Figure 279: Characteristics of wild and farmed fish

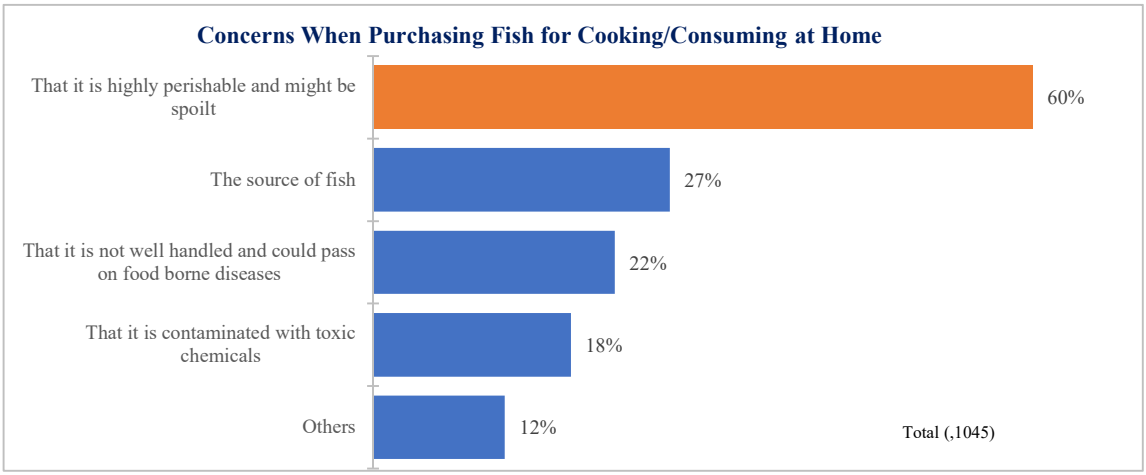


Similarly, consumers that correctly identified imported fish indicated that this fish variety had a flat taste, was tender, and had good natural taste among other characteristics.

Consumer Concerns and Perceptions

More than half of fish consumers (60%) were generally concerned that fish purchased for consumption at home would get spoilt as it is a perishable commodity. As cited in previous sections of this report, only small proportions of consumers have access to electricity and subsequent storage equipment.

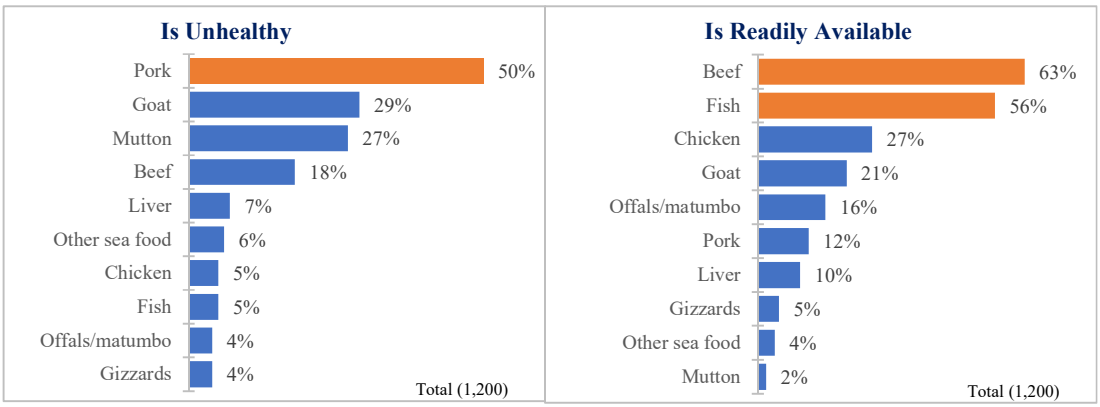
Figure 280: Concerns consumers have when purchasing fish for cooking/consuming at home



The study further explored consumers' perceptions around various attributes on meat and meat products. It was observed for instance that pork was largely considered to be

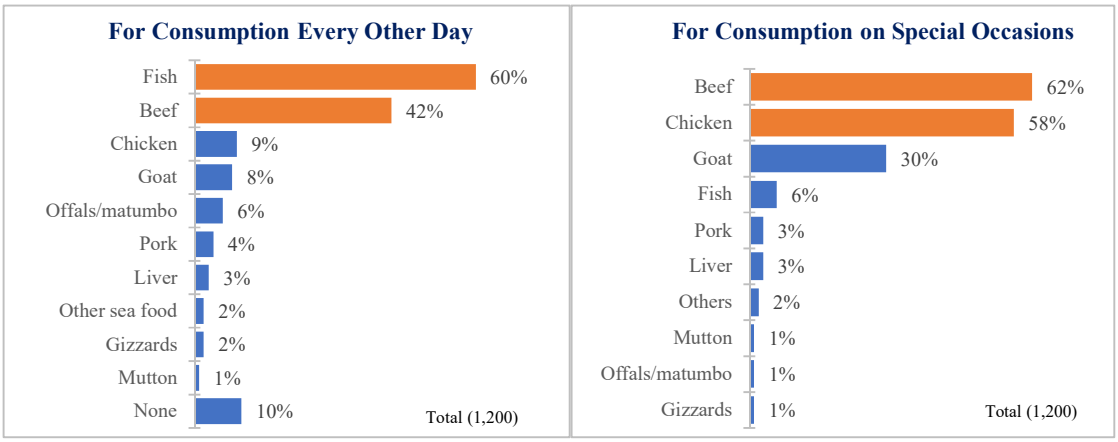
unhealthy while beef and fish were type of meat considered to be readily available as shown below. Only a small proportion (4%) considered fish to be unhealthy.

Figure 281: Type of meat considered to be unhealthy and meat considered to be available



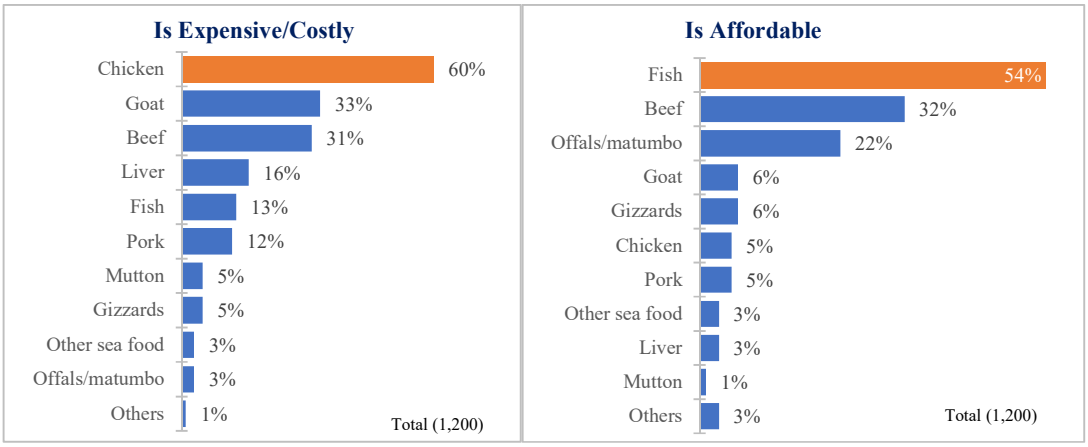
Further, fish and beef were also largely considered as types of meats for consumption every other day while beef and chicken were considered as types of meat for consumption on special occasions. Fish was considered by a small proportion (6%) as being a type of meat for consumption on special occasions.

Figure 282: Type of meat for consumption every other day and on special occasions



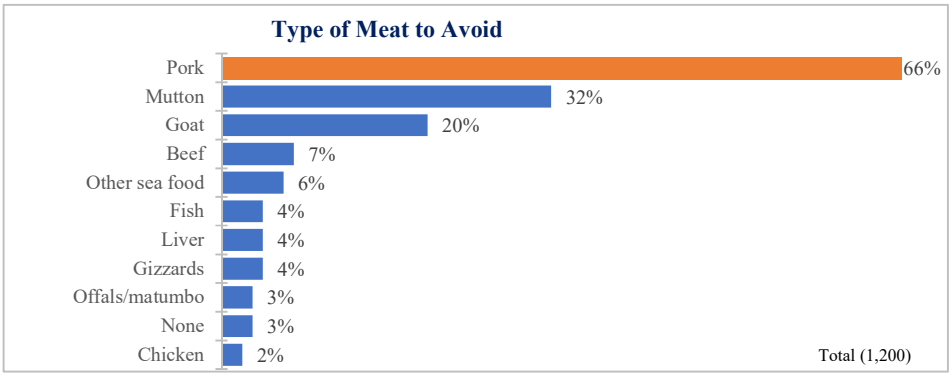
Additionally, chicken was considered to be expensive by most of the meat consumers (60%). Fish on the other hand considered to be affordable (54%) as shown below.

Figure 283: Type of meat considered to be costly and type considered to be affordable



Lastly, pork was considered as a type of meat to avoid by 66% of the meat consumers as shown below. Only 4% of the meat consumers considered fish as a type of meat to avoid.

Figure 284: Type of meat to avoid



From a longer list of attributes about fish (shown below), it was observed that fish consumption can easily be driven up by ensuring it is readily available and more affordable. Further, packaging it as a product that is quick and easy to prepare and which can easily be prepared at home, as well as a product that is nutritious for young children can are practical ways that traders of fish and fish products can adopt to drive up demand.

Figure 285: Perceptions around various attributes about fish

Perceptions on various attributes (Total – 1,045)				
	Agree	Neither Agree nor Disagree	Disagree	Average Differences
I would be willing to consume more fish products if it was available near me	87%	9%	5%	82%
I would be willing to consume more fish products if the price went down	86%	9%	5%	81%
I feel comfortable buying and preparing fish at home	84%	11%	5%	79%
Fish is nutritious for young children	81%	13%	7%	74%
Fish is quick and easy to prepare	81%	11%	8%	73%
People in this location traditionally eat fish	76%	14%	9%	67%
Fish is a healthier source of protein than other sources	75%	16%	8%	67%
Fish fillet is mainly consumed by children	74%	16%	10%	64%
Local fish is of higher quality than imported fish	64%	26%	10%	54%
Generally, fish is too expensive	67%	16%	16%	51%
Everyone should eat fish once a week	65%	17%	17%	48%
Wild fish is more "natural"	60%	27%	13%	47%
Wild fish is safer/free from chemicals or artificial boosters than farmed fish	59%	28%	13%	46%
Frozen fish is tasteless	60%	25%	14%	46%
It is easy to judge the freshness of fish and other sea food	57%	32%	12%	45%
Farmed fish spoils quickly even when frozen, it turns green	35%	47%	18%	17%
Fish sold in the supermarkets is not good quality fish	36%	39%	24%	12%
Wild fish is more expensive than farmed fish	34%	39%	26%	8%
Farmed fish is fragile/breaks apart when being cut and fried	26%	52%	23%	3%
Farm raised fish is of the same quality as wild fish from the rivers, lakes and the sea.	32%	35%	33%	-1%
Imported fish is larger in size than local fish	23%	45%	31%	-8%
Farmed fish is larger in size than wild fish	26%	38%	37%	-11%
Farmed fish is tastier than wild fish	28%	31%	41%	-13%
Fish sold in this area is not handled hygienically	32%	23%	45%	-13%
Fish from China is more affordable than fish from other sources	17%	46%	38%	-21%
Fish from China is tastier than fish from other sources	12%	44%	43%	-31%
In rural areas, fish is never consumed	23%	17%	60%	-37%

Consequently, only small proportions of consumers perceive that farmed fish is of the same quality as wild fish, or that it is tastier than wild fish, a factor which would need to be addressed to drive up the uptake of farmed fish for sustainability. Additionally, if imported fish (including Chinese fish) is to be considered as an alternative source of fish to manage demand, there will be a need to manage perceptions around it as it currently has negative perceptions on issues of pricing and taste.

3.3.3 Fish Production, Processing and Route to Market

This section provides insights on the supply side of the fish industry, specifically from fish farmers, fish retailers, storage and transportation businesses as well as an overview of the market organization through cooperatives and associations.

A. Fish Farming Trends

Aquaculture, in Tanzania is said to have started in the early 1950s with experiments with Tilapia in pond culture. In modern times, the sector includes Tilapia, Trout, and Catfish (in fresh water), and a small marine aquaculture (mariculture) sector producing Milkfish and Prawns, in addition to small Seaweed farming.[30] As at 2015, the amount of fish produced from farms amounted to 3,118 tonnes for Tilapia, 442.8 tonnes for Milkfish, 396 tonnes of Prawns and 223 tonnes of Seaweed; though aquaculture production has been static in recent years.[31] Aquaculture in Tanzania is primarily a small-scale activity, with small ponds, little formal management and low productivity, reflecting its largely subsistence nature.[32] To gain more understanding of the aquaculture sector in Tanzania, 9 owners/key decision makers of fish farms/ ponds factories were interviewed and findings from the study are presented below.

Fish Species Farmed

It was observed that all the 9 fish farmers interviewed were stocking Tilapia. A significant proportion of them also (5 out of 9), were also stocking Catfish. Some of the motivations for stocking these species included their high demand in the market, availability of fingerlings, and affordability among other reasons as shown in the table below.

Table 126: Fish farmers- reasons for stocking species

Reasons for stocking species		
	Tilapia (9)	Catfish (5)
High demand in the market	100%	100%
Readily available fingerlings	67%	40%
Affordable to purchase	67%	80%
Cost effective to maintain	56%	60%
Less prone to diseases	56%	60%
Do well/provide better returns	44%	40%

[30] The Tanzanian fisheries sector; Challenges and Opportunities, September 2016, by the Ministry of Agriculture, Livestock and Fisheries.
[31] Ibid
[32] Op Cit

Sources of Fingerlings

Fish farmers indicated that they largely purchased the fingerlings they stocked from local sources (7 out of 9 farmers). A considerable proportion (2 out of 9 farmers) also indicated that they owned their own hatcheries for fish production. All farmers who purchased fingerlings from local sources indicated that they largely did so because the species acquired were cost effective to rear, were healthier/less prone to diseases, more affordable and provided better returns.

All farmers who owned a hatchery for producing their own fingerlings indicated that they had owned it for a period of between 6 months to 1 year. On the other hand, farmers who purchased fingerlings indicated that they mainly sourced them from fellow fish farmers among other sources as shown below.

Table 127: Fish farmers- Source of species stocked

Source of species currently stocked		
	Tilapia (9)	Catfish (5)
From fellow farmers in Tanzania	56%	80%
From the lake e.g., Lake Victoria	22%	-
Edeni Agriaqua Limited	11%	20%
Tanzania Fisheries	11%	-

Number of Fingerlings Purchased and Amount of Fish Harvested

It was estimated that on average, farmers purchase about 52,000 fingerlings of Tilapia and 3,500 fingerlings of Catfish as shown in the table below.

Table 128: Fish farmers- Number of fingerlings purchased per batch/lot

Fingerlings purchased for farming per batch/lot		
	Tilapia (9)	Catfish (5)
Average number of fingerlings purchased per batch	52,000	3,500

Additionally, it was observed that farmers harvest an average of between 4,103kgs of Tilapia and 3,408kgs of Catfish per batch/lot as shown below.

Table 129: Fish farmers- Kgs of mature fish harvested per batch/lot

Kgs of mature fish harvested per batch/lot		
	Tilapia (9)	Catfish (5)
Average amount of fish harvested	4,103	3,408

This amount of fish harvested appears low considering the number of fingerlings purchased and this could mean either farmers were experiencing losses in the fish population or their record keeping was not accurate.

From the amount of fish harvested, it was observed that farmers were selling an average of 3,936kgs of Tilapia and 3,406kgs of Catfish as shown below.

Table 130: Fish farmers- Kgs sold from harvest per batch/lot

Kgs sold from harvest per batch/lot		
	Tilapia (9)	Catfish (5)
Average amount of fish sold for each batch of fish	3,936	3,406

Average Cost of Production

In terms of the cost of production for the business, it was observed that farmers spent an average of about TZS. 362,222 (equivalent to about USD.159) for keeping the Tilapia species and TZS. 251,111(equivalent to about USD.110) for the Catfish species as shown below.

Table 131: Fish farmers- total cost of production

Total cost incurred in production (TZS.)		
	Tilapia (9)	Catfish (5)
Average amount incurred in the production of fish per batch	362,222	251,111

The main factors driving the cost of production were cited as being the cost of feeds, the hired labour, electricity, maintenance of consistent water supply and the cost of fingerlings.

Challenges and Bottlenecks that Farmers Face

It was observed that fish farmers are facing several challenges in running their businesses. Some of those cited included shortage of quality feeds and fingerlings, lack of knowledge and experience in fish farming, costly fish farming inputs, lack of electricity and water, low demand for fish and fish products, lack of hatcheries for fish production, shortage of affordable labour to run the farms, and the lengthy processes involved to acquire required businesses licences for fish farming.

Additionally, it was noted that majority of fish farmers (8 out of 9) did not own any fish storage equipment, and are therefore most likely forced to sell or offload fish harvested immediately to avoid losses.

Further, as indicated in the section above, a significant proportion of fish farmers (4 out of 9) cited that access to fingerlings was one of the challenges faced. This issue was explored further, and it was observed that the high cost of the fingerlings, high taxation costs incurred when importing fingerlings, delays in receiving fingerlings, shortage/low

supplies, and quality control issues were some of the issues farmers were facing when sourcing for fingerlings.

It was noted earlier that there were variances in the number of fingerlings kept versus the quantities of mature fish harvested by fish farmers. Some of the farmers (4 out of 9 farmers) confirmed that they sometimes experienced losses in the quantities of fish stocked in the farms/ponds, mainly because of animal predators, unavailability of quality feeds, fish diseases and getting fingerlings that were not of good quality.

Farmers also noted that some of the most difficult services to access in their businesses included veterinary and extension services for disease management, quality feeds, consistent water supply, markets for products and access to qualified labour.

Further, farmers indicated that the entry of Chinese fish in the Tanzanian market had mainly led to low prices of fish which in turn resulted to low income for those trading local fish. It was also noted that the Chinese fish was more readily available than the local fish, which was influencing consumers to prefer it more. Interestingly, it was observed that a significant proportion of the farmers (4 out of 9) felt that presence of Chinese fish in the market had no impact on the industry, while 2 of the farmers did not know that Chinese fish had entered the market, depicting knowledge gaps on the developments in the industry likely to affect businesses.

Lastly, it was observed that a significant proportion of farmers (6 out of 9) had not engaged in any activities to improve their fish farming businesses in the past year. Those that had done so indicated that they had largely attended sessions to improve knowledge on fish disease management (3 out of 9), setting up of new fish ponds and cattle farming for manure (2 out of 9 farmers) among other activities.

Available Opportunities

Despite the challenges faced in the industry, most farmers (8 out of 9) are optimistic that the demand for fish is likely to increase, largely because of fish's availability, its nutritious status, and its affordability among other reasons. Additionally, there is optimism by all the farmers that the production of fish is likely to increase in the next

two years, mainly because of the high demand for fish, source of livelihood from fish farming, and because of technological innovations in the industry.

To succeed in fish farming, fish farmers advised that critical factors that needed to be addressed included ensuring the availability of water, proper maintenance of fish ponds, access to training to acquire the required skills in fish farming, enough capital to run the businesses, commitment to the fish farming business and ensuring availability of fish species with high yields.

Since access to water is a critical factor in fish farming, the study sought to establish where farmers interviewed were accessing water from and whether the source was reliable or not. It was observed that the participating farmers were mainly accessing water for fish farming from boreholes (7 out of 9 farmers), and that the supply of water was mainly consistent (8 out of 9 farmers). All farmers indicated that they had exclusive control of the water supply to their farmers.

With regards to the future, majority of farmers (8 out of 9 farmers) indicated that they would construct new ponds, which could be attributed to the fact that they had undergone training on ideal methods of pond construction in the past year as indicated in the previous section. Additionally, farmers mentioned that they had plans to improve on sales related services (4 out of 9 farmers) among others. Farmers planned to engage in these business expansions largely through seeking for affordable credit, seeking for expert advice on fish farming and seeking for training opportunities to boost knowledge and skills in fish farming among others.

All farmers interviewed were eager to receive training on the latest technologies in fish production, while significant proportions also mentioned they were interested in training on where to access affordable credit, marketing of their business, forecasting consumption and demand for their products, quality requirements needed for fish, government policies relevant to the fishing sector, and formulation of pricing policies among others.

To grow the fish farming industry in the Tanzania, farmers largely recommended that there is a need to ensure access to relevant information, and the need to set up government programs to support fish farmers among others.

B. Fish Processing

As indicated in the study design section of this report, the government slapped fines on several fish processing factories due to illegal processing of fish (immature fish) when data collection for the fish processors category was ongoing in this study. This resulted in suspicions by most processing factories approached to participate in the study despite reassurances that the study was being implemented independently. Only 6 out of the targeted 9 fish processing factories agreed to participate in this study. Presented in this section are insights that were gleaned from them.

Species Processed

More than half of the interviewed processors (4 processors) indicated that they largely processed the Nile Perch fish variety. Additionally, 2 of the fish processors indicated that they processed Tuna fish and Siganids. Other fish varieties also processed included Mullet and Carp. The fish varieties for processing were largely obtained from fishermen, and were mainly sourced locally.

Further, it was noted that processors preferred to process these types of fish species due to different motivations which included availability, affordability and demand in the market among other reasons. It was also observed that fish processors mainly received fish in its fresh form for processing and these were largely frozen and packed or minced and packed for sale. Majority of the interviewed fish processors (5 out of the 6 interviewed) used advanced machines in their processing business. Processors however still desired to acquire even more advanced machines, among them including dehydrating machines. The main barriers for using these machines currently included cost and accessibility.

Amount Processed and Sold

With regards to the amounts of fish, it was observed that on average, the processors produced about 241,021kgs of Nile Perch products in a month, among other species as shown below.

Table 132: Processors- Amount of fish processed/produced per month

Amount of fish processed/produced (kgs) per month					
	Nile Perch (4)	Tuna (2)	Siganids (2)	Carp (1)	Mullet (1)
Average production (kgs) per month	241,021	5,000	10,000	8,000	3,000

Half of the interviewed processors (3 fish processors) observed that the amount of fish they processed had largely increased in the last 2 years, mainly because of improved relationships between the processors and the fishermen. The other half of the processors felt that the amount processed in the last 2 years had largely decreased mainly because of increased government regulations, especially on wild catch fishing which affected supply.

Further, it was observed that the amount of processed fish sold by processors was lower than the amount of fish reported as processed. As shown above for instance, processors handing the Nile Perch fish variety indicated that they processed an average of 241,021kgs in a month, but only sold 158,625kgs as shown below. This would imply that processors were either making significant losses in their businesses, their record keeping was poor, or they were unwilling to share accurate information, noting that this sensitive business information.

Table 133: Fish Processors- Average amount of fish sold

Amount of fish sold (kgs) per month					
	Nile Perch (4)	Tuna (2)	Siganids (2)	Carp (1)	Mullet (1)
Average sales (kgs) per month	158,625	653	1,003	1,417	1,600

Further, it was noted that most processors (4 out of the 6 interviewed) mainly delivered products to their customers, while others had their buyers pick products from the processing firm or would sometimes deliver to them. It was noted that the processors delivered products to their customers mainly using specialized trucks with cold storage, by air or by sea (ship). These methods of transport were preferred because they minimized spoilage of processed products, guaranteed reaching of many customers and

allowed transport of large quantities of processed products. It was reported that the main methods of preservation used during transportation were freezing and chilling and these were also preservation methods largely preferred by customers.

Regarding competition, the maximum number of competitors mentioned was between 21 to 50 competitors, while the lowest mentioned was less than 5 competitors. Additionally, most processors could not estimate the sales volumes of their competition; only one processor indicated that their competition was producing an average of 16kgs in a month. Further, it was noted that there were forms of collaboration among the processors; half of the interviewed processors indicated that they largely collaborated with others on areas that enhanced good customer relations, pricing and product promotion, largely through social media.

With regards to good business practices, it was noted that majority of the processors (5 out of the 6 interviewed) maintained a database of suppliers, distributors and customers that was regularly updated. They acknowledged that this was important in the management of their businesses. The telephone was mainly used to communicate with these groups of stakeholders. Other means of communication used included meetings with individuals and email communication.

Fish Supply

With regards to fish supply, it was observed that fish processors engaged a variety of suppliers who ranged from 15 to 100 suppliers. More than half of the processors interviewed (4 processors) indicated that they mainly looked at the quality of products being supplied, reliability of the suppliers and the size of the fish stocked being supplied when selecting their suppliers.

Further, it was observed that supply was highest in the month of December and lowest in the month of July and this was caused by seasonal issues. During the periods when the fish supply was low, processors tended to increase the price of the fish products sold to cope with the decline in fish supply. In addition, processors also reduced the production capacity and offered suppliers better prices to obtain more fish.

Fish Handling by the Processors

It was observed that fish processors largely checked on the freshness of the fish stocks procured for processing to determine their quality. Further, most processors (4 processors) indicated they used a fish quality testing equipment to determine the quality of fish provided for processing. Other processors indicated that they also checked on the physical appearance and smell of the fish to determine the quality of the fish stocks. One of the processors also added that they also considered the mode of transportation used to transport the fish stocks to determine whether the fish stocks delivered were of good quality or not.

On average, fish processors indicated that they experienced spoilage of about 11%, and this was mainly during transportation of fish stocks into the factories. Fish stocks that were rejected as bad quality were either handed back to the suppliers, sold off as animal feeds or even sold for human consumption but at lower prices. By-products from fish processing included scales, fish oils, bones, skeletons and fish intestines, which were either sold off in local or international markets or disposed as waste products.

Fish Storage Status

All processors reported that they had access to electricity while 5 processors reported that they also had access to a back-up generator. One of the processors also indicated the firm had access to a solar panel for use during power outages. Additionally, most of the processors had access to cold rooms, freezers, ice boxes and refrigerated showcases for storing fish stocks.

With regards to storage capacity, it was observed that there was over-utilization of the daily storage capacity. The average maximum daily storage capacity was noted to be about 153,967kgs while the average optimum storage capacity in a day was observed to be about 220, 275kgs. Majority of the processors however (5 processors), indicated that they had plans to boost their storage capacity in the future, which they noted, would increase their sales by about 60%. The main limiting factor towards making this investment was noted as being the low supply of fish stocks, as well as the lack of capital to finance the investment and the lowered demand for products over time. Processors

indicated that they planned to overcome these challenges by seeking for skilled labour to boost sales, constructing modern storage facilities as well as increasing efforts to market products.

Challenges and Bottlenecks that Fish Processors Face

Participating processors indicated that some of the challenges faced in their businesses included high prices of fish supplies, lack of diversity in fish products, stiff competition, seasonal/climate changes, poor infrastructure, high business taxes, lack of capital to invest in the business, low fish supplies/unavailability of fish stocks to meet demand, low quality fish stocks in the market, stiff industry regulations, low demand of processed products, lack of specialized transaction options, difficulties in custom clearance, lack of qualified personnel/labour, high cost of business/low business returns and lack of funding to invest in business. The most pressing challenge was the high business taxes. The processors indicated that one of the ways they were implementing to overcome the challenges was by venturing into fish rearing to manage the cost of running the businesses. Further, most processors (4 out of the 6 interviewed), indicated that there was no need to regulate fish importation as this was largely working for their businesses. The ban of plastics in Zanzibar was also cited as having had an impact on business operations as some products were either no longer packed for selling, alternatives that were cost effective were being used (boxes), or the cost of procuring new packaging materials were passed to the customers.

Available Opportunities for Fish Processing

Half of the processors perceived that the demand for fish in the country had largely stayed the same in the last 2 years, largely because they had not observed any changes in the industry. A few (2 processors) however, perceived that the demand for fish had increased in the last 2 years, largely because the supply of fish had increased and their customer bases had also grown.

Further, it was noted that most processors (4 out of the interviewed 6) had participated in training on fish production in the past 2 years. For future training opportunities, most processors largely desired to learn more about sources of fish, quality issues, marketing

strategies. Other areas processors were interested in learning about included government policies affecting the fishing industry, latest technologies of fish processing, forecasting consumption and demand for fish products and taxation issues. These training areas would be key in future programming targeting this group. In the next 2 years, processors planned to expand their businesses/increase market share by increasing their quantity of fish production, and by investing in storage equipment.

C. Fish Storage and Transportation

This subsection looks at the fish storage and transportation operations, challenges and recommendations made by the players. A total of 5 fish storage and transportation businesses were interviewed in Tanzania. Presented below are insights gleaned from them.

Business Operations

It was observed that fish storage and transportation businesses handled various types of fish species among them including Tilapia, Sardines, and Nile Perch. These were mostly preferred due to their demand in the market. Additionally, it was observed that different players handled fish from different sources, with some indicating that they handled wild catch fish, while others handled farmed fish varieties. Those that largely handled wild catch fish indicated that farmed fish was largely unavailable in their areas of operation, which was an indication of a gap in the market for farmed fish.

Further, it was noted that fish storage and transportation businesses were serving a variety of customers who included local customers as well as international customers. Some of the local customers mentioned included supermarkets, hotels, processing factories, and the public (individuals in the communities). International markets for fish storage and transportation services on the other hand included exports to clients in Burundi, Malawi, Rwanda and Zambia.

Additionally, it was observed that some of the more established entities used modern equipment to store and transport products while the less established entities used relied on traditional methods. For instance, some of the less established entities indicated that they largely preserved fish through drying, or through using insulated bins covered with

ice, while the more established entities had access to cold rooms, and refrigerated equipment for preserving fish. Further, the more established entities had access to specialized trucks for fish transportation, while the less established entities relied on trucks and lorries for transporting their products.

With regards to capacities handled in a day, it was observed that the more established entities handled quantities as high as 15 tonnes in a day, while the less established entities handled quantities as low as 300kgs in a day.

Fish storage and transportation companies noted that the demand for their serviced had largely decreased in the last 2 years. Some of the reasons cited for this decrease included Government bans on illegal fishing (fishing of immature fish), which affected supply, especially of wild catch varieties. Additionally, climatic/seasonal changes had also contributed to the fluctuation in fish supply, which as a result affected the demand for fish storage and transportation services.

Challenges Faced

Fish storage and transportation players indicated that they had faced several challenges in their line of business. To begin with, it was noted that players were experiencing frequent power outages, which were leading to fish spoilage, and in some instances, loss of taste/flavour of the fish and fish products (because of de-freezing and re-freezing). The value of such products would decrease as customers would complain and demand for re-funds or discounted pricing. Additionally, the less established entities were relying on purchased ice blocks, which were in some instance not available, leading to fish spoilage.

Further, fish spoilage was also experienced because of the preservation methods used. The less established entities who were for instance relying on sun-drying as a method of fish preservation indicated that use of this method was challenging in the rainy seasons. Huge losses would be incurred during such periods. Further, the less established entities also indicated that they experienced losses because of the mode of transport used. Most relied on the use of ordinary vehicles to transport their products, which resulted in fish spoilage especially when there were delays in transit, as the ice in the storage equipment

used would melt. Overall, fish storage and transportation companies indicated that fish spoilage experienced due to various factors was a minimum of 2 to 3kgs on average and a maximum of 500kgs on average within a single transit.

Additionally, it was observed that the storage capacity in the storage and transportation facilities was not adequate to meet the demand in the market, especially during seasons of high supply. Some players indicated that they would be forced to turn down orders for transportation or storage because they had reached maximum capacities, which led to loss of business opportunities. During seasons of low supply however, the storage space would be wasted while still incurring associated costs, such as electricity. Further, it was observed that the storage equipment used would get worn out fast and would require frequent replacements, which was costly for business.

Storage and transportation companies also indicated that they faced frequent harassment from the traffic police during transportation of their products. Sometimes the cargo would get held up by the officials at the expense of the fish stocks getting spoilt, until the fish handlers parted with bribes. Further, Government officials would make surprise visits at the fish storage premises to seize fish stocks which were indicated as being of low quality/illegal catch, but which had already been purchased, leading to losses in the businesses.

Despite the challenges experienced, the fish storage and transport entities were largely optimistic that the demand for their services would increase in the next 2 years, mainly because of the increased demand for fish and fish products. The players however observed that the supply of fish needed to be looked into, as the growth in the fish farming sector was still low in the country. Further, the strict regulations in the fishing industry were also discouraging more players from venturing into the sector.

Available Opportunities

Storage and transportation companies made several recommendations for consideration, which would assist players in the industry to function better. To begin with, players recommended that the Ministry of Energy and Natural Resources needed to work more

efficiently to reduce the power outages experienced. Constant/stable power supply would help in addressing the issue of fish spoilage.

Further, storage and transportation companies observed that there was the need to support players in the industry to access storage equipment at affordable pricing. Equipment such as refrigerators and freezers were indicated as being essential for all players handling fish at all levels in the value chain. Players suggested that there was need to construct buildings for fish storage centres to avoids fish spoilage during the rainy seasons.

Additionally, players felt that the Fishing Act which controlled the fishing of small/immature fish was oppressing the players in the value chain, but was benefiting the Government officials. This was because the officials would take advantage of the situation to slap players with fines, but the players were not equipped well to avoid contravening the laws. For instance, most fishermen did not have access to the right fishing nets and ended up catching the small fish would in turn end up with storage, transportation and processing factories. The players recommended that the application of the laws on illegal fishing needed to be reviewed and players educated and equipped to abide with the laws.

The storage and transportation companies also recommended that there was the need to regulate importation of fish into the country to protect the local industry. Lastly, players observed that there was a need to address the problem of poor infrastructure as it was leading to frequent breakdown of vehicles transporting fish stocks.

D. Fish Retail Market

This sub-section, looks at the retail for fish but with a focus on the retailers as compared to the other players in the value chain.

Main Purchase Point for the Consumers

It was observed that fish consumers largely purchased fish for consumption from general market places or from street vendors/retailers as shown below.

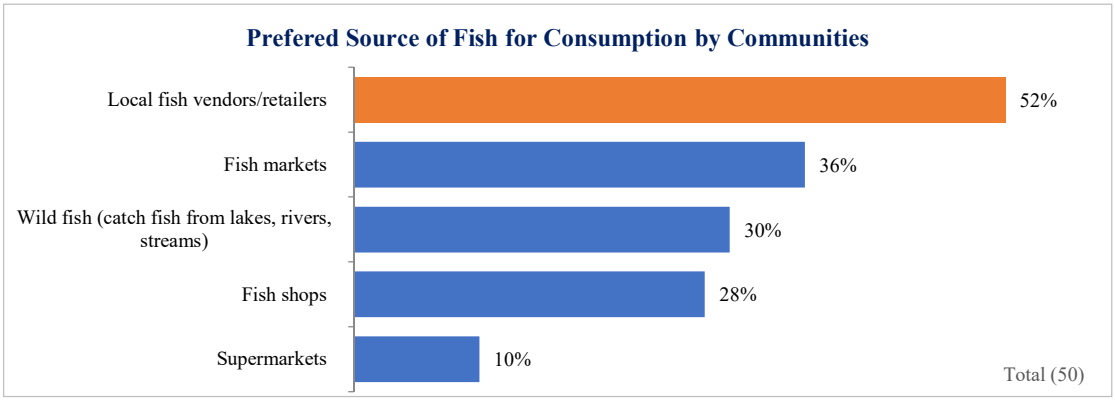
Figure 286: Consumers- Sources of fish consumed

Source of fish purchased	Deep fried fish (636)	Fresh fish (437)	*Dagaa/ Mukene/ Omena* (462)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (276)	Frozen or fresh fish fillets (39)	Prawns/ other sea food (22)	Tinned/ canned fish (1)	Other fish (30)
From the market	50%	45%	63%	65%	41%	32%	100%	53%
From a street vendor/local fish fryer	27%	28%	14%	20%	18%	36%	-	30%
From the fish market	8%	8%	8%	8%	8%	-	-	10%
From other fish vendor	12%	8%	14%	7%	10%	32%	-	3%
From a fish shop	3%	11%	1%	-	23%	-	-	3%
From a fish farm/pond	1%	1%	-	-	-	-	-	

While only small proportions of fish consumers purchased fish from fish farmers, fish farmers perceived that large proportions of fish consumers purchased the products from fish farmers (6 out of 9 farmers), most likely because majority of fish farmers' customers were individuals in the communities as noted in previous sections.

More than half of the fish retailers on the other hand, perceived that consumers largely preferred purchasing fish for consumption from fish vendors/retailers (52%) among other sources as shown below.

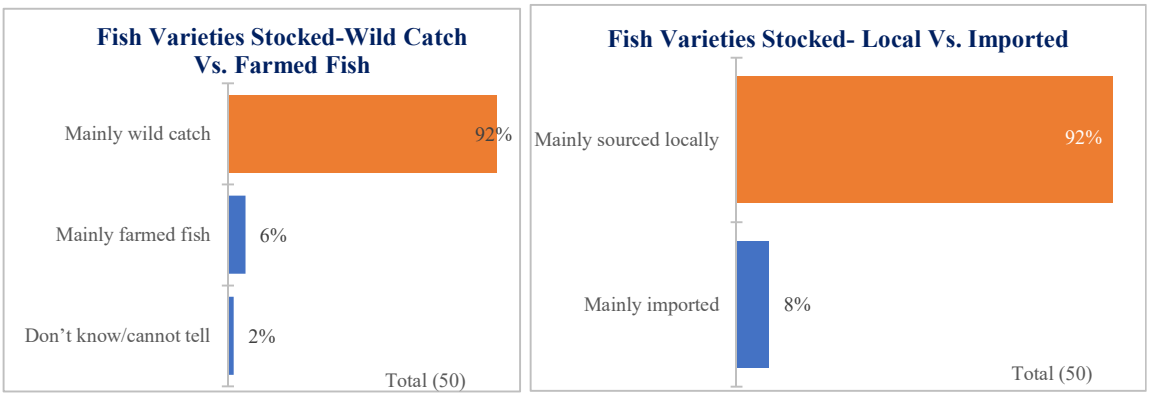
Figure 287: Fish retailers- Preferred source of fish by communities



Type of Fish Stocked by the Retailers

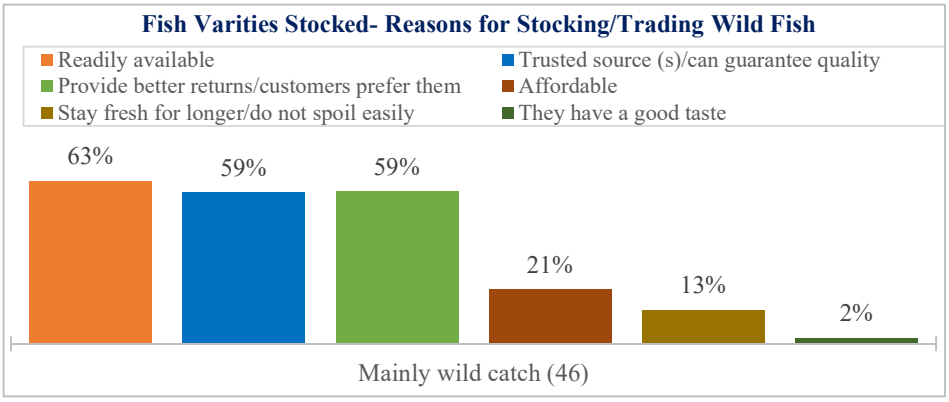
Fish retailers indicated that they mainly stocked wild catch at their businesses and that these were largely locally sourced (92% respectively). Interestingly, 2% of the fish retailers could not tell whether the varieties they stocked were wild catch or farmed fish.

Figure 288: Fish retailers- Fish varieties stocked



The fish retailers mainly preferred to stock wild catch due to the availability, trust in the sources obtained from, better returns and affordability of the fish varieties among other reasons as shown below.

Figure 289: Fish retailers- Reasons for stocking fish varieties and varieties stocked



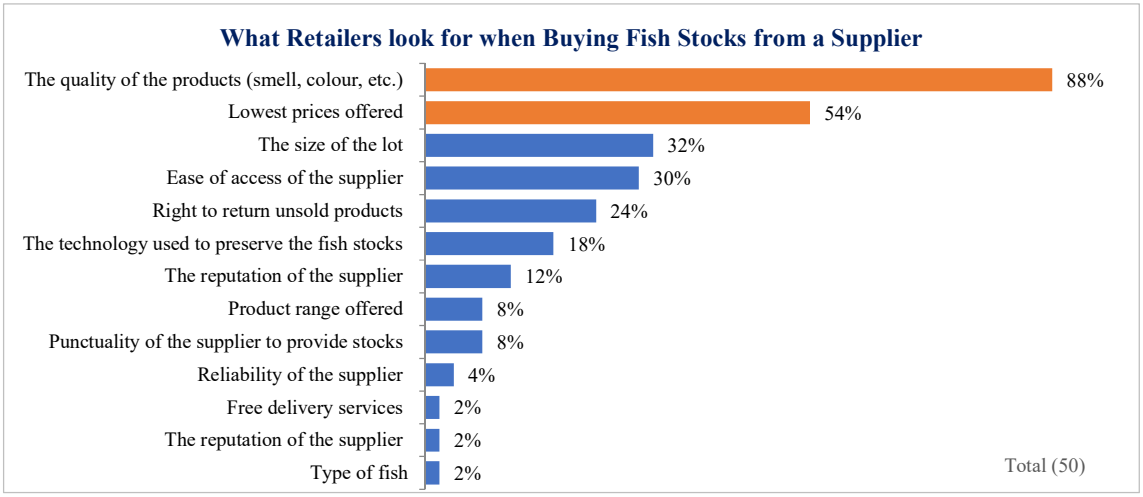
It was observed that fish retailers sourced their fish stocks from a variety of sources with some of the most common ones being from the lakes as shown below.

Table 134: Fish retailers- Source of fish for trading

Source of fish stocks for trading										
	Tilapia (23)	Nile Perch (27)	Sardines (17)	Carp (16)	Siganids (16)	Mudfish (13)	Mullet (9)	Catfish (7)	Penaeid Shrimps (6)	Eel (6)
Lake e.g. Lake Victoria	96%	89%	-	-	-	15%	-	14%	-	-
Indian ocean	4%	4%	69%	25%	69%	-	78%		83%	80%
From fish pond	-	-	-	-	6%	38%	-	43%	-	
From rivers	-	-	-	-		31%	-	43%	-	
Imported	-	-	-	31%		-	-	-	-	
Landing site	-	4%	31%	38%	19%	8%	22%	-	17%	20%

The retailers mentioned that when making purchase decisions, they largely looked out for quality of products (88%) and pricing (54%) among other factors as shown below.

Figure 290: Fish retailers- What retailers look for when buying stocks from suppliers



Average Amount of Fish Stocked and Resold

On average, the retailers stocked about 193kgs of the Nile Perch species and 125kgs of the Tilapia species for each batch/lot procured in a month, among other species as shown below.

Table 135: Estimated number of kgs of fish procured per batch/lot in a month

Number of kgs procured per batch/lot											
	Nile Perch (27)	Tilapia (23)	Indian Mackerel (18)	Sardines (17)	Carp (16)	Siganids (16)	Mudfish (13)	Catfish (7)	Penaeid Shrimps (7)	Mullet (9)	Eel (6)
Average kgs bought per batch/lot	192.9	125.4	39.5	31.8	123.6	52.4	134.2	48.3	29.7	74.1	73.3

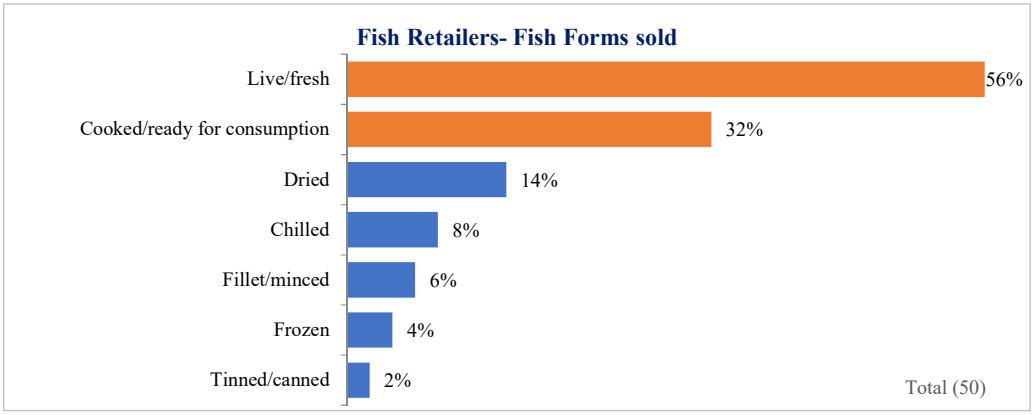
On the other hand, it was noted that out of the batch/lot of fish procured in each month, retailers largely sold an average of 174kgs of Nile Perch and 92kgs of Tilapia, among other species, indicating some extent of losses.

Table 136: Retailers- Number of kgs sold per batch/lot

Number of kgs. sold per batch/lot in a month											
	Nile Perch (27)	Tilapia (23)	Indian Mackerel (18)	Sardines (17)	Carp (16)	Siganids (16)	Mudfish (13)	Catfish (7)	Penaeid Shrimps (7)	Mullet (9)	Eel (6)
Average kgs sold per batch/lot in a month	174.1	91.7	35.0	27.4	101.3	45.1	128.9	45.1	21.7	67.4	73.3

Consequently, it was observed that fish was largely sold by the retailers in the fresh form or cooked/ready for consumption as shown below.

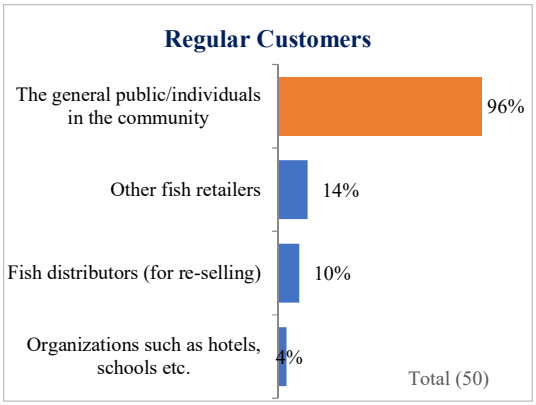
Figure 291: Fish retailers- Proportions of sales from fish states

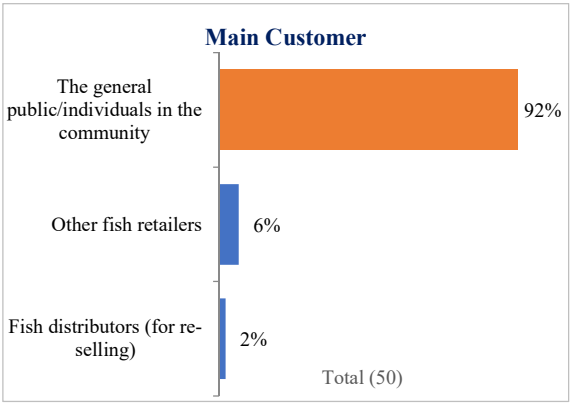


The Main Customers for the Retailers

The fish retailers' customers were largely individuals in the communities (96%). These were also cited at the main customers (92%) as shown below.

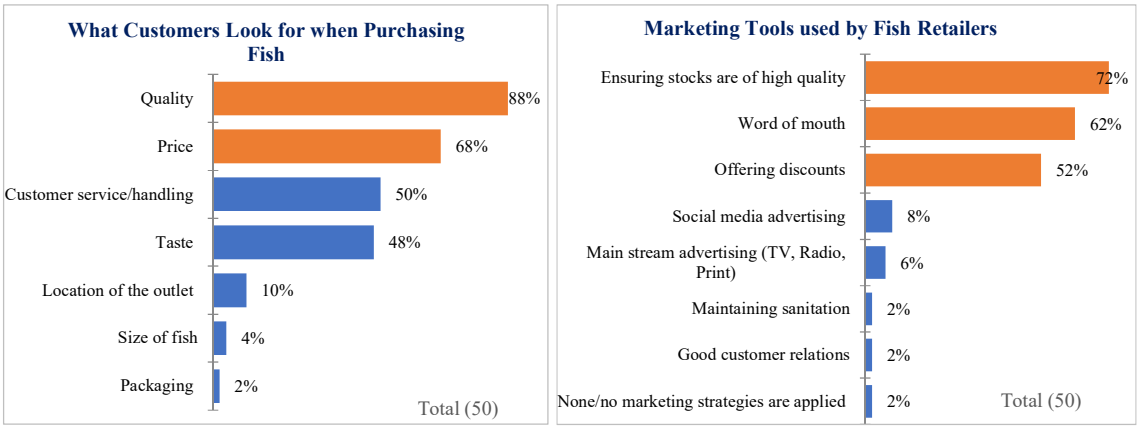
Figure 292: Fish retailers- Regular and main customers





Fish retailers indicated that their customers largely looked at the quality of products (88%) and pricing of the fish (68%) when making purchase decisions. They, on the other hand, marketed their businesses through ensuring that products were of high quality (72%), used word of mouth to market their products (62%) and offered discounts (50%) among other ways as shown below.

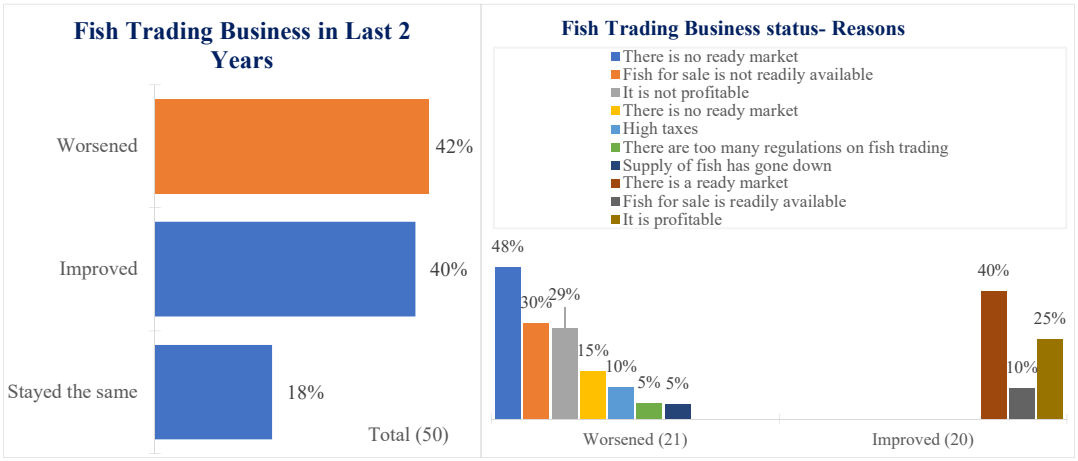
Figure 293: Fish retailers- What customers look for and marketing tools applied



Challenges and Bottlenecks that Retailers Face

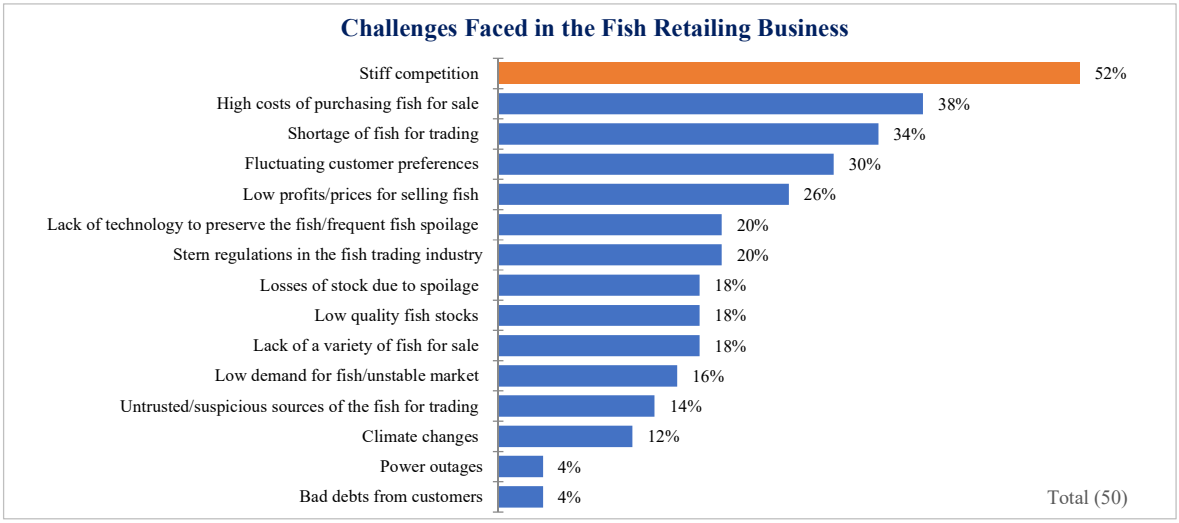
It was observed that more than half of the fish retailers (58%) felt that the fish trading business had either stayed the same or improved in past 2 years. A significant proportion (42%), however, felt that the business environment had worsened over the same time. Those who felt the business environment had worsened in the past 2 years largely cited the lack of markets for their products, unavailability of fish stocks and the businesses not being profitable, while those who felt the business environment had improved largely cited the opposite; a readily available market for products, availability of fish stocks for sale and profitable businesses.

Figure 294: Retailers- Fish trading business in the last 2 years



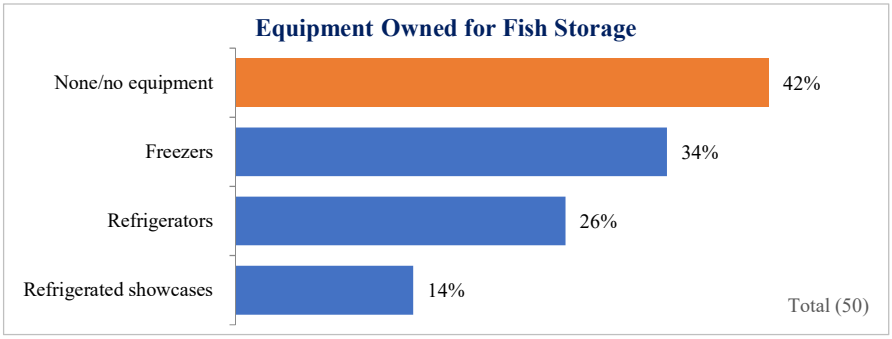
Further, it was observed that fish retailers were facing several challenges in their trade, with the most pressing one cited being stiff competition (52%) as shown below.

Figure 295: Retailers- Challenges faced



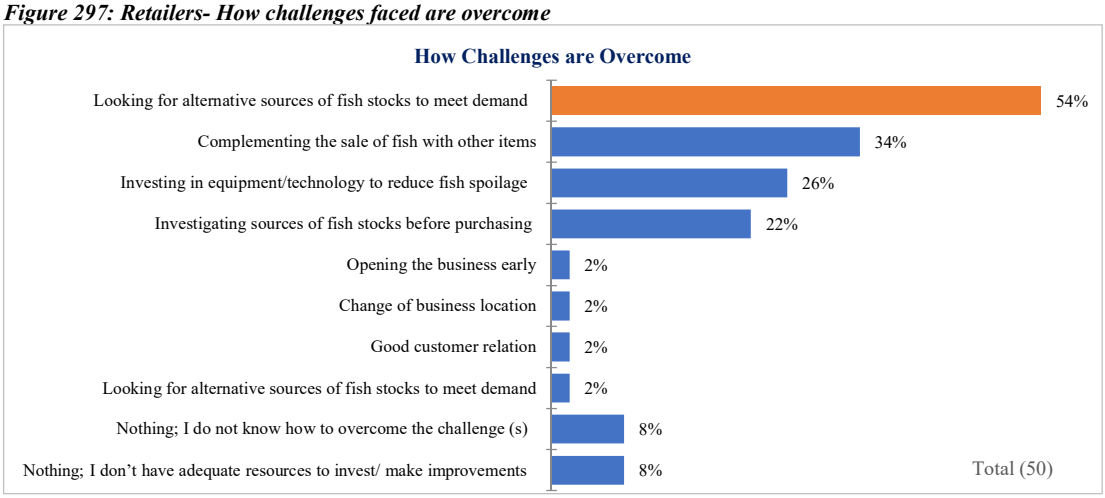
As observed in the previous sections, there was an indication that fish retailers were experiencing some extent of losses, and most of them were selling their fish stocks in either the fresh/live form or cooked/ready for consumption. As shown in the figure above, 18% of fish retailers indicated that one of the challenges they were facing in their businesses was spoilage of stocks. It was noted that almost half of the fish retailer (42%) did not own any storage equipment, which explained the fish retailers' predicaments.

Figure 296: Type of storage equipment owned by the retailers



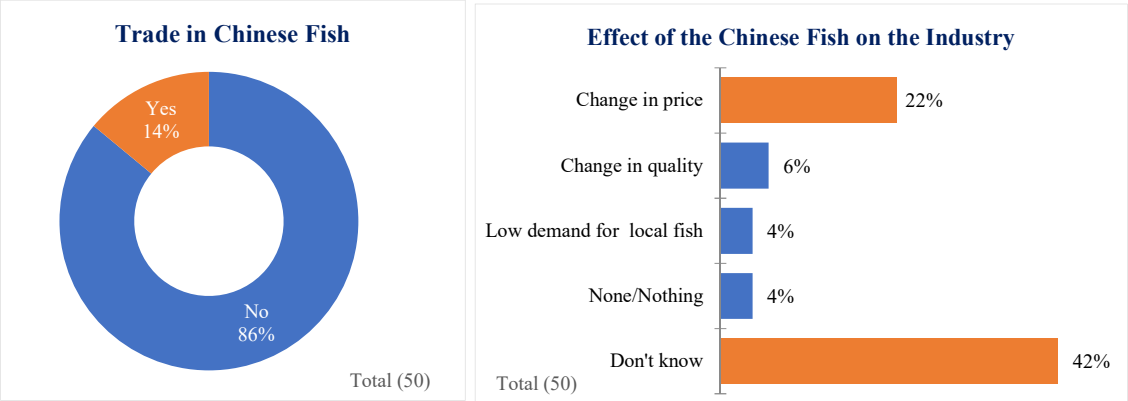
It was observed that most retailers have strived to look for solutions to the challenges faced in the businesses. For instance, more than half (54%) have looked for alternative sources of fish stocks to meet demand as shown below.

Figure 297: Retailers- How challenges faced are overcome



With regards to Chinese fish, it was observed that a sizeable proportion of fish retailers (14%) were trading in Chinese fish; most likely as an alternative source to meet demand as noted above. When asked about the impact of the Chinese fish in the market, sizeable proportions indicated that there had been changes in the pricing of the fish stocks, changes in quality and a lowered demand for local fish varieties. Almost half of the retailers (42%) however did not know the impact the Chinese fish had brought in the business environment, which depicted information gaps among the retailers on the industry developments.

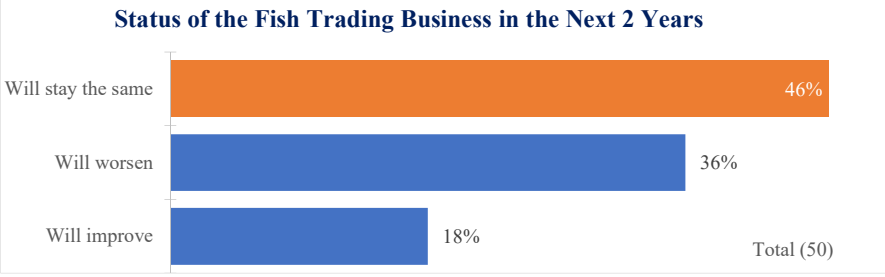
Figure 298: Retailers- Trade in Chinese fish and impact on industry



Available Opportunities for Fish Retailing

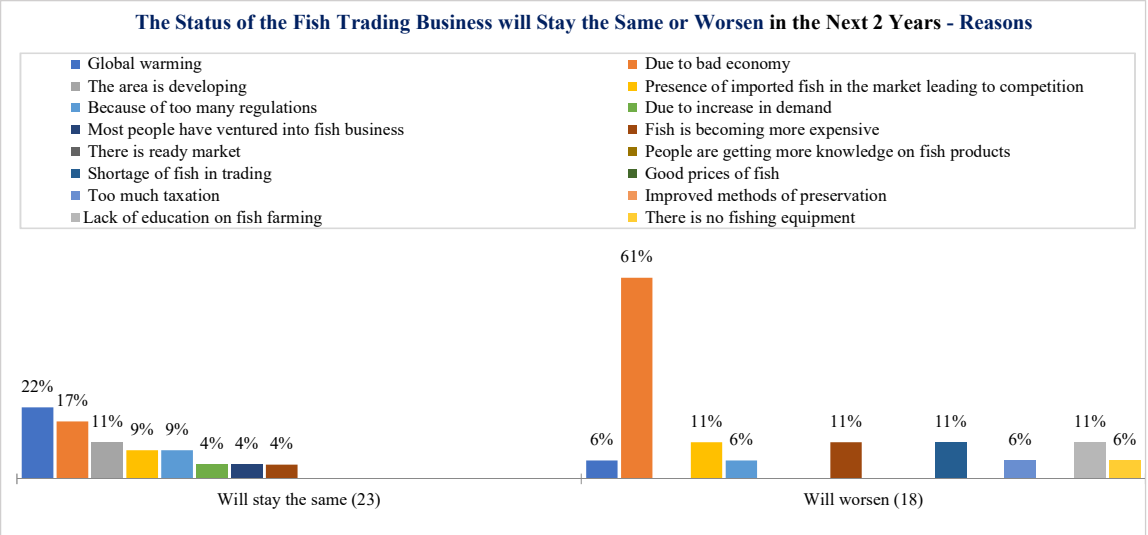
With regards to the future, almost half of the interviewed retailers (42%), indicated that the fish trading business will stay the same in the next 2 years, while a significant proportion (36%) felt that it would worsen.

Figure 299: Retailers- Business environment status- next 2 years



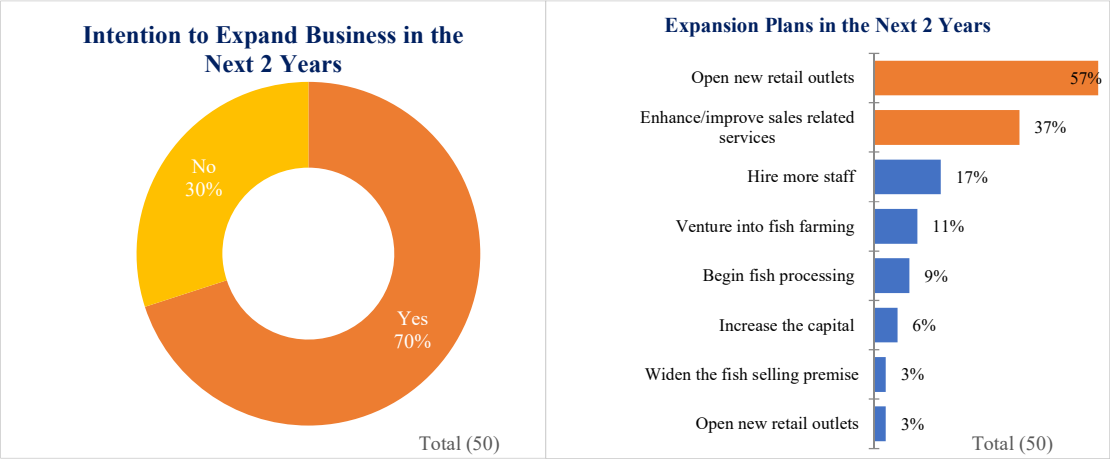
It was observed that retailers felt that the business environment will largely stay the same in the next two years because of global warming which was resulting to climatic changes (and thus affecting the availability of fish for trading) among other reasons. Those that felt that the business environment would worsen largely cited bad economy which was not favouring the trade, while who felt the business environment would improve largely cited developments in their area that were likely to favour the fish trading business among other reasons as shown below.

Figure 300: Retailers- Reasons for status of fish trading business in the next 2 years



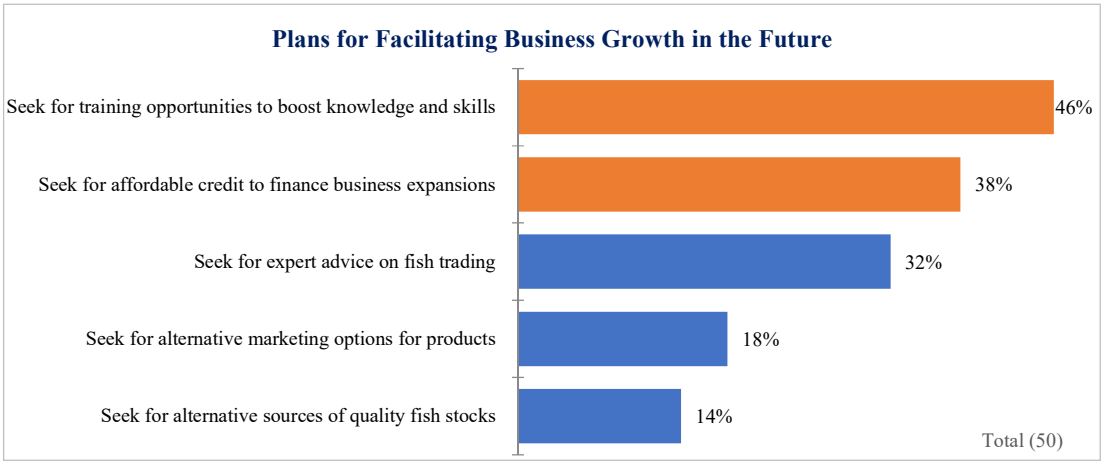
All in all, the fish retailing industry is bound to grow as majority of the retailers (70%) intend to expand their business in the next 2 years. Expansion plans indicated largely included opening of new retail outlets (57%) and improving sales related activities (37%) among other initiatives as shown below.

Figure 301: Retailers- Business expansion plans in the next 2 years



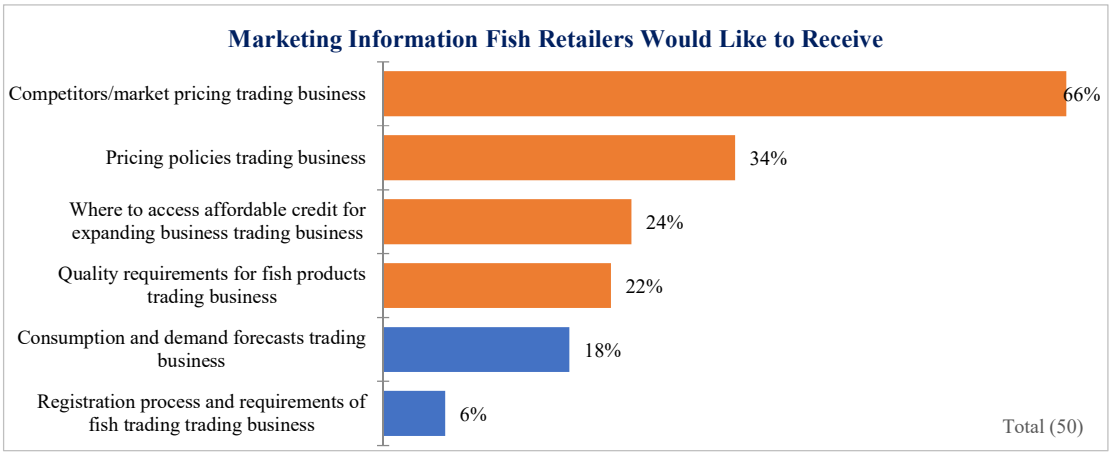
Provision of training to boost knowledge and skills in fish trading business and making affordable credit accessible to retailers would be some of ways to support trading in the fish industry. As shown below, retailers largely intend to seek for training opportunities on fish trading (46%) and affordable credit (38%) to finance their business expansion plans among other plans.

Figure 302: Retailers- Plans to facilitate business growth in the future



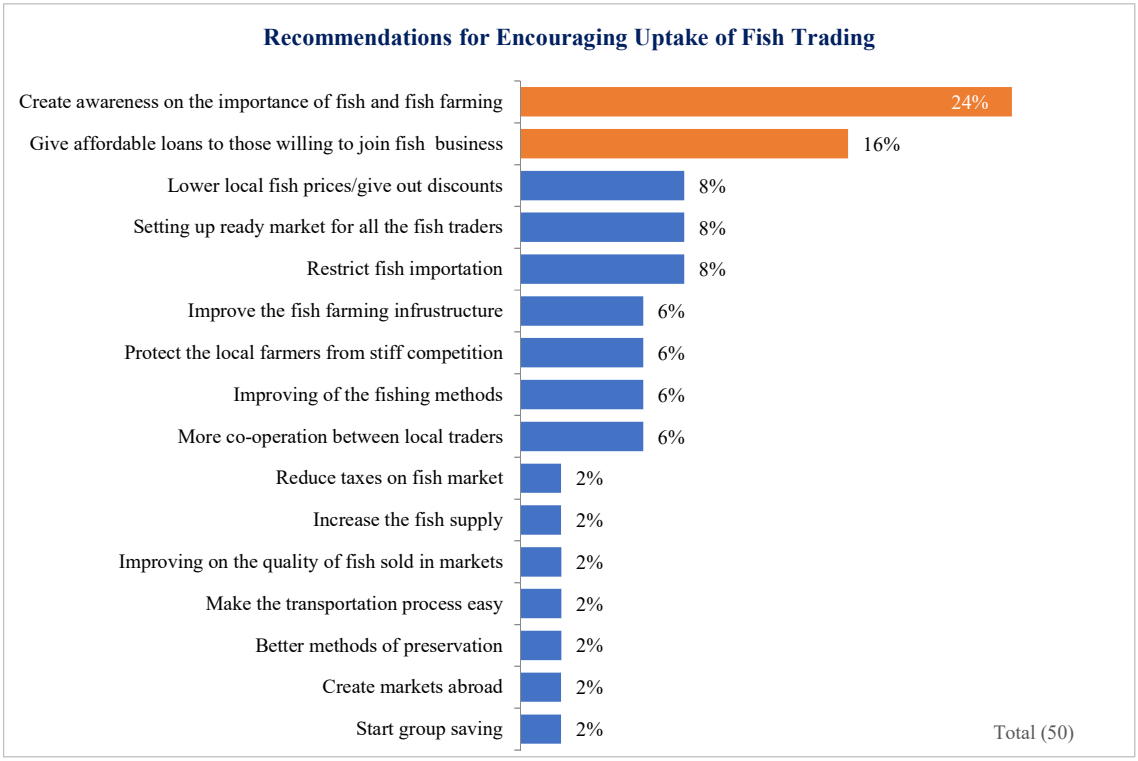
Further, retailers would be interested in receiving information on competitors/market pricing (66%), pricing policies (34%), how to access credit for business expansion (24%) and quality requirements for fish products (22%) among other market information to support them in their trade.

Figure 303: Retailers- Market information fish retailers would be interested in



To grow the industry, retailers recommended that there was need for creation of awareness on the importance of fish and fish farming (24%) and provision of credit to venture into fish trading business (16%) among other initiatives shown below.

Figure 304: Retailers- Encouraging the fish trading business



Lastly, those wishing to venture into fish retailing were advised to focus on good customer relations (30%), maintain good business practices (28%), and ensure they had

enough capital (24%) among other things to guarantee success in the venture as shown below.

Figure 305: Retailers- Recommendations for succeeding in fish trading

3.3.4 Fish Price Analysis

This section presents insights on the prices of fish in the value chain as well as the mark-ups added before the fish reaches the end consumer.

Fish Prices from Farmer, Processor, Retailer to Consumer

Fish Farmers

Fish farmers indicated that they sold each kg of Tilapia for TZS. 7,944 (equivalent to about USD.4) and each kg of Catfish for TZS. 7,000 (equivalent to about USD.3) as shown below.

Table 137: Fish farmers- Selling price per kg

Amount sold/will sell per kg (TZS.)		
	Tilapia (9)	Catfish (5)
Average selling price per kg	7,944	7,000

It was observed that the fish was mainly sold live/in fresh state, as shown below, though, one farmer also sold cooked fish that was ready for consumption.

Regarding the pricing model and marketing rationale of fish by farmers, it was observed that farmers mainly considered the cost of quality feeds, the cost of hired labour, the cost

of maintaining consistent water supply, cost of electricity, the cost of disease management and the cost of quality feeds among other factors when determining the pricing of fish. Additionally, prices of fish were observed to be mainly highest during the holiday seasons/festivities and during the summer time and mainly lowest when the market is flooded.

The regular customers for the farmers were observed to be largely individuals in the communities, fish retailers at the specialized fish shops and supermarkets and organizations such as hotels and schools among other customers. These were also reported as being the main customers for fish farmers. Farmers indicated that their customers largely look out for the quality of fish, the pricing and the type of fish among other factors when making purchases. Subsequently, when marketing their products, farmers cited that they largely ensured that their stocks were of high quality and offered discounts among other ways.

Fish Processors

When the prices of products were highest, it was observed that fish processors sold various fish types for an average of TZS. 4,900 to TZS. 18,700 (equivalent to about USD.2 to USD.8) per kg as shown below.

Table 138: Fish processors- Cost of fish per kg when price is highest

Cost per kg when price is highest					
	Nile Perch (4)	Tuna (2)	Siganids (2)	Carp (1)	Mullet (1)
Average cost per kg	18,700	9,000	8,364	4,900	4,900

On the other hand, when prices of the products were at their lowest, it was observed that fish processors sold various fish types for an average of TZS. 4,500 to TZS. 13,700 (equivalent to about USD.2 to USD.6) per kg as shown below.

Table 139: Fish processors- Cost of processed fish per kg when price is lowest

Cost per kg when price is lowest					
	Nile Perch (4)	Tuna (2)	Siganids (2)	Carp (1)	Mullet (1)
Average cost per kg	13,688	5,750	6,682	4,500	4,900

Fish Retailers

On the retail side, it was observed that fish retailers largely procured various fish types for an average cost of TZS. 3,000 to TZS. 8,200 (equivalent to about USD.1 to USD.4) as shown below.

Table 140: Retailers- Cost of procuring fish per kg

Buying price per kg (Tzs)											
	Nile Perch (27)	Tilapia (23)	Indian Mackerel (18)	Sardines (17)	Carp (16)	Siganids (16)	Mudfish (13)	Catfish (7)	Penaeid Shrimps (7)	Mullet (9)	Eel (6)
Average buying price	5,965	8,244	6,213	4,571	4,363	5,588	5,077	5,500	3,700	4,778	3,008

Additionally, it was noted that fish retailers were running profitable business from the sales figures reported. As shown below, retailers were selling different types of procured fish for an average cost of about TZS. 4,000 to TZS. 9,800 (equivalent to about USD.2 to USD.4) per kg.

Table 141: Retailers- Fish selling price per kg (TZS)

Selling price per kg (Tzs)											
	Nile Perch (27)	Tilapia (23)	Indian Mackerel (18)	Sardines (17)	Carp (16)	Siganids (16)	Mudfish (13)	Catfish (7)	Penaeid Shrimps (7)	Mullet (9)	Eel (6)
Average selling price	9,352	9,891	7,794	6,059	6,463	7,128	6,615	6,929	6,357	5,391	4,003

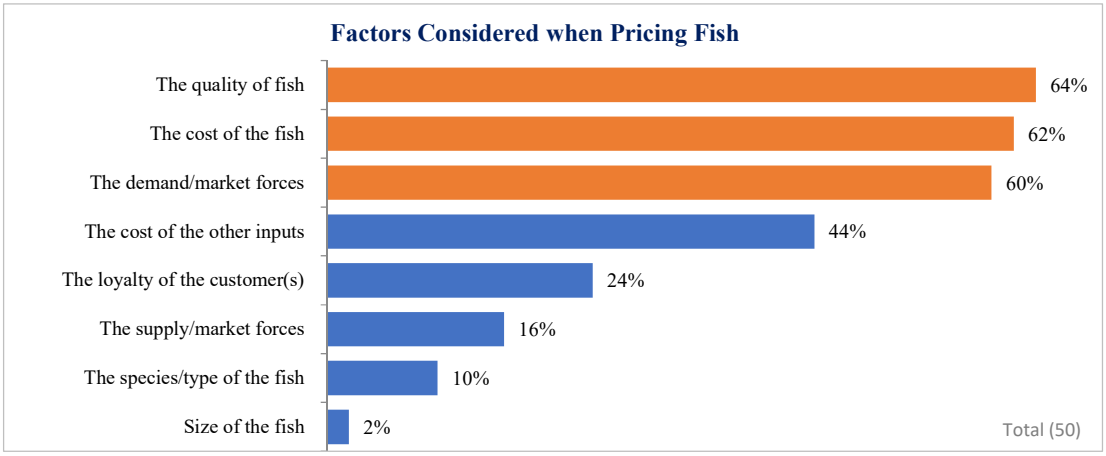
It was observed that fish retailers spent an average of TZS. 372,100 (equivalent to about USD.164) per month to run their retail businesses. Factors driving the cost of running the business included rent, electricity, hired labour and marketing costs.

Table 142: Fish retailers- Total cost of running the business per month

Total cost of running the business in a month (TZS)	
Average cost of running a fish retail business	372,100
Minimum cost	30,000
Maximum cost	2,150,000

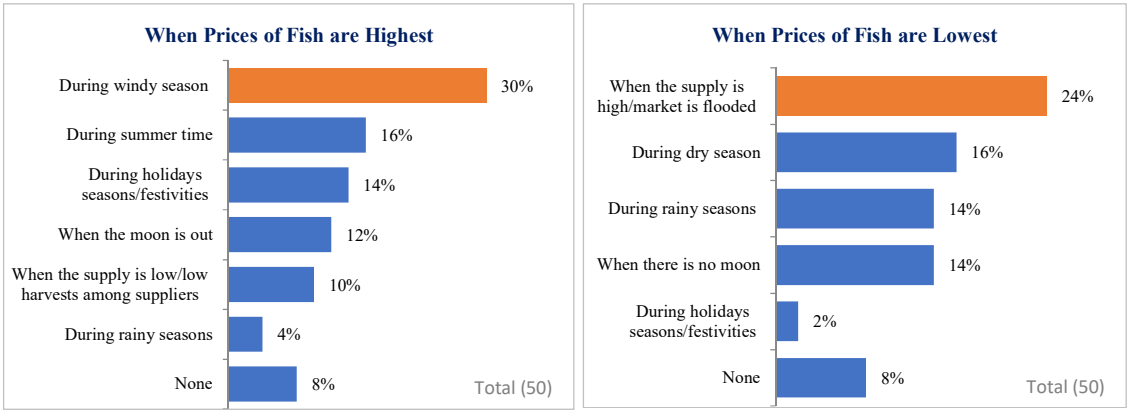
In terms of determining the sales price for fish, the retailers indicated that they largely considered the quality of the fish (64%), the cost of the fish (62%) and the market demand for fish (60%) among other factors as shown below.

Figure 306: Fish retailers- Factors considered when pricing fish



It was observed that fluctuations of fish prices were observed in the market, and these were usually highest during the windy season (30%) among other seasons and lowest when the market was flooded (24%) among other seasons as shown below.

Figure 307: Fish retailers- Periods when fish prices are highest/lowest



From a consumer perspective, and as mentioned earlier, households consume an average of 5.8kgs of fish in a month, though as noted earlier, consumers tend to buy more than one fish type, and so, the aggregated amount of fish and fish products they purchase in a month is higher.

It was observed that consumers purchase the different fish varieties at an average cost of about TZS. 5,500 to about TZS. 9,350 (equivalent to about USD.2 to USD.4). Deep fried fish for instance was purchased at an average price of TZS. 6,989 (equivalent to about USD.3), while fresh fish retails at a slightly higher price of TZS. 7,290 (also equivalent

to about USD.3). Some consistency was observed with the pricing of products by retailers (about TZS. 4,000 to about TZS. 9,800 in the sections above, an equivalent of about USD.2 to USD.4), though variations were inevitable due to factors such as the type of fish purchased/sold, setting (for instance, the cost of fish was slightly higher in the urban settings compared to the rural settings as shown below), and the form the fish was purchased/sold in; dried fish for instance was observed to be slightly cheaper than fresh fish as shown below, and the effect of middle-men who mark up the cost of fish stocks to the end consumer.

Table 143: Average purchase price per kg- Setting

Average price per kg (TZS.)			
	Total (1,200)	Urban (599)	Rural (601)
Deep fried fish	6,989	7,424	6,462
Fresh fish	7,290	7,833	6,367
Frozen or fresh fish fillets	5,768	6,287	3,756
Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*]	5,750	5,278	6,147
Dagaa/Mukene/Omena	5,545	5,780	5,361
Prawns/other sea food	7,850	6,808	9,356
Tinned/canned fish	9,000	9,000	-

Variations were observed across the regions, where for instance prices for the various fish forms were largely higher in Zanzibar than in other regions as shown below.

Table 144: Average price per kg- Region

Average price per kg (TZS.)								
	Total (1,200)	Central (130)	Coastal (360)	Lake (260)	Northern (170)	Southern Highlands (180)	Western (60)	Zanzibar (40)
Deep fried fish	6,989	5,636	6,986	7,329	7,394	6,069	7,131.6	13,979
Fresh fish	7,290	5,620	7,500	6,178	7,734	6,592	11,325.8	7,564
Frozen or fresh fish fillets	5,768	6,000	7,043	4,525	6,167	5,080	2,400.0	4,580
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	5,750	3,750	6,034	5,268	6,679	5,323	6,757.1	16,000
Dagaa/Mukene/Omena	5,545	5,290	6,074	4,863	7,228	3,269	8,217.4	12,214
Prawns/other sea food	7,850	2,000	7,792	-	3,333	-	-	11,200
Tinned/canned fish	9,000	-	-	-	-	9,000	-	-

Fish Prices- Mark-up

This section provides an indication of the average mark-up/profit made by various players in the value-chain.

Fish Farmers

It was observed that fish farmers were making about TZS. 30,905,362 (equivalent to about USD. 13,598) from each batch/lot of Tilapia reared and sold, and about TZS.

23,590,889 (equivalent to about USD. 10,380) from each batch/lot of Catfish reared and sold as shown below.

Table 145: Fish farmers- Average mark-up (TZS)

Average mark-up price per batch/lot (TZS)					
	Average number of kgs sold per batch/lot	Average selling price per kg	Total sales per batch/lot (TZS)	Average cost of production per batch/lot (TZS)	Average mark-up/profit per batch/lot (TZS)
Tilapia (9)	3,936	7,944	31,267,584	362,222	30,905,362
Catfish (5)	3,406	7,000	23,842,000	251,111	23,590,889

Fish Processors

It was noted that fish processors in Tanzania were making an average of about TZS.3.7M to about TZS. 2.1B (equivalent to about USD. 1,650 to USD. 955,350) from processing and selling of different fish varieties as shown below. It was observed that the processing and selling of the Nile Perch variety seemed to be more profitable than other varieties.

Table 146: Fish processors- Average mark-up (TZS)

Average mark-up/profit per month (TZS)					
	Average price per kg when price is highest	Average kgs sold in a month	Total average sales in a month	Average price per kg when price is lowest	Total average sales in a month
Nile Perch (4)	18,700	158,625	2,966,287,500	13,688	2,171,259,000
Tuna (2)	9,000	653	5,877,000	5,750	3,754,750
Siganids (2)	8,364	1,003	8,389,092	6,682	6,702,046
Carp (1)	4,900	1,417	6,943,300	4,500	6,376,500
Mullet (1)	4,900	1,600	7,840,000	4,900	7,840,000

Fish Retailers

For fish retailers, it was observed that they were making about TZS.600 to TZS. 3,390 (equivalent to less than USD.1 to USD.2) per kg for the different fish varieties stocked and sold. Similar to fish processors, it was observed that the Nile Perch fish species was the most profitable for retailers as shown below. The Mullet fish variety was observed to the least profitable for retailers who were stoking it.

Table 147: Fish retailers- Average mark-up per kg (TZS)

Average mark-up price (TZS)			
	Average buying price per kg.	Average selling price per kg.	Average mark-up/profit
Nile Perch (27)	5,965	9,352	3,387
Tilapia (23)	8,244	9,891	1,647
Indian Mackerel (18)	6,213	7,794	1,581
Sardines (17)	4,571	6,059	1,488
Carp (16)	4,363	6,463	2,100
Siganids (16)	5,588	7,128	1,540
Mudfish (13)	5,077	6,615	1,538
Catfish (7)	5,500	6,929	1,429
Penaeid Shrimps (7)	3,700	6,357	2,657
Mullet (9)	4,778	5,391	613
Eel (6)	3,008	4,003	995

3.3.5 Market Organization/Cooperatives and Associations

As we note that marketing organisations, cooperatives and associations run across the value chain, we have organised this section in terms of the different players in this value chain.

Fish Farmers

A considerable proportion of fish farmers (7 out of 9 farmers) are not members of any cooperative or association to boost their fish farming businesses. Farmers who indicated that they were members of an association (2 farmers) were members of Aquaculture Association of Tanzania. It was noted that this association was registered. One farmer indicated that there was a payable membership subscription fee, while the other indicated that there was no membership subscription, which would allude to a tiered membership structure in the association. The fish farmer who paid a membership subscription indicated that he paid a monthly fee of TZS. 16,000 (equivalent to about USD.7).

The benefits that members enjoyed by members included provision of fish storage after harvesting, support in construction of fish ponds, sourcing for markets of fish and access to credit for their businesses. Members indicated that the association was performing averagely on the benefits provided to members. Additionally, members recommended that the association should facilitate their members to participate in exchange programs.

Fish Storage and Transportation Businesses

It was noted that 2 of the 5 fish storage and transportation businesses interviewed were members of cooperatives. Cooperatives mentioned by the companies were *Wasamwa* and *Ushirika wa Wauza Samaki Mwalone* cooperatives. The fish storage and transportation companies indicated that both cooperatives were registered and required membership subscription. One of the cooperatives required a one-off membership joining fee of TZS. 300,000 (equivalent to about USD.132), while the other required members to pay a monthly contribution fee of TZS. 10,000 (equivalent to about USD.4). Some of the benefits members enjoyed included linkages to market opportunities and provision of information on the developments in the industry. Members felt that the cooperatives were performing well (rated as good) and recommended that the cooperatives should also support members to access modern equipment for use in their businesses, as well as implement the convening of regular meetings to keep members updated on the developments in the running of the cooperatives' affairs.

Fish Processors

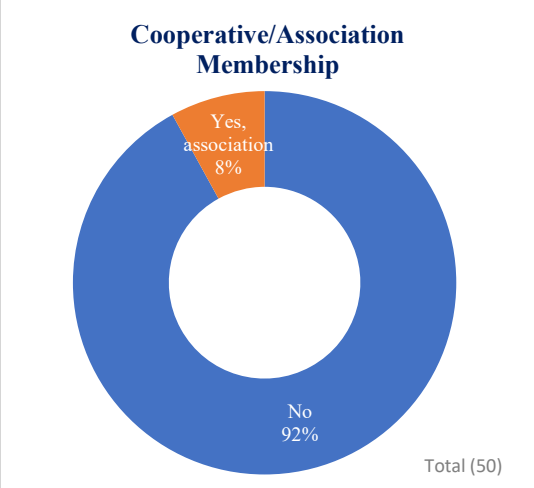
Like the other categories, majority of the fish processors indicated that they were not in organized groups (cooperatives or associations) to help them in their business ventures. From the 6 interviewed processers, only two indicated that they were members of the Tanzania Fish Processing Association. This association was reported by one of the members as being a registered entity, while the other did not know about its registration status. Further, the processors indicated that they paid a membership subscription fee which ranged between TZS. 10,000 to TZS. 100,000 (equivalent to about USD.4 to USD.44), an indication that membership could be tiered in the association. Membership benefits cited included provision of support to construct the fish ponds, provision of storage after fish harvesting and sourcing of markets for fish. The association was rated as performing good on all the benefits offered to its members. The processors recommend that the association should have better equipment for fishing.

Fish Retailers

Similarly, only a small proportion of fish retailers (8%) were in organized settings (cooperatives/associations) to support their business ventures as shown below. Some of

the associations and cooperatives that retailers were members of included the Fish Mongers Association and Fish Importers Cooperative (*Chama cha Waagizaji Samaki).*

Figure 308: Retailers- Cooperative membership



Half of the fish retailers who were in an association/cooperative (2 retailers) indicated that these were registered. The other half (2 retailers) could not tell whether their cooperative/association was registered or not, which depicted knowledge gaps between some of the members and the cooperatives' leadership. Further, 3 of the 4 retailers indicated that they paid a membership in the cooperative/ association, where the highest paid fee was cited as TZS. 15,000 (equivalent to about USD.7) while the lowest fee paid was TZS. 500 (equivalent to less than USD.1). Further, it was observed that membership fee paid was largely not renewable/was a one-off fee. Retailers in cooperatives/associations also indicated that key benefit they enjoyed included linkages to markets for their products, source of credit for advancing their business ventures and discounted prices on their products. The performance of cooperatives/associations on benefits provided was generally rated as being average. Additionally, members recommended that the cooperative should work on improving team work in projects, lowering the registration fee and improving the customer care services.

Cooperatives' Administrators' Perspective

In addition to speaking from the members of cooperatives, this study sought insights from the administrators of cooperatives providing support to various players in the value

chain. A total of 4 cooperatives supporting the fish industry in Tanzania were interviewed and presented below is qualitative feedback that was obtained from them.

Cooperative Structure

It was observed that interviewed cooperatives interviewed consisted of a variety of players who included fish farmers, fishermen, fish experts, fish food producers, fish processors, fish suppliers and fish traders. The motivations for establishing the cooperatives included support for members in running their businesses, such as through marketing of products, information sharing, provision of training opportunities, as well as offering of credit facilities to members. It was observed that cooperatives had varying membership bases, which the more established entities having as many as 600 members, while the less established entities had about 21 members on average. Further, it was observed that some of the cooperatives required members to pay a subscription fee when joining while in others, membership was free of charge. Benefits enjoyed by those joining cooperatives for free were however noted to be limited.

Funding Model

It was observed that cooperatives largely depended on membership subscriptions to sustain their operations. Cooperatives that charged a membership subscription fee charged as low as TZS. 20,000 (equivalent to about USD.20), while others charged as high as TZS. 250,000 (equivalent to about USD.110) as joining fees. Additionally, some cooperatives required their members to make monthly contributions which ranged from TZS. 5,000 to TZS. 10,000 (equivalent to about USD.2 to USD.4). Further, some cooperatives, especially those that were not charging membership subscription fees, indicated that they depended on donations from different stakeholders and donors, based both locally and internationally.

Benefits of Membership

Some of the benefits enjoyed by cooperative members included regulation of selling prices, whereby members were assured of making profits through the selling prices set by the cooperatives when marketing their products. Further, cooperatives acted as a

source of information for the members on various issues, such as the requirements needed for starting up and sustaining successful business ventures, as well as general industry information which kept members abreast of developments in the industry.

Additionally, some cooperatives indicated that they provided loan facilities to their members at competitive rates for starting and sustaining their businesses ventures. Other cooperatives indicated that they also provided quality fingerlings and other fish farming inputs, or facilitated their members to access these at negotiated prices. Further, cooperatives indicated that they actively lobbied against laws/policies that were not favourable for business. For instance, it was observed that the Government had put in place strict regulations for starting and running of fish farming businesses, which was discouraging fish farming in the country. Some of the cooperatives indicated that they were currently involved in the discussions with relevant Government bodies to ease the processes of venturing into fish farming.

Trade Regulations and Policy Issues

It was observed that the Government of Tanzania has put strict regulations on cage farming, where the law for instance prohibits fish farming on natural water bodies, except besides rivers and valleys. Further, the Government currently allows importation of fish, which, the cooperatives felt that, though important in sustaining supply, it needed regulation to protect the local industry. It was also observed that there were laws that required imported fish to be largely processed, which the cooperatives felt was working against the processing industry in the country.

Challenges Faced by the Cooperatives

Cooperative administrators indicated that the industry was facing several challenges which affected their members. To begin with, it was observed that there was a general lack of understanding on the benefits of cooperative membership in supporting business ventures in the fish industry. As a result, membership in cooperatives was generally low and attempts to drive up membership bases were not fruitful most of the time.

Further, cooperative administrators observed that there was a general lack of awareness on the laws and procedures that players in the industry needed to abide with. As a result, there were frequent cases of cooperative members contravening set laws which led to penalties from the relevant authorities. Additionally, players in the industry generally perceived the Government as being oppressive and they would break set laws on purpose as a way of getting back at the Government. The fishing of immature fish was cited as an example, where fishermen would frequently fish small-sized fish banned by the Government and try and elude the consequences.

Additionally, as cited in the previous section, there were strict laws guiding fish farming in Tanzania, which discouraged people from venturing into this line of business. Additionally, the process of acquiring the required permits for venturing in fish farming was observed as being lengthy and tedious. Cooperatives indicated that the Government enacted these laws without engaging relevant stakeholders who were now mostly affected.

Cooperatives also indicated that acquisition of fishing equipment was expensive, and most were not able to lend the money to their members to acquire the equipment. It was observed for instance that the price of a fishing canoe was TZS. 2,500,000 (equivalent to about USD. 1,100), which majority of the fishermen were unable to raise. The least a fishing net would cost on the other hand was TZS. 6,000 (equivalent to about USD.3), which small-scale fishermen could not raise with ease. Furthermore, it was observed that some of the equipment needed to venture into fish farming were not available locally. Some of these included scoop nets and water parameter analysis equipment used to measure heat levels, pH levels and oxygen levels for ensuring the environment used for rearing the fish was conducive.

Further, it was observed that Tanzania lacked factories that could produce high quality feeds for the farmers. As a result, farmers were largely relying on imported fish feeds, which were not only expensive to purchase, but which also attracted high taxes.

Additionally, cooperatives observed that access to the latest technologies by the fish farmers was a challenge. For instance, it was observed that there was a high demand for

the Sea Cucumber fish variety in the international markets, but farmers in Tanzania were unable to rear it due to limited resources to rear this fish type. Access to modern fish ponds for rearing such varieties in Tanzania was for example cited as being limited, largely to the capital and skill required. Further, the fish experts were observed to largely have theoretical knowledge about fish farming, but lacked practical experience. It was noted that the Government lacked the capability of sending such experts to other countries that have excelled in fish farming for benchmarking and acquiring practical knowledge.

It was further observed that there was a general lack of awareness among fish farmers, where for instance, some farmers were not able to distinguish between fish species, including their sexes, when making purchases for rearing. They would purchase the wrong breeds and experience overpopulation in their ponds which led to poor harvests.

Lastly, cooperatives observed that there was generally a higher demand of imported fish, specifically from China, since it was available at lower prices, and this was affecting the local industry.

Recommendations for the Future

Cooperatives were keen on ensuring that members had access to affordable credit to start and sustain business ventures in the fish industry. To achieve this, the administrators recommended that there was a need for encouraging partnerships with financial institutions which would lend to members at affordable rates.

Further, cooperatives observed that there was a need to educate the public on available opportunities in the fish farming sector and offer training opportunities for those willing to join the industry. They however recommended that there was a need to review existing laws on fish farming in the country, as several potential fish farmers had been discouraged from making the ventures due to the processes required.

Additionally, cooperatives indicated that there was the need to support fishermen to acquire their own equipment, as they were currently depending on equipment owned by foreign investors. There was also the need to support this group in accessing modern

equipment, as it was noted majority were still using traditional equipment, and were frequently getting into trouble with the law (for instance, use of fishing nets not designed to capture mature fish).

Cooperatives also recommended that the Government needed to make interventions in assisting fish farmers access quality seeds and feeds from local sources at affordable prices. Subsidies were recommended for farmers to help reduce the cost of business, in addition to easing the process of acquiring these from imported sources at negotiated prices. To achieve this goal, it was observed that the Government needed to support initiatives of encouraging international investors to venture into fish seeds and fish feeds production in the country, as they were also well placed to make negotiations in the international markets.

Lastly, cooperatives observed that there was an urgent need to educate players in the fish industry on the need for cooperative membership. They noted that cooperatives were a direct link for the members to the Government and other stakeholders, a factor which was crucial in propelling growth in the industry.

3.3.6 Policy and Trade Regulations

This section of the report explores the currently existing standards regulating the fish industry in Tanzania including suppliers/market players' awareness of and adherence to existing regulations.

Current Status

The Ministry of Agriculture, Livestock and Fisheries (MALF) is responsible for the preparation, implementation, monitoring, and reviewing of national fisheries policies and regulatory frameworks in Tanzania.[33] Under this Ministry, the Director of Fisheries is vested with the administrative control and management of aquaculture, with the

[33] The Tanzanian Fisheries Sector; Challenges and Opportunities, September 2016, by the Ministry of Agriculture, Livestock and Fisheries.

specific responsibility being the formulation and implementation of policy; formulation of the Fisheries Act and associated regulations; enforcement of fisheries-related legislation; management of fisheries resources for sustainable utilization; and involvement of fisheries stakeholders, including those involved in aquaculture, in all aspects of resource management.

Various pieces of legislation as well as policy documents give the direction on the management of fisheries in Tanzania. Notable of these is the Fisheries Act, 2003 that regulates fishers and fish dealings. Specifically, to aquaculture, the Act, in Section 25 restricts the importation and exportation of fish and introduction of new species without authorisation. It directs the director in section 26 to collaborate with other ministries to ensure sustainable aquaculture practices, but gives no guidance as to what this comprises of. It envisions the presence of both large and small scale aqua farmers because in Section 27 and 28, it directs large scale aqua farmers to seek guidance and permission from the director of fisheries as well as obtain advice on proper site selection, species available for farming and general farm management practices. Before the establishment of a large scale aqua farm, such a person needs to consult an authorised officer who is expected to examine the soil type and properties of the proposed site, the water source, quality and dynamics, land topography, vegetation and social economic factors, as well as ensure that there is an approval for the use of land for establishing a large scale aqua farm by the community concerned. Aquaculture practice in Tanzania at a large scale requires that an Environmental Impact Assessment is undertaken as guided by section 30 of the Act. Such aquaculture should not disrupt the environment and not affect other human activities. Indeed section 38 of the same Act directs that large scale aqua farms shall not be located close to any discharges, floods or drainage systems of any effluents, to be provided with adequate natural water, to have equipment and non-corrosive utensils for handling aqua products, have adequate changing rooms, adequate washing and disinfection facilities, properly trained personnel on food hygiene disciplines, proper waste treatment facilities and have a supply of potable water. The Act seems not to be bothered to give direction on the guidelines that small scale aqua farmers are supposed

to adopt, yet these are the most common types of aqua farmers present in Tanzania. All the same, it provides for the labelling and certification of aquaculture products.

The Act further goes on to state that if such farming is to be undertaken in cages on Tanzania's territorial waters, such cage culture is required to be permitted by the Director of fisheries as guided by section 33. It appears that there might be a good record of aqua farmers in Tanzania because section 34 directs for the registration of aqua farmers and this is the responsibility of each District Fisheries Officer, of which the large-scale farmers are expected to submit quarterly progress to. In Zanzibar, the Fisheries Act of 2010 is in operation, and it seeks to mainly guide the administration of the fishing sector, develop and control the fishing industry, license fishing operations, promote conservation, and ascribe penalties for certain offences related to the sector. While it defines what aquaculture is, it does not provide for clear guidelines for aqua farmers in the region.

Another important document that guides the fisheries sector in Tanzania is National Fisheries Policy of 2015 from the Ministry of Livestock and Fisheries Development. It provides that aquaculture can take place in fresh and marine waters where suitable species are raised. It anticipates that the cultured species in fresh water farming would be the Nile Tilapia (*Oreochromis Niloticus*) and the African Catfish (*Clarias Gariepinus*), while it anticipates that on the marine side, fish farming will be geared towards culture of the Milkfish (*Chanos Chanos*), Mullet, Pearly Oysters as well as Seaweed. It notes that aquaculture in Tanzania has been mainly for subsistence purposes in small ponds but notes that recently, commercial aquaculture has started in prawn farming in Mafia, Nile Tilapia and Catfish in Mwanza and Kagera, and Trout farming in Arusha. It also notes that Seaweed, Crab fattening and Milkfish farming is mainly practiced in the coastal regions of Lindi, Mtwara, Coast and Tanga. The policy document seeks to address the many challenges that have faced the fisheries sector in Tanzania. With regards to aquaculture, it notes that the government shall promote the private sector to participate in the production of quality aqua feeds and seeds, promote and regulate the application of appropriate technologies, regulate the quality of aqua feeds and seeds,

strengthen surveillance and control of fish diseases and escapees. Beyond that, it just mentions that it would provide a conducive environment for the investment and management of fisheries, including infrastructure that will support aquaculture. It also commits to coordinate data collection and analysis of sector information and enhance the participation of the private sector actors in the collection and analysis of that information. It also seeks to enhance the accessibility of capital and financial resources for investment and development of the fisheries sector, as well as facilitate the availability of inputs used for aquaculture and ensure that they are available, of good quality, at the right cost, and manage distribution issues as well as create awareness among stakeholders.

In summary, it can be said that with regards to Tanzania, there is more legislation in place to protect and manage wild fish sources, both Mainland and in Zanzibar, and less to support the growth of Aquaculture. All in all, the United Republic of Tanzania has several institutions responsible for fisheries research, education and training. The Tanzania Fisheries Research Institute (TAFIRI) has overall responsibility for all the research on fisheries; the Faculty of Aquatic Sciences and Technology (FAST) at the University of Dares Salaam and the Sokoine University of Agriculture (SUA) are both responsible for carrying out research and training on fisheries. The Mbegani Fisheries Development Centre and the Nyegezi Fisheries Institute are involved in training.

To enhance strengthening marketing chain and marketing information of fish and fishery products [the Tanzania government has put in place the policy statements below.] The Government shall: strengthen marketing information systems and linkages in marketing chain; encourage and promote the establishment of fisheries/aquaculture products processing plants; encourage and support private sectors for domestic manufacturing, importation and distribution of quality fisheries and aquaculture inputs.[34]

[34] National-Fisheries-Policy-of-2015

Challenges and Bottlenecks

The primary research phase of the study sought to understand the awareness levels of legal standards required to operate in the industry as well as the major hurdles faced in running affairs. Presented below are the awareness levels from each category interviewed in the supply side as well as perceptions on the most difficult legal requirement to comply with in running businesses.

Fish Farmers

Fish farmers indicated that to start and run a successful fish farming business in Tanzania, one needed to comply with the environmental impact assessment provision from the National Environment Management Council (NEMC), have a business permit and have approval from Tanzania Fisheries, having consistent water supply, licensing from the local government, and access to fish feeds. One farmer, however, indicated that there were no legal requirements needed to be complied with.

Further, it was observed that the requirements that farmers perceived they needed to comply with were largely the ones complied with. Farmers indicated that the most difficult requirement to comply with was the NEMC provision, mainly because the requirement involved long process to acquire due to bureaucracy.

Processors

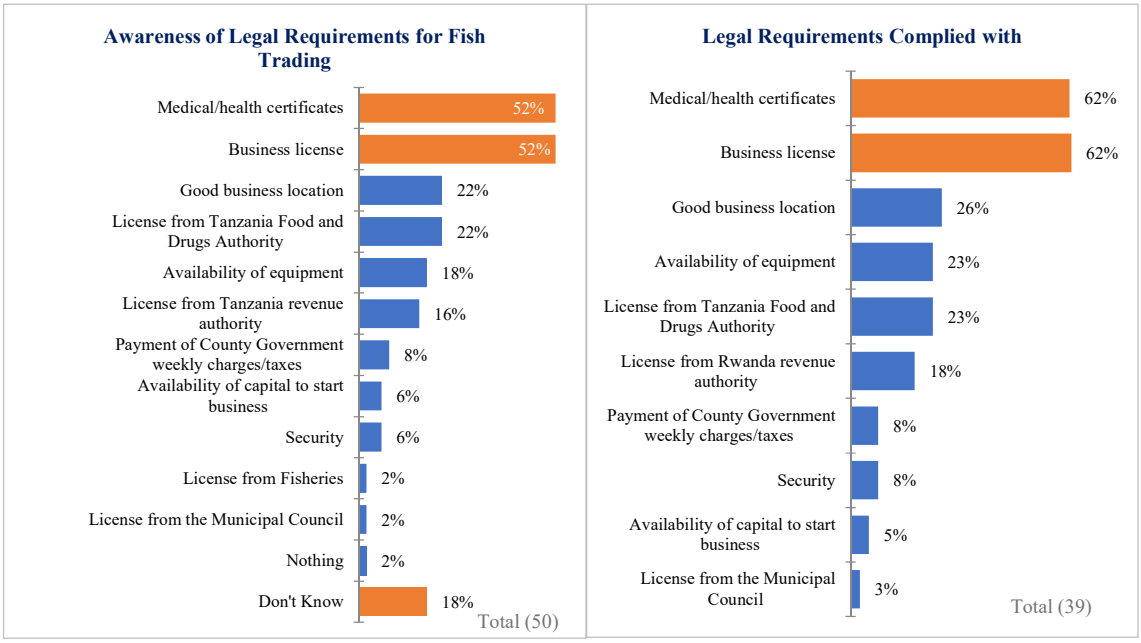
Fish processors indicated that to operate as a fish processor, one needed a medical health certification. This certification was indicated as being important because it was a state obligation, it ensured staff were qualified to handle food products and it guaranteed that workers were medically fit.

Most staff working in the processing factories were reported as having complied with this provision, and that it was both a government requirement as well as a requirement of the processing factories. Processors noted that staff were required to undergo health checks after a period of between 2 months and 3 years.

Fish Retailers

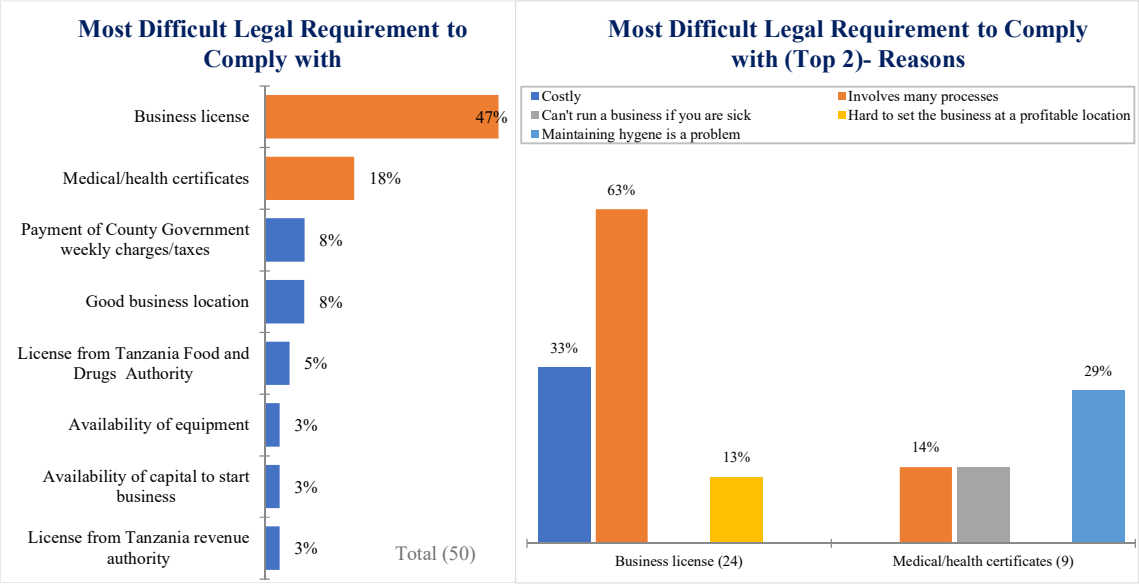
Fish retailers indicated that to start and run a successful fish retailing business, one mainly needed a medical/health certificate and a business licence (52% respectively), among other provisions as show below. Consequently, these were the requirements that retailers cited they had largely compiled with as shown below. A significant portion (18%) cited that they did not know the legal requirements for running a fish retailing business.

Figure 309: Retailers- Legal requirements for running business



Further, retailers indicated that these same requirements were largely the most difficult to comply with as shown below, largely because they involved lengthy processes to acquire them and they were costly.

Figure 310: Retailers- Most difficult legal requirement to comply with



3.3.7 Demographic Information and Future Communication Insights

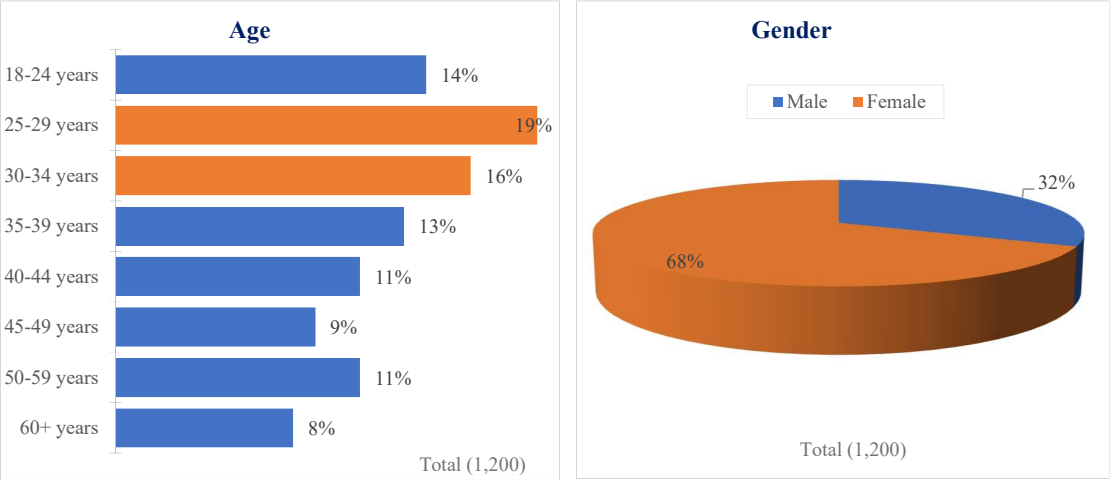
This study targeted consumers as well as market players in the fish industry. Demographic information/profile of participating respondents as well as channels of communication that can be utilized for future programming is presented below.

E. Demographic Information

Consumers

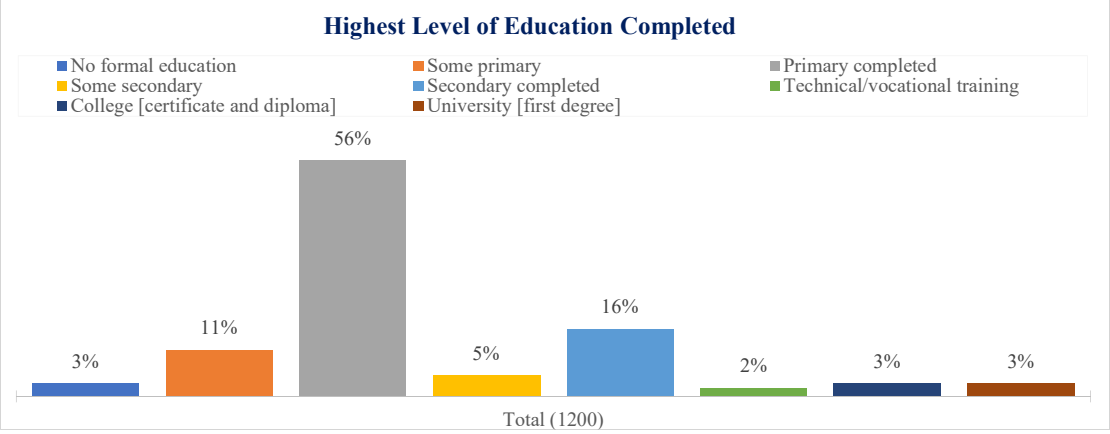
The consumer study targeted persons aged 18 years (adults) and above in Tanzania at the households. Interviewed persons in selected households were key decision makers of food items purchased in the household. As shown in the figure below, key decision makers of food items purchased in the households were largely aged between 25 years and 34 years (35%) and were mainly female (68%).

Figure 311: Consumers- Age and gender



Further, key decision makers on food items purchased in the households had largely completed primary school (56%) as their highest level of education completed as shown below.

Figure 312: Consumers- Level of education



Additionally, households interviewed has an average of 2 persons as shown in the table below.

Table 148: Consumers- Number of people in the household

Number of People in the Household								
	Total (1,200)	Central (130)	Coastal (360)	Lake (260)	Northern (170)	Southern Highlands (180)	Western (60)	Zanzibar (40)
Average number of persons	2	2	2	2	2	2	2	2

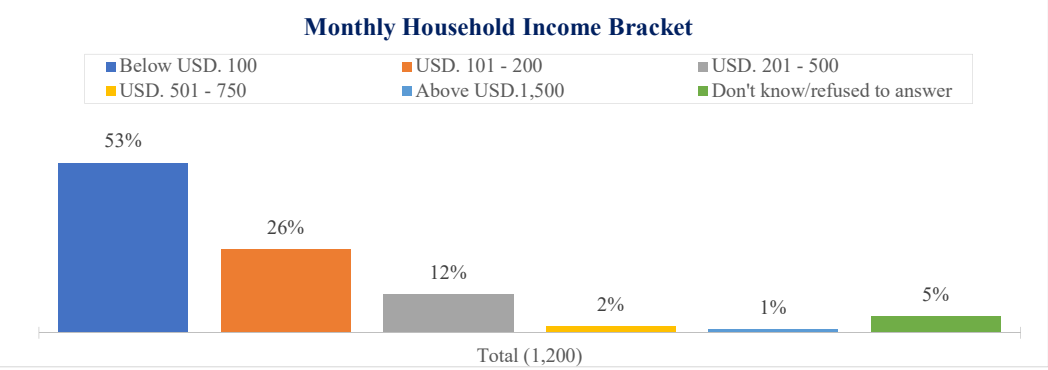
Further, it was observed that the people living in the households were mainly adults (aged 18 years and above) with an average of 3 persons falling under this category as shown in the table below.

Table 149: Consumers- Number of people in the household (age brackets)

Number of people living in the household						
	Adults [18 years and above, including servants if they share the same cooking pot	Children [12 but less than 18 years]	Children [6 but less than 12 years]	Children [2 years but less than 6 years]	Children [6 months but less than 2 years]	Children [under 6 months]
Average number of people	3	1	1	1	-	-

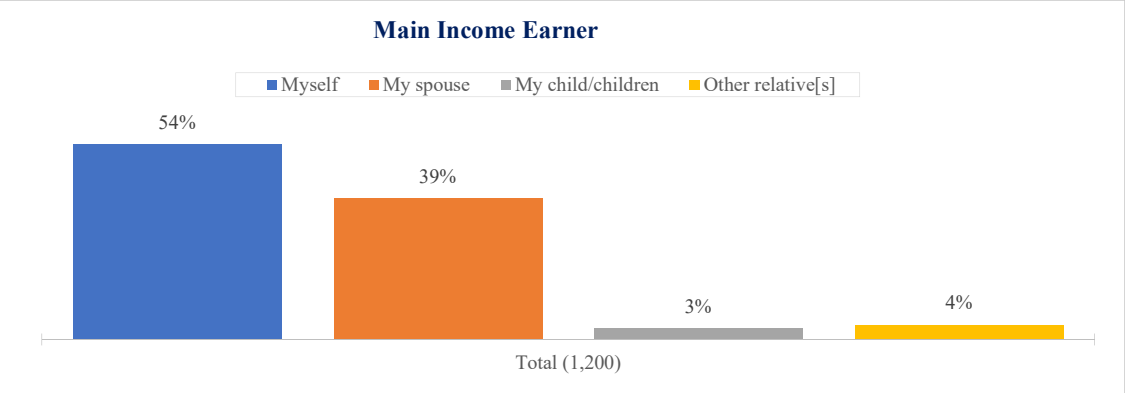
Additionally, more than half of households interviewed (53%) reported that their monthly income was below USD. 100, while significant proportions (38%) reported that their monthly household income ranged between USD. 101 to USD. 500 as shown below.

Figure 313: Consumers- Monthly household income bracket



The main income earner in the household was also reported to be mainly either the key decision maker of food items purchased in the household (person interviewed/self) (54%) or their spouse (39%) as shown below.

Figure 314: Consumers- Main income earner



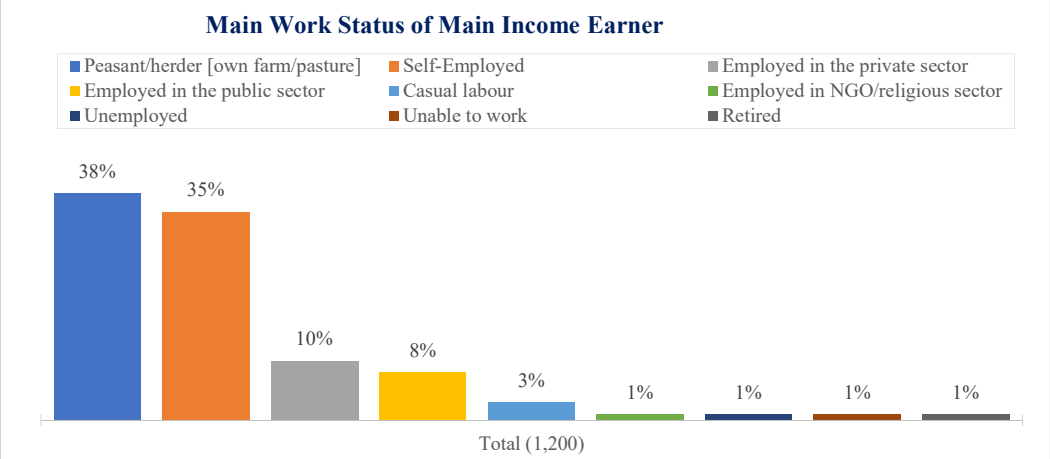
In addition, it was observed that on average, 1 person earned an income in the household and contributed to the household's income and expenditure. As shown below also, more households with a monthly income of between USD. 201 to USD. 750 reported that 2 persons in the households earned an income and contributed to household income and expenditure.

Table 150: Consumers- Number of people in the household contributing to income and expenditure

Number of persons in household earning an income and contributing to household income and expenditure								
	Total (1,200)	Below USD. 100 (639)	USD. 101 - 200 (316)	USD. 201 - 500 (144)	USD. 501 - 750 (29)	USD. 751 -1,000 (4)	Above 1,500 (11)	Don't know /refused to answer (57)
Number of people contributing to household income	2	1	2	2	2	2	1	2

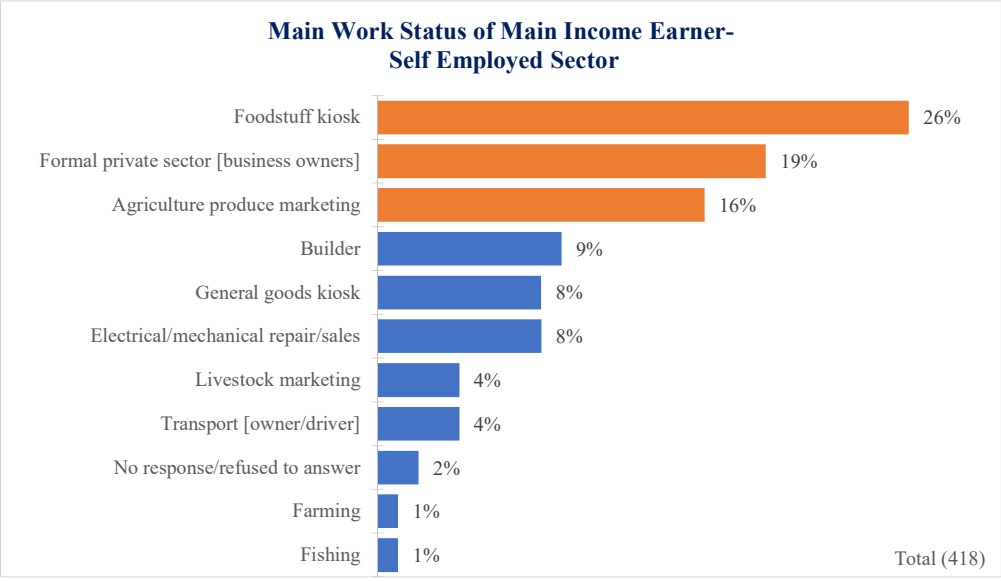
The main income earner for the household was reported to be largely either a peasant/herder [own farm/pasture] (38%) or self-employed (35%) as shown below.

Figure 315: Consumers- Main work status of main income earner



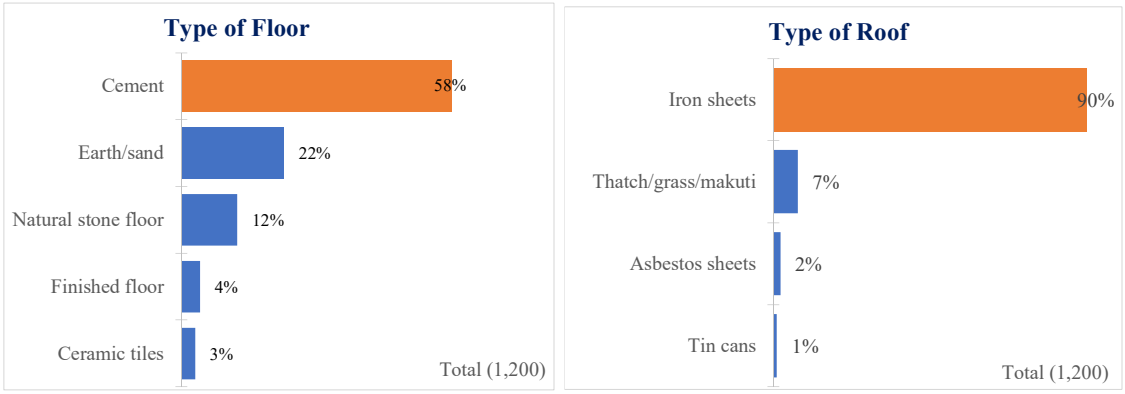
Main income earners who were self-employed were reported to be largely running food stuff kiosks (26%), were in the formal private sector/business owners (19%) or working in the agriculture sector (16%) among others as shown below.

Figure 316: Consumers- Main work status of main income earner- Self-employed sector



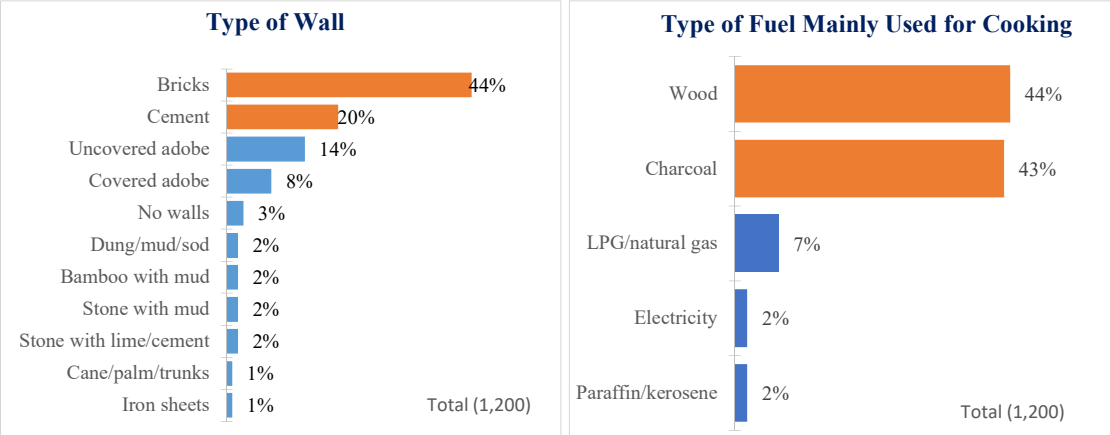
Further, consumers were found to be living in households that largely had cemented floors (58%), and roofed with iron sheets (90%) as shown below.

Figure 317: Consumers- Type of floor and roof of the household



The households' walls were also largely made of bricks (44%) as shown in the figure below. Lastly, households reported that they largely used wood (44%) and charcoal (43%) as the main type of fuel for cooking in the households among other types of fuel.

Figure 318: Consumers- Household's type of wall and type of fuel mainly used for cooking



Market Players

The Market Players' segment targeted fish farms and ponds, fish retailers, processors, storage and transportation business as well as cooperatives supporting the fish industry business. The profile of participating respondents is presented below.

Fish Farmers

Fish farms and ponds for this study were mainly found in Dar es Salam (5 farmers), followed by Pwani (3 out of 9 farmers) and Bagamoyo (1 farmer). Further, the owners or key decision makers in the farmers were targeted for interview. These were mainly aged between 49 years to 59 years (6 out of 9 farmers) and had largely either completed primary school (2 farmers), secondary school (2 farmers), had a college certificate (1 farmer), or had a university degree (bachelors, masters or a PhD degree) (3 farmers) as the highest level of formal education completed. One farmer refused to provide this information. Participating fish farmers had also largely been in the business for a period of 1 year or longer (8 out of 9 farmers) and had continually been in the practice (7 out of 9 farmers).

Further, it was observed that fish farmers had largely joined the business to produce fish for consumption at the household and for sale locally as well as to mainly produce fish for selling internationally (8 out of 9 farmers). Additionally, interviewed farmers mainly practiced pond farming (8 out of 9 farmers), while one farmer was practicing cage farming.

It was also noted that all the farmers had permanent employees, while one farmer also engaged temporary staff. Further, an average of 6 permanent staff and 1 temporary staff were engaged in running the fish farming businesses as shown in the table below.

Table 151: Fish farmers- Number of staff working in business

Number of staff working in the business		
	Permanent	Temporary
Average number staff	6	1

It was reported that the source of credit for starting the fish farming business, was largely from their own savings (8 out of 9 farmers), while one farmer indicated he had obtained a loan from a financial institution. Additionally, most farmers (7 out of 9) relied on their own savings to sustain the business. Others either ploughed back profits, or obtained loans to sustain their businesses.

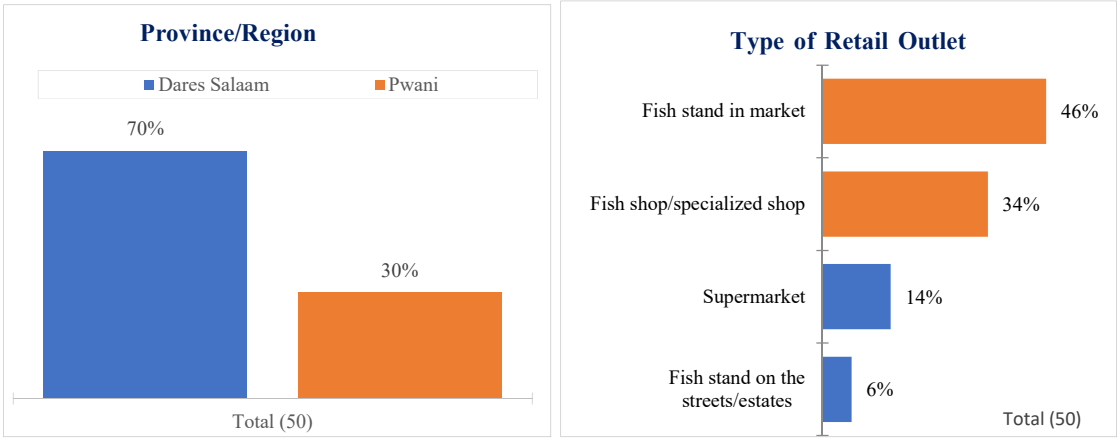
Storage and Transportation Businesses

This study targeted the senior representatives of the fish storage and transportation businesses. It was observed that the highest level of education attained by all the key decision makers interviewed was primary school. Additionally, it was noted that the decision makers were aged between 39 years to 54 years.

Retailers

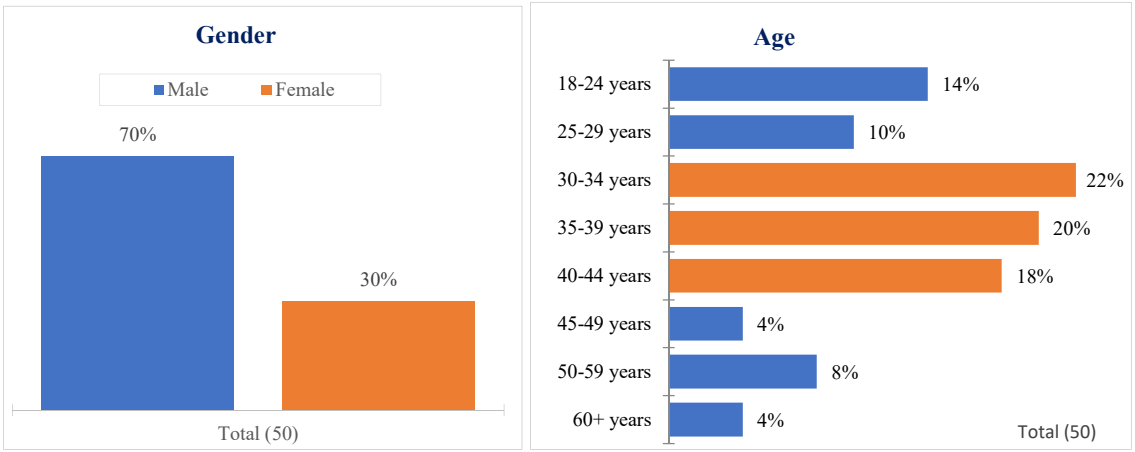
Fish retailers targeted in this study were mainly found in Dares Salaam (70%) and in Pwani (30%) regions as shown in the figure below. Additionally, the fish retail outlets were largely fish stands in the market (46%) and in the fish specialized shops (34%) among others as shown below.

Figure 319: Retailers- Region/type of outlet



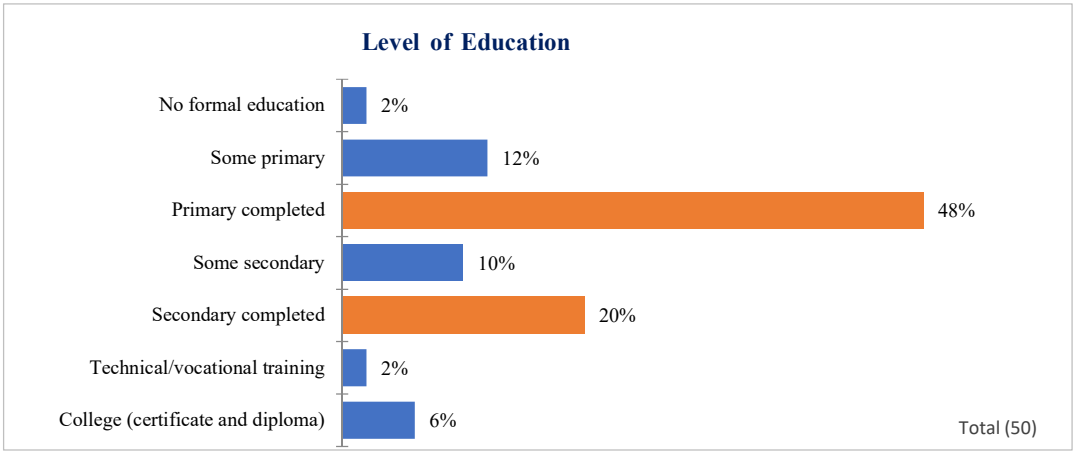
Persons interviewed in the retail outlets were either the owners of the businesses or key decision makers. As shown below, the fish retailers interviewed were largely male (70%) and a significant portion (60%) were aged between 30 years and 44 years.

Figure 320: Retailers- Gender and age



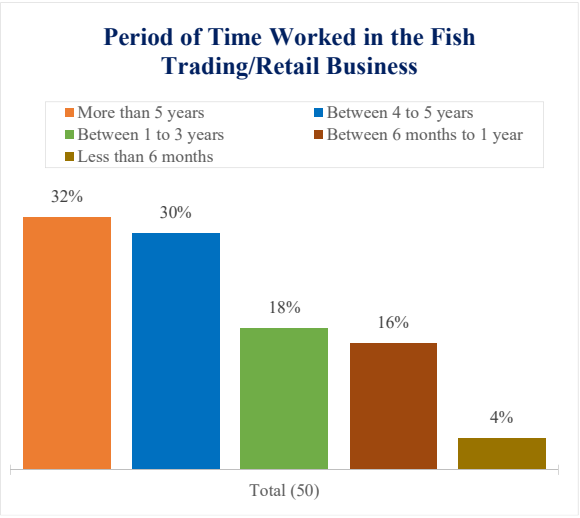
Additionally, owners/key decision makers of retail outlets had largely attained primary education (32%) and secondary education (20%) as the highest level of formal education completed as shown below.

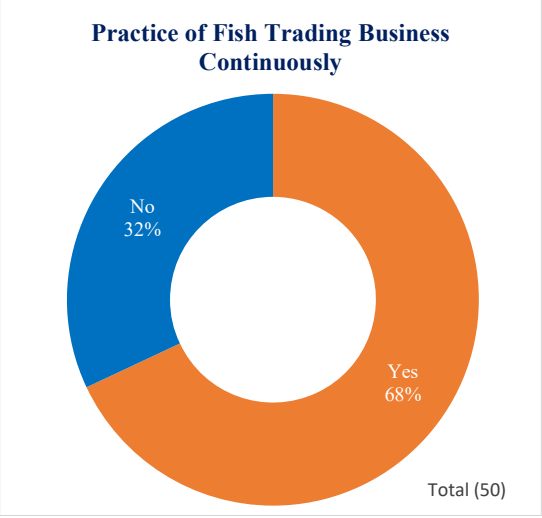
Figure 321: Retailers- Highest level of education completed



It was observed that fish retailers had largely been in the fish trading business for more than 5 years (32%) and between 4 years to 5 years (30%) as shown below. Additionally, a significant proportion (68%) had been in the business continuously since venturing into the trade.

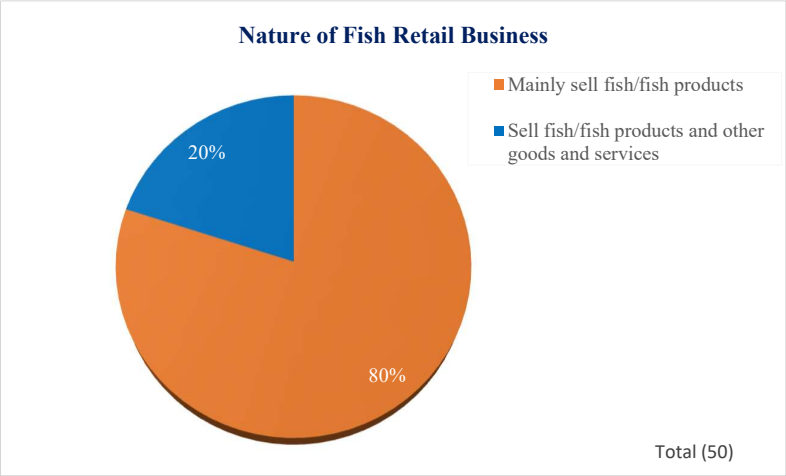
Figure 322: Retailers- Duration of time in the fish trading business





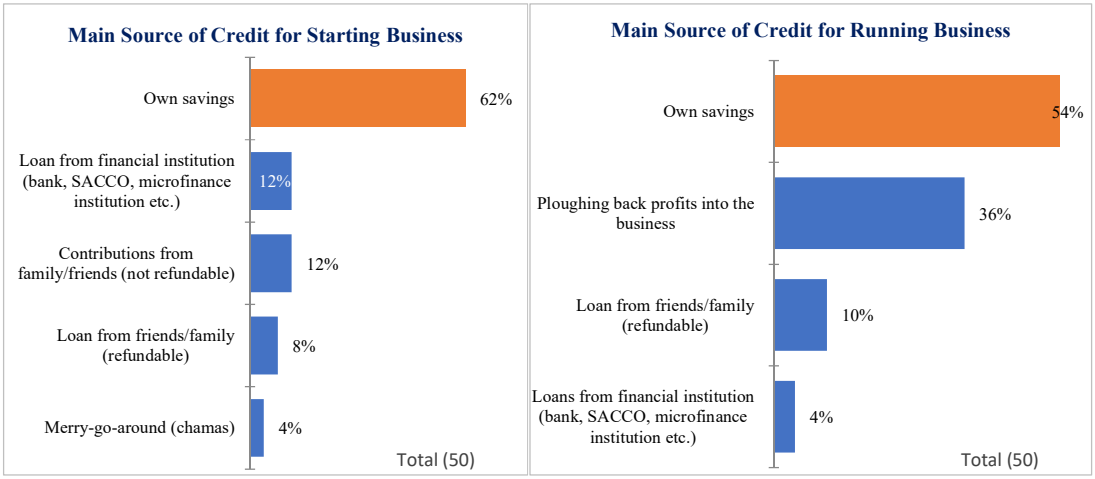
A significant proportion of participating fish retailers (80%) indicated that they mainly engaged in the sale of fish and fish products, with a small proportion (20%) complementing this trade with the sale of other goods and services.

Figure 323: Retailers- Nature of fish trading business



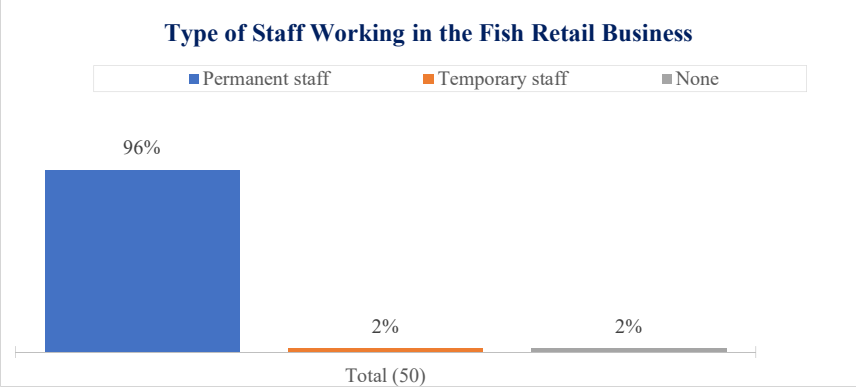
It was also observed that fish retailers had largely used their own savings (62%) to start off their trade among other channels, and had also largely relied on own savings (54%) to keep their businesses running as shown below.

Figure 324: Retailers- Main source of credit for starting and running business



Further, it was observed that fish retail businesses mainly engaged permanent staff (96%) as shown below.

Figure 325: Retailers- Type of staff working in the business



Additionally, fish retailers engaged an average of 2 permanent staff to run their businesses as shown below.

Table 152: Retailers- Number of staff in business

Number of staff working in the fish retail business		
	Permanent staff	Temporary staff
Average number of staff	2	-

Processors

The 6 processing factories interviewed in this study were found in Dares Salaam, Musoma, Mwanza and Tanga regions. The key decision makers in the processing factories were mainly aged between 35 years to 39 years (3 processors). Additionally, the highest level of education attained by the fish processors was largely University (first degree) (3 processors) while 2 processors had completed University (masters or PhD).

It was observed that all fish processors interviewed in this study had worked in the decision role they were currently in for more than 3 years. Further, the main motivation for joining the industry was because the line of business was a preference to the processors.

Processing factories were observed to have an average of 286 employees who comprised of permanent and temporary staff. Staff working in the processing factories were largely male.

Table 153: Processors- Number of employees in firm

Number of employees in processing factories					
	Total Number of Employees	Full Time-Male	Full Time-Female	Temporary- Male	Temporary- Female
average number of employees	286	42	35	132	75

Half of the fish processors indicated that there were periods when there was need to employ more staff than the above, and the main reason for increasing the number of staff was mainly when they purchased too much fish and when there was an increase in the number of customers. The other fish processors reported that they did not employ other staff.

Cooperatives

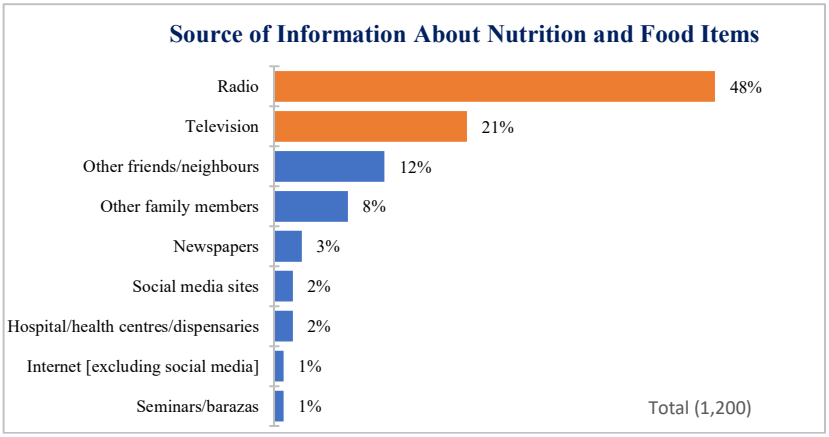
It was noted that the highest level of education attained by cooperative administrators was postgraduate education, while the lowest reported was at diploma level. Additionally, it was observed that youngest cooperative administrator was aged 30 years, while the oldest was aged 53 years. Further, it was noted that all cooperative administrators were male.

F. Future Communication

Consumers

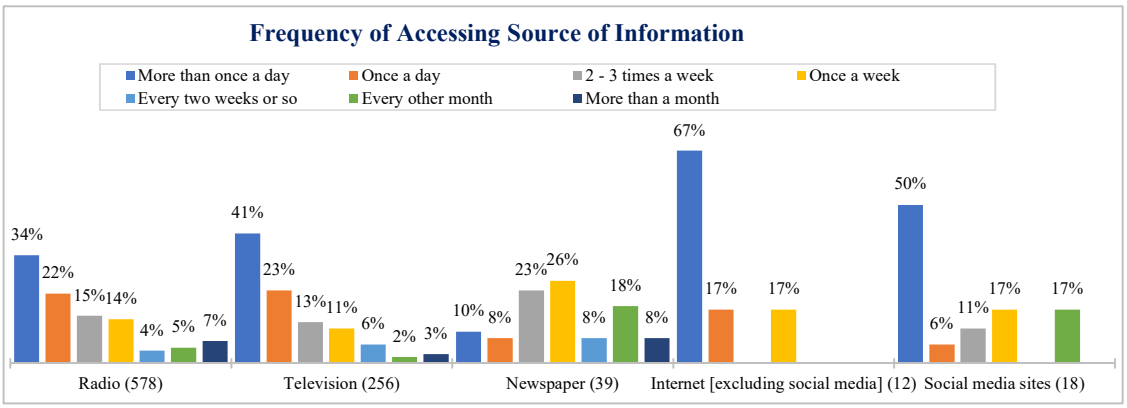
Consumers mainly accessed information about nutrition and food items from the radio (48%) and television (21%) among other sources as shown below. These would be the most appropriate channels to reach them on issues of interest.

Figure 326: Consumers- Source of information



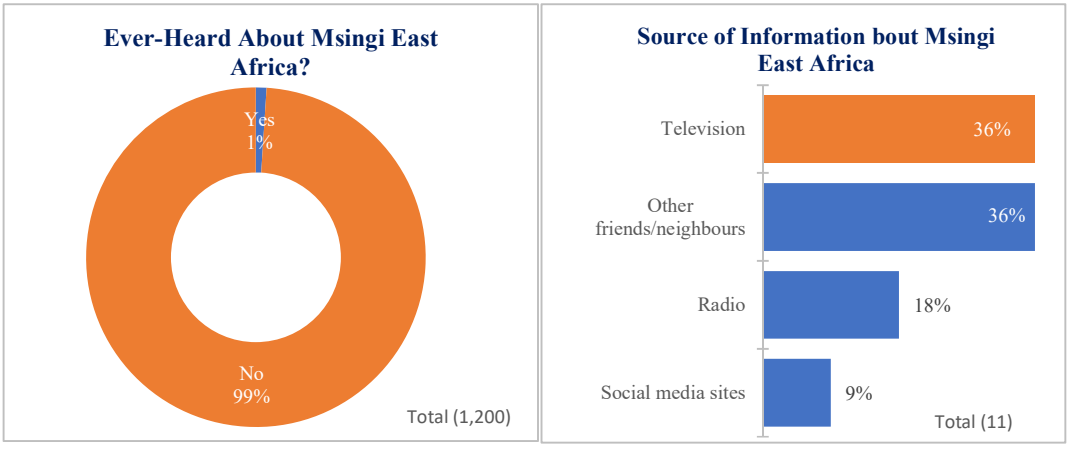
Further, consumers accessed these main sources of information largely more than once a day as shown below.

Figure 327: Consumers- Frequency of accessing sources of information



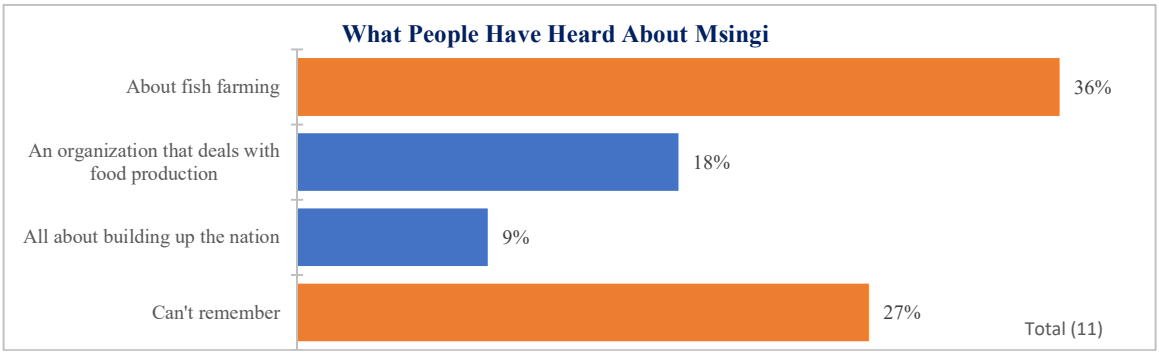
It was observed that only a small proportion of consumers (1%) had heard about Msingi East Africa prior to the study's implementation, mainly through the television (36%) and through friends and neighbours (36%).

Figure 328: Consumers- Ever heard about Msingi in the past?



A significant proportion of those that had heard about Msingi in the past could not remember the information they heard about Msingi. Those that could remember associated Msingi with fish farming, food production, and about building up the nation as shown below.

Figure 329: Consumers- What people have heard about Msingi



Market Players

This section provides insights on viable channels of communication that can be utilized to reach out to various players in the fish industry in Tanzania.

Fish Farmers

Fish farmers indicated that their main source of information about fish farming and other general market information was through the internet (excluding social media), social media sites and the radio. These are therefore channels that can be utilized in future communication. Farmers accessed the internet largely more than once a day, the social media site either more than once a day, once a week or 2 to 3 times a week and the radio more than once a day.

Additionally, it was established that a significant proportion of farmers interviewed had not heard about Msingi East Africa before the study was implemented (8 out of 9 farmers). The one farmer who had heard about Msingi East Africa prior to the study indicated that he had heard about it from friends and neighbours. The farmer indicated that he had heard that Msingi is an organization that deals with fish farming, and supports farmers with funding and training.

Storage and Transportation Businesses

It was reported that key decision makers of fish storage and transportation companies relied on different sources of information to remain informed on new developments in the fish industry. Some of the sources of information mentioned included updates from fishing officers, as well as regular attendance to international fish shows. It was also

observed that some of them had subscribed to the Fish Kinds Newspaper to remain updated. Other channels mentioned included word of mouth through friends and fellow businessmen, general newspapers, television, radio and the internet. These would therefore be relevant channels to utilize in future program work targeting this group. It was noted that none of the fish storage and transportation companies had heard about Msingi prior to the study implementation.

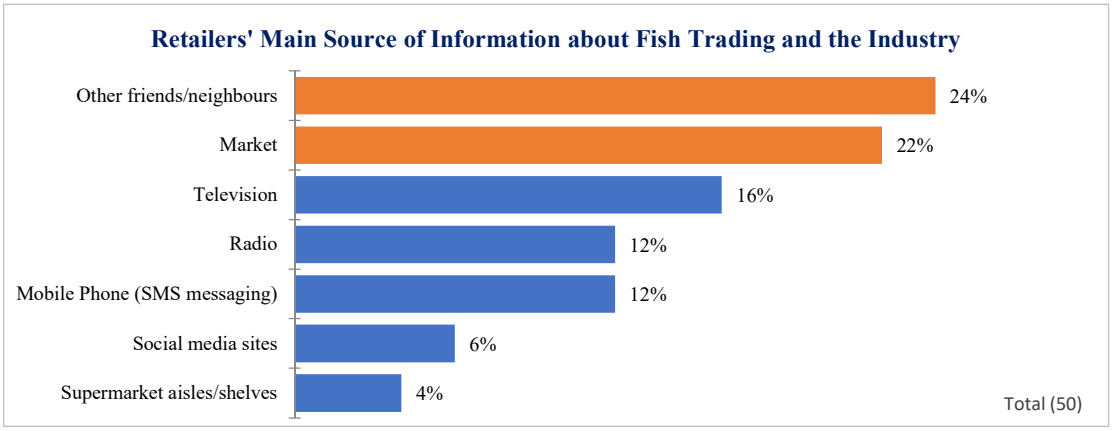
Processors

Half of the processors mainly accessed information about fish processing and general market information from the newspapers. Smaller proportions were also accessing this information from the television, the internet (exuding social media sites) and from social media sites. Additionally, processors indicated they accessed newspapers once a day, while other channels were largely accessed either once a day or more than once a day. It was further noted that none of the processors had heard about Msingi East Africa before the data collection period.

Fish Retailers

Fish retailers indicated that their main sources of information about fish trading and other general market information was largely through the friends and neighbours (24%) and from informal channels in the markets (22%) among other channels as shown below. These would therefore be viable channels to utilize to reach this category of players in the value chain.

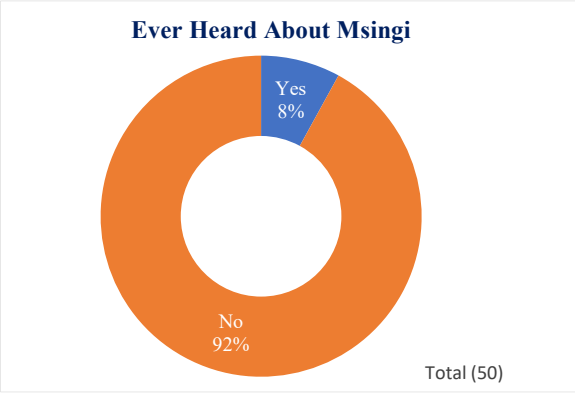
Figure 330: Retailers- Main source of information



More formal channels of communication that were accessed by significant proportions (television and radio as shown above), were largely either accessed more than once a day, or once a day.

Lastly, it was observed that majority of fish retailers (92%) had not heard about Msingi East Africa prior to the study's implementation. The few that had heard about the organization (4%) indicated that they had either heard about the organization from fish association, from friends and neighbours, from the internet (excluding social media) or through the television. Additionally, all retailers that had heard about Msingi perceived that the organization dealt with loans.

Figure 331: Retailers- Source of Information about Msingi



Cooperatives

It was observed that most cooperative administrators accessed relevant information from the television, radio, social media, magazines and books among other publications. Other organized channels of communicating developments about the fish sector that were reported included attending symposiums and seminars, communication from the Ministry of Fisheries and from fish experts in the Government. These would therefore be relevant channels to utilize in future program work targeting this group. It was noted that none of the cooperative administrators had heard about Msingi prior to the study implementation.

3.4 Focus on Rwanda

Rwanda is a land-locked country that is currently a net importer of fish from neighbouring Uganda and Tanzania due to the shortage of fish from its market…The latest trade data [on fish imports] from the government indicate that Rwanda imports 36,000 tonnes of fish annually... Among key challenges faced [in Rwanda's fish industry] are increased degradation of the lakes environment and poor management of the fisheries. Local authorities do not have the capacity to manage the fisheries resources sustainably[35]. Presented in this section are insights on the fish industry in Rwanda from the study implemented.

3.4.1 Summary of Findings

Key Findings in Rwanda

Size of fish consumption and potential demand

- The current market for fish consumption (current and potential) is estimated at 49,301mt.
- Fish is currently consumed by 87% of the population interviewed in Rwanda. High pricing and unavailability are some of the main barriers to fish consumption in Rwanda.
- Whilst fish is consumed by most households interviewed, it is only considered as the most important source of protein for the household by 12%. Both animal and plant proteins are considered as the most important source of protein by most households (37%) followed closely by plant proteins (36%). Additionally, beef is considered as the most favourite type of meat by half of the households consuming meat (50%), followed by fish (37%). Quality of the meat and preference by family members are some of the key factors considered by households when choosing meat types to consume.
- Fish consumers in Rwanda are mainly purchasing and consuming Tilapia among other fish varieties. Most consumers are also purchasing the Silver Cyprinid (*Dagaa/Mukene/Omena)* (66%) and fresh fish (51%) for consumption.

[35] http://rab.gov.rw/animal-resources-department/fisheries/

- Subsequently, though a significantly high proportion of the households (78%) have access to electricity, only small proportions (less than 10%) have access to storage equipment, which influences fish forms purchased. Consequently, over 80% of most of most fish forms are purchased and consumed within the same day.
- Fish-consuming households purchase and consume an average of 2.3kgs of fish in a month, with consumption observed to be higher in the urban areas. Different households, however, tend to purchase and consume more or less of different types and forms of fish. Consumption is, therefore, not linear/the same across households. Consumption of fresh fish was for instance observed to be higher than other fish forms.
- Households tend to spend an average of Rwf. 7,412 (equivalent to about USD.9) in a month on fish and fish products, with some variations being observed across the regions and monthly household income bands.
- Small proportions of households (27%) are also consuming fish outside the household, more so, in the urban areas. Consumption in the household is, however, higher.
- Most consumers believe that the fish they purchase and consume is wild fish from local sources. Interestingly, however, only small proportions perceive they can tell the difference between wild fish and farmed fish (27%) or between local and imported (26%). When prompted to do so through a fish tasting exercise, however, all could perceive there were differences in the wild, farmed and imported fish samples presented. To most consumers, however, it does not matter whether fish is farmed, wild, local or imported, because most of them believe all fish is the same.
- Key concerns that fish consumers have is that fish is highly perishable and could get spoilt, and that it is not well handled and could pass food borne diseases.

Fish production, processing and route to market

Fish Farming

- All fish farmers interviewed are keeping Tilapia fish species, mainly because the fingerlings were readily available and affordable.
- Most fish farmers are sourcing fingerlings from local sources (largely from fellow farmers), while one farmer mainly imports. None, however, owns a hatchery for fish production.
- Farmers purchase an average of about 21,800 fingerlings of the Tilapia species per batch/lot for production, and harvest about 1,300kgs from each batch/lot.

- From the total harvests made by farmers, an average of 1,284kgs are sold. An average cost of production of about Rwf. 85,200 (equivalent to about USD.102) is incurred for rearing each batch/lot. Factors driving the cost of production include the cost of fingerlings, disease management, quality of feeds and maintaining consistent water supply.
- Key challenges faced by fish farmers include shortage of quality feeds and fertilizer, high costs of fish inputs and low prices of selling fish among others. The main challenges faced when accessing fingerlings include long distances, delays in receiving fingerlings, shortages/unavailability of the fingerlings, high prices and mishandling of the fingerlings, which resulted in some dying. Most of the farmers (4 out of 5), however, did not know what impact the Chinese fish had brought about in the market, which depicts knowledge gaps among this group on industry developments likely to affect them. One farmer indicated that the entry of Chinese fish in the Rwandan market has mainly increased the presence of poor quality fish in the market, and has also lowered the prices of fish.
- Critical factors noted by farmers that are needed for succeeding in fish farming include availability of quality fingerlings and feeds for the fish, consistent water supply in the farmers among other factors.
- Most farmers intend to begin fish processing, making of their own feeds, and improve on sales related services among other initiatives. Key training needs include latest technologies in fish production, fish disease management, fish larvae rearing and forecasting consumption and demand for fish products among others.

Fish processing

- Interviewed fish processors mainly process Tilapia, which are largely sourced from local and imported sources. Most processors interviewed (4 out of 5) cannot tell whether the fish they process is wild catch, farmed or imported fish.
- Fish is largely received in the fresh or chilled form for processing, and is largely processed into fillets/special cuts, smoked, dried, salted or frozen for sale.
- Processors indicate that they process an average of 264kgs of Tilapia, and sell an average of 211kgs in a month, which could imply a degree of loss, or that all processed fish in a month is not all sold out.
- Processors are currently over-utilizing their storage capacities, as the maximum daily capacity is 44kgs while the average optimum storage capacity in a day was observed to be about 40kgs.
- Key challenges faced by processors include low fish supplies/unavailability of fish stocks to meet demand, poor handling of fish stocks from the sources, high

prices of fish supplies and stiff industry regulations among others. Processors tend to cope with these challenges by reducing prices (to overcome competition), engaging in marketing activities, and improving on customer service.

- To support business growth, processors have engaged in financial management training to help in the running of their business, and had also engaged in the formation of a party of labourers to improve the access of skilled labour in the market in the past. They desire to learn more about the latest technologies in fish processing, forecasting consumption and demand for fish products and how to access affordable credit among other areas.

Storage and transportation

- Storage and transportation businesses mainly handle imported fish varieties, that are largely wild catch and farmed fish varieties. These include Tilapia, *Tompson* and *Capitaine/Sangara* fish varieties.
- The demand for these services is perceived to have generally increased in the past 2 years to factors such as the country's development initiative to reduce power outages.
- Interviewed entities tend to have access to modern storage and transportation equipment for use in their businesses.
- Key challenges faced by storage and transportation businesses include shortages of fish supply, high pricing of fish, high costs of acquiring and maintaining modern storage equipment, and fish spoilage among others
- Key recommendations made by this group include: lobbying by the government for large-scale inventors to venture in fish importation to manage supply and support for the small-scale players in accessing modern storage and transportation equipment among other initiatives.

Fish retailers

- Fish retailers in Rwanda largely stock wild catch fish varieties obtained locally, with main variety kept being Tilapia among other varieties.
- The quality, pricing and size of the fish are some of the key factors retailers consider when making purchases of fish stocks.
- On average, retailers procure about 225kgs of Tilapia in a month, and sell an average of 188kgs, which implies a degree of loss in fish stocks experienced or that all stocks purchased in a month are not sold off within the same period.
- Retailers mainly sell fish in the frozen or cured state for consumption, and their main customers are individuals in the communities. Retailers largely market their businesses through word of mouth, offering discounts and ensuring stocks are of high quality.

- Retailers perceive that the business environment has largely worsened in the last 2 years, mainly because there is a ready market. A significant proportion, however, feel that the situation had worsened, largely because there is no ready market.
- Key challenges faced by retailers include shortage of fish for trading and stiff competition among others. Additionally, majority of fish retailers are not trading in Chinese fish (86%). The few that are trading in Chinese fish indicated that the Chinese fish is not popular, and the quality is also not the same as the other fish.
- Retailers are largely optimistic that the business environment will improve in the next 2 years, and, most retailers therefore intend to improve sales-related services and open new outlets.
- Retailers are interested in learning more about the quality requirements needed for fish products, pricing policies and where to access affordable credit among other areas. To grow the industry, retailers largely recommend for improvement of customer services in various levels of the value-chain, improvement of the quality of fish sold in the markets and hygiene. Critical factors needed for success in this line of business include provision of quality products to the customer and maintaining good customer relations among others.

Fish price analysis

- Fish farmers sell a kg of Tilapia for Rwf 3,100 (equivalent to about USD.4). From the average sales made from each batch/lot, farmers tend to make a mark-up/profit of about Rwf.3.8M (equivalent to about USD. 4,674) from each batch/lot of Tilapia.
- Fish processors sell a kg of Tilapia for an average of about Rwf. 4,900 (equivalent to about USD.6) per kg when prices are highest and about Rwf. 3,500 (equivalent to about USD.4) per kg when prices are lowest. Processors are making an average of about Rwf. 924,000 to about Rwf.1.2M (equivalent to about USD. 1,109 to USD. 1,552) in a month from processing and selling Tilapia products.
- Fish retailers procure different fish varieties for sale at an average price of between Rwf. 1,167 to Rwf. 3,000 (equivalent to about USD.1 to USD.3) per kg. They then re-sell at an average of between Rwf. 1,500 to Rwf. 4,500 (equivalent to about USD.2 to USD.5) per kg, making an average of about Rwf.200 to Rwf. 1,500 (equivalent to less than USD.1 to about USD.2) from each kg sold.

Market organization/cooperatives and associations

- None of the interviewed farmers is a member of a cooperative or an association.

- Similarly, none of the interviewed storage and transportation companies is a member of a cooperative or an association.
- Also, none of the processors is a member of a cooperative or an association.
- Most retailers (92%) are not members of any cooperative or association. The small proportion that is part of a cooperative or association (8%) largely pay an average membership subscription fee of Rwf. 21, 250 (equivalent to about USD.26) for each round of subscription, which is largely a one-off fee. Membership benefits accrued include linkages to markets for products, sourcing for quality fish stocks and support to members to grow themselves (such as building houses).
- Cooperatives' structure in Rwanda tend to vary. The more established cooperative has membership bases as high as 300 members, while the less established one has as few as 12 members. Cooperatives interviewed comprise of fishermen and fish farmers. Cooperatives largely rely on membership subscriptions to run their affairs, where some charge monthly contributions of about Rwf. 5,000 (equivalent to about USD.6). Membership benefits accrued include regulation of fish prices, products' marketing, provision or facilitation of members to acquire fish fingerlings and fish seeds among others. Key challenges faced by cooperatives include low awareness levels on the importance of cooperative membership, high costs for members to start-up businesses, and generally high costs or running businesses for members among others.
- Cooperative administrators recommend for support in the industry for members to diversify their sources of funding to start up and sustain businesses, setting up of factories for availability of fish inputs locally, and support of the growth of fish farming in Rwanda to reduce the dependence on fish imports.

Policy and trade regulations

- In Rwanda, Law No. 58/2008 of 10/09/2008 (Determining the Organisation and Management of Aquaculture and Fishing in Rwanda), determines the organisation and management of Aquaculture and Fisheries. Though there exists various policies and guidelines regulating the industry, there seems to be gaps in the level of awareness among players in the value-chain.
- Fish farmers perceive that to operate in this line of business in Rwanda, one largely needs to have access to a fish pond, have constant supply of water, a good size of land, a business permit and have storage equipment among other requirements. Farmers largely feel that the requirements needed are not difficult to comply with. However, a few perceive that accessing a fish pond is the most

difficult requirement to comply with, since it is costly and involves a long bureaucratic process.

- Fish processors on the other hand perceive that to operate as a processor in Rwanda, staff in the processing factory need to have a health mutual insurance certificate renewable after a period to between 12 months to 14 months.
- Fish retailers perceive that they largely need to have medical health certification, pay local government weekly taxes, have a business licence and have required equipment. The most difficult to comply with is payment of local government weekly taxes, largely because they are costly.

Future communication

- Consumers and potential fish consumers can be reached largely through the radio and television as these are the main channels of information about food and general nutrition. Consumers access these channels daily. Only a small proportion (1%) has heard about Msingi in the past, with information heard about the organization being largely inaccurate.
- Fish farmers can be reached through the radio, internet (excluding social media) and social media sites. They largely access these channels daily or weekly. None has heard about Msingi in the past.
- Storage and transportation businesses can be reached through trainings and forums organized by Government institutions, such as Rwanda Agricultural Board (RAB) and Rwanda Bureau of Standards (RBS) among other channels. None has heard about Msingi in the past.
- Processors can be reached through radio, television, newspapers and social media. They largely access these channels daily. None has heard about Msingi in the past.
- Fish retailers can be reached largely through informal sources such as friends and neighbours, and through formal channels such as the television and the radio, which they access daily. None has heard about Msingi in the past.
- Cooperatives' administrators can be reached through radio, newspapers and the television, as well as through organized forums by RAB. None has heard about Msingi in the past.

3.4.2 The Size of Consumption and Potential Demand

Presented in this sub-section are findings on the estimated market size of fish in Rwanda, consumer preferences, and insights into fish-non-consumption.

A. Estimated Market Size

The estimated current size of the market for fish is 42,225 tonnes of fish in a year for Rwanda- including Silver Cyprinid *(Dagaa/Mukene/Omena)* as discussed further below. The size of the under-served market (past consumers who would be willing to continue consuming) on the other hand is estimated at 5,099 tonnes, while the size of the un-served market (potential consumers) is estimated at 1,977 tonnes as shown below. The total size of the fish market in Rwanda (current and potential) is therefore estimated at 49,301 tonnes as shown below.

Table 154: Estimated market for fish per annum

Size of the market in metric tonnes (mt.)	Rwanda
Current consumption	42,225
Under-served (past consumers, willing to continue)	5,099
Un-served (never consumed, but would consume)	1,977
Total fish market size (current +potential)	49,301

These figures have been computed based on average consumption figures per month projected against the total population in the country. The assumption that has been made in computing the annual market size is that consumption is linear (where each household consumes the same amount of fish on average); which might not be the case. However, this provides a good proxy estimate and provides an insight on the size of the market.

As indicated above, the estimated size of the fish market in Rwanda includes *Dagaa/Mukene/Omena.* When the *Dagaa/Mukene/Omena* is excluded from the computation, the estimated size of fish in Rwanda is an average of 25,690 tonnes per annum, while the size of *Dagaa/Mukene/Omena* is estimated at 16,536 tonnes per annum as shown below.

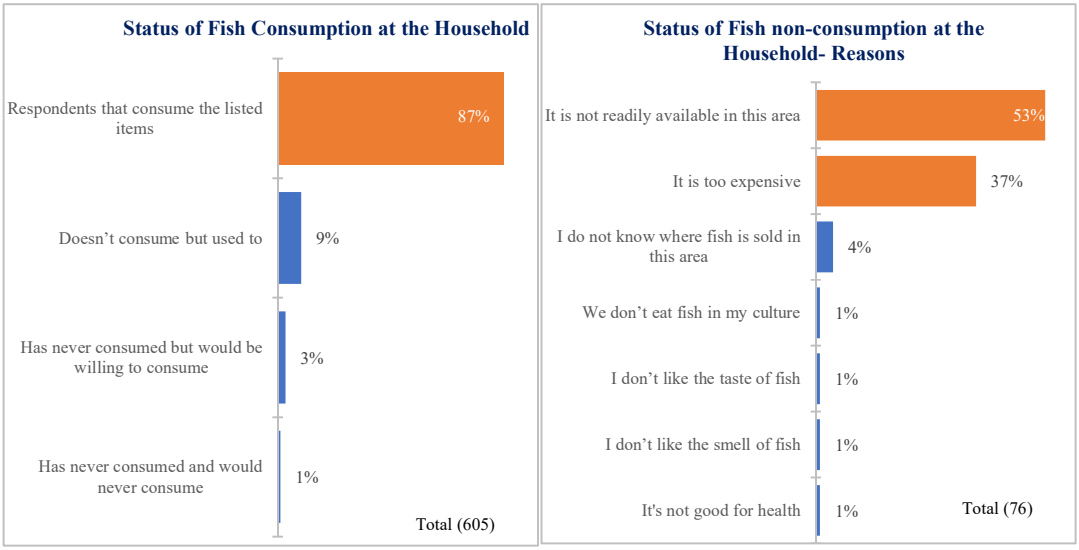
Table 155: Estimated market size for fish per annum

Estimated market size for fish in tonnes						
	Total (605)	Eastern (100)	Kigali City[36] (141)	Northern (83)	Southern (121)	Western (160)
Beef	61,244	15,088	6,589	11,598	12,250	15,719
Chicken	14,922	3,653	2,348	2,782	3,466	2,673
Fish - Overall including Silver Cyprinid (*Dagaa/Mukene/Omena*)	42,225	5,172	4,590	7,295	7,312	17,857
Fish - Excluding Silver Cyprinid (*Dagaa/Mukene/Omena*)	25,690	3,037	2,863	3,884	2,327	13,580
Fish - Silver Cyprinid (*Dagaa/Mukene/Omena*)	16,536	2,135	1,727	3,411	4,986	4,277

B. Fish Non-Consumption

A large proportion of households in Rwanda indicated they currently consume fish (87%). Small proportions, however, indicated that they did not consume fish, with the main barriers of consumption cited including unavailability of fish and its pricing, where fish was considered to be expensive as shown below.

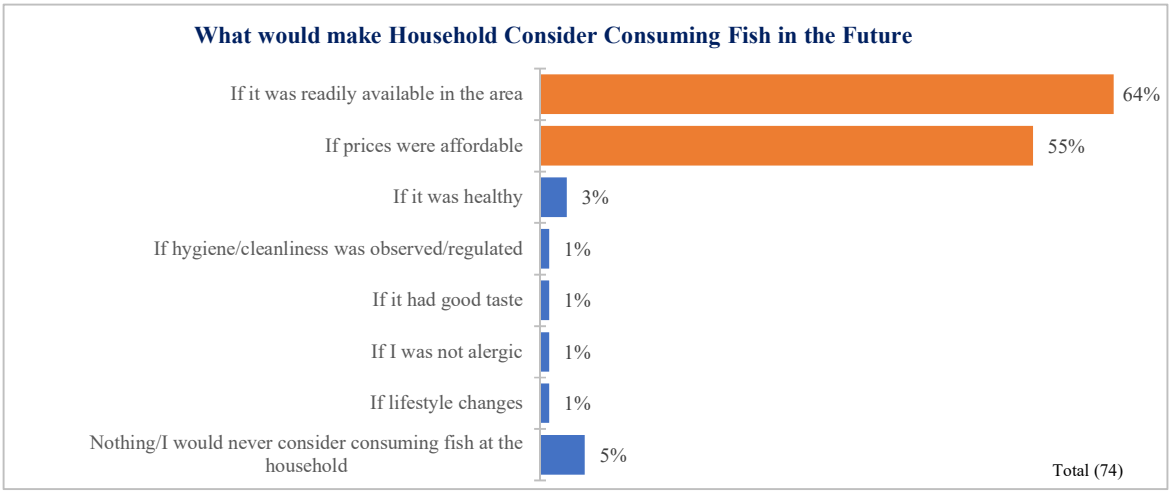
Figure 332: Status of fish consumption at the household



[36] Kigali City is classified as an administrative region in Rwanda by the National Institute of Statistics of Rwanda in addition to the other 4 provinces. It comprises of 3 districts; Gasabo, Kicukiro and Nyarugenge

Consequently, for households that were not consuming fish, availability (64%) and moderation of pricing (55%) are some of the key factors that would encourage consumption as shown below.

Figure 333: Factors that would encourage fish consumption in households not consuming fish



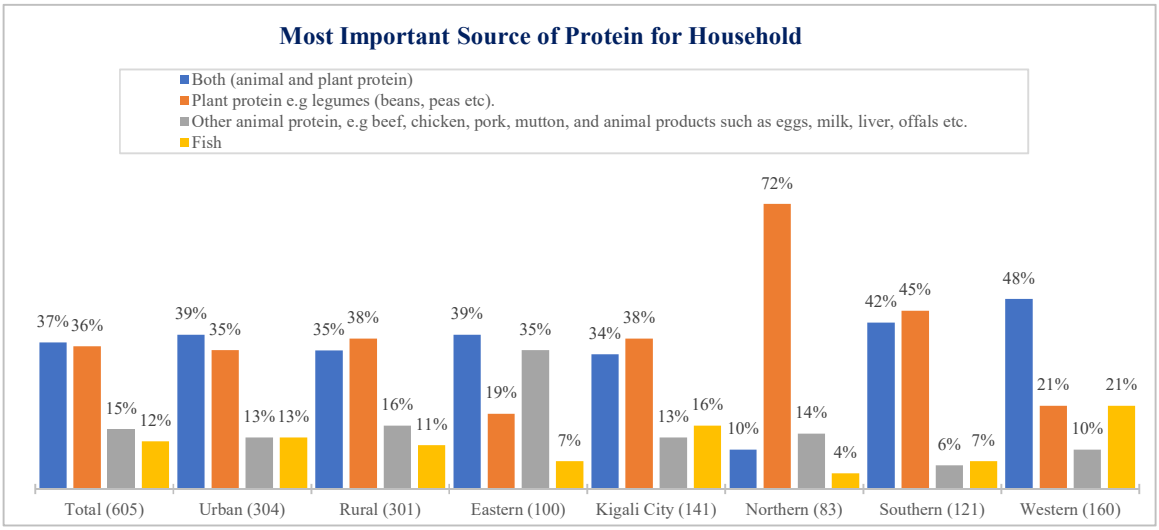
C. Consumer Preferences

This section of the report provides insights on the type of proteins consumed by households, favourite types of meats for the households, fish consumption trends and varieties purchased, frequency of purchase, preferences of wild vs. farmed species, local vs. imported species and concerns consumers have when making fish purchases.

Type of Protein Consumed at the Household

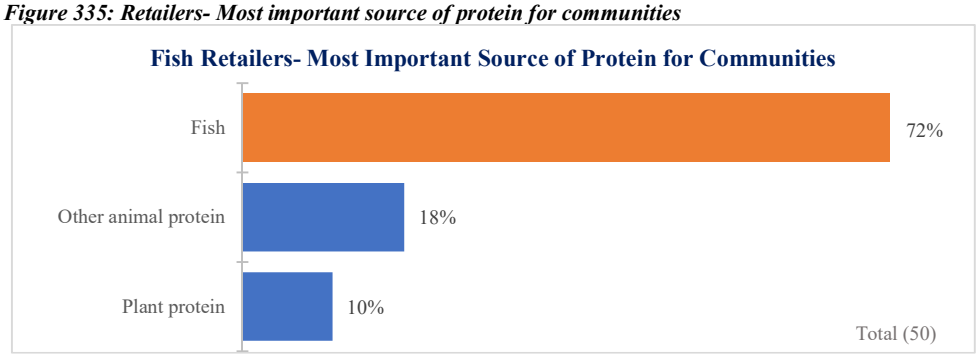
From the primary data research findings, both animal and plant protein (37%) were generally considered as the most important source of proteins, mostly in the Western Region. A significant proportion also considered plant proteins (36%) which was most mentioned in the Northern Region. A small portion (15%) reported that animal protein was the most important source of protein, while an even smaller proportion (12%) considered fish, largely in the Western Region.

Figure 334: Consumers- Most important source of Protein for Household



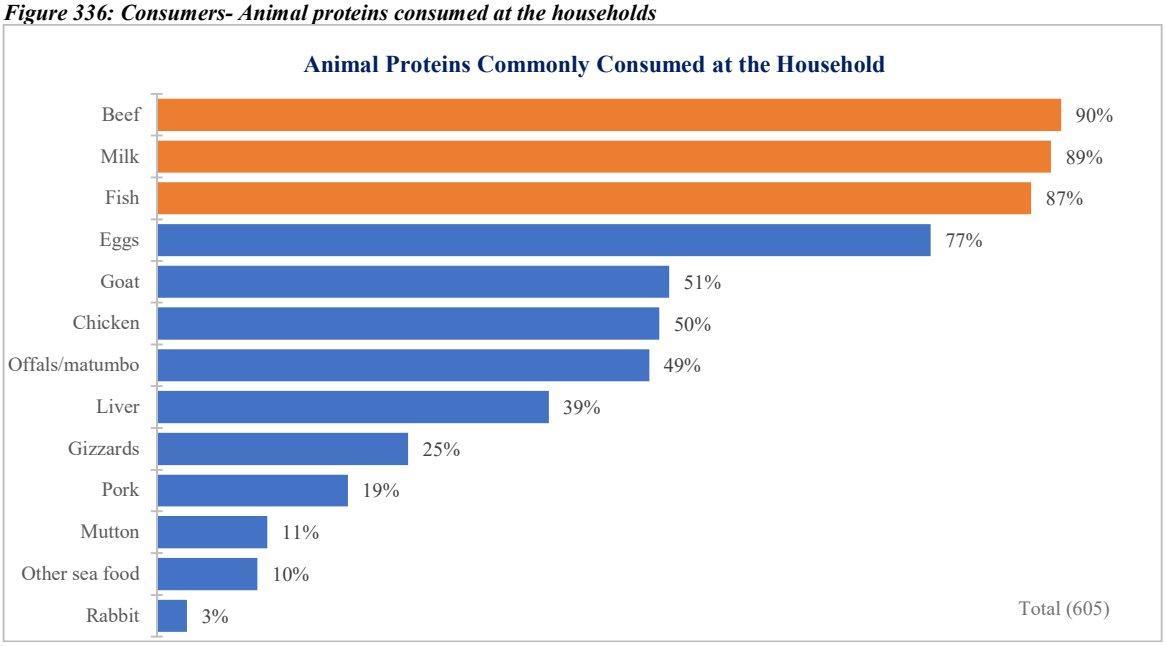
Contrary to this, all farmers interviewed reported that plant protein was the most important source of protein, while fish retailers perceived that the most important source of protein was fish (72%), which could be mainly attributed to the fact that they were engaged in fish business.

Figure 335: Retailers- Most important source of protein for communities



Majority of the consumers reported that they largely consumed beef (90%), closely followed by milk (89%) and fish (87%) among other animal proteins as shown below.

Figure 336: Consumers- Animal proteins consumed at the households



It was observed that fish consumption in Rwanda was largely higher in the urban areas as shown below. Further, the Northern Region, Kigali, and Western Region were observed to have a higher proportion of fish consumers than other regions.

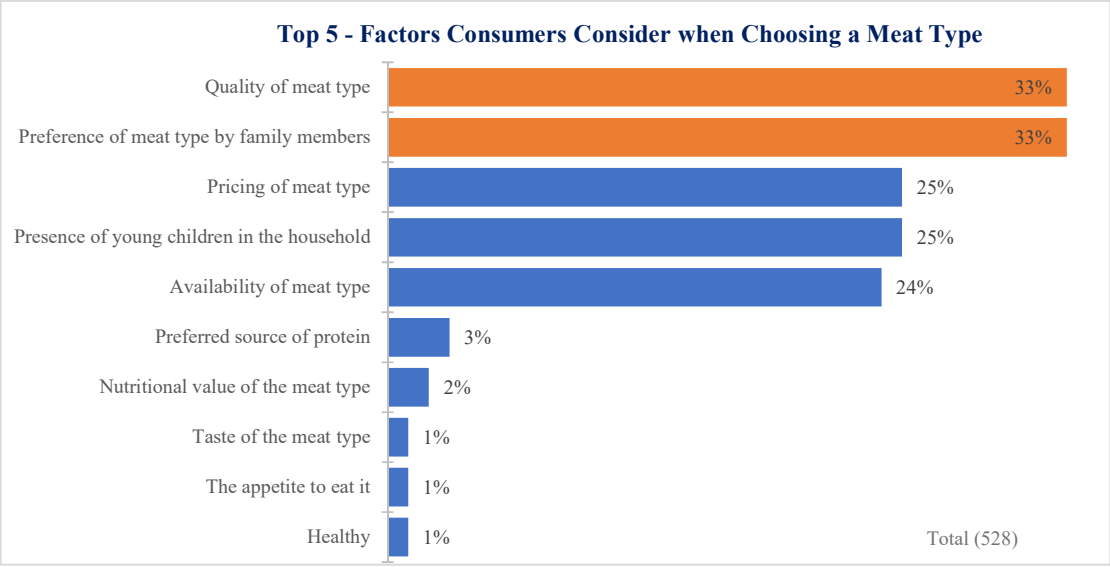
Table 156: Consumers- Animal proteins consumed at the households- Region

Animal proteins consumed at the household								
	Total (605)	Urban (304)	Rural (301)	Eastern (100)	Kigali City (141)	Northern (83)	Southern (121)	Western (160)
Beef	90%	91%	89%	97%	91%	96%	81%	89%
Milk	89%	92%	86%	99%	94%	94%	83%	81%
Fish	87%	94%	81%	82%	94%	96%	74%	90%
Eggs	77%	81%	72%	88%	89%	90%	65%	61%
Goat	51%	49%	53%	70%	40%	75%	50%	38%
Chicken	50%	52%	49%	62%	50%	77%	48%	31%
Offals/*matumbo*	49%	49%	49%	43%	48%	88%	37%	41%
Liver	39%	38%	40%	19%	33%	81%	37%	36%
Gizzards	25%	26%	24%	-	21%	66%	26%	22%
Pork	19%	17%	21%	9%	13%	36%	25%	17%
Mutton	11%	11%	11%	2%	5%	33%	5%	15%
Other sea food	10%	11%	9%	-	3%	40%	2%	12%
Rabbit	3%	3%	3%	1%	1%	11%	2%	4%

Factors Influencing Consumer Choice for Type of Meat

It was observed that the main factor considered when consumers choose meat type for consumption was largely the quality of meat and the family members' preference (33% respectively) as shown below.

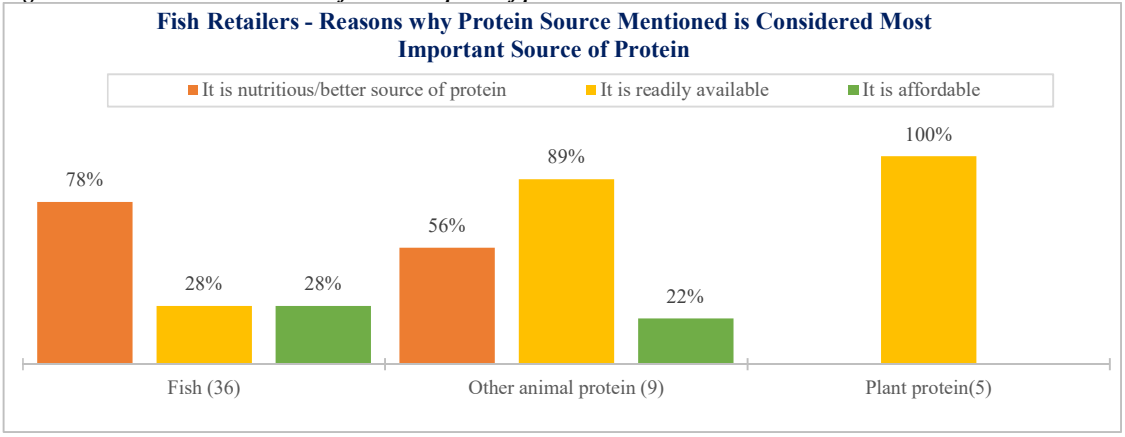
Figure 337: Factors consumers consider when choosing a meat type



On the other hand, all the fish farmers interviewed indicated that plant protein is the most important source of protein, largely because it was readily available and affordable.

Fish retailers on the other hand perceived that fish was the most important source of protein. They largely cited that the nutritional status of the source of protein, availability and affordability were the main drivers of the source of protein consumed as shown below.

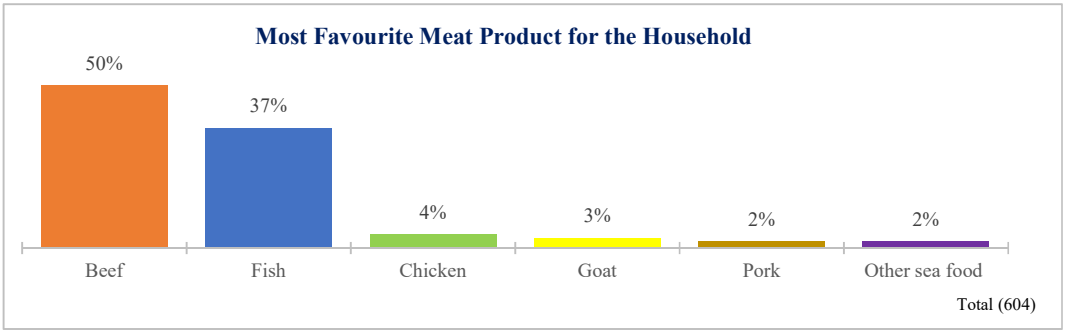
Figure 338: Fish retailers- Reasons for consumption of protein in household



Favourite Types of Meat for the Household

If was observed that half of the meat consumers in Rwanda considered beef as the most favourite meat in the household, followed closely by fish (37%) among other meat types as shown below.

Figure 339: Most favourite type of meat for household



Regional variations were however observed where for instance fish was more favoured in the Western and Southern Regions over beef. In addition, it was noted that fish was least favoured in the Eastern and Northern Regions as shown below.

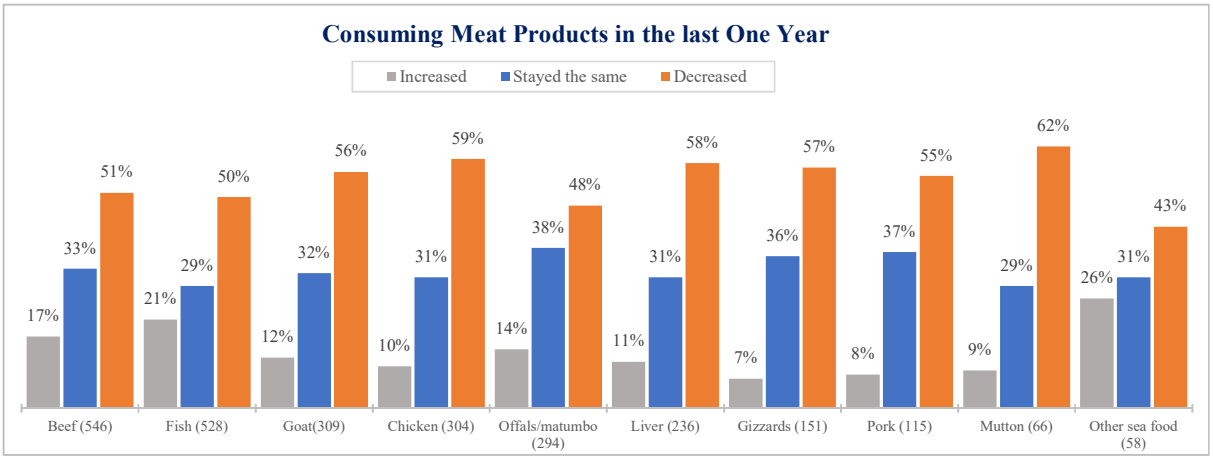
Table 157: Most favourite type of meat for household- Region

Most favourite types of meat for household								
	Total (604)	Urban (303)	Rural (301)	Eastern (100)	Kigali City (141)	Northern (83)	Southern (121)	Western (160)
Beef	50%	53%	47%	76%	55%	51%	37%	39%
Fish	37%	34%	40%	11%	35%	18%	52%	52%
Chicken	4%	5%	3%	4%	4%	10%	5%	1%
Goat	3%	3%	3%	4%	2%	6%	3%	1%
Pork	2%	1%	2%	1%	1%	-	2%	3%
Other sea food	2%	1%	3%	-	1%	11%	-	1%
Offals/*Matumbo*	1%	1%	1%	3%	1%	2%	-	-
Mutton	-	-	1%	-	-	-	-	2%
Rabbit	-	-	1%	1%	-	1%	-	1%

Fish Consumption Trends

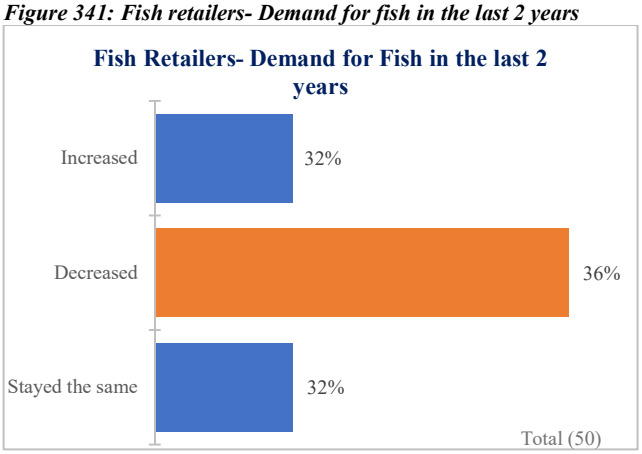
It was observed that consumption of meat in general had largely decreased in the last one year. Consumption of fish for instance was reported to have largely decreased by half of fish consumers as shown below.

Figure 340: Consumers- Meat consumption patterns in the last 1 year



Fish farmers (3 out of 5) agreed that the demand for fish had largely decreased in the last 2 years, and fish retailers largely held the same view as shown below.

Figure 341: Fish retailers- Demand for fish in the last 2 years



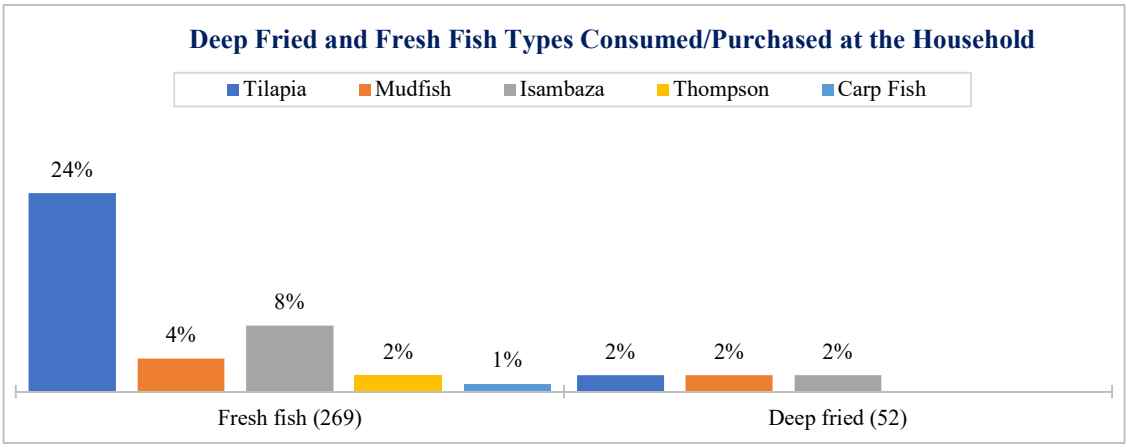
Fish Variety Purchased and Consumed at Home

Information from secondary sources indicate that 40 species are reported in Rwandan waters of which only four: *Limnothrissa Miodon* (locally called *Isambaza*), the Nile Tilapia (*Oreochromis Niloticus*), *Inkube* or the African Catfish (*Clarias gariepinus*), and *Haplochromis sp* are of economic importance. Other species in Rwanda water bodies include: *Indagala* (*Rastrineobolaargentea*), Common carp (*Cyprinuscarpio*), Mamba (*Protopterusaethiopicus*), Ningu (*Labeovictorianus*), *Schlibemystus, Nkolongo* (*Synodontissp*), *Lamprichthystanganicanus* Msiha (Swahili), Rwanda *Rushya*

(Kinyarwanda)". [37] Rwanda's Fish market demand consists of almost 90% of Tilapia, 5% of *Sambaza* and 5% of others like Catfish.[38]

From the primary research phase, it was observed that fish species commonly consumed included Tilapia, Mudfish, *Isambaza*, *Tompson*[39] and Carp. These were largely purchased for consumption in the fresh form or in the deep-fried form as shown below.

Figure 342: Consumers- Species of fish consumed



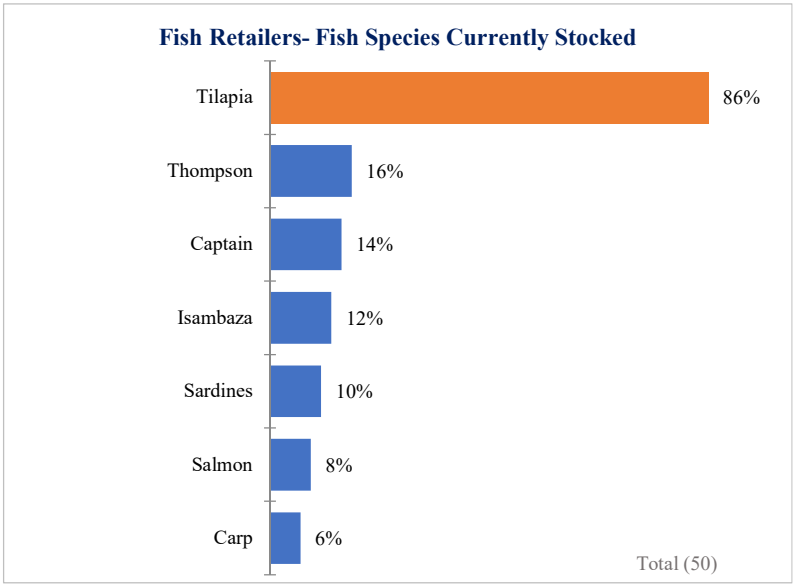
Further, a correlation was observed with fish farmers and fish retailers. All the farmers indicated that they stocked Tilapia exclusively while the fish retailers also mainly stocked Tilapia (86%) among other fish species as shown below.

[37] Master Plan for Fisheries and Fish Farming in Rwanda (2011 to 2020)

[38] http://www.rdb.rw/index.php?id=76&tx_kesearch_pi1%5Bsword%5D=fish&tx_kesearch_pi1%5Bpage%5D=1&tx_kesearch_pi1%5BresetFilters%5D=0&tx_kesearch_pi1%5BsortByField%5D=&tx_kesearch_pi1%5BsortByDir%5D=

[39] This is an imported fish variety whose scientific name is unknown

Figure 343: Fish farmers and retailers- Fish species stocked



Fish farmers cited availability of fingerlings and affordability as the main reasons they stocked the Tilapia.

Fish retailers on the other hand also largely cited availability, affordability and better returns as some of the reasons they stocked the various fish species as shown below.

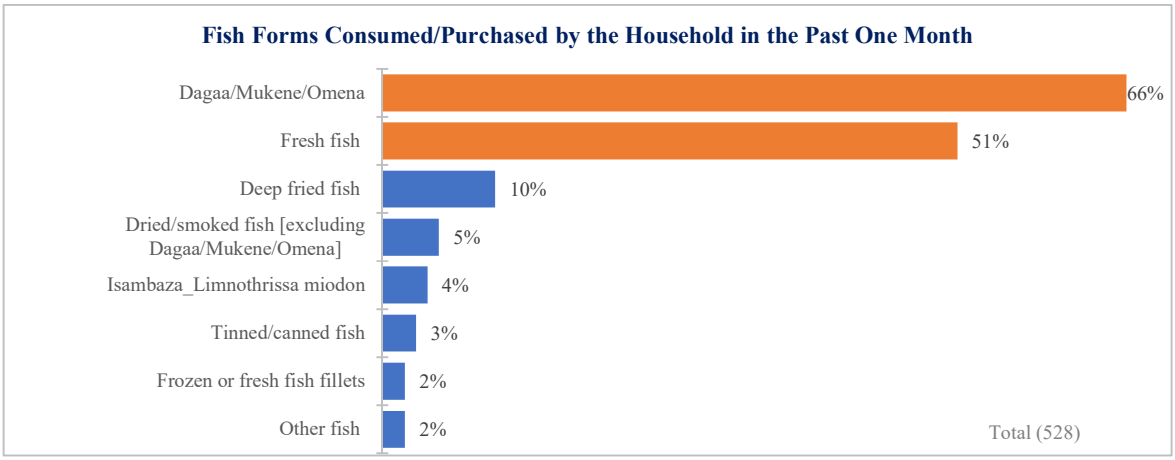
Table 158: Fish Retailers- Reasons for stocking species

Reasons for stocking												
	Tilapia (43)	*Tompson* (8)	*Capitaine/Sangara* (7)	*Isambaza* (6)	Sardines (5)	Salmon (4)	Carp (3)	Catfish (1)	Trout (1)	Nile Perch (1)	Mudfish (1)	Penaeid Shrimps (1)
Readily available	77%	-	14%	83%	40%	25%	33%	-	-	-	-	-
Affordable to purchase	37%	63%	29%	67%	40%	-		-	-	-	-	-
Provide better returns	49%	50%	86%	83%	40%	-	33%	-	-	-	-	-
Stay fresh longer	37%	75%	57%	17%		25%	33%	-	-	-	-	-
I trust the source	28%	38%	57%	50%	20%	25%	33%	100%	100%	100%	10-%	100%
Good quality	2%	-	-	-	-	-	-	-	-	-	-	-
Customers' preference	2%	-	-	-	-	-	-	-	-	-	-	-
Has no bones	-	-	-	-	-	25%	-	-	-	-	-	-

Form in Which Fish is Purchased

It was observed that fish consumers largely purchased and consumed *Dagaa/Mukene/Omena* (66%) and fresh fish (51%) among other fish forms as shown below.

Figure 344: Consumers- Fish forms purchased and consumed in the households



Regional variations were observed where for instance *Dagaa/Mukene/Omena* was largely consumed in the Southern and Northern regions while fresh fish was largely consumed in the Eastern and Western regions as shown below.

Table 159: Consumers- Fish forms consumed by households- Region

Fish types consumed/purchased by the household in the past one month								
	Total (528)	Urban (285)	Rural (243)	Eastern (82)	Kigali City (132)	Northern (80)	Southern (90)	Western (144)
Dagaa/Mukene/Omena	66%	65%	68%	49%	69%	86%	87%	50%
Fresh fish	51%	55%	47%	68%	49%	45%	28%	62%
Deep fried fish	10%	13%	6%	13%	13%	11%	4%	7%
Other fish types	6%	4%	8%	6%	2%	-	7%	10%
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	5%	6%	5%	2%	5%	5%	-	11%
Tinned/canned fish	3%	3%	2%	2%	1%	4%	8%	1%
Frozen or fresh fish fillets	2%	4%	1%	-	2%	4%	4%	2%

Some variations were observed by levels of household income where for instance household earning a monthly income of above USD. 1,000 consumed fresh fish only.

Table 160: Consumers- Fish forms consumed by households- Household income

Fish forms consumed/purchased by the household in the past one month								
	Total (528)	USD. 101 - 200 (157)	USD. 201 - 500 (71)	USD. 501 - 750 (11)	USD. 751 - 1,000 (4)	USD. 1001 – 1,500 (1)	Above USD. 1,500 (1)	Don't know/ refused to answer (2)
Dagaa/Mukene/Omena	66%	59%	80%	91%	75%	-	-	100%
Fresh fish	51%	59%	63%	73%	50%	100%	100%	100%
Deep fried fish	10%	11%	8%	9%	-	-	-	-
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	5%	5%	7%	9%	-	-	-	-
Tinned/canned fish	3%	5%	1%	-	-	-	-	-
Frozen or fresh fish fillets	2%	2%	7%	9%	-	-	-	-
Other fish	6%	4%	3%	-	-	-	-	-

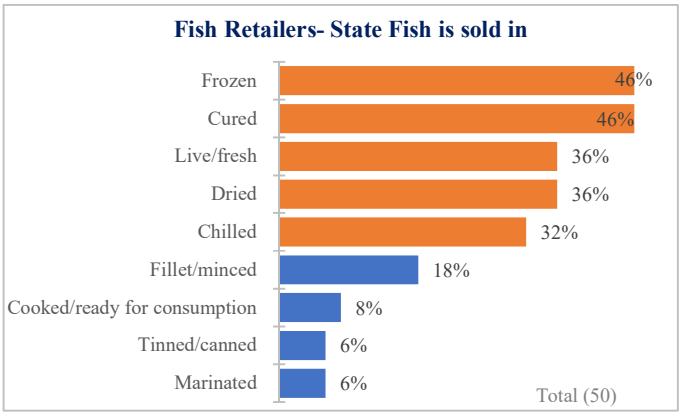
It was observed that consumers mainly preferred *Dagaa/Mukene/Omena* and dried/smoked fish because of their affordability and nutritional value. Fresh fish was largely preferred because of its nutritional value while deep-fried fish was mainly preferred because of its readiness to cook. Frozen fish and prawns/other sea foods on the other hand were largely preferred because of their affordability while tinned/canned fish was preferred because of its good taste and lack of bones as shown below.

Table 161: Consumers- Reasons for preferring fish form

Reasons for preferring type/form of fish								
	Dagaa/ Mukene/ Omena (493)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena*] (483)	Fresh fish (441)	Deep fried fish (257)	Frozen or fresh fish fillets (16)	Prawns/ other sea food (3)	Tinned/ canned fish (2)	Others (6)
Cost effective/affordable	38%	20%	8%	6%	44%	100%	-	17%
Nutritious	30%	23%	41%	11%	6%	-	-	17%
Readily available	12%	17%	13%	16%	6%	-	-	-
Can be prepare quickly	5%	7%	4%	7%	-	-	-	-
Ready for cooking	4%	11%	7%	33%	19%	-	-	17%
Taste preferences/good taste	4%	13%	15%	17%	19%	-	50%	-
Good for health	3%	4%	3%	2%	-	-	-	-
Good for young children	2%	1%	3%	-	-	-	-	-
Has no bones	1%	1%	1%	2%	-	-	50%	-
Goes well with other foods i.e. millet	1%	-	-	-	-	-	-	-
I was brought up eating/habitual	-	1%	1%	-	-	-	-	-
Preferred by family	-	-	-	-	6%	-	-	-

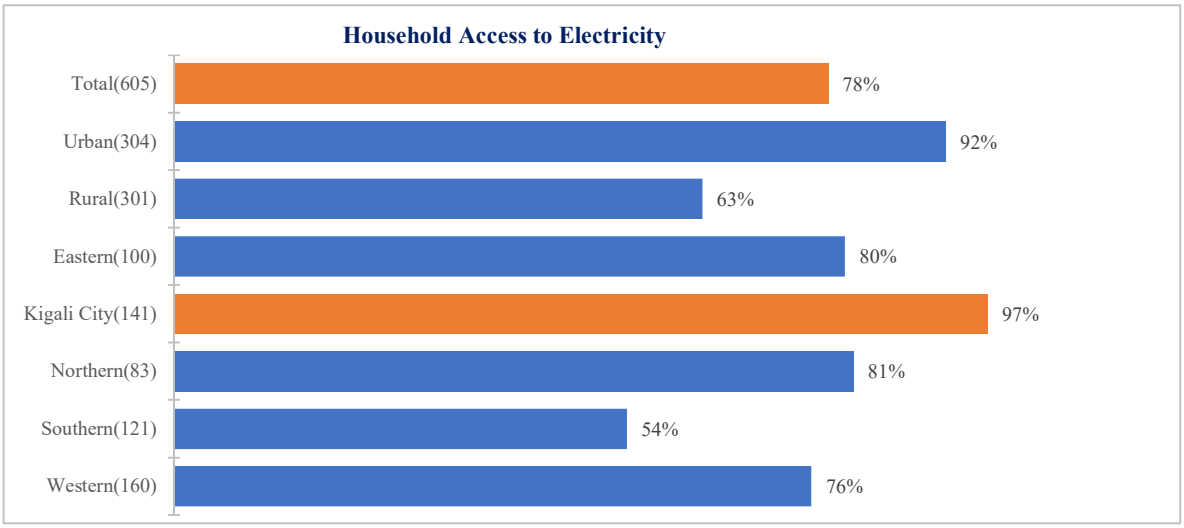
It was observed that all fish farmers sold fresh/live fish to their customers, while 2 farmers also sold chilled or dried fish. Fish retailers, on the other hand, mainly sold frozen, cured, live/fresh, dried or chilled fish to their customers as shown below. As will be seen in later sections, significant proportions of farmers (4 out of the 5 interviewed) and retailers (46%) do not own any storage equipment, and are therefore left with little choice of the states in which to present their products to their customers.

Figure 345: Fish retailers- State fish is sold in



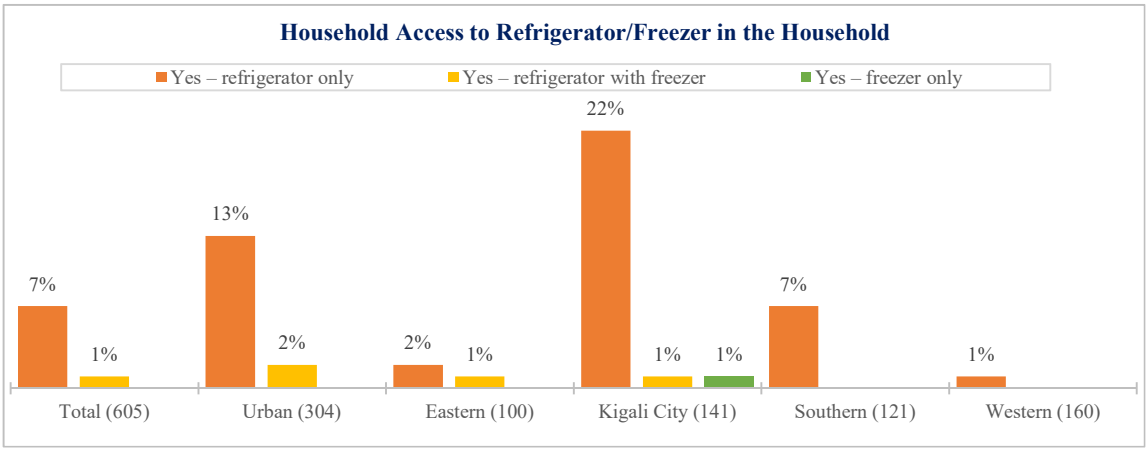
It was noted that a significant proportion of the consumers had access to electricity (78%), though, this was largely in the urban settings, more so in Kigali.

Figure 346: Consumers- Households' access to electricity



The access of electricity notwithstanding, only small proportions of households had access to storage equipment (8%) as shown below, with higher proportions being in Kigali City.

Figure 347: Households access to storage equipment



It was reported that households mainly consumed fish within the same day of purchase (63%) which further confirms that most of the households do not have access to storage equipment.

Figure 348: Methods of preserving fish

Methods used to preserve fish							
	Dagaa/ Mukene/ Omena (350)	Fresh fish (271)	Deep fried fish (51)	Dried/smoked fish [excluding *Dagaa/Mukene/ Omena* (29)	Other fish (33)	Frozen or fresh fish fillets (12)	Tinned/ canned fish (14)
No need to preserve/consume all in a day	63%	80%	86%	90%	12%	100%	93%
Drying	20%	3%	2%	14%	-	-	-
Keep in cupboard	7%	2%	-	-	12%	-	7%
Keep in a store	3%	-	-	-	62%	-	-
Keep in a cool dry place	2%	-	-	-	-	-	-
In a well-covered bucket	2%	-	-	-	-	-	-
Keep in refrigerator	1%	6%	4%	3%	-	8%	-
Smoking	1%	1%	4%	3%	-	-	-
Deep frying	1%	11%	4%	-	-	-	-
Uses wheat flour to dry the fish	1%	-	-	-	-	-	-
Put in a container/wrap and cover it	1%	-	-	-	12%	-	-

Amount of Fish Purchased on Average for Home Consumption

It was observed that on average, households purchase/consume 2.3kgs of fish in a month. Fish consumption was observed to be higher in urban setting than in rural setting as shown below.

Table 162: Amount of fish purchased by households in a month- Setting

How much fish does your household consume in a month on average? (kgs)			
	Total (528)	Urban (285)	Rural (243)
Average household consumption of fish in a month (kgs)	2.3	2.8	1.7

Variations in fish consumption patterns were observed across the regions, where, for instance, fish consumption was highest in the Western region (3.5kgs), and lowest in the Eastern region (1.3kgs) as shown below.

Table 163: Amount of fish purchased by households in a month- Region

How much fish does your household consume in a month on average? (kgs)						
	Total (528)	Eastern (82)	Kigali City (132)	Northern (80)	Southern (90)	Western (144)
Average household consumption of fish in a month (kgs)	2.3	1.3	2.3	1.7	1.7	3.5

Across different household income brackets, it was observed that the more affluent households tended to consume more fish in a month on average as shown below.

Table 164: Amount of fish purchased by households in month- Household income

How much fish does your household consume in a month on average? (kgs)									
	Total (528)	Below USD. 100 (281)	USD. 101 - 200 (157)	USD. 201 - 500 (71)	USD. 501 - 750 (11)	USD. 751 - 1,000 (4)	USD. 1001 - 1500 (1)	Above USD. 1,500 (1)	Don't know/refused to answer (2)
Average household consumption of fish in a month (kgs)	2.3	2.1	2.1	2.8	4.6	2.5	3.2	1.0	1.5

With regards to the purchase and consumption of different fish forms, it was observed that fish consumers in Rwanda tend to consume more of fresh fish (3kgs) in a month on average than other fish forms as shown below. Consumption of the various fish forms was also observed to be higher in the urban setting.

Table 165: Amount of fish purchased by household in a month- Setting

Over the past month, how much of …… was purchased by the household (kgs)?			
	Total (528)	Urban (285)	Rural (243)
Deep fried fish	1.8	1.8	1.8
Fresh fish	3.0	3.4	2.6
Frozen or fresh fish fillets	2.0	2.1	1.5
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	1.7	2.1	0.9
Dagaa/Mukene/Omena	1.4	1.4	1.3
Prawns/other sea food	1.0	-	1.0
Tinned/canned fish	1.4	1.6	1.2
Other fish	1.0	1.1	1.0

Regional variations were observed, where for instance, consumption of the various fish forms was generally higher in the Western Region than in other regions as shown below.

Table 166: Amount of fish purchased by household in a month- Region

Over the past month, how much of …… was purchased by the household (kgs)?						
	Total (528)	Eastern (82)	Kigali City (132)	Northern (80)	Southern (90)	Western (144)
Deep fried fish	1.8	1.7	1.7	1.6	1.2	2.6
Fresh fish	3.0	1.7	2.7	3.1	2.4	4.3
Frozen or fresh fish fillets	2.0	-	1.5	2.0	2.0	2.3
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	1.7	1.5	1.6	1.0	-	1.9
Dagaa/Mukene/Omena	1.4	1.1	1.3	0.9	1.3	1.9
Prawns/other sea food	1.0	-	-	-	-	1.0
Tinned/canned fish	1.4	1.5	1.0	1.3	1.6	1.0
Others	1.0	1.0	0.7	-	1.0	1.1

With regards to household income, it was observed that fish was consumed more by the less affluent households as shown below.

Table 167: Amount of fish purchased by household in a month- Household income

Over the past month, how much of …… was purchased by the household (kgs)?									
	Total (528)	Below USD. 100 (281)	USD. 101 - 200 (157)	USD. 201 - 500 (71)	USD. 501 - 750 (11)	USD. 751 - 1,000 (4)	USD. 1,001 – 1,500 (1)	Above USD. 1,500 (1)	Don't know/refused to answer (2)
Deep fried fish	1.8	1.3	2.8	1.2	3.0	-	-	-	-
Fresh fish	3.0	3.1	2.7	3.1	3.0	2.5	3.2	1.0	1.5
Frozen or fresh fish fillets	2.0	1.3	2.7	2.0	2.0	-	-	-	-
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	1.7	1.5	2.1	1.4	2.0	-	-	-	-
Dagaa/Mukene/Omena	1.4	1.2	1.5	1.7	1.8	2.0	-	-	0.5
Prawns/other sea food	1.0	1.0	-	-	-	-	-	-	-
Tinned/canned fish	1.4	2.0	1.1	1.0	-	-	-	-	-
Others	1.0	0.7	1.4	-	-	-	-	-	-

On average, households spend about Rwf. 7,412 (equivalent to about USD.9) a month on fish and fish products. It was also observed that urban areas spent more on fish and fish products more than in rural area. Variations were also noted across the different regions where the Eastern Region had the least spend on fish and fish products and a higher spend was observed in Kigali City and the Western Regions.

Table 168: Average household spend on fish and fish products in a month- Region

On average, how much does this household spend on fish and fish products in a month? (Rwf)								
	Total (605)	Urban (304)	Rural (301)	Eastern (100)	Kigali City (141)	Northern (83)	Southern (121)	Western (160)
Average spend	7,412	9,123	5,405	4,643	9,833	5,155	5,888	8,977

Some variations were observed across different household income categories, with the more affluent households tending to spend slightly more on fish and fish products as shown below.

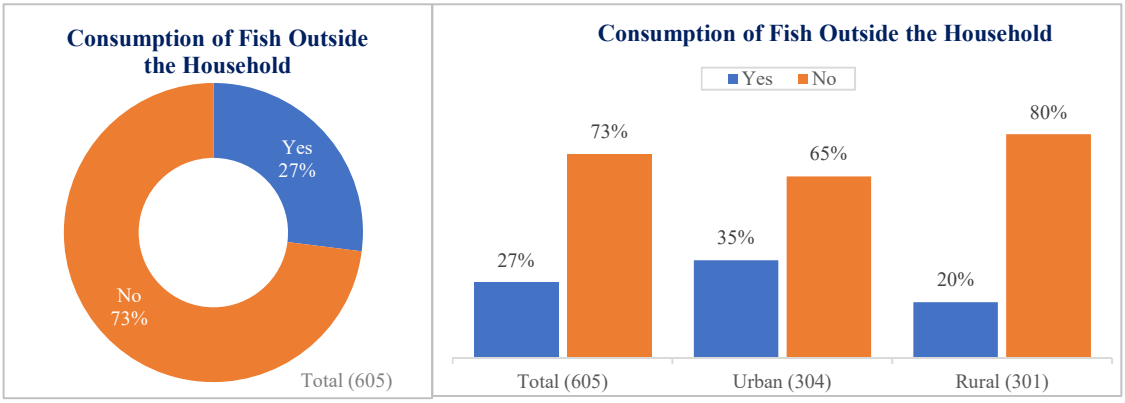
Table 169: Average household spend on fish and fish products in a month- Household income

On average, how much does this household spend on fish and fish products in a month? (Rwf)									
	Total (528)	Below USD. 100 (281)	USD. 101 - 200 (157)	USD. 201 - 500 (71)	USD. 501 - 750 (11)	USD. 751 - 1,000 (4)	USD. 1,001 – 1,500 (1)	Above USD. 1,500 (1)	Don't know/refused to answer (2)
Average spend	7,412	5,329	7,678	10,172	16,955	31,500	15,000	10,000	12,500

Fish Consumption Outside the Household

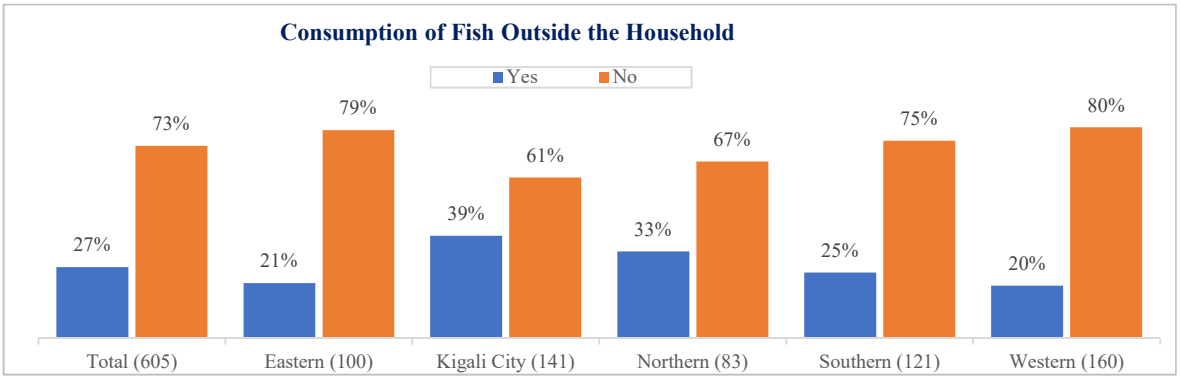
It was observed that almost 30% of the consumers consume fish outside the household. This trend was slightly higher in urban areas (35%) than in the rural areas (20%) as shown below.

Figure 349: Consumption of fish outside the home



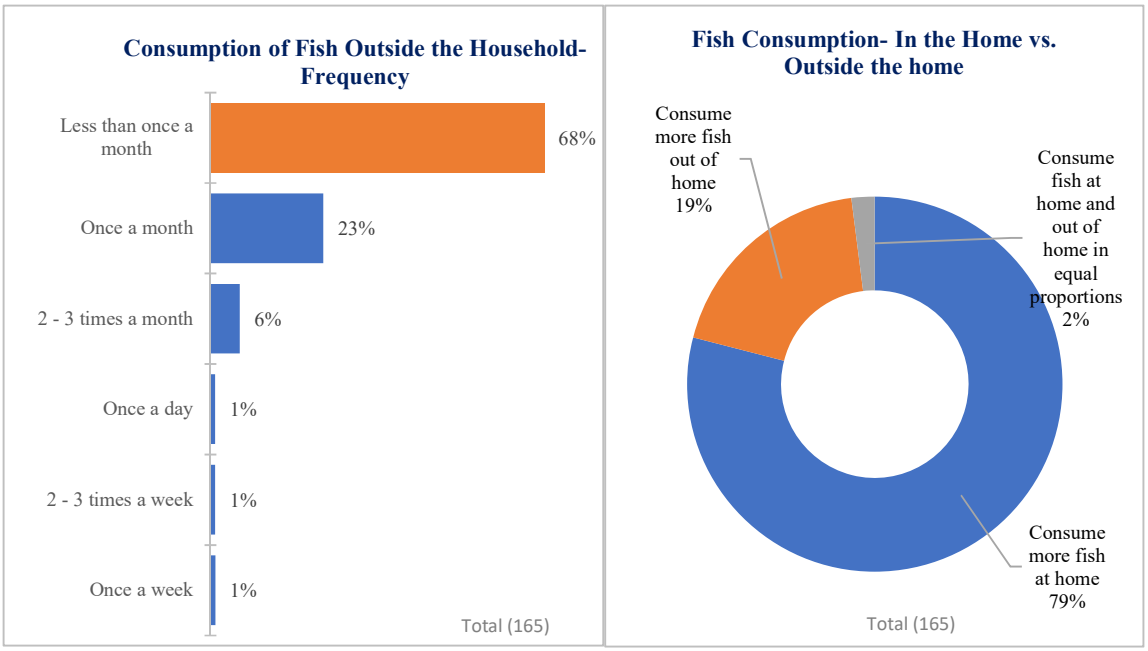
It was noted that households in Kigali City consumed more fish outside the household than other regions. The metropolitan nature of the region may explain the high consumption patterns of fish outside the home in Kigali City.

Figure 350: Consumption of fish outside the home- Region



It was observed that consumers largely consumed fish outside the home less than once a month (68%). Also, fish consumers tended to eat more fish at home than outside the home as shown below (79%).

Figure 351: Frequency of consumption of fish outside the home



Frequency of Fish Consumption

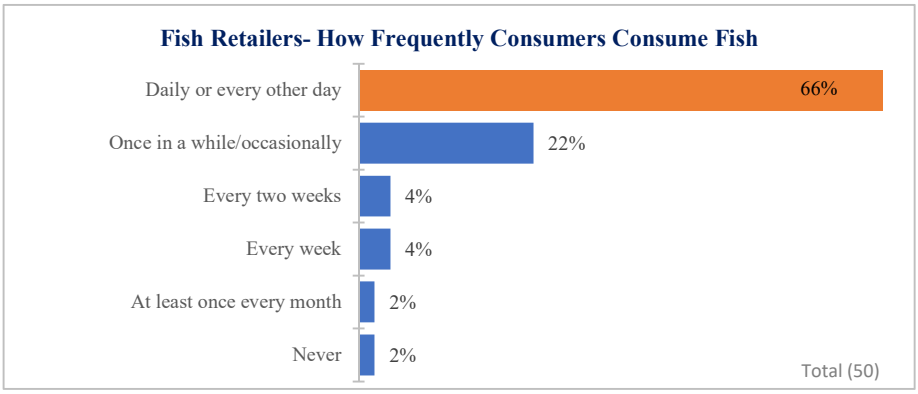
It was observed that households largely consumed the different types of fish purchased two to three times a week as shown below.

Table 170: Frequency of fish consumption in the household

Number of times fish is consumed at the household								
	Dagaa/ Mukene/ Omena (350)	Fresh fish (271)	Deep fried fish (51)	Dried/smoked fish [excluding *Dagaa /Mukene/Omena* (29)	Tinned/ canned fish (14)	Frozen or fresh fish fillets (12)	Prawns /other sea food (1)	Other fish (33)
More than once a day	1%	1%	2%	3%	-	-	-	-
Once a day	10%	1%	-	3%	-	-	-	3%
4 to 6 times a week	25%	2%	-	-	-	-	-	9%
2 to 3 times a week	33%	13%	16%	10%	-	8%	100%	45%
Once a week	7%	7%	8%	10%	21%	8%	-	6%
2 to 3 times a month	16%	21%	20%	31%	29%	33%	-	15%
Once a month	7%	40%	41%	24%	14%	25%	-	12%
Less than once a month	2%	15%	14%	17%	36%	25%	-	9%

All farmers interviewed on the other hand perceived that fish consumers only consumed fish occasionally or on special occasions. Most fish retailers, on the contrary, perceived that fish was consumed daily/every other day, most likely because of their sales patterns.

Figure 352: Retailers- Perception on frequency of fish consumption



The Preference for Wild vs. Farmed Fish

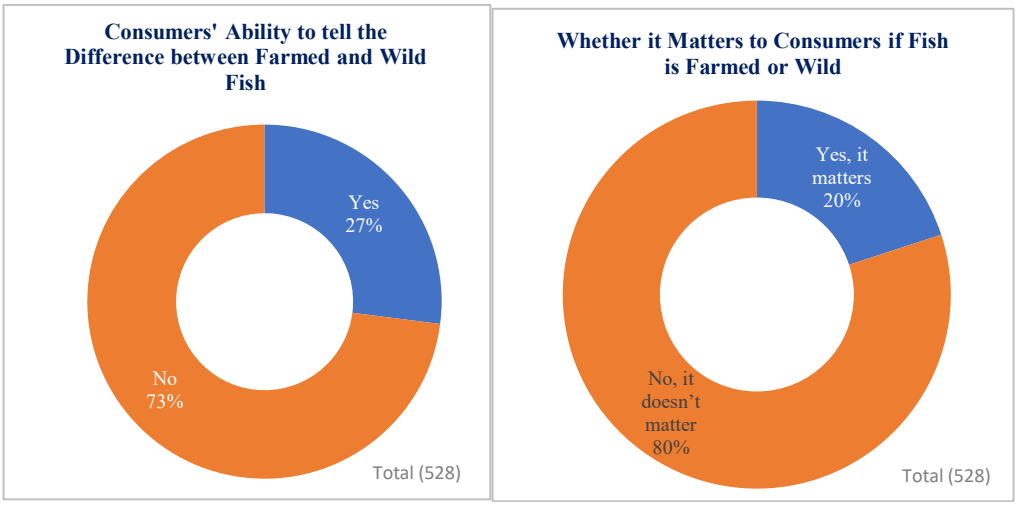
Consumers in Rwanda largely perceived that the fish they were purchasing and consuming was from local sources and was largely wild catch as shown below.

Table 171: Perceived source of fish consumed

Perceived source of fish purchased/ consumed at the household								
	Dagaa/ Mukene/ Omena (350)	Fresh fish (271)	Deep fried fish (51)	Dried/smoked fish [excluding *Dagaa/ Mukene/ Omena* (29)	Tinned /canned fish (14)	Frozen or fresh fish fillets (12)	Prawns/ other sea food (1)	Other fish (33)
Local – wild fish [from lakes, rivers, streams, the ocean]	59%	89%	84%	62%	14%	33%	100%	38%
Local – fish farms, fish cages and ponds	13%	14%	12%	10%	14%	33%	-	-
Imported – wild fish	37%	9%	12%	10%	93%	50%	100%	75%
Imported – fish farms, fish cages and ponds	16%	9%	12%	28%	57%	42%	-	38%

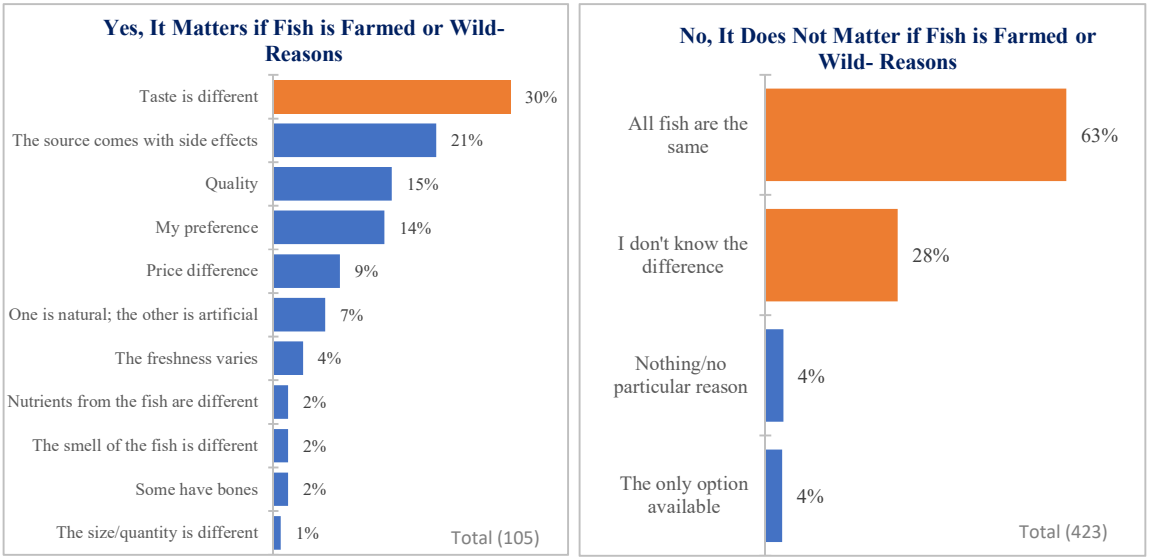
It was observed that only 27% of the consumers interviewed could tell the difference between wild fish and farmed fish. Nonetheless, to most of the consumers (80%) it did not matter whether the fish they were purchasing and consuming was wild fish or farmed fish as shown below.

Figure 353: Consumers ability to differentiate between wild and farmed species



Consumers who indicated that it mattered to them whether fish was farmed or wild, largely cited that taste was different (30%) between the two varieties among other reasons as shown below. For those that noted that it didn't matter, it was largely indicated that this was because all fish were the same (63%) while a significant proportion could not differentiate between the two fish varieties (28%) as shown below.

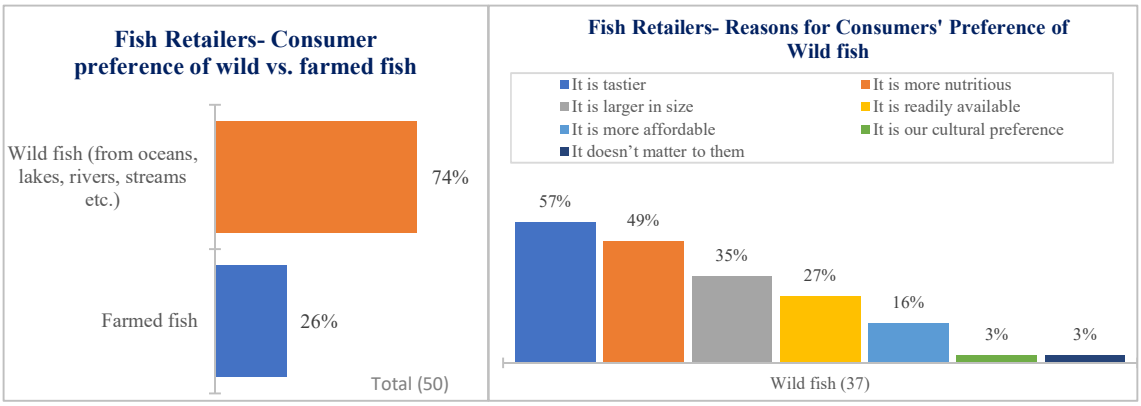
Figure 354: Consumers' perspective on wild vs. farmed fish



On the contrary, most fish farmers (4 out of 5) perceived that consumers largely preferred farmed fish because of its affordability and availability.

Fish retailers, on the other hand, percived that wild fish was mainly preferred by consumers largely because it was tastier, more nutritious and larger in size, among other reasons as shown below.

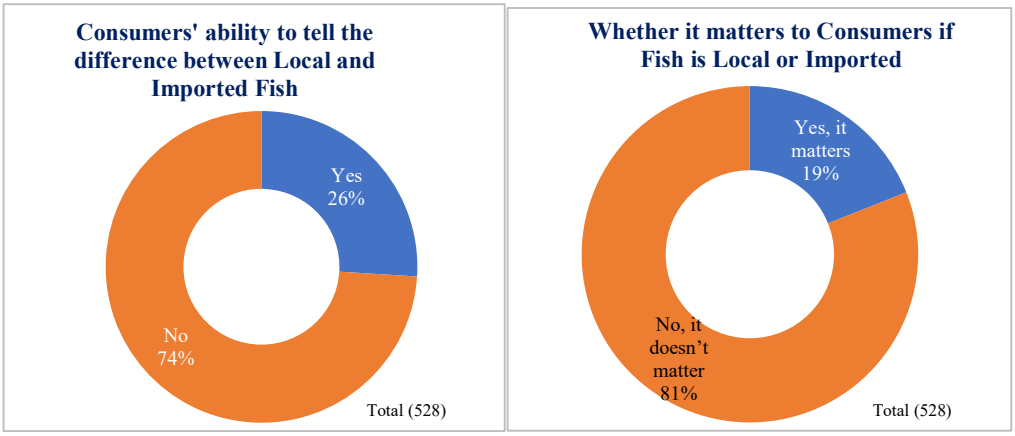
Figure 355: Fish retailers' perspective of consumer preferences- wild vs. farmed fish



The Preference for Local vs. Imported Fish

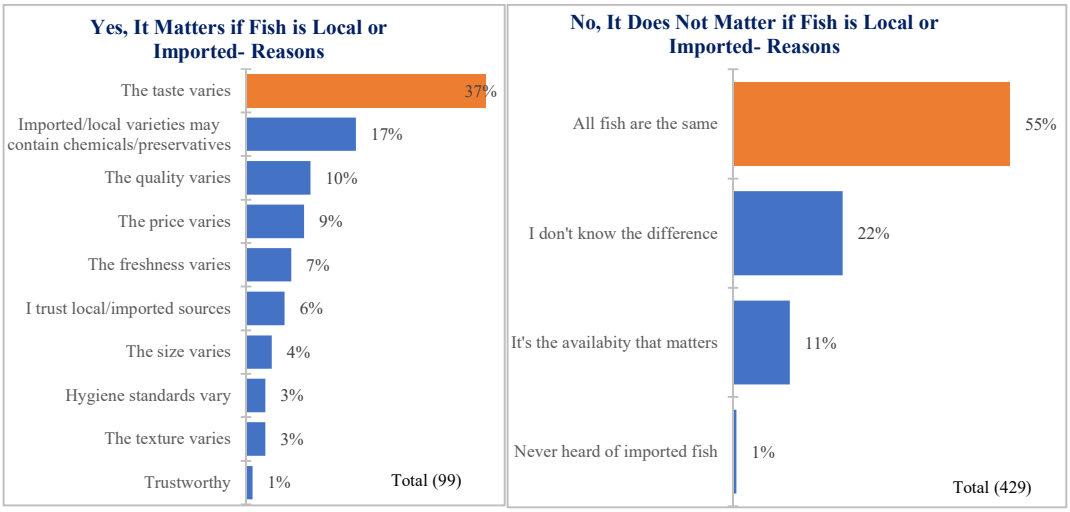
It was observed that most consumers (74%) are not able to tell the difference between local and imported fish varieties. Furthermore, it largely does not matter to consumers whether fish is from local sources or imported sources (81%) as shown below.

Figure 356: Ability of consumers to tell the difference between local and imported fish



For those to whom it mattered whether fish was from local or imported sources, they largely cited that the taste varies (37%) among other reasons as shown below. For consumers to whom the source of the fish did not matter, more than half (55%) cited that all fish are the same among other reasons as shown below.

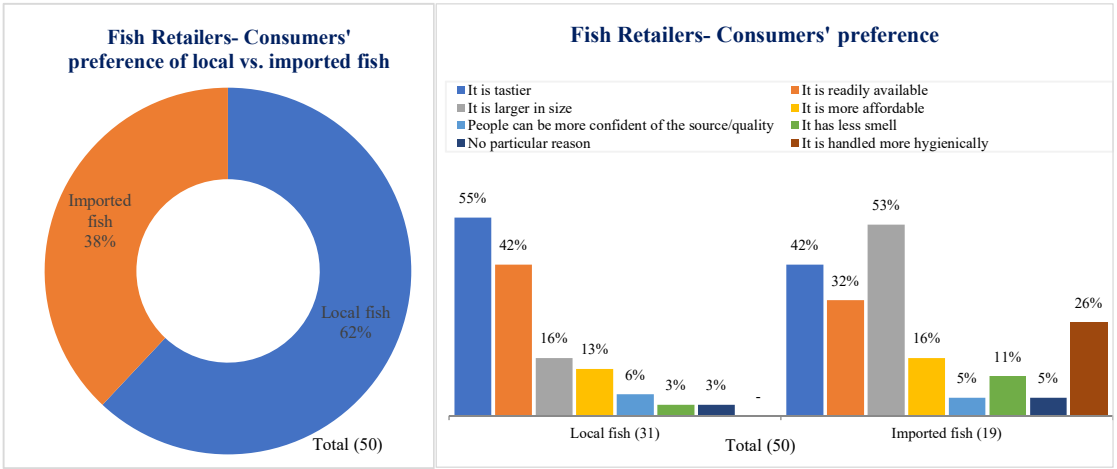
Figure 357: Consumers' perspective on local vs. imported fish



Similarly, fish farmers largely perceived that consumers mainly prefer local fish (3 out of 5 farmers) and because it is readily available, affordable and larger in size. Two farmers, however, perceived that consumers prefer imported fish because it is available and tastier than local fish.

Fish retailers interviewed, on the other hand, perceived that consumers mainly prefer local fish (62%), largely because it is tastier and readily available among other reasons as shown below.

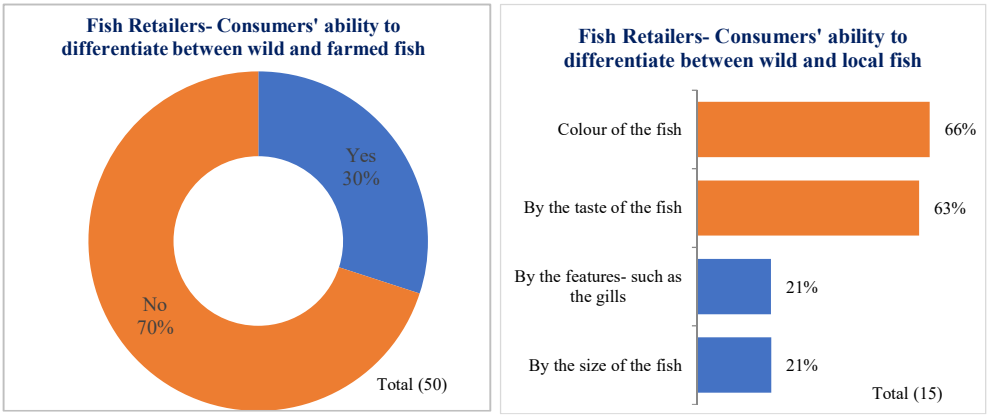
Figure 358: Fish retailers' perspective of consumer preferences- Local vs. imported



Fish Tasting Exercise

As indicated in the previous sections, consumers are largely not able to tell the difference between wild and farmed fish, or between local and imported fish. From the retailers' perspective, consumers are generally not able to tell the difference. A small proportion of retailers (30%), however, perceived that consumers can differentiate the fish varieties, largely by the colour and taste of the fish among other ways as shown below.

Figure 359: Fish retailers' perspective of consumers ability to differentiate between wild and farmed fish



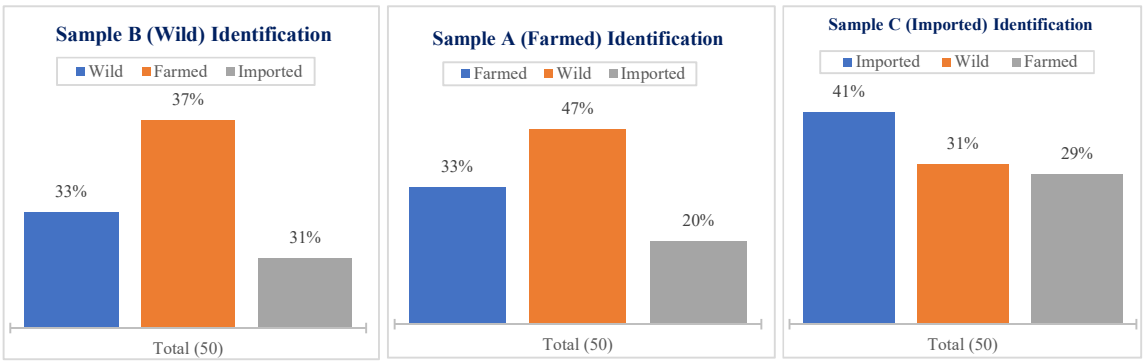
To ascertain this, a fish tasting exercise was carried out with a sample of consumers of fish in Kigali (50) where consumers were invited to taste three samples of fish varieties, one of which was wild, the other farmed and the other an imported variety. All fish was of the same species (Tilapia) and was prepared in a standardized way (deep-fried). Feedack from the consumers was then sought on their perceptions of the fish after tasting each sample.

All the consumers participating in the tasting exercise indicated that there were differences in the samples of fish tasted. This could be attributed to the fact that consumers were keen about the fish tasting exercise and therefore looked out for differences in the fish samples.

Further, 33% of the consumers correctly identified the wild fish, while a significant proportion (37%) mistook it for farmed fish. Consequently, 33% of consumers correctly identified the farmed fish variety and a significant proportion (47%) mistook it for wild

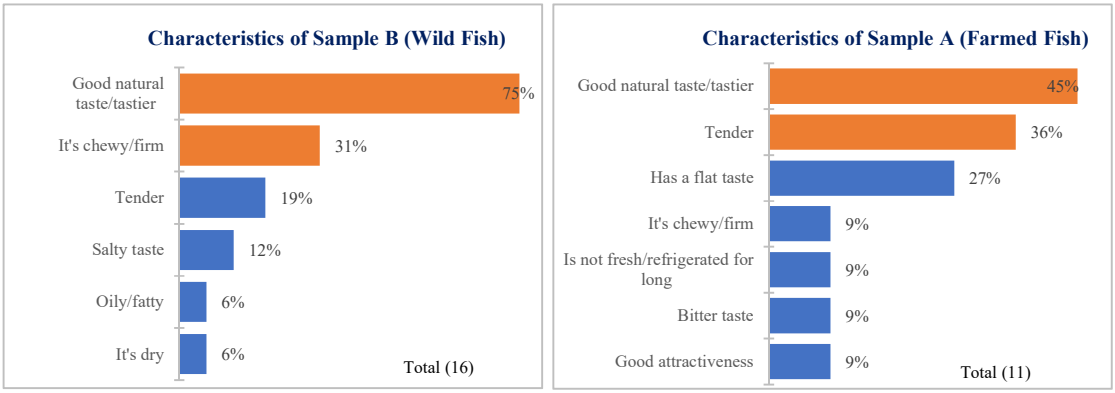
fish. Additionally, 41% correctly identified the imported fish while smaller portion (31%) mistook it for wild fish as shown below.

Figure 360: Fish tasting exercise results



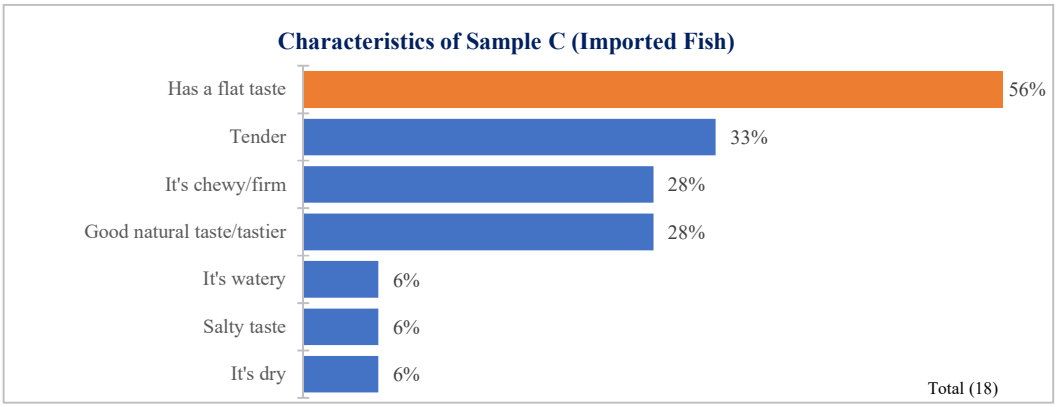
Consequently, most consumers largely described the characteristics of wild and farmed fish the same way, by noting that both fish types have good natural taste. A significant portion of consumers reported that wild fish was more chewy/firm (31%) while the farmed fish was more tender (36%) among other characterics as shown below.

Figure 361: Characteristics of wild and farmed fish



Consumers that correctly identified imported fish largely indicated that this fish variety had a flat taste as shown below.

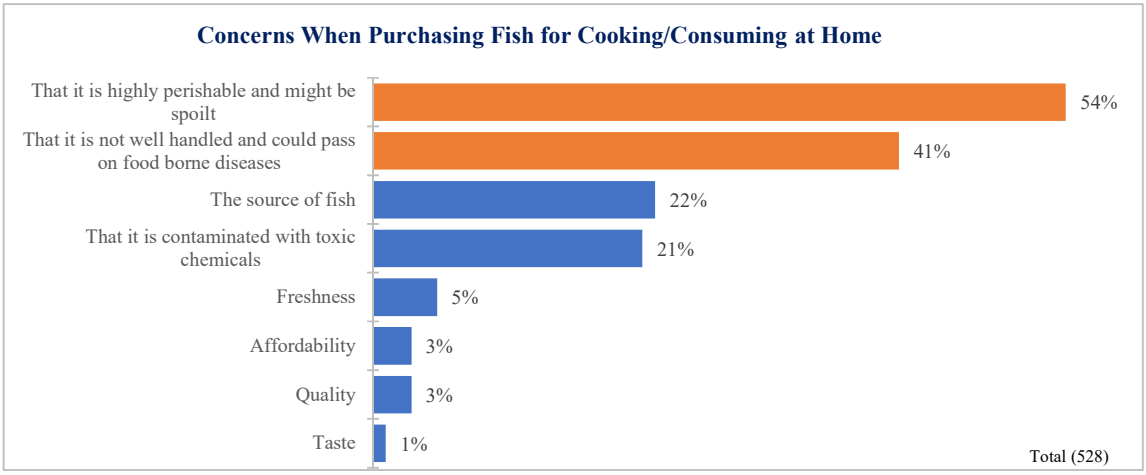
Figure 362: Characteristics of imported fish



Consumer Concerns and Perceptions

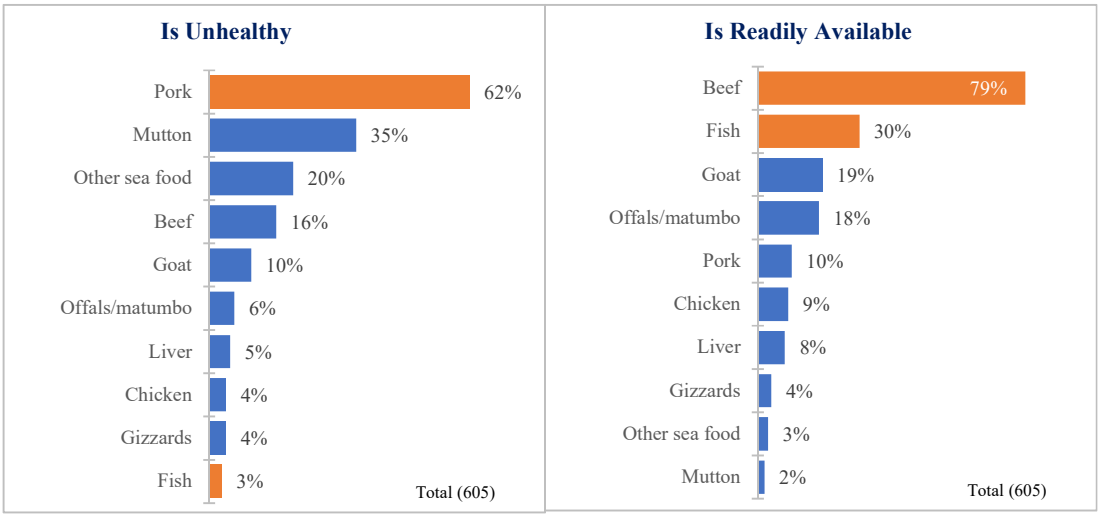
More than half of fish consumers (54%) were generally concerned that fish purchased for consumption at home would get spoilt as it is a perishable commodity. As cited in previous sections of this report, significant proportions of households have no access to electricity and subsequently, few have access to storage equipment (8%). Additionally, there was a concern about the handling of the commodity among 41% of consumers, which is an area that future programming can consider supporting on the fish supply side.

Figure 363: Concerns consumers have when purchasing fish for cooking/consuming at home



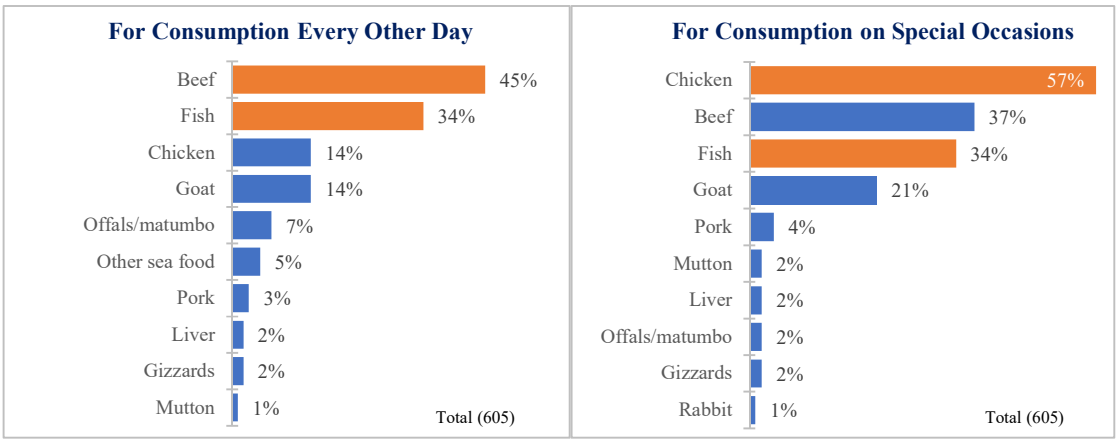
Further, the study explored consumers' perceptions around various attributes on meat and meat products. It was observed for instance that pork was largely considered to be unhealthy (62%). Only a small proportion (3%) considered fish to be unhealthy (the least unhealthy type of meat). Beef (79%) and fish (30%) were types of meat considered to be readily available as shown below.

Figure 364: Type of meat considered to be unhealthy and meat considered to be available



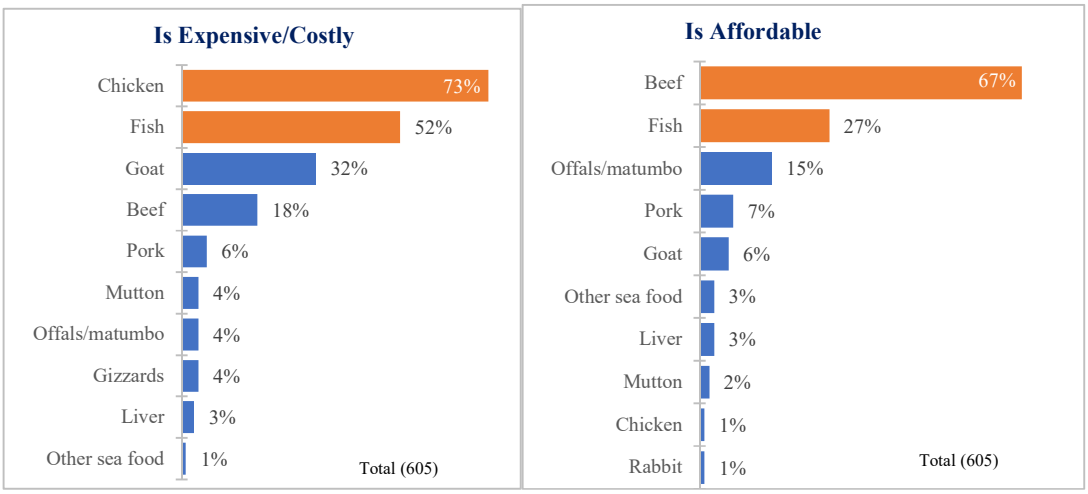
Further, beef and fish (45% and 34% respectively) were largely considered as types of meats for consumption every other day while chicken was considered as a type of meat for consumption on special occasions. Fish was considered by a significant proportion (34%) as being a type of meat for consumption on special occasions.

Figure 365: Type of meat for consumption every other day and on special occasions



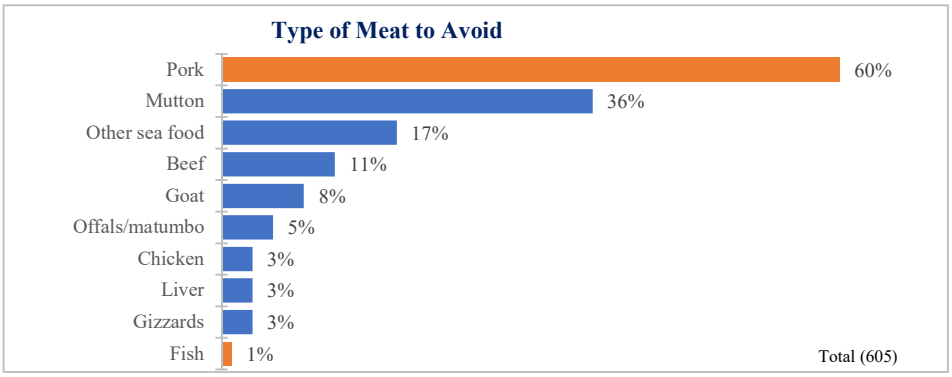
Additionally, chicken was considered to be expensive by most of the meat consumers (73%), while more than half of the consumers (52%) also considered fish to be expensive. Beef on the other hand was considered to be largely affordable, while only a small proportion (27%) considered fish affordable.

Figure 366: Type of meat considered to be costly and type considered to be affordable



Lastly, pork was considered as a type of meat to avoid by more than a half (60%) of the meat consumers as shown. Only 1% of the meat consumers considered fish as a type of meat to avoid.

Figure 367: Type of meat to avoid



A longer list of attributes was explored, and it was observed that fish consumption could be driven up easily if pricing and availability could be looked into. Fish consumers generally perceive fish as an expensive product which is not readily available, and would be willing to consume more if these two aspects were reviewed, as fish is also generally perceived as a healthier source of protein. Further, packaging fish as a product that is easy to prepare at home, and as a product that is nutritious and convenient for young children could also drive up demand.

Figure 368: Perceptions around various attributes about fish

Perceptions on various attributes (Total 528)	Agree	Neither Agree nor Disagree	Disagree	Average Differences
I would be willing to consume more fish products if the price went down	89%	9%	1%	88%
I would be willing to consume more fish products if it was available near me	88%	10%	2%	86%
Fish is nutritious for young children	88%	9%	3%	85%
Fish is a healthier source of protein than other sources	86%	10%	4%	82%
I feel comfortable buying and preparing fish at home	85%	11%	4%	81%
Fish fillet is mainly consumed by children	82%	14%	3%	79%
Generally, fish is too expensive	83%	11%	6%	77%
Wild fish is more "natural"	75%	18%	7%	68%
Fish is quick and easy to prepare	76%	13%	11%	65%
It is easy to judge the freshness of fish and other sea food	64%	23%	13%	51%
Wild fish is safer/free from chemicals or artificial boosters than farmed fish	62%	25%	13%	49%
Local fish is of higher quality than imported fish	59%	27%	14%	45%
Imported fish is larger in size than local fish	58%	27%	14%	44%
People in this location traditionally eat fish	59%	25%	17%	42%
Frozen fish is tasteless	56%	26%	17%	39%
Everyone should eat fish once a week	58%	18%	24%	34%
Farmed fish is larger in size than wild fish	52%	26%	22%	30%
Farmed fish is fragile/breaks apart when being cut and fried	46%	33%	20%	26%
Wild fish is more expensive than farmed fish	45%	30%	25%	20%
Farm raised fish is of the same quality as wild fish from the rivers, lakes and the sea.	40%	33%	27%	13%
In rural areas, fish is never consumed	46%	20%	33%	13%
Farmed fish spoils quickly even when frozen, it turns green	36%	38%	26%	10%
Farmed fish is tastier than wild fish	34%	27%	39%	-5%
Fish sold in the supermarkets is not good quality fish	29%	35%	37%	-8%
Fish sold in this area is not handled hygienically	35%	22%	43%	-8%
Fish from China is more affordable than fish from other sources	20%	50%	29%	-9%
Fish from China is tastier than fish from other sources	16%	50%	34%	-18%

Subsequently, there is a need to drive positive perceptions about farmed fish to encourage the growth of this sector. Similarly, considering the multiple channels used for the distribution of fish to the end consumers, there is a need to address the perception that fish sold in supermarkets is of low quality. Lastly, since Chinese fish is being considered an alternative source to meet the demand of fish in Rwanda, there is a need to address negative perception about it, especially around pricing and taste.

3.4.3 Fish Production, Processing and Route to Market

This section provides insights on the supply side of the fish industry, specifically from fish farmers, fish retailers, storage and transportation businesses as well as an overview of the market organization through cooperatives and associations.

A. Fish Farming Trends

Fish farming in Rwanda is still undeveloped. Yields of edible fish from rural ponds in Rwanda have been so disappointing that farmers are reluctant to invest labour and time in this form of cultivation. Many ponds have been abandoned or not harvested regularly for a very long time. Nevertheless, there is keen interest among the rural population in the possibility of producing more food by fish farming.[40] The primary research phase sought to understand this sector by speaking to 5 owners/key decision makers of fish farmers and insights gleaned from them are presented below.

Fish Species Farmed

It was observed that all fish farmers interviewed were rearing Tilapia, mainly because the fingerlings were readily available and were affordable to purchase.

Sources of Fingerlings

Fish farmers indicated that they largely purchased the fingerlings they stocked from local sources (reported by 4 out of the 5 interviewed farmers), while one farmer indicated that they largely imported the fingerlings. Those who purchased from local sources indicated that they largely did so because it was affordable, the species provided better returns and due to demand in the market. The farmer who mainly imported the fingerlings indicated that these were largely affordable from imported sources.

Number of Fingerlings Purchased and Amount of Fish Harvested

It was observed that farmers largely purchased an average of 21,800 fingerlings of Tilapia per batch/lot for fish farming. Further, from each batch/lot, it was noted that farmers largely harvested about 1,300kgs of Tilapia. From each harvest in a batch/lot, farmers indicated that they largely sold an average of 1,284kgs of mature fish.

[40] http://www.fao.org/docrep/006/P3718E/P3718E02.htm

Average Cost of Production

The average cost of production for rearing Tilapia was about Rwf. 85,200 (equivalent to about USD.102) and the main factors driving costs included the cost of fingerlings, disease management, quality of feeds and the cost of maintaining a consistent water supply.

Challenges and Bottlenecks that Farmers Face

It was observed that fish farmers are facing several challenges in running their businesses. Most farmers cited the shortage of quality feeds, shortage of fertilizer, high cost of fish inputs, low prices of selling fish, and lack of equipment for fish farming. Other challenges mentioned included shortage of fingerlings, low demand for fish products/unstable markets, lack of knowledge and experience in fish farming, lack of affordable credit to invest in the businesses, lack of hatcheries for fish production, and lack of electricity and security in the farms among others. Additionally, as noted in sections above, most of the farmers (4 out of 5) did not own any fish storage equipment. Only one farmer had access to a refrigerator and a freezer.

Further, as noted above, one of the challenges faced by farmers is shortage of fingerlings for fish farming. The study explored this issue further, and observed that some of the hurdles faced by farmers in the access of fingerlings included long distances, delays in receiving fingerlings, shortages/unavailability of the fingerlings, high prices and mishandling of the fingerlings, which resulted in some dying. Additionally, one of the farmers indicated that the farm sometimes experienced losses, largely due to animal predators, human poaching and unexpected drying/flooding of the pond/farm.

Additionally, farmers indicated that some of the most difficult services to access included sourcing of fingerlings, accessing quality feeds, qualified labour, consistent water supply and extension/veterinary services for disease management.

One of the farmers also indicated that the entry of Chinese fish in the Rwandan market had mainly increased the presence of poor quality fish in the market, and had also lowered the prices of fish. Most of the farmers (4 out of 5), however, did not know what

impact the Chinese fish had brought about in the market, which depicted knowledge gaps among this group on industry developments likely to affect them.

In terms of improving businesses, it was noted that farmers had engaged in several activities in the past year, some of which included improving hygiene in ponds, fencing the ponds, improving the water circulation system in the ponds, and performing general maintenance in the ponds. A few of them had also sourced for more fish feeds, built a shed over their ponds to improve security, and installed electricity in the ponds among other initiatives. Two out of the five farmers, however, indicated that they had not engaged in any activity to improve their businesses.

Future Fish Farming Opportunities

Despite the challenges faced in the industry, all the farmers are optimistic that the demand for fish is likely to increase largely because it's affordable and readily available. Additionally, there is optimism by all farmers that the production of fish is also expected to increase mainly because of high demand for fish, digging of more fish ponds, increased support towards fish farming and increased knowledge of handling fish farming.

Fish farmers advised that to succeed in fish farming, several factors needed to be considered. These included availability of quality fingerlings and feeds for the fish, consistent water supply in the farmers, having enough capital for the businesses, and committing to the businesses, among other considerations. These are some of the areas that can be considered in future programming to support the growth of fish farming in Rwanda.

Since availability of water is a critical factor in fish farming, the study sought to find out whether participating farmers had challenges with access to water. It was observed that all farmers were accessing their water for fish farming from a spring and they had constant supply. Since relying on natural water bodies for fish farming may not be sustainable, the government could explore other ways of accessing water for fish farming that are environmentally friendly, to encourage more people to take up the venture.

With regards to the future, all farmers indicated that they would construct new ponds and increase the variety of fish reared. Some of the farmers also indicated that they would begin fish processing, making of their own feeds, and improve on sales related services to boost their sales. Farmers planned to engage in these business expansions through largely seeking for alternative sources of quality feeds, seeking for expert advice on fish farming, seeking training opportunities to boost knowledge and skills and seeking alternative marketing options for products.

Training on latest technologies of fish production, fish disease management, fish larvae rearing and forecasting consumption and demand for fish products were cited as some of the key training needs that would facilitate fish farmers' business growth, as noted by all farmers. Other training areas noted included information on sources of affordable credit, pricing of fish for sale and general marketing techniques, quality requirements needed for fish, quantities and species of fish needed for production, governing policies in the fishing sector, taxation issues, and information about competition among others.

To grow the fish farming industry in the country, farmers largely recommended ensuring the availability of fish feeds, information sharing on areas of interest (such as through training), setting up of programs to support fish farmers, provision of fingerlings and supply of high yielding breeds for fish farming, and ensuring access of veterinary services and medicines to manage fish diseases among others.

B. Fish Processing

This study targeted 5 fish processing factories in Rwanda to gain insights in this level of the value chain. Presented in this section are insights that were gleaned from them.

Species Processed

All the 5 processors interviewed in this study indicated that they were mainly processing Tilapia, which was largely sourced from fishermen, cooperatives and fish importers. One of the fish processors indicated that the processed fish was mainly wild catch but the other 4 processors could not tell whether the fish processed was wild catch or farmed fish. Additionally, only one of the processors could tell that the fish they processed was mainly imported; the others could not tell.

Processors indicated that they largely preferred processing Tilapia because of its availability, affordability, high demand in the market, its ability to stay fresh for longer, and because it provided better returns. Additionally, it was observed that fish processors received fish for processing in its fresh form or in the chilled form, and largely processed it into fillets/special cuts, smoked, dried, salted or frozen fish for sale.

Amount Processed and Sold

Processors produced an average of 264kgs of Tilapia fish per month as shown below.

Table 172: Processors- Amount of fish processed/produced per month

Amount of fish processed/produced (kgs) per month	
Tilapia (5)	
Average production (kgs)	264
Minimum production	100
Maximum production	450

Fish processors indicated that the amount of fish they processed had either increased in the last 2 years, mainly because of increased customers.

It was noted that on average, processors sold 210.5kgs of processed Tilapia in a month, and that processors mainly sold their products to individual consumers, small scale fish traders and wholesale fish traders. Additionally, processors indicated that they largely relied on advertising and moderating their pricing to make their products attractive in the market. Further, buyers largely picked the fish products at the processors' premises.

Processors perceived that they largely had more than 50 competitors in the market. None of the processors could also approximate the sales volumes of their competition. It was also observed that there were areas that processors were collaborating on in the market, largely in lending business materials to each other and referring customers to one another.

Further, all processors indicated that they maintained a database of suppliers, distributors and customers that was regularly updated. They acknowledged that this was important in the management of their businesses. The telephone was mainly used to communicate with these groups of stakeholders.

Fish Supply

It was observed that most fish processors had between 1 and 6 suppliers. Most processors had an average of 3 fish suppliers. Further, it was noted that processors used various criteria to select fish suppliers, some of which included the pricing of fish (with the lowest bid being considered), the size and quality of fish, the accessibility and reliability of the supplier, hygiene standards practiced by the supplier and possession of quality certification by the supplier.

With regards to fish supply, it was noted that supply was mainly highest in the month of April and lowest in the months of August and December. It was observed that government bans and seasonal issues were the main reasons for the low fish supply. During such moments when fish supplies were low, processors tended to reduce production capacity and reduced the number of staff working in the processing factories.

Fish Handling by the Processors

Fish processors indicated that they largely determined the quality of fish for processing by checking the weight and size of the fish, as well as considering customer preferences. Further, the fish processors indicated that they did not experience any fish spoilage in their business and that waste from the processing, which included fish scales, maws and fish thorns, was largely disposed with other waste.

Fish Storage Status

It was observed that all participating processors had access to electricity. Further, all processors owned a refrigerator while two of the processors also owned freezers and refrigerated showcases. With regards to storage capacity, it was observed that the maximum storage capacity in a day for the processors was 44kgs, while the optimum storage capacity in a day was 40kgs. This implied that processors were overutilizing their storage capacity. All processors however indicated that they had plans of boosting their storage capacity in the future. This boost was projected to increase their sales by 80%. Lack of capital, lack of space to house expansions, and lack of knowledge were reported as the main limiting factors towards making investments to boost storage capacity.

Processors indicated that they would look for accessible credit to finance their investment plans, as well as look for space for the expansion plans.

Challenges and Bottlenecks that Fish Processors Face

For fish processors, the most pressing challenges faced in the industry included low fish supplies/unavailability of fish stocks to meet demand, poor handling of fish stocks from the sources, high prices of fish supplies, stiff industry regulations, stiff competition, and poor infrastructure which was affecting transportation of products, among others. Fish processors indicated that they were currently dealing with the challenges faced in the businesses by reducing prices (to overcome competition), engaging in marketing activities, and improving on customer service.

Further, processors felt that the presence of imported fish in the market mainly compromised the quality of fish in the market, and reduced the demand for local fish varieties. Most (3 out of 5 processors) felt that there was the need to regulate fish importation in Rwanda.

Available Opportunities for Fish Processing

Fish processors felt that demand for fish had largely increased in the last 2 years because of an increase in the number of customers. One processor, however, felt that the demand for fish had largely decreased due to an increase in taxes, which affected the pricing of products. Most Processors (4 out of 5) were, however, optimistic that the demand for fish would increase in the next 2 years mainly because of the increased number of customers/demand.

To support growth of their business, processors had largely engaged in financial management training to help in the running of their business, and had also engaged in the formation of a party of labourers to improve the access of skilled labour in the market in the past 2 years. With regards to the future, processors desired to learn more about the latest technologies in fish processing, forecasting consumption and demand for fish products, accessibility of affordable credit, taxation issues, pricing and marketing strategies and quality requirements needed for fish in the industry among other areas. Processors noted that these training areas would largely make them work effectively in

their businesses. In the next 2 years, processors noted that they planned to increase their storage and production capacities as well as invest in more processing equipment.

C. Fish Storage and Transportation

This subsection looks at the fish storage and transportation operations, challenges and recommendations made by the players. In Rwanda, 2 storage and transportation companies were interviewed. Presented below is the qualitative feedback gleaned from them.

Business Operations

It was observed that the storage and transportation companies interviewed largely imported wild catch fish for handling, while one of the companies also imported farmed fish. This company however noted that the farmed fish was largely not preferred by customers because it was smaller in size. It was noted that the fish handled was mainly imported from Uganda. It was noted that the most commonly handled fish species included Tilapia, *Tompson* and *Capitaine/Sangara*.

The interviewed companies observed that the demand for their services had largely increased in the last 2 years. The increase was attributed to factors such as the country's development initiative to reduce power outages; fish preservation had improved as a result. It was also noted that there had been an increase in awareness among the players on the need to use modern equipment for transportation and storage of fish to optimize on business operations. The interviewed companies were for instance noted to be largely using modern equipment in the transportation and storage of fish, which they noted they had been using for an average of about 8 to 15 years. Additionally, it was noted that some of the modern equipment was available locally, which made it easy for players to access. Parts needed for the construction of cold rooms were for example reported to be imported from Dubai and Japan and assembled locally.

Further, it was observed that the storage and transportation companies were handling an average of about 10kgs to 30,000kgs of fish in a day.

Challenges Faced

Storage and transportation companies interviewed indicated that they experienced several challenges. To begin with, it was noted that were frequent shortages of fish supply since the country mainly relied on imports. This affected business operations, where for instance the storage space remained unutilized for prolonged periods of time. Players would result in stocking other animal proteins, such as chicken, which would interfere with the quality of fish when these were stored together.

Further, interviewed companies indicated that the price of imported fish was quite exorbitant and this was leading to high costs of running the business. When the prices were passed on the end consumers, the demand for the products and services would decrease. Additionally, it was observed that the fish imports were largely transported by road where frequent delays would be experienced due to poor infrastructure. This would result in fish spoilage and decrease the amounts of fish provided to the players.

The interviewed companies also indicated that the cost of acquiring the modern equipment was high, and it also required high standards high standards of maintenance. For instance, in every three months, a technician was required to inspect the cold rooms, empty all the stock and wash them, which increased the cost of running the businesses. When not able to fund the cost of maintaining the modern equipment, it was observed that players resulted in using other traditional methods of storing fish stocks, such as the use of sacks or envelopes, and transport them using ordinary vehicles, especially when the distances covered were short. The companies indicated that they would sometimes get in trouble with the relevant authorities during such times, but that the cost of the penalties was sometime lower than the cost of maintaining the modern equipment.

Additionally, though it was noted that developments initiated by the Government had reduced cases of power outages, the problem was yet to be fully resolved as outages would still be experienced at certain times. This would lead to fish spoilage, where for instance, about 4kgs of fish would get spoilt in every 80kgs of fish stored. The cost of back-up generators as alternatives was indicated as being high and unaffordable.

Lastly, it was observed that the storage and transportation companies were experiencing challenges in handling customer payments, where delays in receiving payment for fish stocks sold was affecting business operations; especially during re-stocking of fish.

Despite the challenges reported, fish storage and transport companies were optimistic that the demand for their services would increase in the next 2 years. They for instance observed that there was Government intervention to promote fish consumption in the country, a factor would drive demand. It was further observed that the hospitality industry had developed over time, which had seen the construction of numerous hotels in Rwanda. These hotels were anticipated to be main purchasers of fish and fish products for selling to their customers. Further, it was observed that there were initiatives of setting up cooperatives to support the fishing sector in the country, which would further drive growth.

Available Opportunities

Storage and transportation companies made several recommendations for consideration, which would improve their business environments. To begin with, players recommended that there was the need for the Government to lobby for large-scale investors who could venture in fish importation to manage the supply of fish in Rwanda.

Further, the companies recommended that there was the need to support small-scale players to access modern storage and transportation equipment, since these were expensive to acquire. Additionally, it was recommended that there was the need to make spare parts for such equipment to be available locally and at affordable pricing for sustainability.

Lastly, players recommended for the need to invest in the transportation of fish imports by railway lines, rather than by road. This would increase the capacity of fish transported, reduce delays in transit, and reduce chances of accidents which often led to loss of fish stocks.

D. Fish Retail Market

In this sub-section, we look at the retail for fish but with a focus on the retailers as compared to the other players in the value chain.

Main Purchase Point for the Consumers

It was noted that fish consumers in Rwanda largely purchased fish for consumption from fish markets, general markets, fish shops or from local street vendors as shown below.

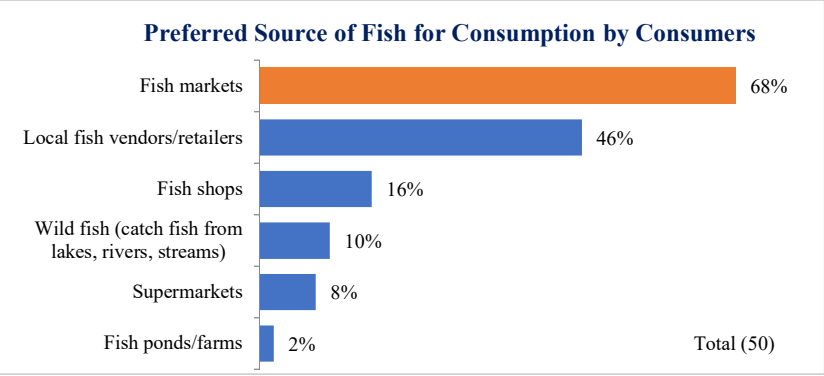
Table 173: Point of purchase of various fish forms by the consumers

Where/source of fish purchased and consumed at the household								
	Dagaa/ Mukene/ Omena (350)	Fresh fish (271)	Deep fried fish (51)	Dried/smoked fish [excluding *Dagaa/Mukene/ Omena* (29)	Frozen or fresh fish fillets (12)	Tinned/ canned fish (14)	Prawns/ other sea food (1)	Other fish (33)
From the fish market	28%	20%	10%	17%	33%	57%	-	24%
From the market	25%	24%	59%	34%	42%	7%	-	6%
From a fish shop	18%	7%	6%	-	-	36%	-	3%
From a street vendor/local fish fryer	16%	26%	16%	38%	8%	-	100%	33%
From other fish vendor	10%	8%	4%	7%	-	-	-	24%
From the supermarket	1%	3%	-	3%	17%	-	-	-
From a fish farm/pond	1%	12%	6%	-	-	-	-	9%

On the other hand, whilst only small proportions of consumers indicated they purchased fish from fish ponds/farms from the table above, all fish farmers interviewed perceived that fish consumers mainly purchased fish from fish ponds/farms. A few farmers also perceived that fish consumers purchased fish from fish markets, local vendors or accessed fish from natural habitats.

Fish retailers, on the other hand, perceived that fish consumers largely purchased fish from the fish markets and from local vendors, among other sources as shown below, probably because of the retailers' positioning.

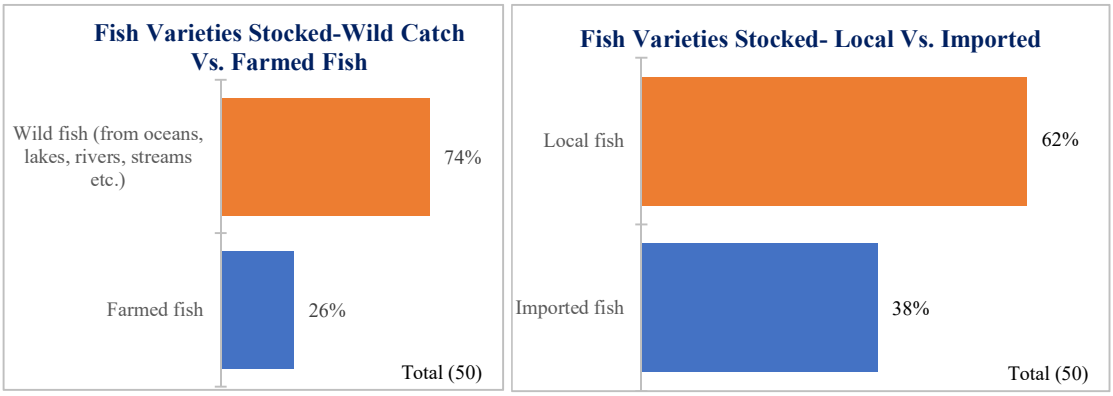
Figure 369: Fish retailers -Preferred source of fish by consumers



Type of Fish Stocked by the Retailers

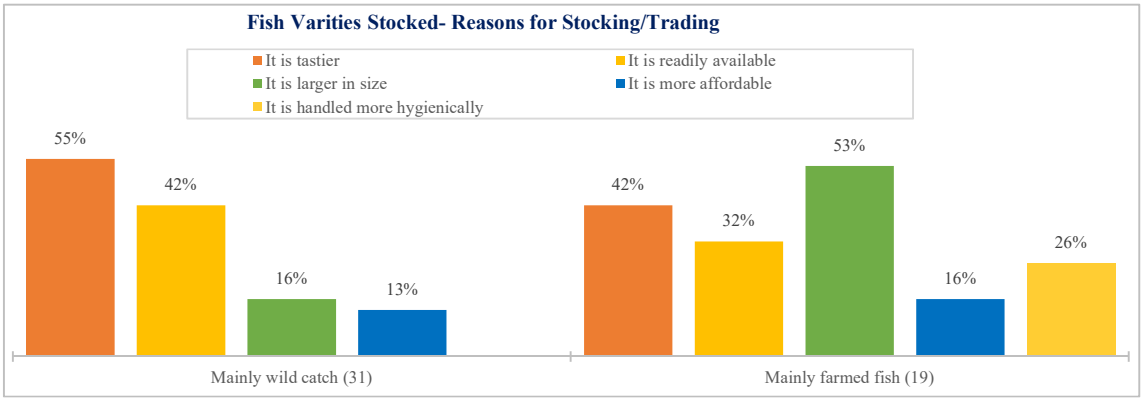
Fish retailers indicated that they mainly stocked wild catch at their businesses (74%) and that these were largely locally sourced (62%).

Figure 370: Fish retailers- Fish varieties stocked



The fish retailers largely preferred stocking wild catch because it was tastier (55%) and was readily available among other reasons as shown below. Those who largely stocked farmed fish preferred to do so largely because farmed fish was larger in size (53%) among other reasons.

Figure 371: Fish retailers- Reasons for stocking fish varieties and varieties stocked



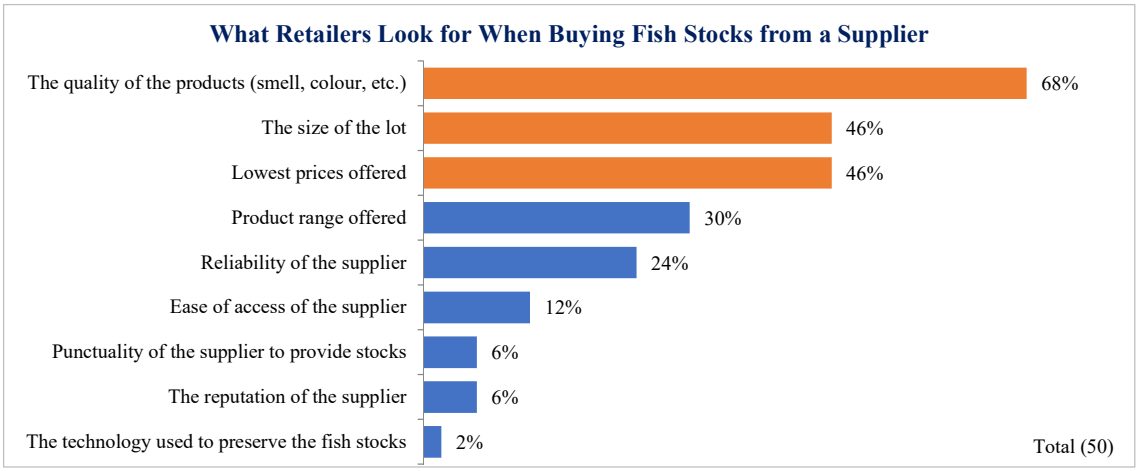
It was observed that fish retailers sourced their fish stocks from a variety of sources with some of the most common ones being from the fish markets. The table below shows the sources for the various sources of fish varieties kept.

Table 174: Fish retailers- Source of fish for trading

Source of fish for trading								
	Tilapia (43)	Catfish (1)	Carp (3)	Trout (1)	Nile Perch (1)	Sardines (5)	Salmon (4)	Mudfish (1)
Fish market	35%	-	33%	100%	-	40%	25%	100%
From suppliers	26%	100%	33%	-	100%	20%	25%	-
Imported	9%	-		-	-	40%	50%	-
From wholesalers	26%	-	33%	-	-	-	-	-

The retailers mentioned that when making the purchase decision, they largely looked out for quality of products (68%), size of the lot and low prices (46% respectively) among other factors as shown below.

Figure 372: Fish retailers- What retailers look for when buying stocks from suppliers



Average Amount of Fish Stocked and Resold

On average, the retailers stocked an average of 225kgs of Tilapia (species stocked by most retailers) for each batch/lot procured in a month.

Table 175- Estimated number of kgs of fish procured per batch/lot in a month

Number of kgs procured in a month per batch/lot								
	Tilapia (43)	Catfish (1)	Carp (3)	Trout (1)	Nile Perch (1)	Sardines (5)	Salmon (4)	Mudfish (1)
Average amount procured for re-sale (kgs)	225	10	10	20	50	716	33	30

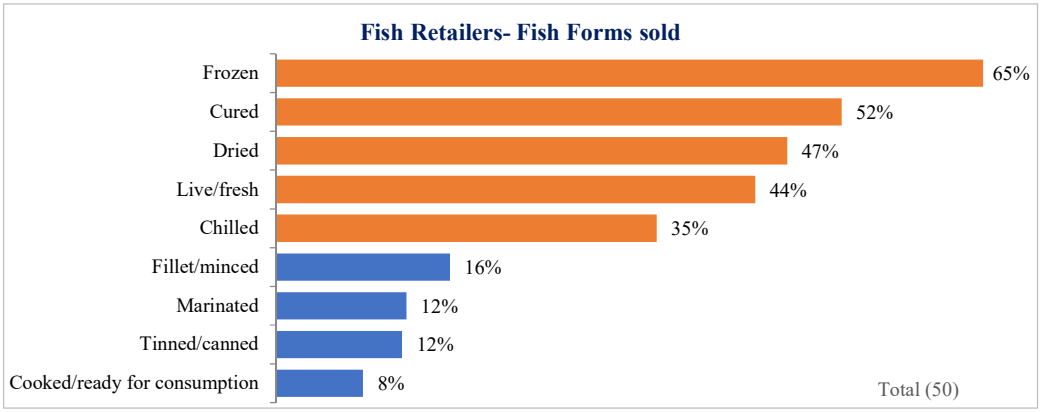
On the other hand, it was noted that out of the batch/lot of fish procured in each month, retailers largely sold an average of 188kgs of Tilapia (species commonly stocked) among other species, indicating some extent of losses.

Table 176: Retailers- Number of kgs sold per batch/lot

Number of kgs sold from each batch/lot per month								
	Tilapia (43)	Catfish (1)	Carp (3)	Trout (1)	Nile Perch (1)	Sardines (5)	Salmon (4)	Mudfish (1)
Average amount resold (kgs)	188	5	10	20	40	154	33	30

It was noted that fish retailers mainly sold fish in the frozen, cured, dried, live/fresh or chilled forms as shown below.

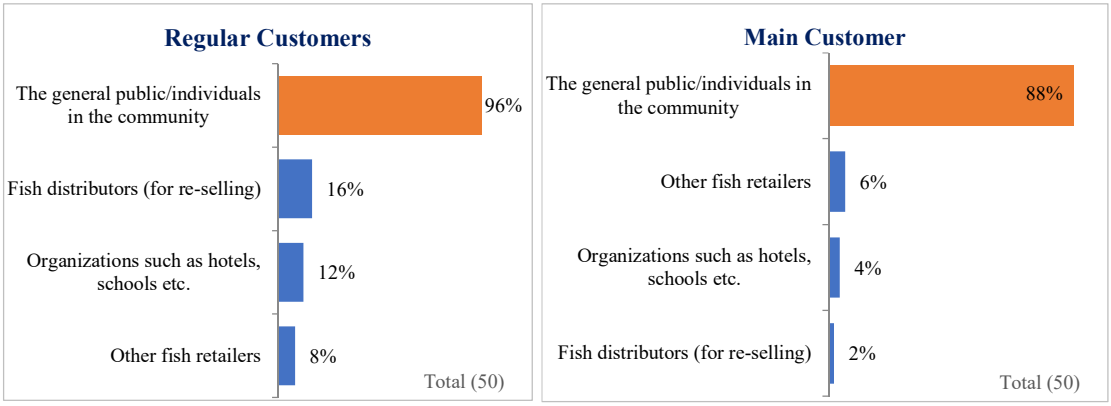
Figure 373: Fish retailers- Proportions of sales from fish states



The Main Customers for the Retailers

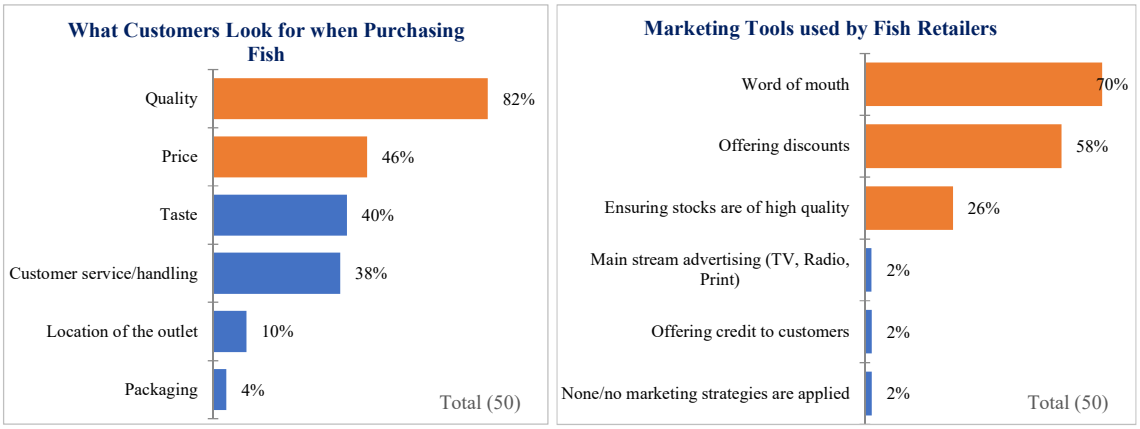
The fish retailers' customers were largely individuals in the communities (96%). These were also cited as the main customers (88%) as shown below.

Figure 374: Fish retailers- Regular and main customers



The retailers indicated that their customers largely looked at the quality of products (82%) and pricing (46%) among other factors when making purchase decisions. Due to the nature of the customers they have, retailers indicated that they thus marketed their products largely through word of mouth (70%) and through market incentives such as offering of discounts (58%). A significant proportion (26%) also ensured their products were of high quality as shown below.

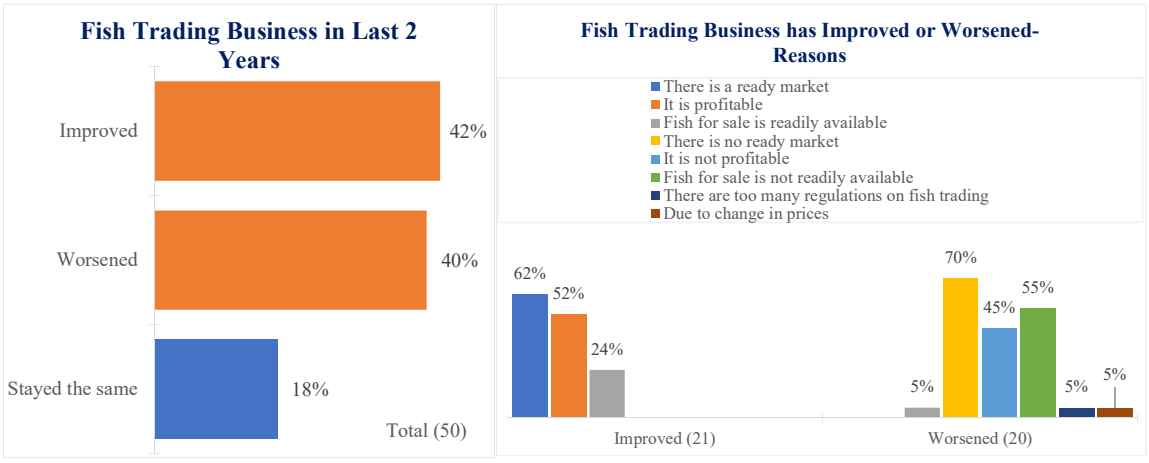
Figure 375: Fish retailers- What customers look for and marketing tools applied



Challenges and Bottlenecks that Retailers Face

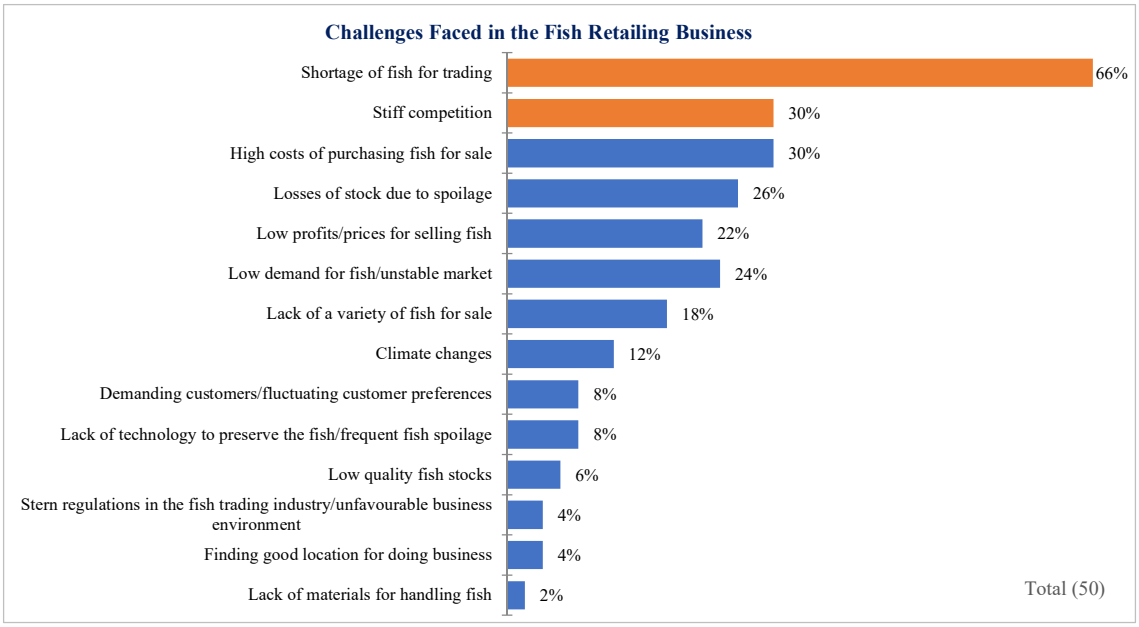
It was observed that fish retailers felt that the fish trading business had improved in the past two years (42%). A significant proportion however (40%) felt that the fish trading business had worsened in the past 2 years. Those who felt the business environment had improved over time indicated that there has been a ready market (62%) and the businesses had been profitable (52%) among other reasons, while those who felt the business environment had worsened indicated that there had not been a ready market for the products (70%) and fish for sale had been unavailable (55%) among other reasons as shown below.

Figure 376: Retailers- Fish trading business in the last 2 years



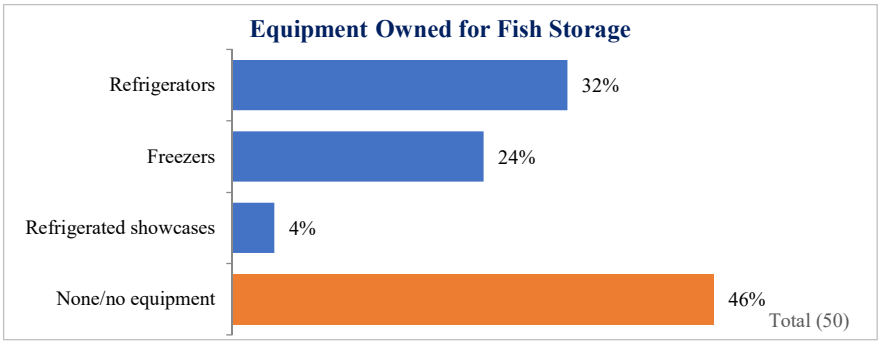
Further, retailers indicated that some of the challenges faced in the business included shortage of fish for trading (66%), stiff competition (30%) and high costs of procuring fish stocks for sale (30%) among others as shown below.

Figure 377: Retailers- Challenges faced



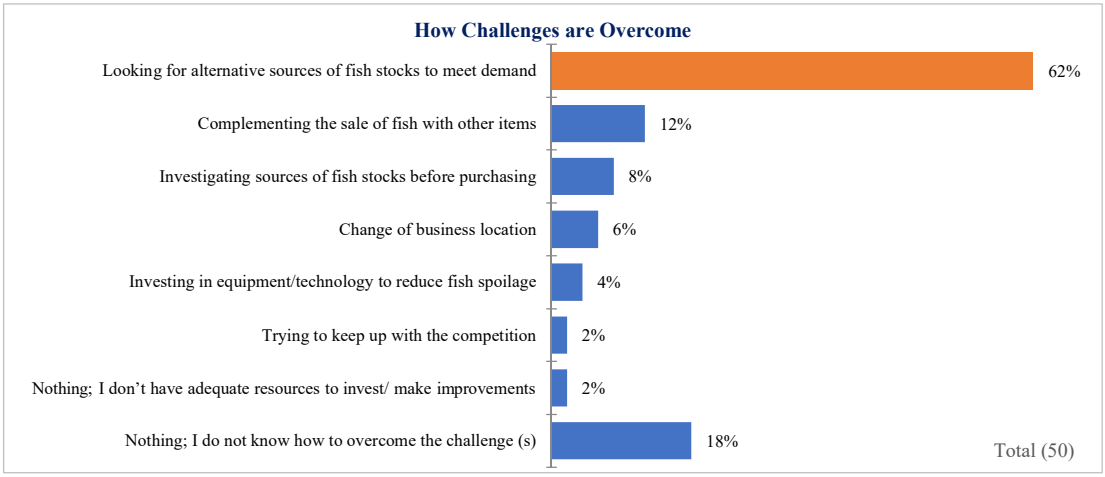
As spoilage was mentioned by a significant proportion of the retailers (26%), the study sought to find out the proportion of retailers that had access to storage equipment. It was noted that close to half of the retailers (46%) did not own any storage equipment. Small proportions on the other hand owned refrigerators, freezers and refrigerated showcases as shown below.

Figure 378: Type of storage equipment owned by the retailers



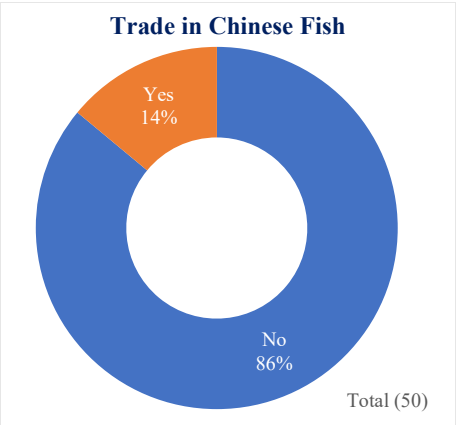
Most retailers have sought solutions to the challenges that they face in their operations. For instance, they have tried to look for alternative sources of fish to meet the increasing demand (62%). However, a significant proportion of the retailers however indicated that they either did not know how to overcome challenges faced or did not have the required resources (20%) as shown below.

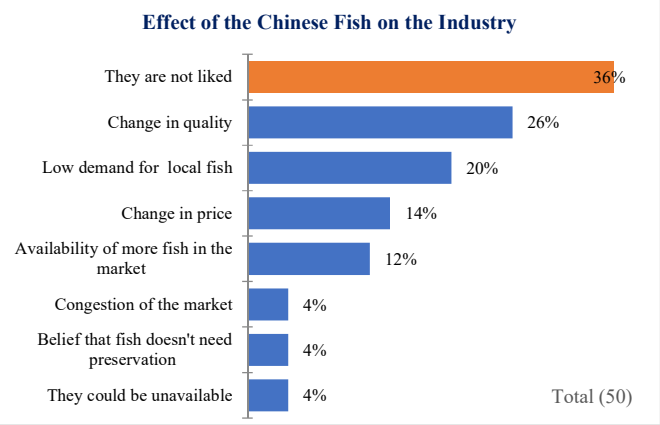
Figure 379: Retailers- How challenges faced are overcome



It was observed that a sizeable proportion of fish retailers (14%) were trading in Chinese fish; most likely as an alternative source to meet demand/overcome losses from spoilage. Most retailers however felt that the Chinese fish had had a negative impact on the industry largely because it is not liked (36%) among others as shown below.

Figure 380: Retailers- Trade in Chinese fish and impact on industry

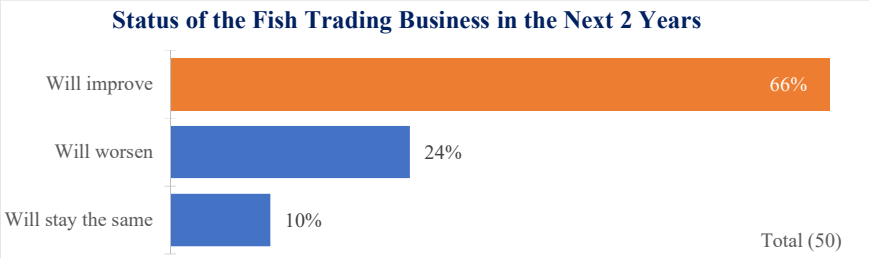




Available Opportunities for Fish Retailing

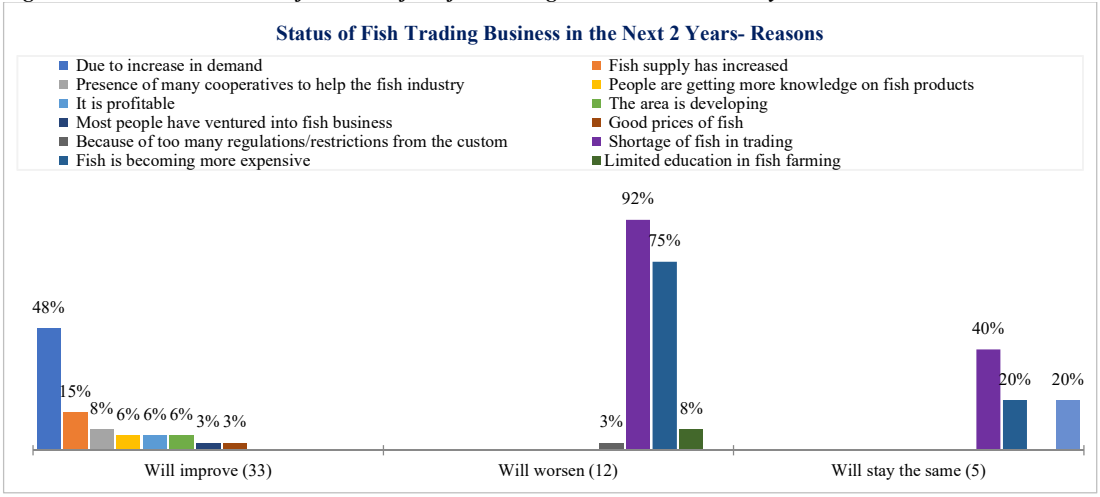
Despite the challenges, fish retailers were optimistic that the business environment will improve in the next 2 years (66%), however, a sizeable proportion (24%) felt that the business environment would worsen over that time.

Figure 381: Retailers- Business environment status- Next 2 years



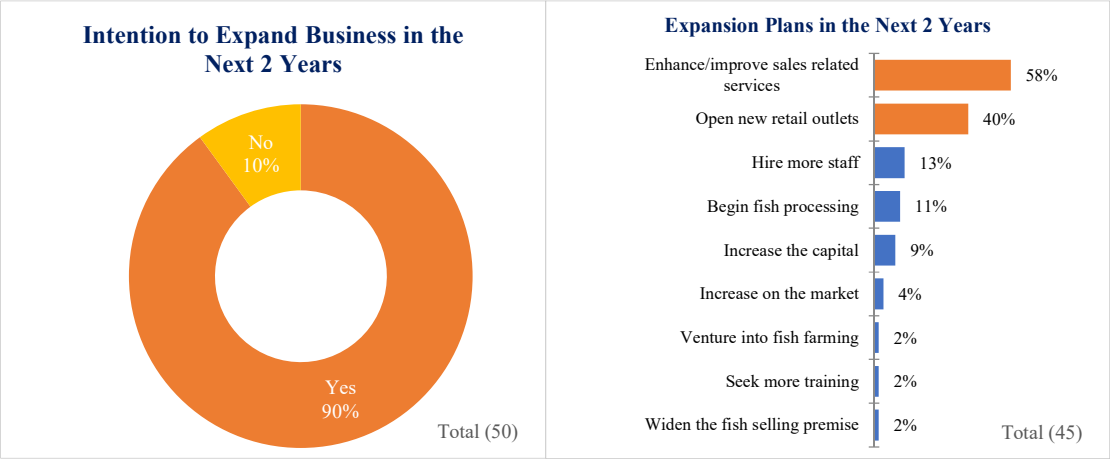
Retailers that were optimistic about the future of the fish trading business largely cited increased demand (48%) among other reasons, while those that were pessimistic largely cited shortage of fish for trading (92%) as shown below.

Figure 382: Retailers- Reasons for status of the fish trading business in the next 2 years



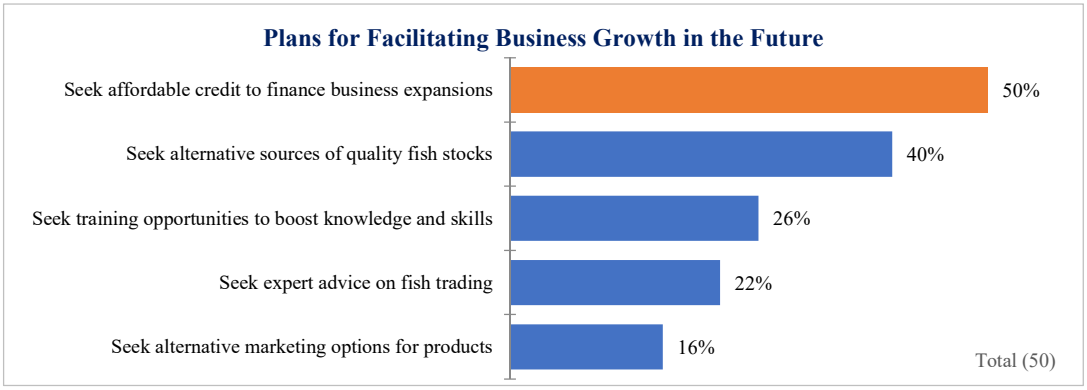
All in all, the fish retailing industry is bound to grow as most of the retailers (90%) intend to expand their business in the next 2 years. Expansion plans largely include enhancing/improve sales related services (58%) and opening of new retail outlets (40%) among other initiatives as shown below.

Figure 383: Retailers- Business expansion plans in the next 2 years



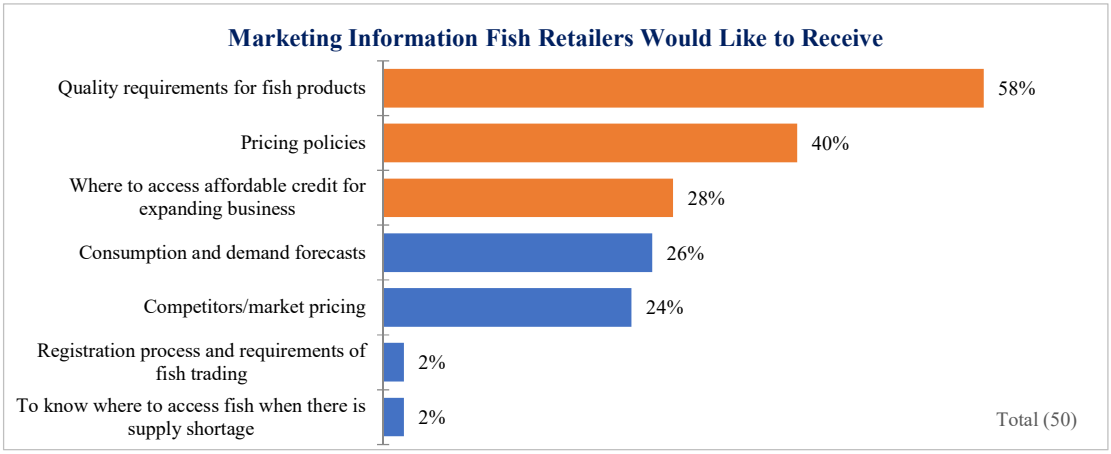
Making affordable credit accessible to retailers would be one way to support this part of the value chain in the fish industry. As shown below, retailers largely intend to seek affordable credit (50%) to finance their business expansion plans among other options.

Figure 384: Retailers- Plans to facilitate business growth in the future



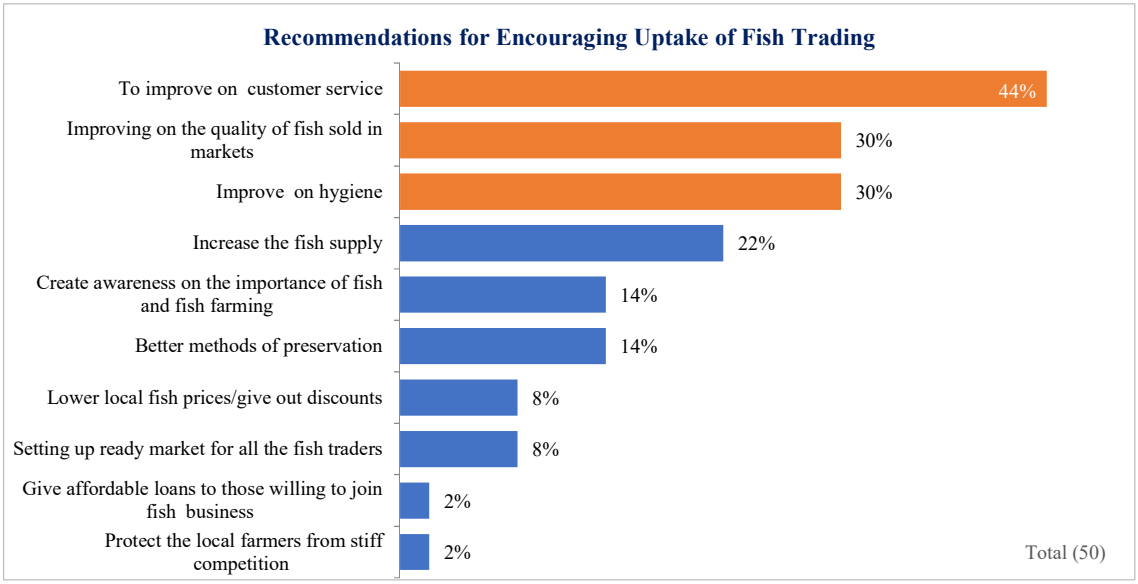
Further, retailers would be interested in receiving information on quality requirements for fish products (58%) and pricing policies (40%) among other market information to support them in their trade.

Figure 385: Retailers- Market information fish retailers would be interested in



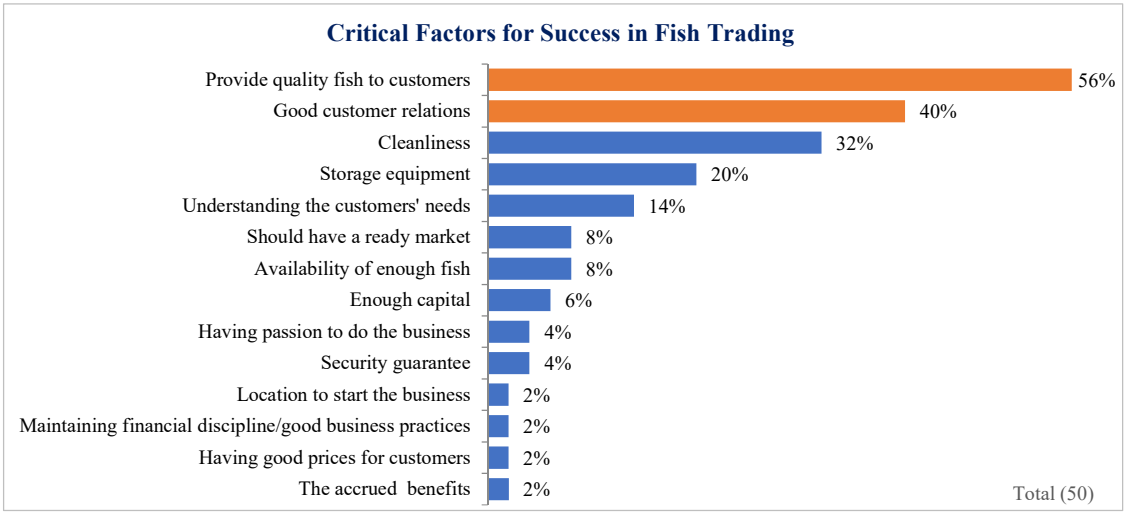
To grow the industry, retailers recommended that the improvement of customer service at the various levels of the value chain that retailers interact with (44%) as well as improving on the quality of fish sold in the markets and on the hygiene standards (30% respectively) among implementing other initiatives shown below.

Figure 386: Retailers- Encouraging the fish trading business



Lastly, those wishing to venture into fish retailing were advised to focus on providing quality fish to customers (56%) and good customer relations (40%) among others to guarantee success in the venture as shown below.

Figure 387: Retailers- Recommendations for succeeding in fish trading



3.4.4 Fish Price Analysis

This section presents insights on the prices of fish in the value chain as well as the mark-ups added before the fish reaches the end consumer.

Fish Prices from Farmer, Processor, Retailer to Consumer

Fish Farmers

The farmers indicated that they sold each kg of Tilapia for an average of Rwf 3,100 (equivalent to about USD.4). It was observed that the fish was mainly sold in the live/in a fresh state, though, a few of the fish farmers also sold chilled and dried fish.

Regarding the pricing model and marketing rationale of fish by farmers, it was observed that farmers mainly considered the demand/market forces, the quality of the fish and the species/type of the fish when determining the pricing of fish. Other factors considered included the loyalty of the customer, the cost of inputs, the type and size of the fish.

Additionally, the prices of fish were observed to mainly remain the same over different periods. However, significant proportions of farmers (2 out of 5) indicated that prices were usually highest during the summer time and when supply is low, while 3 farmers indicated that prices were usually lowest when the market was flooded or during the holiday seasons/festivities.

The regular customers of the farmers were observed to be mainly individuals in the communities (reported by all farmers), while some farmers were also selling fish to fish retailers, fish vendors, fish distributors and institutions/organizations such as hotels and schools. Most farmers (3 out of 5) indicated that their main customers were individuals in the communities, while 2 of the farmers indicated that their main customers were either fish retailers or organizations/institutions.

Farmers also indicated that customers largely look out for the quality of fish, the type of fish, pricing, the size of fish and location of the farm when making purchases. When marketing their products, farmers indicated that they mainly offered discounts and used word of mouth to market their businesses. Other marketing initiatives employed included social media advertising, delivering products for free and attractive packaging of products for the customers. It was noted, however, that a significant proportion of farmers (2 out of 5) did not apply any marketing strategies.

Fish Processors

It was noted that when prices were highest, fish processors sold Tilapia products for about Rwf. 4,900 (equivalent to about USD.6) per kg. On the other hand, when fish prices were lowest, Tilapia products were sold for about Rwf. 3,500 (equivalent to about USD.4) per kg.

Fish Retailers

On the retail side by the fish retailers, it was observed that retailers largely procured Tilapia at an average price of Rwf. 2,800 (equivalent to about USD.3) per kg among other species as shown below.

Table 177: Retailers- Cost of procuring fish per kg

Cost of procuring fish per kg. (Rwf)								
	Tilapia (43)	Sardines (5)	Salmon (4)	Catfish (1)	Carp (3)	Trout (1)	Nile Perch (1)	Mudfish (1)
Average cost per kg	2,800	1,420	2,575	1,600	1,167	3,000	3,000	2,500

Further, retailers indicated that they sold each kg of fish for an average of Rwf. 3,009 (equivalent to about USD.4) for the Tilapia species.

Table 178: Retailers- Fish selling price per kg (Rwf)

Amount sold per kg of fish (Rwf.)								
	Tilapia (43)	Sardines (5)	Salmon (4)	Catfish (1)	Carp (3)	Trout (1)	Nile Perch (1)	Mudfish (1)
Average selling price per kg	3,009	2,000	3,550	2,200	1,500	3,500	4,500	3,500

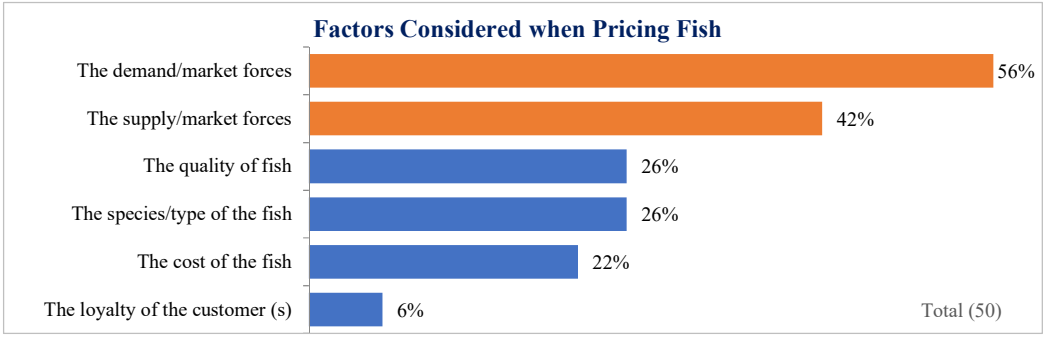
It was observed that fish retailers spent an average of Rwf. 174,832 (equivalent to about USD.210) per month to run their retail businesses as shown below. The factors driving the cost of running the business included rent, electricity, hired labour and marketing costs.

Table 179: Fish retailers- total cost of running the business per month

Total cost of running the business in a month (Rwf.)	
Average cost of running a fish retail business	174,832
Minimum cost	3,600
Maximum cost	842,000

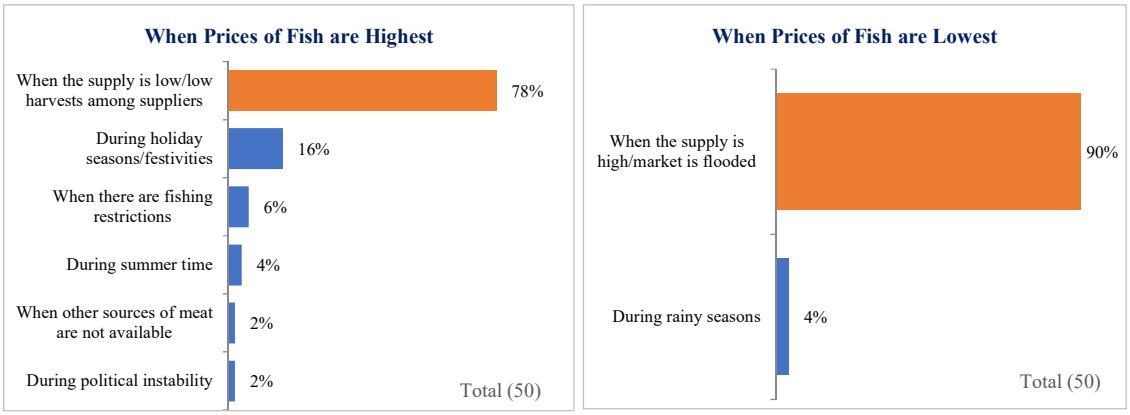
In terms of determining the sales price for fish, the retailers indicated that they largely considered the demand/market forces and supply/market forces among other factors as shown below.

Figure 388: Fish retailers- Factors considered when pricing fish



Fluctuations are often observed in the market in terms of the supply for fish and the retailers indicated that the prices of selling the fish were largely highest when the supply is low/low harvests among suppliers and lowest when the market was flooded among other periods as shown below.

Figure 389: Fish retailers- Periods when fish prices are highest/lowest



From a consumer perspective, and as mentioned earlier, households consume an average of 2.3kgs of fish in a month, though as noted earlier, consumers tend to buy more than one fish type, and so, the aggregated amount of fish and fish products they purchase in a month is higher.

It was observed that consumers purchase the different fish varieties at an average cost of about Rwf. 1,200 to about Rwf. 4,000 (equivalent to about USD.1 to USD.5). *Dagaa/Mukene/Omena* for instance was purchased at Rwf. 2,712 (equivalent to about USD.3) per kg, while fresh fish was purchased at Rwf. 3,053 (equivalent to about USD.4) per kg (fish forms most commonly purchased). A kg of frozen or fresh fish fillets was observed to be the most expensive, retailing at Rwf. 4,017 (equivalent to about USD.5). Some consistency was observed between the prices consumers were purchasing the fish and fish products at and the prices retailers were selling their products at as noted above (about Rwf. 1,500 to Rwf. 4,500 or an equivalent of about USD.2 to USD.5 per kg) though variations were inevitable due to factors such as the type of fish purchased/sold, setting (for instance, the cost of fish was slightly higher in the urban settings compared to the rural settings as shown below), and the form the fish was purchased/sold in; dried fish for instance was observed to be slightly cheaper than fresh fish as shown below, and the effect of middle-men who mark up the cost of fish stocks to the end consumer.

Table 180: Amount of fish purchased on average in kgs- Setting

Average cost per kg (Rwf)			
	Total (528)	Urban (285)	Rural (243)
Deep fried fish	2,600	3,047	1,527
Fresh fish	3,053	3,452	2,503
Frozen or fresh fish fillets	4,017	4,070	3,750
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2,836	2,861	2,796
Dagaa/Mukene/Omena	2,712	3,029	2,360
Prawns/other sea food	1,200	-	1,200
Tinned/canned fish	1,818	1,544	2,310
Other fish	2,768	3,754	2,128

Regional variations were observed in terms of fish and fish products pricing. For instance, and as shown in the table below, prices tend to be higher in Kigali than in other regions. Frozen fish/fillet also tends to be more expensive in the Southern Region than in other regions.

Table 181: Average purchase price per kg- Region

Average cost per kg (Rwf)						
	Total (528)	Eastern (82)	Kigali City (132)	Northern (80)	Southern (90)	Western (144)
Deep fried fish	2,600	1,127	4,018	2,922	1,875	1,810
Fresh fish	3,053	2,086	4,665	3,424	2,464	2,499
Frozen or fresh fish fillets	4,017	-	4,750	3,233	5,500	2,333
Dried/smoked fish [excluding *Dagaa/Mukene/Omena*]	2,836	2,750	3,214	3,125	-	2,609
Dagaa/Mukene/Omena	2,712	2,448	3,458	1,919	2,378	3,038
Prawns/other sea food	1,200	-	-	-	-	1,200
Tinned/canned fish	1,818	2,900	2,100	2,183	1,286	2,000
Other fish	2,768	2,160	4,500	-	4,056	2,035

Fish Prices- Mark-up

This section provides an indication of the average mark-up/profit made by various players in the value-chain.

Fish Farmers

It was noted that fish farmers in Rwanda were making an average of Rwf.3.8M (equivalent to about USD. 4,674) from each batch/lot of Tilapia reared and sold as shown below.

Table 182: Fish farmers- Average mark-up (Rwf)

Average mark-up price per batch/lot (Rwf)					
	Average number of kgs sold per batch/lot	Average selling price per kg	Total sales per batch/lot (Rwf)	Average cost of production per batch/lot (Rwf)	Average mark-up/profit per batch/lot (Rwf)
Tilapia (5)	1,284	3,100	3,980,400	85,200	3,895,200

Fish Processors

Fish processors on the other hand were observed to be making about Rwf.1.2M (equivalent to about USD. 1,552) when the prices of products were highest and about Rwf. 924,000 (equivalent to about USD. 1,109) when the prices of products were lowest in a given month as shown below.

Table 183: Fish processors- Average monthly mark-up (Rwf)

Average mark-up/profit per month (Rwf)					
	Average price per kg when price is highest	Average kgs sold in a month	Total average sales in a month	Average price per kg when price is lowest	Total average sales in a month
Tilapia (5)	4,900	264	1,293,600	3,500	924,000

Fish Retailers

Fish retailers were observed to be making an average of Rwf.200 to Rwf. 1,500 (equivalent to less than USD.1 to about USD.2) for each kg of fish sold from the different fish varieties kept. It was observed that the Nile Perch fish variety was the most profitable for retailers, while the Tilapia fish variety was the least profitable.

Table 184: Fish retailers- Average mark-up per kg (Rwf)

Average mark-up price (Rwf)			
	Average buying price per kg.	Average selling price per kg.	Average mark-up/profit
Tilapia (43)	2,800	3,009	209
Sardines (5)	1,420	2,000	580
Salmon (4)	2,575	3,550	975
Catfish (1)	1,600	2,200	600
Carp (3)	1,167	1,500	333
Trout (1)	3,000	3,500	500
Nile Perch (1)	3,000	4,500	1,500
Mudfish (1)	2,500	3,500	1,000

3.4.5 Market Organization/Cooperatives and Associations

Noting that market organisations (in form of cooperatives and associations) run across the value chain for supporting business ventures in the fish industry, this section provides insights on the status of the fish market organization in Rwanda.

Fish Farmers

It was noted that all the fish farmers who participated in this study were not members of any cooperative or association to boost their fish farming businesses.

Storage and Transportation Companies

It was noted that none of the two-interviewed storage and transportation companies was a member of a cooperative or association to boost business operations. One of the companies however indicated that the company had joined a cooperative in the past, but that the cooperative was dissolved because members could not agree on the best way forward for the cooperative to support members in their operations.

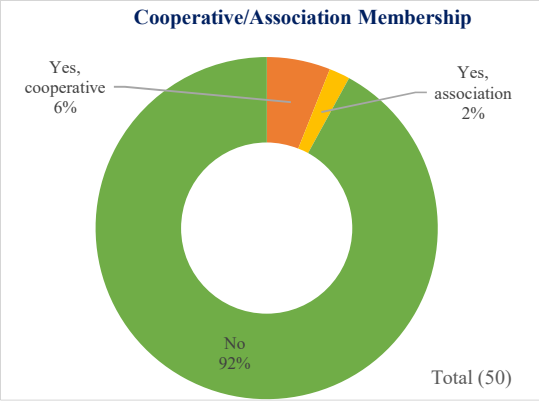
Fish Processors

It was observed that though processors had collaborations among themselves on some aspects of their business operations, they were not formally organized in cooperatives or associations in support of their businesses and possibly, this is one of the areas that can be explored in the future.

Fish Retailers

With regards to the fish retailers, only a small proportion (8%) noted were members of either a cooperative or an association to support them in their business ventures. Some of the cooperatives/associations mentioned included Copavu Ktd, Alpha Choice Ltd and Turwanyinzara.

Figure 390: Retailers- Cooperative membership



All retailers that were members of an association/cooperative indicated that the entities were registered and that a membership subscription fee was payable. The retailers indicated that they paid an average membership subscription fee of Rwf. 21, 250 (equivalent to about USD.26) for each round of subscription. The maximum payable

amount was noted as Rwf. 50,000 (equivalent to about USD.60) while the minimum payable amount was Rwf. 5,000 (equivalent to about USD.6) as shown below.

Table 185: Retailers- Cooperative membership subscription fee

Cooperative/association membership subscription fee (Rwf).	
Average subscription fee	21,250
Max subscription fee	50,000
Min subscription fee	5,000

The membership fee paid to the cooperatives/association was largely a one-off fee which was not renewable after some time. Retailers in cooperatives also indicated that some of the key benefits enjoyed included linkages to markets for products, sourcing for quality fish stocks and support to members to grow themselves (such as building houses). Members indicated that the cooperatives/associations were largely performing well (good) on the benefits accrued. Most members in the cooperatives/associations (3 out of 4) recommended that the entities should emphasise the improvement of hygiene standards. Other recommendations made included encouraging teamwork in projects run by cooperatives/associations, increasing the frequency of meetings for members, improving on communication among members, opening of more branches for accessibility, improving on the cooperatives/associations' leadership, management of funds disbursed to members in form of loans, and improving on customer care services.

Cooperatives' Administrators' Perspective

In addition to speaking to members of cooperatives, this study sought insights from the administrators of cooperatives providing support to various players in the value chain. In Rwanda, administrators of 2 cooperatives were interviewed. This section provides the qualitative feedback that was obtained from them.

Cooperative Structure

It was noted that the cooperatives interviewed mainly comprised of fish farmers and fishermen. The main motivations of establishing the cooperatives included the regulation of fish prices, provision of fish seeds and fish feeds, as well as marketing of members' products. It was noted that membership bases varied, with the more established cooperative having about 300 members, while the other cooperative, which was less established had 12 members.

Further, it was noted that the interviewed cooperatives did not charge a membership subscription fee, but required members to make monthly contributions. It was observed that registration of members in the cooperatives was a democratic process, where all applications were reviewed and admission guided by a members' voting process.

Funding Model

It was noted that cooperatives largely depended on members monthly contributions to run their operations. The 2 cooperatives interviewed indicated that their members were required to make monthly contributions of about Rwf. 5,000 (equivalent to about USD.6). Further, it was reported that the cooperatives also received funding from the Rwanda Agriculture Board (RAB) to supplement membership subscriptions.

Benefits

As noted above, the interviewed cooperatives were set up to accomplish certain goals, which included regulations of fish prices, marketing of members' products as well as provision of, or facilitation of members to acquire fish fingerlings and fish feeds. These were therefore some of the benefits enjoyed by members of the cooperatives.

Additionally, it was noted that the cooperatives provided health insurance to their members, as well as training opportunities to keep members abreast of the industry's developments. Cooperatives also indicated that they provided funding to their members to facilitate them set up fish ponds.

Trade Regulations and Policy Issues

Interviewed cooperatives indicated that the registration process for such entities in Rwanda was fairly straight forward. As part of the registration process, it was noted that cooperatives had to adhere to laid out health requirements. Further, it was observed that the process of cooperative registration in Rwanda took about 3 years.

Challenges Faced by the Cooperatives

The interviewed cooperatives indicated that several challenges were faced in the fish industry, which affected business operations. To begin with, cooperatives observed that

there was generally low awareness among players in the industry on the benefits of cooperative membership. Membership bases in cooperatives therefore remained low. Cooperatives, however, observed that the vetting process of membership admission in cooperatives was somewhat biased. For instance, review of the economic status of potential members was usually one of the requirements, which tended to exclude those who were not economically stable.

Further, cooperatives indicated that their members, who were mainly fish farmers, faced several challenges in their business ventures, some of which included high costs of starting up the businesses. The cost of constructing fish ponds, for instance was cited as being high, and moreover, there was lack of skilled labour to engage in the construction.

Additionally, it was noted that the fish farming sector in Rwanda largely depended on importing farming inputs such as fish feeds, which was expensive for running the business ventures. Considering such costs when pricing products was cited as discouraging demand, and farmers therefore ended up selling their products at lower prices. Moreover, farmed fish was generally smaller in size compared to the imported varieties, and customers were therefore unwilling to pay more for the farmed varieties.

Further, it was observed that farmers generally lacked the required skills and training to engage in fish farming, and were therefore not managing their business ventures effectively. Additionally, it was noted that there was a lack of skilled labour in Rwanda to assist farmers in the management of fish diseases, and farmers therefore experienced high mortality rates in their farmers, which affected their return on investment.

The cooperative which had fishermen as part of their membership base also indicated that there was generally practice of illegal fishing in the water bodies in Rwanda where fishing was practiced, which was leading to depletion of wild catch fish in these water bodies. Furthermore, seasonal/climatic changes were also affecting availability of local wild catch varieties, which was affecting the businesses of fishermen in Rwanda.

Lastly, cooperatives indicated that their members lacked access of modern storage facilities in their businesses, which was leading to fish spoilage and subsequent loss of business.

Recommendations for the Future

Cooperatives recommended that players in the industry needed support in diversifying their sources of funding to support their business ventures. One of the ways the cooperatives indicated they were supporting their members was through assisting them to venture in real estate.

Further, cooperatives recommended that there was a need for the Government to support the setting up of local factories of manufacturing fish feeds to reduce the cost of running fish farming businesses. Additionally, cooperatives observed that there was a need to equip fish farmers with the skills to make their own fish feeds to reduce on the cost of running their business.

Additionally, cooperatives recommended for the need to support fish farmers and fishermen with the access of modern storage equipment to reduce loss of fish stocks. It was observed that the current pricing of the equipment was not affordable to small-scale players who were resulting in traditional methods that were not always effective.

Lastly, cooperatives indicated that there was the need to support fish farming in the country, as it would eventually reduce reliance in fish importation. It was noted that fish farmers needed to be equipped with knowledge and skills in fish farming to help them function better in their business ventures. Further, it was noted that there was a need to ensure availability of expertise in fish disease management to reduce the mortality rates experienced by farmers. It was observed that support to players in the fish sector value-chain could be done through cooperatives as they were the most effective.

3.4.6 Policy and Trade Regulations

This section of the report explores the currently existing standards regulating the fish industry in Rwanda including suppliers/market players' awareness of and adherence to existing regulations.

Current Status

Rwanda is landlocked, meaning that its policies and regulation relate to mainland fisheries. The Rwandan fisheries legal framework introduced Law No. 58/2008 of 10/09/2008 (Determining the Organisation and Management of Aquaculture and Fishing in Rwanda), that determines the organisation and management of Aquaculture and Fisheries in Rwanda. It provides for the management and development of aquaculture by giving a mandate to the Rwanda Animal Resources Development Authority (RARDA) that operates under the Ministry of Agriculture and Animal Resources (MINAGRI) to manage the sector. In Article 8, it provides for the minister in charge of aquaculture and fisheries to determine the mode of importation, sale and distribution of fishing equipment for aquaculture and fishing production.

If such aquaculture is to happen in water bodies shared between a number of countries including Rwanda, that aquaculture will be based on the international conventions relating to such countries. No aquaculture can happen on the public waters without the authorisation of RARDA. The regulations expect the establishment of aquaculture and fishing regions that will be guided by the Minister. It also restricts in Article 12, the introduction of aquatic species in Rwandan waters, without the prior authorisation from RARDA. The law also demands that aquaculture will be supported with the necessary facilities to prevent farmed organisms from entering the public waters or prevent waters from such ventures intoxicating public waters. It envisions the participation of individual entities, cooperatives and associations in aquaculture through Article 19 that provides for the granting of concession contracts. The use of fertilisers in aquaculture is regulated in Article 22, while the requirement for hygienic handling of aquaculture and fishery products is provided for in Article 23. At local government level, Fisheries and Aquaculture is the responsibility of the Veterinary or Agricultural Officers.

Further, the development of fisheries and aquaculture in Rwanda is guided by the Fishery and Aquaculture Development Policy, which seeks to contribute to the food security of the communities, contribute to poverty reduction through increased incomes of rural dwellers and contribute to aquatic environmental protection. The Policy provides for the

intensification of aquaculture production using high yield aquaculture techniques. It also provides for support at the institutional level by building national capacities in technical supervision, extension and research, in addition to providing a regulatory framework to encourage private investment in fishery and aquaculture, as well as providing rural credit and marketing opportunities for fish products.

Also in place is the Master Plan for Fisheries and Fish Farming in Rwanda (2011 to 2020), which draws from NEPAD Action Plan for African Fisheries and Aquaculture (NEPAD 2005) which anticipates substantial growth in sustainable production from aquaculture. Mainly, it provides for the development of sector-wide strategies at national level for expansion and intensification of aquaculture. It targets to grow the sector to ensure that Rwanda can produce 112,000 tonnes per annum by 2020 to meet the demands of its growing population. It provides for the growth of aquaculture using the cage system in the bays of Lakes Kivu, Burera, Ruhondo, valley dams and Ibidendenzi. It targets that each of the 5 districts around Lake Kivu will have a minimum of 5 lake based cage parks by 2017, while it anticipates 2 around Lake Burera, and one around Lake Ruhondo. This brings in total 28 such aquaculture parks that are expected to produce 140,000 tonnes of fish. This will be done through the creation of awareness, hands on training, production and distribution of leaflets and demonstration of cage culture. It also anticipates tank based aquaculture as well as ornamental fish rearing in Rwanda. It also examines ways of providing better seed, cheaper and good quality food, fish marketing, fish processing and product development. It also puts into consideration environmental impacts of aquaculture and provides for certain guidelines to prevent excessive erosion as well as degradation of wetlands along the main water bodies. It also provides for short term, medium term and long-term training of various stakeholders supporting the industry. Further, to support the sector, and to address the issue of high cost of fish feeds, the government intervention put in place was scrapping 18% VAT on processed feed.[41]

[41] Master Plan for Fisheries and Fish Farming in Rwanda (2011 to 2020)

The following measures have been put in place for fish marketing in Rwanda: the fisheries products promotion centers that are in Kigali, Rwamagana and Musanze; introducing the concept of open air fish eating places at social gatherings;[42] and mount public promotion initiatives to promote fish consumption.[43]

Challenges and Bottlenecks

The primary research phase of the study sought to understand the awareness levels of legal standards required to operate in the industry as well as the major hurdles faced in running affairs. Presented below are the awareness levels from each category interviewed in the supply side as well as perceptions on the most difficult legal requirement to comply with in running businesses.

Fish Farmers

Fish farmers indicated that to start and run a successful fish farming business in Rwanda, one needed to have access to a fish pond, have constant supply of water, a good size of land, a business permit and have storage equipment. One farmer, however, indicated that he did not know the legal requirements needed. Further, it was also observed that out of all the requirements farmers perceived they needed to have, they had largely complied with ensuring constant supply of water in the farms, having a good size of land and having a business permit.

Most farmers felt that none of the requirements needed were difficult to comply with. However, 2 of the farmers felt that accessing a fish pond was the most difficult requirement to comply with, since it was costly and involved a long bureaucratic process.

Processors

Fish processors indicated that to operate as a fish processor, one needed a health mutual insurance which was reported as being important because it was a government

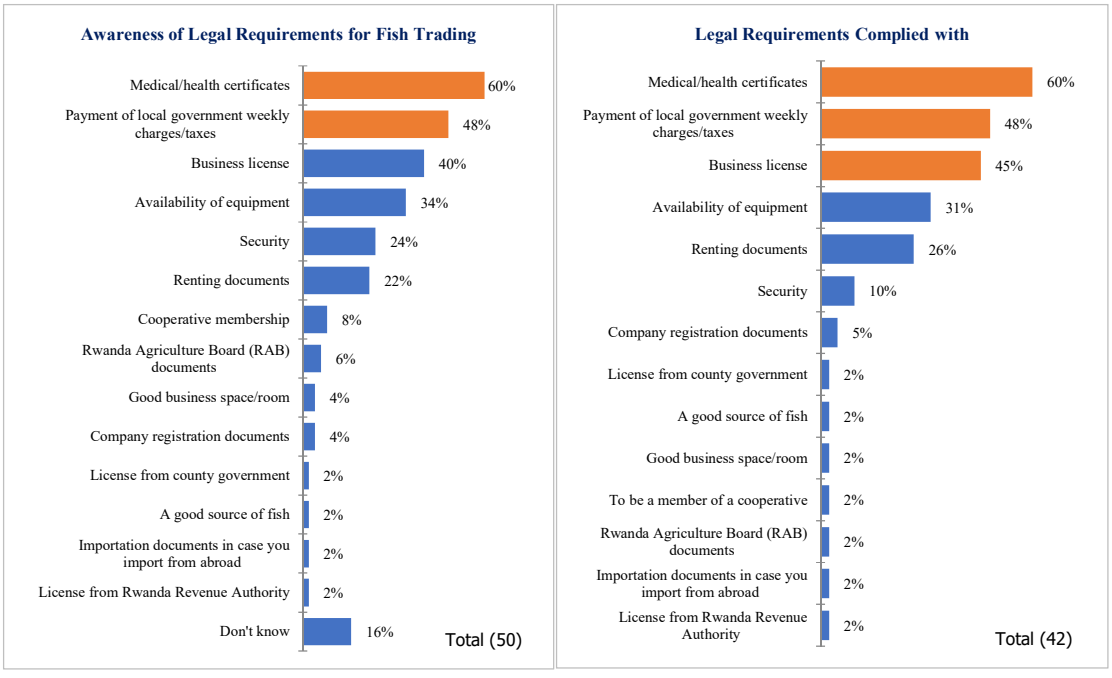
[42] http://rab.gov.rw/animal-resources-department/fisheries/
[43] Master Plan for Fisheries and Fish Farming in Rwanda (2011 to 2020)

requirement and facilitated access to health services at affordable prices. All staff working for the processors were reported as having the health mutual certification. Processors indicated that the duration of time required for staff to undergo health checks ranged from 12 months to 14 months. It was observed that going for health checks for staff in processing factories was a government requirement.

Fish Retailers

Fish retailers on the other hand indicated that to start and run a successful fish retailing business, one mainly needed a medical/health certificate (60%), and payment of local government weekly charges/taxes (48%), among other provisions as show below. Consequently, these were largely the requirements that retailers cited they had compiled with as shown below. A significant proportion however (16%) did not know the requirements needed to start and run a fish retailing business in Rwanda.

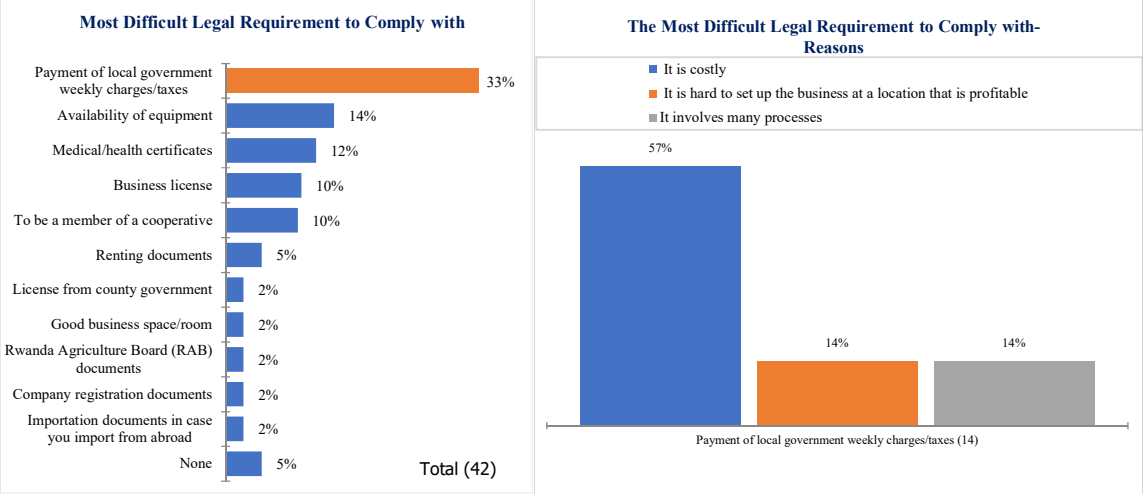
Figure 391: Retailers- Legal requirements for running business



Further, retailers indicated that the most difficult requirements to comply with included payment of local government weekly charges/taxes (33%), availability of equipment (14%), accessing medical certificates (12%), business licences (10%) and becoming a

member of a cooperative (10%) among others. These were largely the most difficult because they were costly and involved many processes as shown below.

Figure 392: Retailers- Most difficult legal requirement to comply with



3.4.7 Demographic Information and Future Communication Insights

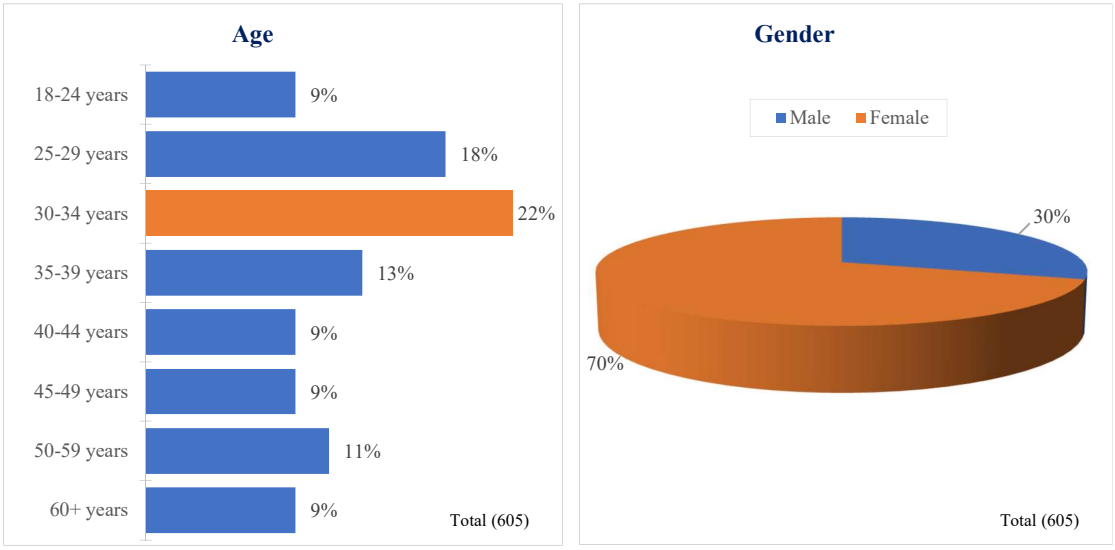
This study targeted consumers as well as market players in the fish industry. Demographic information/profile of participating respondents as well as channels of communication that can be utilized for future programming is presented below.

A. Demographic Information

Consumers

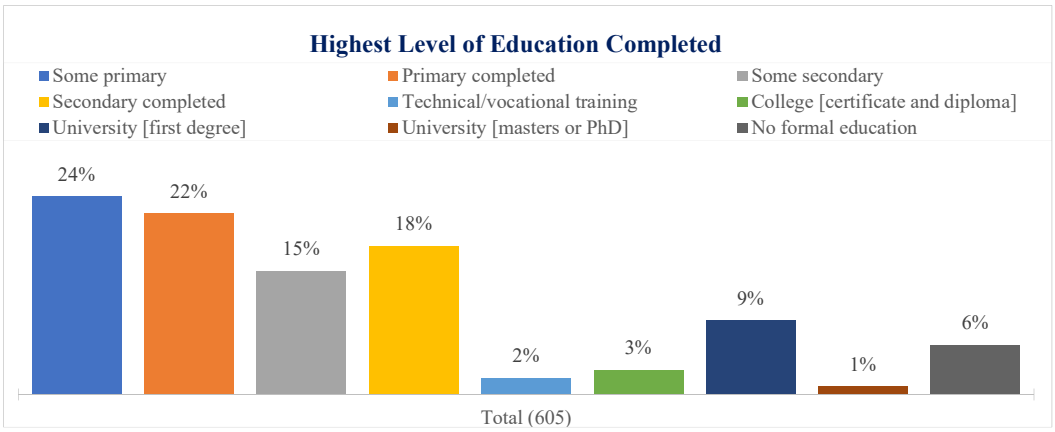
The consumer study targeted the persons aged 18 years (adults) and above in Rwanda at the households. Interviewed persons in selected households were key decision makers of food items purchased in the household. As shown in the figure below, key decision makers of food items purchased in the households were largely aged between 30 years to 34 years (22%) and were mainly female (70%).

Figure 393: Consumers- Age and gender



Further, key decision makers on food items purchased in the households largely had some primary education (24%) or had completed primary education (22%). A significant proportion (18%) had also completed secondary education.

Figure 394: Consumers- Level of education



Additionally, households interviewed had an average of 5 people as shown in the table below. This trend was observed across the regions.

Table 186: Consumers- Number of people in the household

	Total (605)	Urban (304)	Rural (301)	Eastern (100)	Kigali City (141)	Northern (83)	Southern (121)	Western (160)
Average number of people in the household	5	5	5	5	5	5	5	5

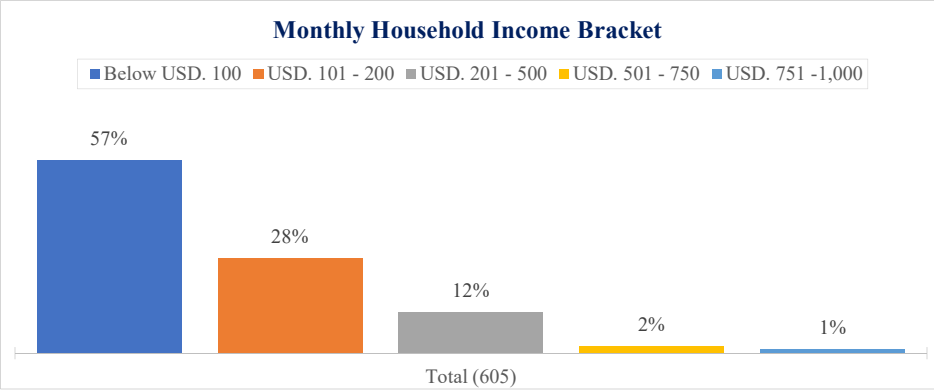
Further, it was observed that the people living in the households were mainly adults (aged 18 years and above) with an average of 3 persons falling under this category as shown in the table below.

Table 187: Consumers- Number of people in the household (age brackets)

Number of people living in the household						
	Adults [18 years and above, including servants if they share the same cooking pot	Children [12 but less than 18 years]	Children [6 but less than 12 years]	Children [2 years but less than 6 years]	Children [6 months but less than 2 years]	Children [under 6 months]
Average number of people in the household	3	1	1	1	-	-

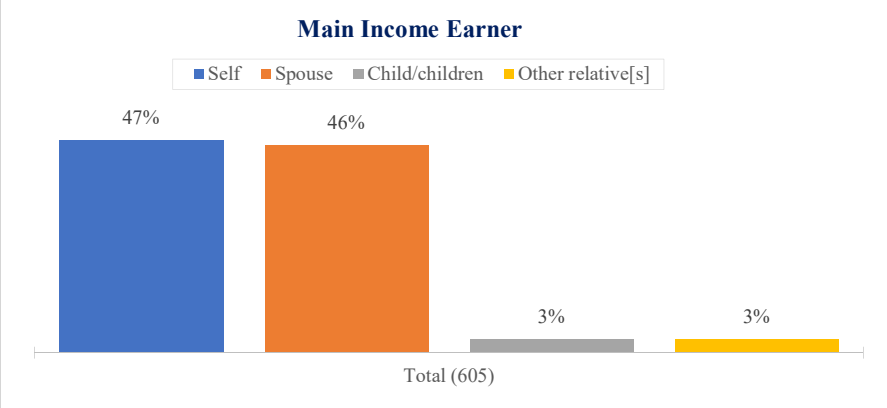
Additionally, most of the households (57%) reported that their monthly income was below USD. 100 as shown below. An equally significant portion also, (28%) reported that their monthly household income was between USD. 101 to USD. 200 as shown in the figure below. Only 1% of the households reported that their monthly income was between USD. 751 to USD. 1,000.

Figure 395: Consumers- Monthly household income bracket



The main income earner in the household was also reported to be largely either the key decision maker of food items purchased in the household (person interviewed/self) (47%) or their spouse (46%) as shown below.

Figure 396: Consumers- Main income earner



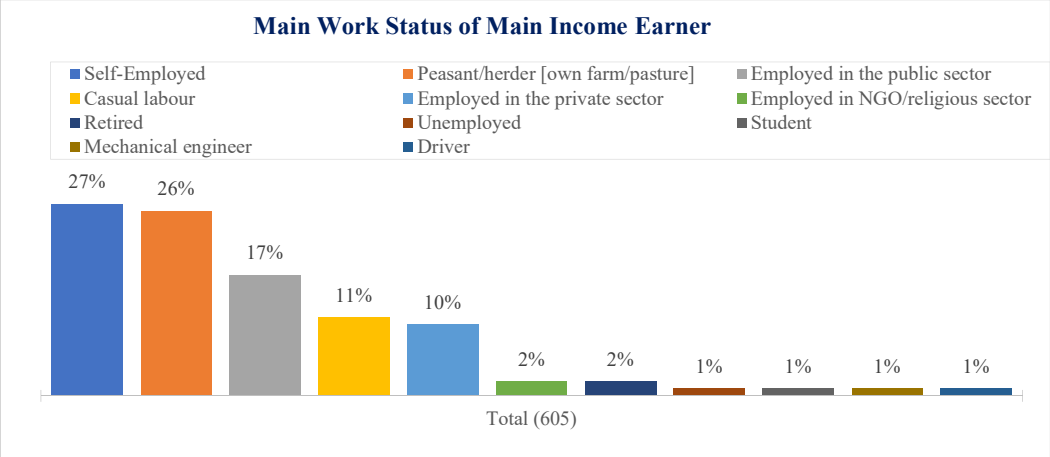
In addition, it was observed that on average, 2 persons earned an income in the household and contributed to the household's income and expenditure. As shown below also, more households with a monthly income of between USD. 751 to USD. 1,000 and USD. 1,001 to USD. 1,500 reported that 2 and 3 persons respectively in the households earned an income and contributed to household income and expenditure.

Table 188: Consumers- Number of people in the household contributing to income and expenditure

	Total (605)	Below USD. 100 (346)	USD. 101 - 200 (168)	USD. 201 - 500 (72)	USD. 501 - 750 (11)	USD. 751 - 1,000 (4)	USD. 1,001 – 1,500 (1)	Above USD. 1,500 (1)	Don't know/ refused to answer (2)
Average number of people earning an income	2	2	2	2	2	2	3	1	2

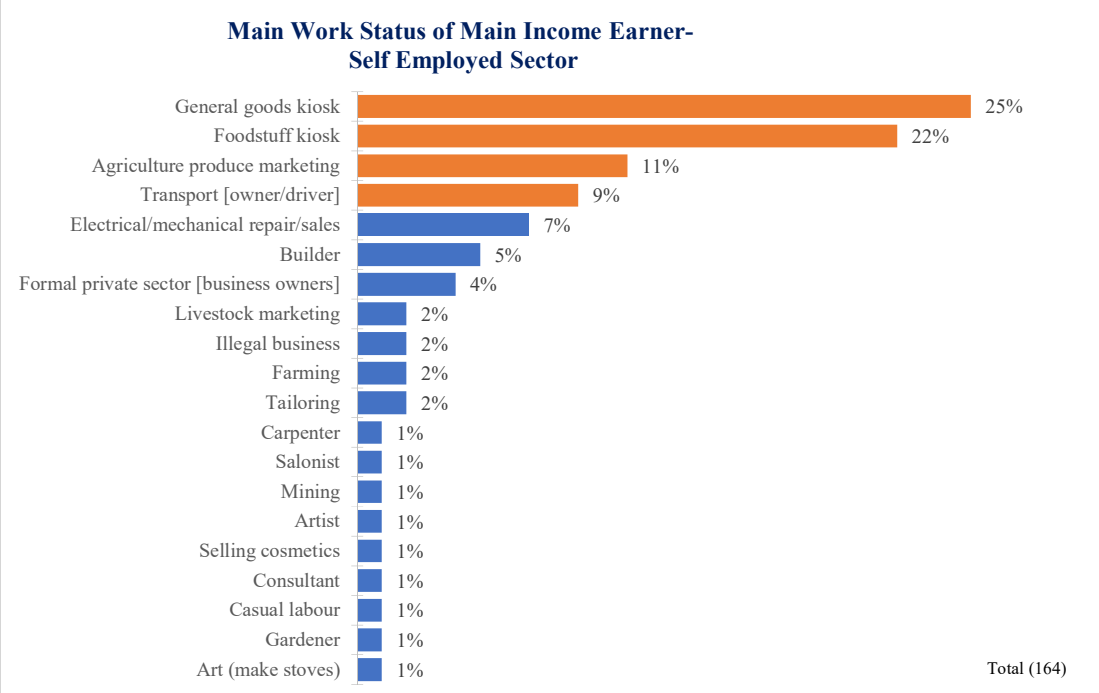
The main income earner for the household was reported to be largely either self-employed (27%) or working as a peasant/herder (26%) as shown below.

Figure 397: Consumers- Main work status of main income earner



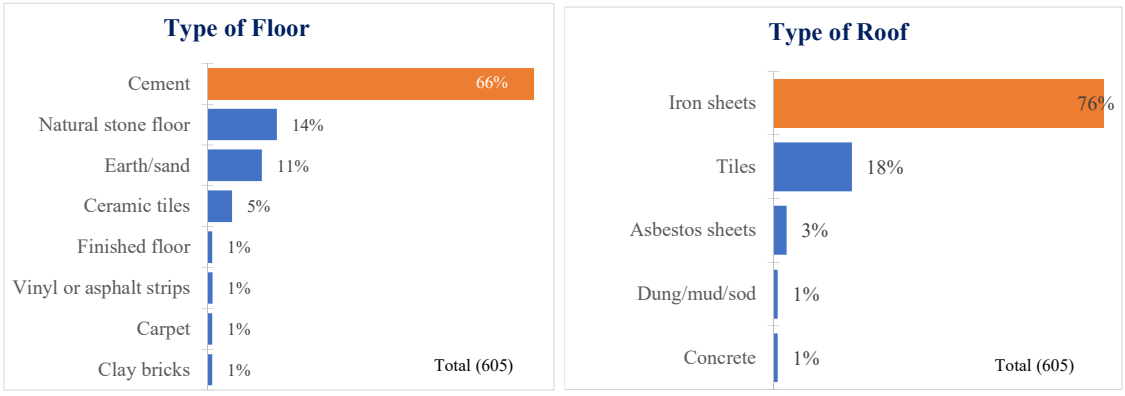
Main income earners who were self-employed were reported to be largely running general goods kiosks (25%), running foodstuff kiosks (22%), or were in agriculture food produce marketing (11%) among others as shown below.

Figure 398: Consumers- Main work status of main income earner- Self-employed sector



Further, consumers were found to be living in households that largely had cemented floors (66%), and were roofed with iron sheets (76%) as shown below.

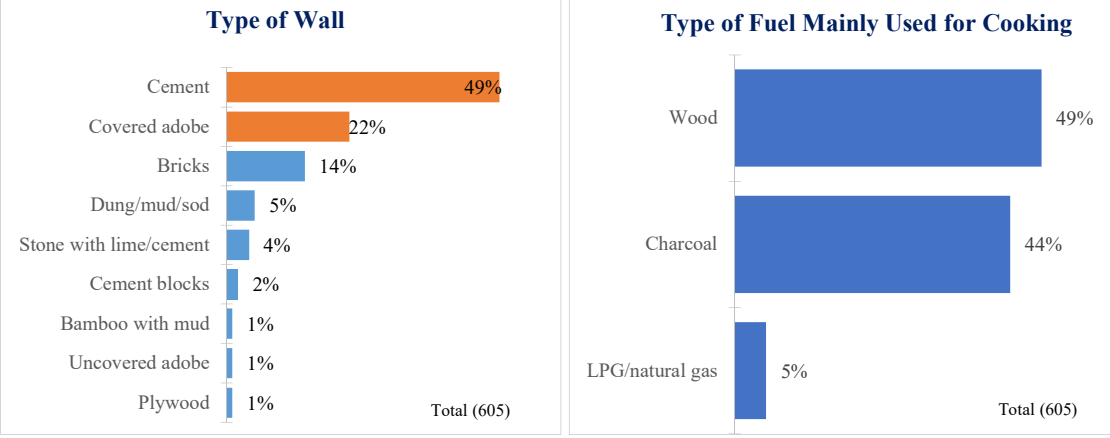
Figure 399: Consumers- Type of floor and roof of the household



The households' walls were also largely cemented (49%) as shown in the figure below. Lastly, the households reported that they largely used wood (49%), charcoal (44%) or

LPG/gas (5%) as the main type of fuel for cooking in the households among other types of fuel.

Figure 400: Consumers- Household's type of wall and type of fuel mainly used for cooking



Market Players

The profile of the key market players namely: fish farmers, fish retailers, processors, storage and transportation business and cooperatives supporting the fish industry business is presented below.

Fish Farmers

Fish farmers interviewed in this study were found in Kigali. The respondents targeted were the owners or the key decision makers in the farmers. These were observed to be largely aged between 35 years to 39 years (2 farmers) or 60 years and above (2 farmers). One of the farmers was aged between 45 years to 49 years. Additionally, it was noted that most farmers were male (4 out of 5) while one of the farmers was female.

Further, it was noted that the highest level of education completed by fish farmers varied. One farmer had a university degree (first degree), while another had a college diploma or certificate. Another farmer on the other hand had technical/vocational training, while another had completed secondary school. The lowest level of education completed was reported as primary school by one farmer.

Most participating fish farmers (4 out of 5) had also been in the business for a period of more than 5 years, while one farmer had been in the business for a period of between 3

to 5 years. All farmers indicated that they had been continually in the practice of fish farming. It was observed that fish farmers had solely joined the business to produce fish for consumption at the household and for sale (locally). Furthermore, all the interviewed farmers practiced pond farming.

In addition, it was noted that farmers were engaging both permanent and temporally staff. An average of 4 permanent staff and 2 temporary staff were engaged in running the fish farming businesses as shown in the table below.

Table 189: Fish farmers- Number of staff working in business

Number of staff working in the business		
Total (5)		
	Permanent	Temporary
Average number of employees	4	2

Regarding the source of credit for starting and running the fish farming business, it was observed that all farmers exclusively used their own savings to start the business. In addition, all the farmers used their own savings in running the business. while one farmer also ploughed back profits from the business.

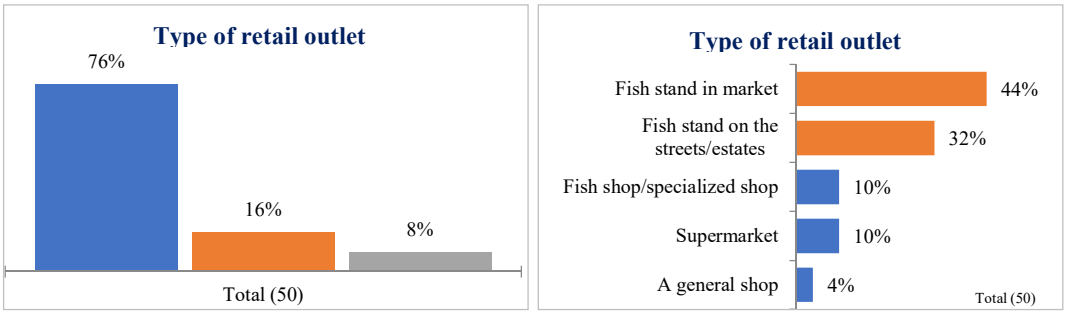
Storage and Transportation Businesses

It was observed that the two persons managing fish storage and transportation businesses had primary education level and secondary education respectively. It was also noted that the managers were aged 30 years and 42 years respectively, and were both male. Lastly, the managers had been in business for a period of 7 years and 14 years respectively.

Retailers

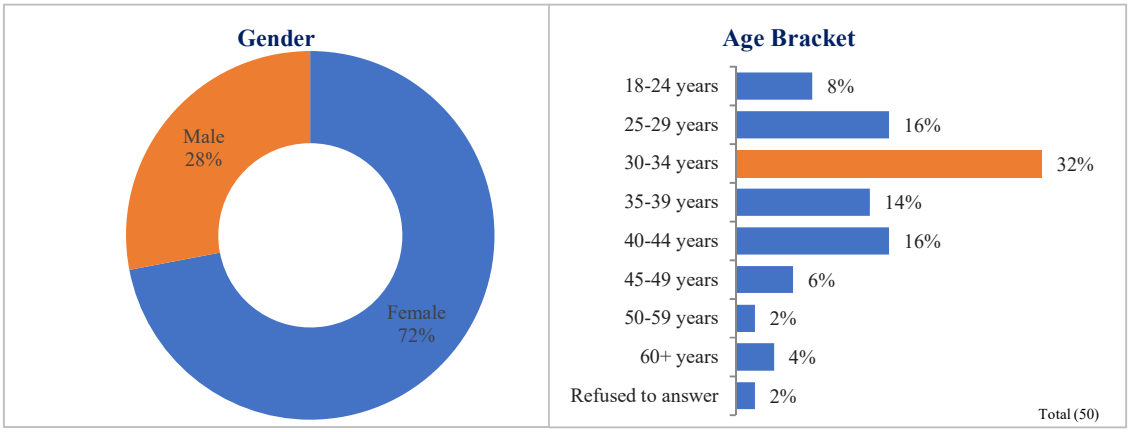
Fish retailers targeted in this study were mainly situated in Kigali (76%), Western (16%) and Southern (8%) Regions as shown in the figure below. Additionally, the fish retail outlets were largely fish stands in the market (44%) and in the streets/estates (32%) among others as shown below.

Figure 401: Retailers- Region/type of outlet



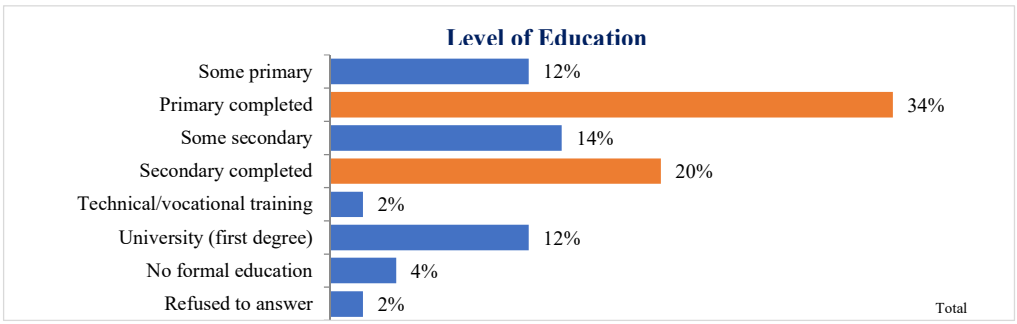
The fish retailer's study component interviewed persons who were either the business owners or the key decision makers. As shown below, majority of the respondents were female (72) and a substantial portion (32%) was aged between 30 years to 34 years.

Figure 402: Retailers- Gender and age



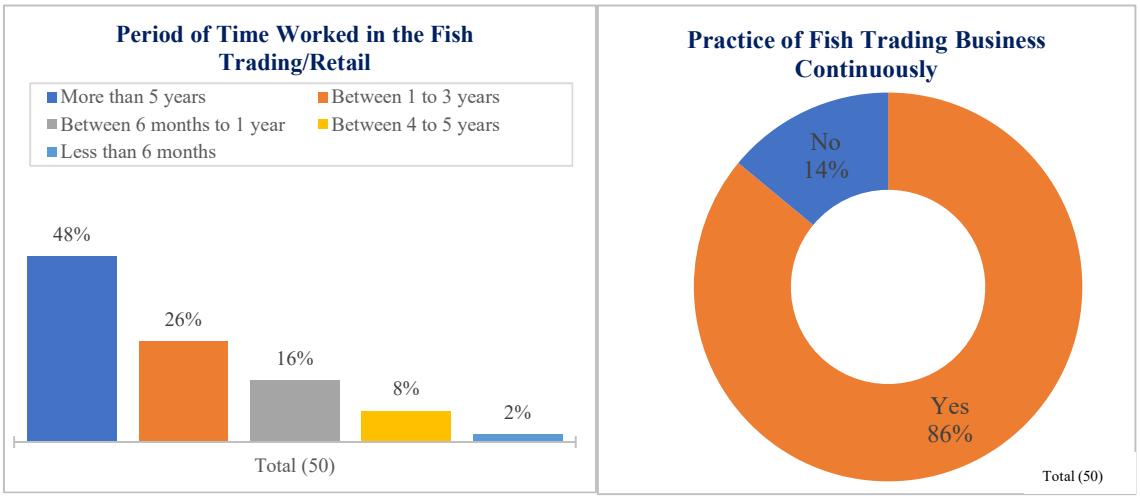
Additionally, the highest level of formal education attained by the owners/key decision makers of retail outlets was mainly primary education completed (34%) or secondary education completed (20%) as shown below.

Figure 403: Retailers- Highest level of education completed



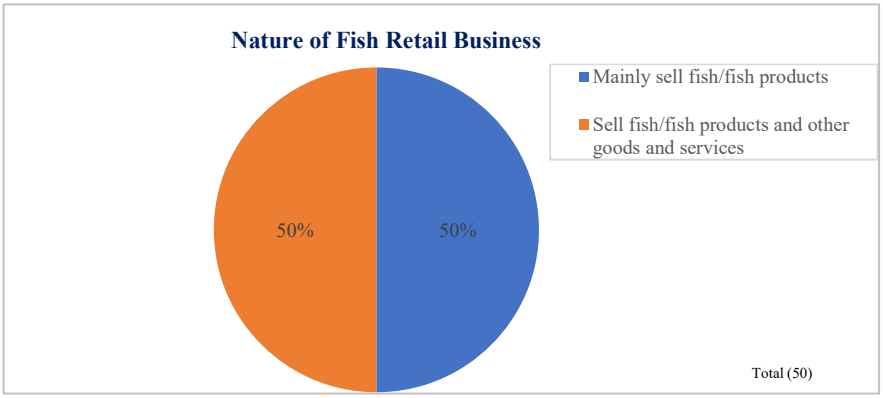
Further, it was observed that fish retailers had largely been in the fish trading business for more than 5 years (48%) as shown below. Further, a substantial proportion (86%) had been in the business continuously since venturing into the trade.

Figure 404: Retailers- Duration of time in the fish trading business



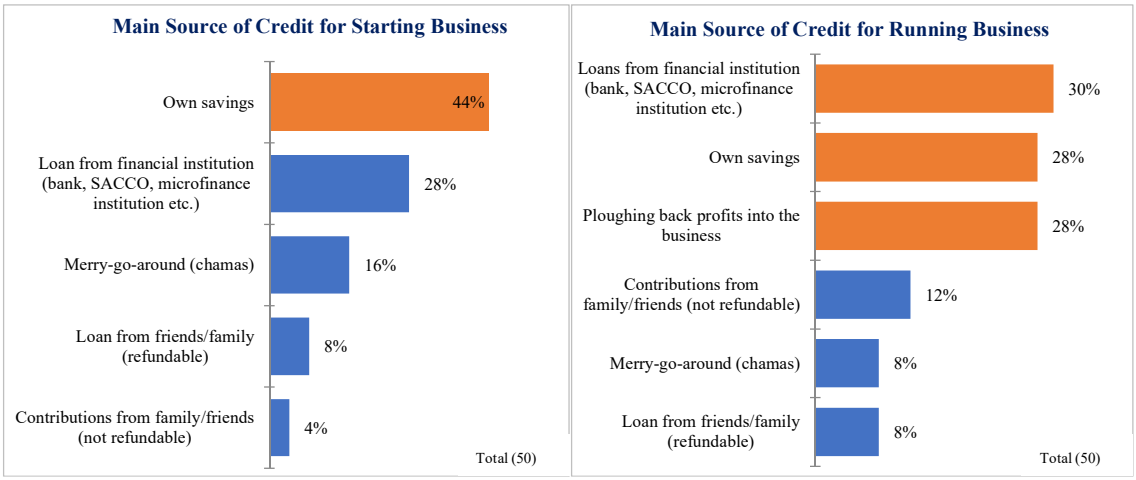
An even distribution of fish retailers engaged in the sale of fish and fish products, as well as the sale of fish/fish products and other goods and services.

Figure 405: Retailers- Nature of fish trading business



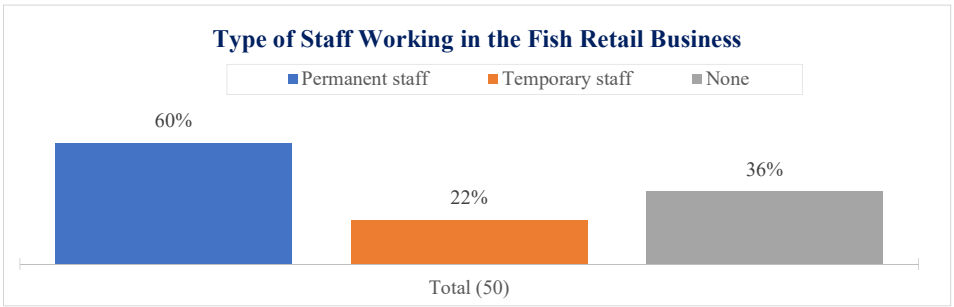
It was also observed that most of the fish retailers had used their own savings (44%) to start off their trade amid other channels. Most of the fish retailers mainly depended on the loans from financial institutions (30%), their own savings and ploughing back profits (28% respectively) among other channels to keep their businesses running as shown below.

Figure 406: Retailers- Main source of credit for starting and running business



Further, it was observed the type of staff engaged in fish retail business were mostly permanent staff (60%) with only a few businesses engaging temporary (22%) staff as shown below.

Figure 407: Retailers- Type of staff working in the business



Additionally, fish retailers engaged an average of 3 permanent staff and 1 temporary staff to run their businesses as shown below.

Table 190: Retailers- Number of staff in business

Number of staff working in the fish retail business		
	Permanent staff	Temporary staff
Average number of employees	3	1

Processors

Five processing factories in Rwanda were interviewed and were situated in Kigali. Additionally, the key decision makers interviewed in the processing factories were mainly aged between 18 years and 24 years (3 out of 5 processors). Two processors were

aged between 40 years to 44 years. Further, 3 out of 5 processors had completed primary school as their highest level of education completed, while 2 processors had either completed secondary school or had some secondary school education as the highest level of education.

Further, it was observed that all fish processors interviewed in this study had worked in the decision role they were currently in for a period of between 1 to 2 years (2 processors) and more than 5 years (2 processors). One processor had worked in the role for a period of between 3 to 5 years.

All the respondents reported that their motivation for joining the industry was because the business was profitable/rewarding and it was the respondent's preferred type of business. One processor also indicated that their motivation to join the business was to network with others.

Processing factories were observed to have an average of 4 employees who were comprised of permanent and temporary staff where the majority were male as shown below.

Table 191: Processors- Number of employees in firm

Number of employees in processing factories					
	Total Number of Employees	Full Time-Male	Full Time-Female	Temporary-Male	Temporary-Female
Average number of employees	4	1	1	2	-

Most processors indicated that they largely did not engage more staff than the reported number. One processor, however, indicated that they engaged more staff than the reported, mainly when the factory purchased more fish, or when there was an increase in the number of customers.

Cooperatives

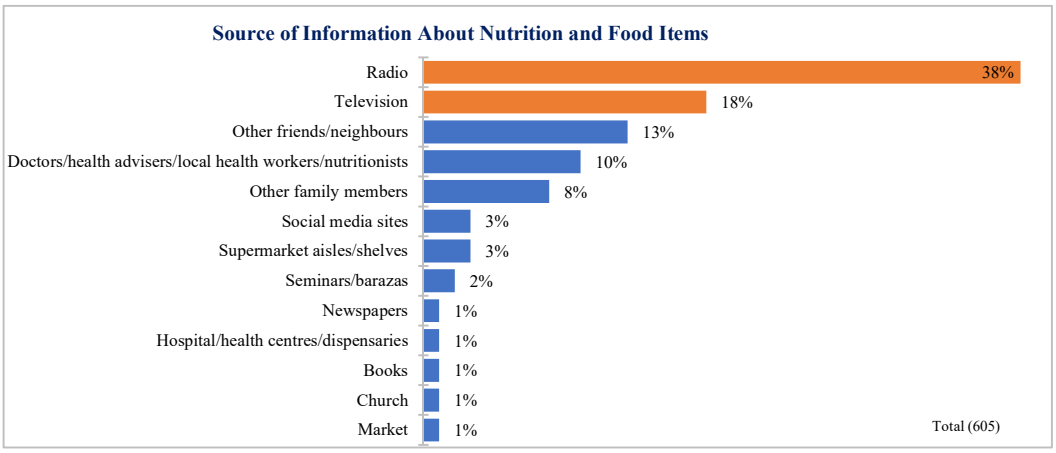
It was observed that the two cooperative administrators had attained secondary school education as the highest level of education attained. Additionally, one of the administrators was aged 39 years, while the other was age 48 years. Both administrators were male, and had been in the business for more than 5 years.

B. Future Communication

Consumers

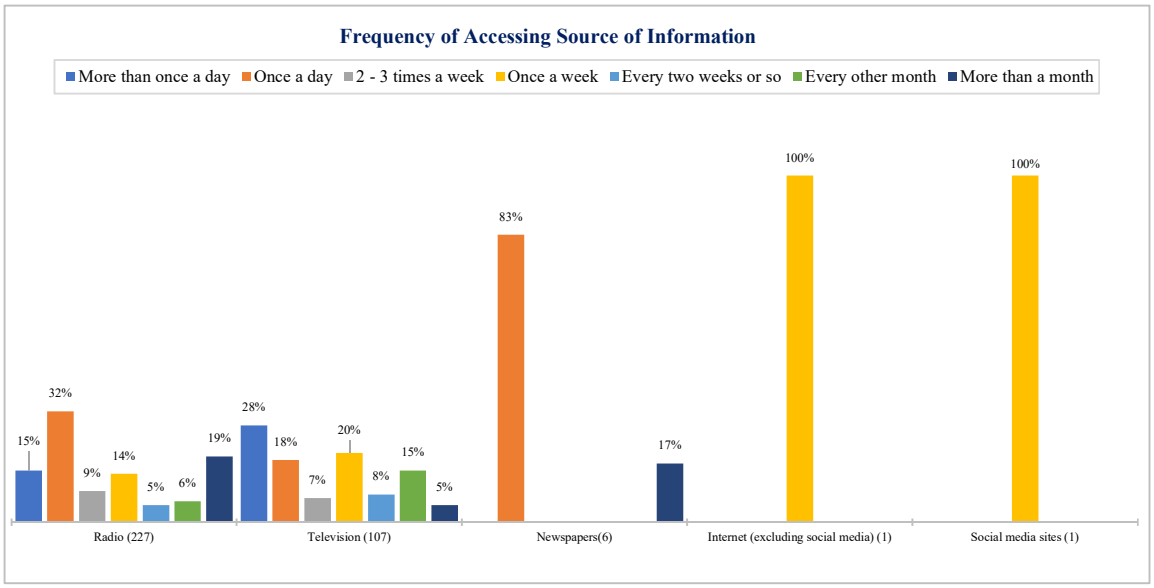
Consumers mainly accessed information about nutrition and food items from the radio, and television among other sources as shown below. These would be the most appropriate channels to reach them on issues of interest.

Figure 408: Consumers- Source of information



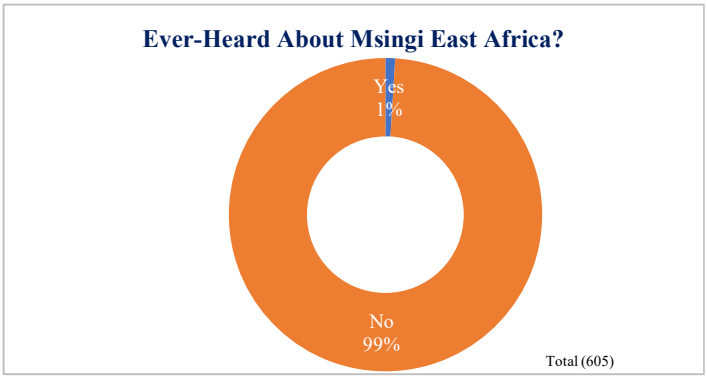
Further, it was observed that consumers accessed the radio largely once a day, the television largely more than once a day, newspapers largely once a day, the internet and social media sites mainly once a week as shown below.

Figure 409: Consumers- Frequency of accessing sources of information



It was observed that only a small proportion of consumers (1%) had heard about Msingi East Africa prior to the study's implementation, mainly through the radio, television and from other family members.

Figure 410: Consumers- Ever heard about Msingi East Africa in the past?



It was noted that consumers who had heard about Msingi in the past had heard that it is an organization that deals with food production, nutrition and fish farming.

Market Players

Presented below are source of information that can be used to contact market players in the fish industry in future.

Fish Farmers

Fish farmers reported that their main source of information about fish farming and other general market information was through the radio, internet (excluding social media) and social media sites. For effective future communication, these three channels are recommended. Farmers accessed the radio largely more than once a day, the internet (excluding social media) and social media sites largely once a week.

Additionally, it was noted that none of the farmers had heard about Msingi East Africa before the study was implemented.

Storage and Transportation Businesses

It was observed that managers of storage and transportation companies utilized relevant information mainly from trainings and forums organized by Government institutions, such as Rwanda Agricultural Board (RAB) and Rwanda Bureau of Standards (RBS).

Other sources of information included social media channels such as Facebook and WhatsApp. It was noted that none of the storage and transportation companies' managers had heard about Msingi prior to the implementation of the study.

Processors

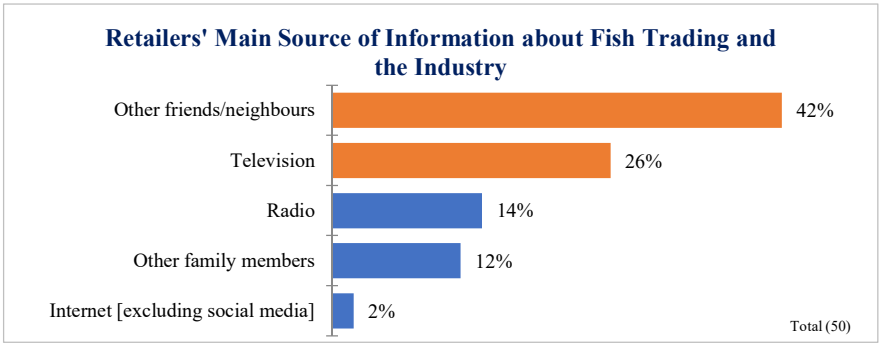
Processors mainly accessed information about fish processing and general market information from the radio, television, newspapers and social media. They largely accessed these channels either more than once a day or once a day.

It was further noted that none of the processors had heard about Msingi East Africa before the data collection period.

Fish Retailers

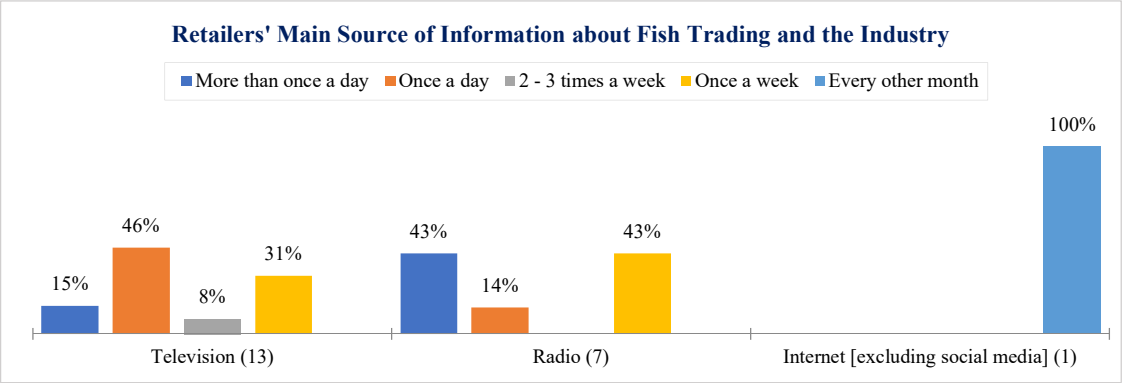
Fish retailers indicated that their main sources of information about fish trading and other general market information was largely through Other friends/neighbours (42%) and the television (26%) among other channels as shown below. These would be most effective channels of communications.

Figure 411: Retailers- Main source of information



Additionally, fish retailers reported that they largely accessed the formal channels of communication largely more than once a day or once a day (radio and television), while they accessed the internet (excluding social media) every other month.

Figure 412: Retailers- Frequency of accessing main source of information



Lastly, it was observed that all the retailers had not heard of about Msingi East Africa prior to the study's implementation.

Cooperatives

It was observed the cooperative administrators accessed relevant information mainly from the radio, newspapers and the television. Other sources of information reported included word of mouth and from RAB. These would therefore be relevant channels to utilize in future program work targeting this group. It was noted that none of the cooperative managers had heard about Msingi prior to the implementation of the study.

4 ANNEX

4.1 Data Collection Team Recruitment Procedures

Ipsos engaged a highly-qualified team of local data collectors with vast experience in the research industry during the implementation of this study. A standard recruitment procedure was followed and the recruited teams had the following basic requirements:

Table 192: Basic requirements for field team recruitment

Key basic requirements for field team recruitment	
General understanding and/or experience in market and social research methodologies and study techniques- quantitative and qualitative (moderator/interviewer/supervisor)	With adequate interviewing skills (moderator/interviewer/supervisor)
Demonstrated competencies in team management (supervisor)	With ability to work collaboratively in a team (moderator/interviewer/supervisor)
Experience/track record of conducting similar studies at the proposed level (moderator/interviewer/supervisor)	With ability to practice discretion during data collection- honesty/trustworthiness (moderator/interviewer/supervisor)
Ability to troubleshoot during data collection (moderator/interviewer/supervisor)	Well groomed (moderator/interviewer/supervisor)
Able to read and write in English and local language to the level required to correctly administer and fill out the study instrument (moderator/interviewer/supervisor)	Confident (moderator/interviewer/supervisor)
Knowledge of selected regions/study sites of data collection (moderator/interviewer/supervisor)	Attentive to detail/accurate (moderator/interviewer/supervisor)
Post-secondary level education – particularly mid-level college education and above (moderator/interviewer/supervisor)	Good organization skills (moderator/interviewer/supervisor)
Had undertaken a research ethics training before engagement in a study (moderator/interviewer/supervisor)	Available during the study execution period (moderator/interviewer/supervisor)

4.2 Data Collection Team Training Procedures

The table below provides an overview of the content that was covered during the training sessions.

Table 193: Research training content

Field team training content	
Research basics- an introduction to market and social research and research methodologies	Concepts, definitions and methods of data collection
Interviewing/moderating techniques	Data collection guide review (moderator, interviewer and supervisor guides)
Research ethics - including internationally approved standards of handling participants	Team (moderator, interviewer and supervisor) roles
Recruitment methodologies	Communication lines to be followed
Sampling techniques	Quality control measures – common errors in data collection, editing questionnaires, back-checking etc.
Dos and don'ts during fieldwork- standard procedures to be followed including implications of not adhering to the laid-out procedures	Implementation logistics/teaming procedures for effective data collection
Overview of the sector relevant to the study	Mobile Data Collection- appreciation of the mobile data collection technology
Overview of Msingi - line of work/mission/vision/objectives etc.	Role-playing, mock interviews and piloting to allow for checking the instrument's flow, comprehension/familiarization with the study instruments, identification of any ambiguities that may be present in the study instrument and clarifications of any arising issues
The study background and objectives	Study instruments systematic reviews (question by question)

4.3 CAPI Data Collection Platform

Ipsos made use of a computer assisted personal interviewing (CAPI) technique for quantitative data collection. The final approved paper questionnaires including translations were converted into electronic format and uploaded onto smartphones for use in data collection. CAPI ensured quality, security, and confidentiality of data besides speedy data collection. All aspects of the paper questionnaire were maintained in the electronic version and a round of tests were carried out by the field coordinators and project managers to ensure that this was the case.

The Ipsos **iField platform** was used. This is a unique, fully integrated application covering all aspects of data collection, field management and quality control. It includes features such as GPS and audio recording to enhance quality control. All data, including sampling, questionnaire and metadata was captured in one data framework, meaning that Ipsos had complete visibility of every aspect throughout the study. The application for Android and Windows 8+ was installed on the tablets or smartphones used by the interviewers (this involved a straightforward download from the Google Play or Windows Stores as for any mobile app). The iField application operates off-line and therefore the interviewers could continue working even when the devices were disconnected from the mobile network or Wi-Fi. Synchronisation was then triggered automatically as soon as a connection was available for data to stream into the Ipsos servers.

4.4 Unique Fish Varieties in Rwanda

Tompson fish

Capitaine/Sangara/Sangara