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DEMAND-DRIVEN VALUE CHAIN OF SMOKED FISH AMONG SMALL-SCALE FISH PROCESSORS IN GHANA

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ABSTRACT

Local smoked fish supplied in Ghana is fraught with challenges that have led to high post-harvest losses and declining profitability as well as putting consumers at high risk of food safety issues. Smoked fish does not generate better market return for key actors in the value chain. Therefore, the underlying goal of the study was to identify and explore how market-driven value chain can lead to improved product quality of smoked fish to increase returns among small-scale fish processors in Ghana. A literature reviewed gave a broad overview of the market-driven value chain concept. Primary data was collected using a questionnaire to identify market requirements and consumer preferences for smoked fish in the supermarkets in Ghana. The findings revealed that the supermarkets and its consumers have different perceptions about smoked fish produced in Ghana. The respondents from the supermarkets rated the quality of smoked fish as poor and the consumers rated it to be good. In contrast to the supermarkets' opinions , 90% of the consumers who purchase items from the supermarket are willing to pay additional premium for improved quality smoked fish product. All the supermarkets are also willing to pay additional premium for a quality product. Also, the respondents of the supermarkets and consumers have limited knowledge about the technologies used to smoke fish in Ghana. The results from this study shows that further research needs to be carried out on the monetary value of a value-added product and class categorisation of consumers to enhance decision making. Among all other things, there is a possibility for smoked fish to enter the higher market if only it meets with the market's requirements and specifications.

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LIST OF ACRONYMS

CSIR	Council of Scientific and Industrial Research
EEZ	Exclusive Economic Zone
EU	European Union
FC	Fisheries Commission
FAO	Food and Aquaculture Organisation
HACCP	Hazard Analysis Critical Control Point
MOFAD	Ministry of Fisheries and Aquaculture Development
NGO	Non-Governmental Organisation
SNV	SNV Netherlands Development Organisation
UNIDO	United Nations Industrial Development Organisation
USA	United States of America
USAID	United State Agency for International Development
SFMP	Sustainable Fisheries Management Project
IFSS	Improved Fish Smoking Smoker
PAH	Polycyclic Aromatic Hydrocarbons

1 INTRODUCTION

1.1 Background

Ghana is in West Africa which shares a boundary with Burkina Faso in the north, Côte d'Ivoire in the west, Togo in the east and the Gulf of Guinea in the south (Figure 1). The coastline of Ghana is about 550 km2 and the maritime domain in addition to the territorial sea and the Exclusive Economic Zone (EEZ) is 228,000km (MOFAD, 2015).

Figure 1: Map of Ghana and surrounding countries (Ghana Web)

Commercial fisheries in Ghana started in the 1900s and today the fisheries sector is classified into three main subsectors; artisanal (also referred to as small-scale), semi-industrial (inshore) and industrial (tuna or large pelagic), but the dominant fisheries sector is artisanal fisheries. The small-scale sector depends heavily on resources from the marine fisheries and to a lesser extent, inland and aquaculture fisheries.

In practical terms, the fisheries sector operates in four coastal regions: Western, Central, Greater Accra, and Volta (figure 1). In these regions, the small-scale fisheries are operating at 304 landing sites in 189 fishing villages with about 1.5 million people relying on it for their livelihood (FAO, 2016). Approximately, 70% of the total marine fish captured by artisanal canoes in Ghana are small pelagic species (FAO, 2016).

The industrial fishers use bottom trawl to fish grouper, sparids, cuttlefish and snappers, and pole and line and purse seine for skipjack, yellowfin and bigeye. The catch from this sector is frequently exported. The semi-industrial uses purse seines and trawl gears to target sardinellas and mackerels in the inshore areas. The artisanal fishers use gillnets, handlines, traps, pots and focus on small pelagic such as sardinellas, anchovy and mackerels. Raw materials from the inshore and artisanal sectors are mostly consumed locally (MOFAD, 2015).

The fisheries sector provides employment, livelihood support, poverty reduction and food security to most of the Ghanaian population. The sector involves both men and women. The men partake in the key fishing activities, and the women do the on-shore post-harvest activities (Ayisi, 2015). There are over 250,000 fishers in the artisanal sector (Asare, 2015). The post-harvest activities provide employment ranging from full-time employment to seasonal involvement in different stages of the post-harvest value chain in Ghana. About 500,000 individuals are engaged in fish processing and distribution in Ghana (FAO, 2016).

Ghana both exports and imports fish. However, fish exports over the years has been unstable. Around 63,000 tons and 57,000 tons were exported in 2012 and 2013 respectively, with an estimated 80% to the EU market (Pierre Failler, 2014).

Despite the importance of the marine sector, Ghana has seen a declining trend in total fish landings and the reduction is mainly attributed to the reduction in the small pelagic. The annual total landings (all species) catch declined from about 400,000 mt in 1996 to 198,000 mt in 2016 (figure 2) (Lazar, et al., 2018). The decrease in the small pelagics is very serious, since the catch has gone from about 250,000 tons to less than 25,000 tons over a 20-year period.

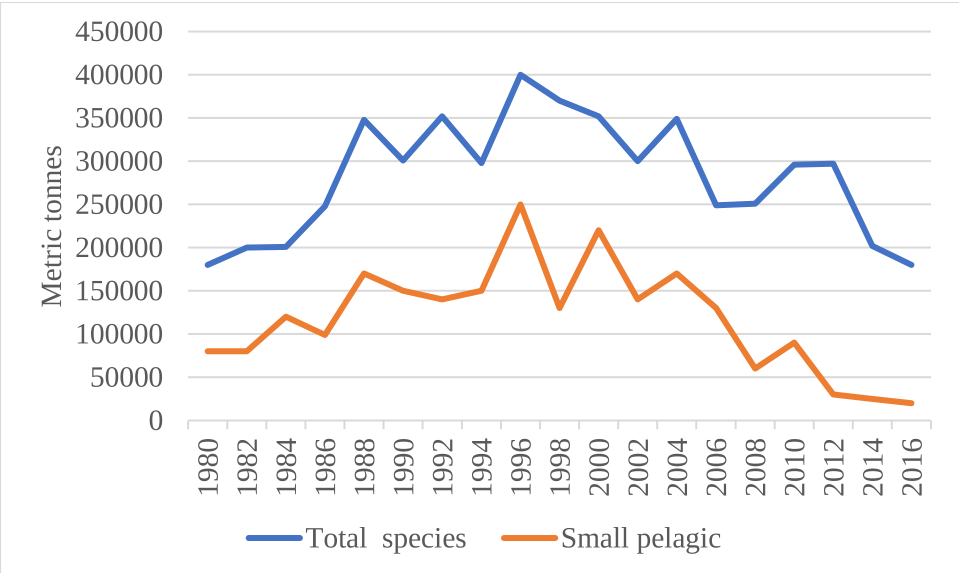

Figure 2: Annual landings of all species and small pelagic in Ghana (Lazar, et al., 2018).

As effort keeps increasing the catch also declines. This situation has been attributed to Illegal Unreported Unregulated (IUU) fishing, overfishing and poor fisheries management (Lazar, et al., 2017). The decline in the fish catch has led to a growing public awareness on the impact of fish stock depletion on the economy. Fisheries management strategies such as closed seasons covering all sectors of the fishing industry and an additional fishing holiday (a day off fishing) to help rebuild the marine fish stocks has been announced for implementation in June 2019 (Zaney, 2019). One way to address these challenges is to observe value creation in the Ghanaian fisheries sector.

1.2 Problem Statement

Pemberton-Pigott, (2016) argues that products produced from simple mud smokers in Ghana are of poor quality due to poor handling, lack of ice on board vessels or at landing sites, lack of use of hygienic handling and processing practices, poor packaging, storage, and infestation of insects (Figure 3).

Pemberton-Pigott, (2016) explained that fish is highly perishable; if it is not properly iced, handled and processed the quality is affected. Poor market facilities, poor hygiene and sanitation in the local informal market in Ghana affects the quality of the fish. These challenges account for high post-harvest losses, food safety issues and low-profit margins among traders in the supply chain.

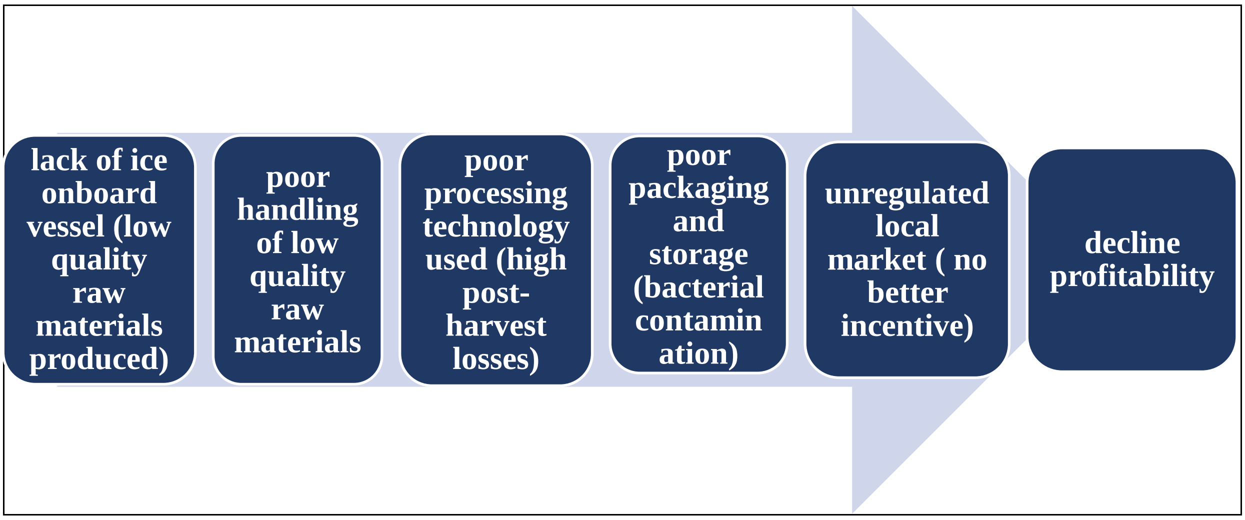

Figure 3 Challenges in the smoked fish supply chain in Ghana.

Another study (Kennedy, et al., 2017), shows that traditional fish smoking technologies (drum and chorkor) recorded high Polycyclic Aromatic Hydrocarbons (PAH) levels in smoked fish that far exceeds the European Union (EU) maximum limit (ML) of 12 microgram per kg (Figure 4).

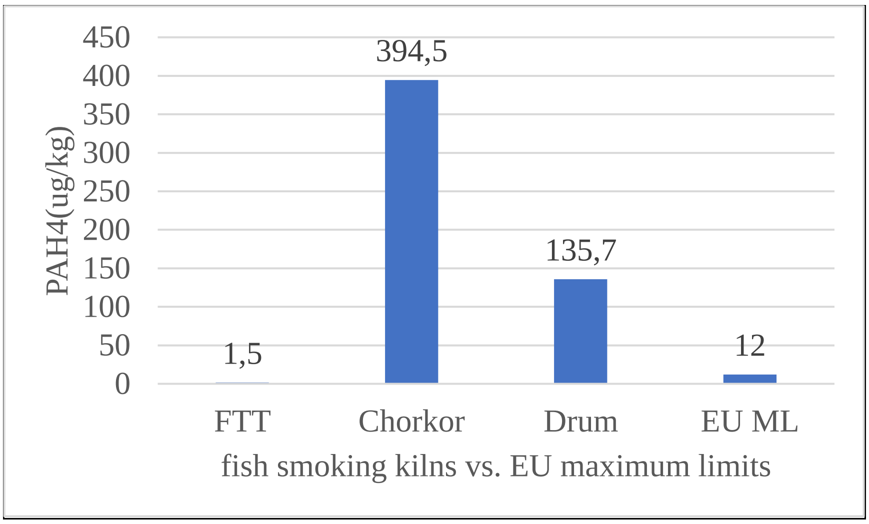

Figure 4: Sample result PAH Levels in smoked dry sardinella in Ghana using FAO- Thiaroye Fish Processing Technology (FTT), Chorkor and Drum kilns (Kennedy, et al., (2017).

PAHs are classes of organic compounds produced by incomplete combustion or high-pressure processes. (Environmental Health and Medicine Education, 2019). Kennedy, et al., (2017) added that the result has prevented fish produced from such technologies entering into higher markets as it does not meet required standard. To enter the international market with smoked fish for instance, stringent standards of the HACCP (Hazard Analysis Critical Control Points) system needs to be obliged. In Ghana, it has been reported that only a few small-scale fish processors can fulfil the HACCP stringent principles and enter the international markets (Failler, Beyens, & Asiedu, 2014). As such, most of the small-scale processors market their smoked fish product in the local informal, unregulated markets in Ghana.

1.3 Goal and Objectives

The underlying goal of the study is to identify and explore how the market-driven value chain can lead to improved product quality of smoked fish to increase returns among small-scale fish processors in Ghana.

1.3.1 Specific objectives

1. Determine the requirements and consumer preferences for smoked fish in the intermediate (higher) markets of Ghana.

2. Assess intermediate market and consumer knowledge on improved fish smoking technologies in Ghana.

3. Establish a feasible pathway to meet with the requirement of the intermediate market demand.

4. Estimate the benefits key actors in the value chain will derive by meeting market requirements and specifications.

1.4 Purpose and significance of the study

Perez-Escamilla (2017) states that all people will obtain food security if everyone has physical, socio- economic access to enough, safe and nutritious food that meet their nutritional needs and preferences. However, food security has become an international issue, especially for developing countries. Food waste and losses in developing countries have been attributed to financial, managerial, technical, harvesting and processing techniques (FAO, 2017)**.**

The Fisheries Commission in Ghana (FC), in order to add value and improve the livelihood of small-scale fish processors, as well as get a better market reward for small-scale fish processors in Ghana, has introduced an improved Fish smoking technology (Ahotor) and has adopted a certification scheme for certified hygiene and handling, labelling and traceability (Ottah, Nkansah, Avega, & Kwarteng, 2017). However, few studies have been carried out to find out the market requirement, market trends, consumer needs and preferences that will yield economic returns among small scale fish processors.

Ottah, Nkansah, Avega, & Kwarteng, (2017) highlighted that although FC has adopted the certification scheme, consumer awareness, access to higher market and market development remain a challenge (figure 5).

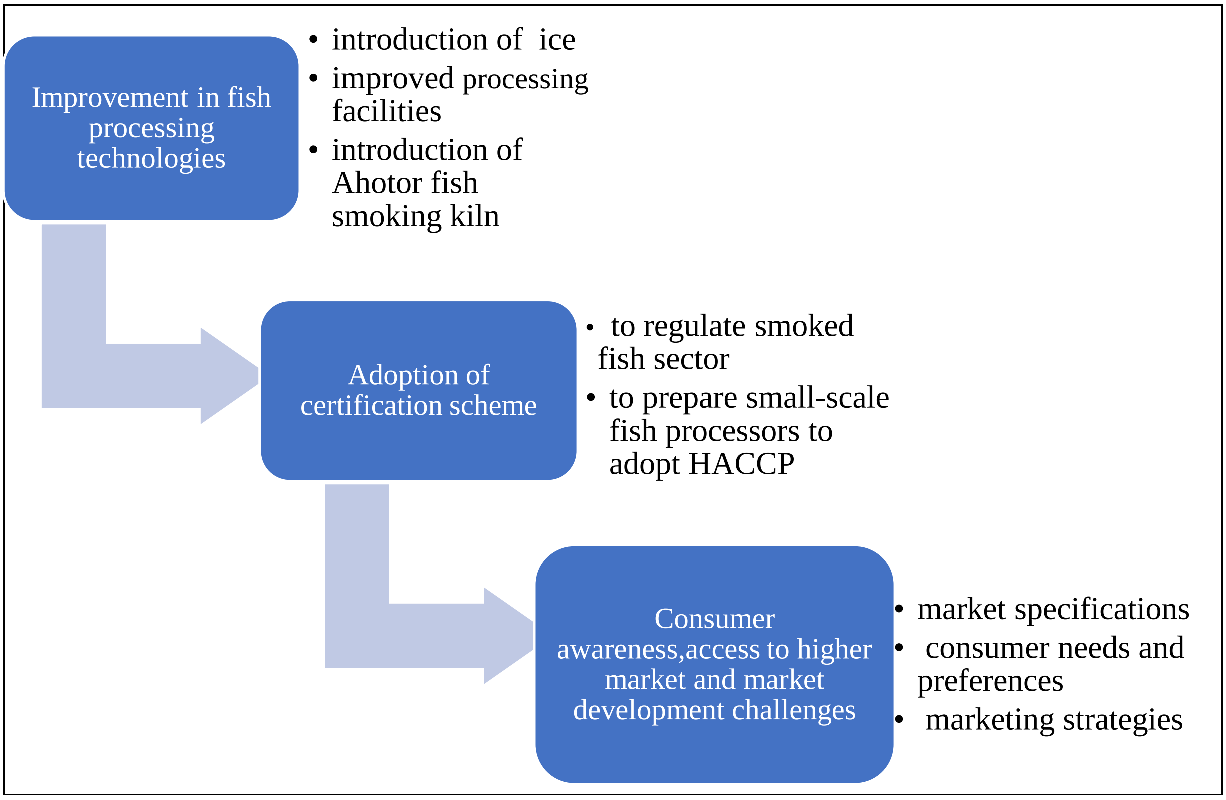

Figure 5: Explanatory sequence of current status of fish smoking in Ghana.

Therefore, to achieve better market reward or enter the higher market, it is necessary to map out a market-driven value chain to identify the structure, potentials, and requirements of information flow of the higher markets to enable small-scale fish processors to develop in their businesses.

It is envisaged that the output of this research will help small-scale fish processors to realise that there could be bigger or better market opportunities within Ghana that are willing to purchase more quality and satisfactory smoked fish product at a premium price. Besides, the study will serve as a learning tool for small-scale fish processors who have a long-term vision of entering the international market. The study can serve as a guideline and a reminder to the Ministry of Fisheries of Ghana and interested stakeholders that a market-driven approach in fisheries is likely to increase value, meet consumers' need and create a better outcome and sales opportunities for local fishers.

2 THEORETICAL BACKGROUND OF THE STUDY

2.1 Market trend of fish and fisheries product

The seafood industry in the world is highly global and is driven by demand and supply. Fish and fish products contribute 18% of animal protein intake worldwide (World Bank, 2018). FAO, (2018) indicated that there had been an upward trend in the share of fish and fish products for human consumption. FAO, 2016 explained that world trade in fish and fishery products have expanded significantly in recent decades, rising by more than 245 % in terms of quantity from 1976 to 2014 and by 515% if one considers just trade in fish for human consumption. Globally, there are countries that are dominant in export and import of fish and fisheries products. These countries form the main import and export markets for fish. The top 10 export and import markets are presented in the table below:

Table 1: Major Exporters and Importers of fish and fisheries product market (FAO 2018)

Exporters	**Importers**
China	United State of America
Norway	Japan
Vietnam	China
Thailand	Spain
United States of America	France
India	Germany
Canada	Italy
Denmark	Sweden
Sweden	Republic of Korea
Chile	United Kingdom

The European markets focus more on prepared and semi-prepared products and cured products such as deep-fried, fillets, salted, smoked, and dried. The Asia market focus on a variety of fish species and value-added products. The USA also focuses on more value-added and fast foods. Although Africa has a fertile fishing ground, lack of finance and unstable politics have led to the overexploitation of fish resources. Also, lack of research, lack of proper fisheries management and surveillance has made Africa a net importer of seafood products. Notwithstanding, there is overexploitation of fish in Europe despite the EU countries having lots of money and management programmes.

Live, fresh or chilled is often the most preferred and highly priced form of fish and represents 45% of fish for direct human consumption in 2016, followed by frozen (31%), prepared and preserved (12%) and cured (dried, smoked, salted, in brine, fermented smoked) (12%) (FAO, 2018).

The trends in the trade of fish and fisheries product indicates there is opportunity to trade smoked fish in the international market. Therefore, Ghana could improve the quality of fish and fishery product particularly smoked fish to be able to enter the ready fish market in Europe. However, to stay in this market requires constant research and means to always fulfil consumer needs and preferences.

2.2 The trend of fish supply in West Africa

Fish smoking is the most widely practised method of fish preservation in many African Countries. It has been estimated that 70–80% of the domestic marine and freshwater catch in Nigeria, Ghana, Ivory Coast, Togo, Benin, Senegal, Sierra Leone, Liberia is traded and consumed in smoked form (figure 6) (Adeyeye, 2016). The smoking process can either be “wet” hot or “dry” hot smoking. These smoking processes depend on the fish spicies, its uses, and storage period, (Entee, 2015). Fish smoking provides employment for most women in West Africa. In Africa, it has been estimated that about 35 million people representing 5% of the population, depend solely or partially on the fisheries sector, typically artisanal fisheries for their livelihood (Adeyeye, 2016).

Figure 6: Smoked fish traded in West African market.

Smoked fish is mostly marketed domestically due to its quality. Nonetheless, some quantities are being exported. Most African countries export markets include Europe (70%), followed by Asia (15%), Africa (11%), North America (2%) and South America depending on the preservation method. West African countries including Ghana import fish from other African countries such as Namibia (Tall, 2018).

Hempel, (2010) showed that value-added products in Africa are not of standard as compared to the rest of the world. Africa’s share of fishery commodity production, i.e. processed products, constitute only 4.3% of the world total. This indicates that, factors that reduce the quality of smoked fish in West Africa and prevent its entry to global market needs to be assessed.

2.3 The trend of fish supply in Ghana

Hot -smoking, deep-frying, salting and sun-drying, are the popular methods used to preserve landed fish in Ghana, although the average Ghanaian prefers smoked fish. Smoking of fish has become the dominant processing method adopted by mostly women who use simple mud and brick smokers to prepare the fish. Smoking gives the fish a longer shelf life, enhances flavour, reduces waste during bumper catches and permits storage for the lean season (Entee, 2015). Over ten thousand fish smoking stoves are operated, mostly by women, along Ghana's coastline and around Lake Volta (Kwarteng, 2016). SNV, (2017) reported that 95% of fish processed in Ghana is smoked, 3% salted and the remaining fried and fermented.

Ghana depends heavily on fish as a source of cheap animal protein. FAO (2016) stated that fish constitute 60% of animal protein intake in the average Ghanaian diet and 16% of household food expenditure. Ghana's per capita fish consumption stands at 28 kg per person per annum, this is above the global average of 18 kg (FAO, 2016). However, most fish produced in Ghana is handled unhygienically, such as putting fish on the ground, exposure of fish to flies, animals, in addition to poor handling, poor personal hygiene and sanitation. The reason for this act is that fish processors have a long traditional belief that seawater (due to salt content) and heat from smoking kills the bacteria in the fish (Antwi & Beran, 2017). As a result, effort is being made to regulate the fishing industry.

2.3.1 Quality attributes of fish

The word "Quality" suggests different things to different people. This term must be defined in association with a specific product type (FAO, 1995). In simple terms, quality involves safety aspects such as products free from harmful bacteria, parasites, or chemicals. A quality fish can be characterised by the shape, size, appearance, colour, odour, flavour, texture and properties of the species type (Manu, Adablah, Conduah, Quaatey, & Kpor, 2016). It is perceived that people use price, brand, accessibility, traceability, stability in demand and supply, package, label, and usability to describe quality product. Although, the consumer is the ultimate judge of quality. The reason being that what maybe quality for one consumer maybe inferior for another (Agyakum, Huang, & Agyeiwaa, 2015).

2.3.2 Description of certification scheme system adopted by Fisheries Commission

Constant improvement in technology and innovation to meet consumer needs is key to a successful business. It has therefore become important for every country to invest in research and development. Fisheries Commission of Ghana has adopted a basic certification scheme developed by a key multidisciplinary stakeholders committee consisting of representatives from Ghana Standard Authority, FAO Ghana, Food Research Institute, Food and Drugs Authority, Fisheries Commission, Various Universities in Ghana, Fish Processors and Non-Governmental Organisations (Samey, 2017). The certification scheme aims at regulating the smoked fish market in Ghana. Although HACCP system is the ultimate tool, with the status and knowledge of small- scale fish processors in Ghana it was necessary to simplify the regulation to make it more achievable (Ottah, Nkansah, Avega, & Kwarteng, 2017) . This system is described as a preparatory stage for small-scale fish processors to adopt HACCP stringent rules gradually. The certification scheme is a basic prerequisite condition of processing fish such as hygienic handling of fish, a clean processing environment, personal hygiene and the use of improved and acceptable fish smoking technology to ensure that smoked fish would be free from a bacterial infection along the fish value chain. It also involves training in business development to equip small- scale fish processors with basic accounting and financial management skills. Successful fish processors are awarded a certificate and a predetermined quantity of labels for branding (Ottah, Nkansah, Avega, & Kwarteng, 2017). This certificate gives a level of assurance that fish from such an environment is safe to consume and can easily enter the intermediate market.

2.3.3 The development of Fish Smoking Technology in Ghana

Over the years different smoking technologies have been introduced with the aim of enhancing smoked fish quality as well as increasing market premium. Nonetheless, these technologies imposed different effects on smoked fish quality, the environment, and the profits of small-scale fish processors in Ghana.

Historically, cylindrical, or rectangular traditional kilns made of mud or metal were mostly in use (Brownell, 1983). These kilns were associated with considerable shortcomings, these included kilns emitting high smoke, excessive heat, high PAH, high fuel consumption which contributed to forest depletion, very tedious to use, produce poor quality fish with a low capacity which could not smoke large quantities of fish during the bumper season. The kiln possesses high health risk as fish processors inhale the smoke during processing (Brownell, 1983). Considering lessons learnt from the constraints associated with these earlier ovens, an improved traditional fish smoking oven, the Chorkor, was introduced. The Chorkor was introduced by FAO in collaboration with Food Research Institute of the Council of Scientific and Industrial Research (CSIR) in Ghana in 1969 and has been in use till the current date.

Despite its advantages such as high capacity in smoking, easy to use, cheap to build, and faster in smoking, the chorkor kiln also has its disadvantages such as higher PAH as compared to the cylindrical kiln. The chorkor consumes more fuelwood as compared with the cylindrical, and it emits smoke which is also harmful to the health of fish processors. These kilns resulted in a waste of fuelwood with lower profit margins and contributes to forest depletion in Ghana (Kwarteng, 2016).

To address the constraints in the small-scale sector, Improved Fish Smoking Stoves (IFSS) models, including Morrison, FAO –Thiaroye Fish processing Technique (FTT) and Ahotor oven were developed. The FAO FTT Thiaroye smoking oven was introduced in Ghana in 2014. This technology meets EU standards; however, most small-scale fish processors complain that the technology is complicated to maintain, and the cost deters them in acquiring it. The Morrison stove was promoted in 2015 under the USAID/ Ghana Sustainable Fisheries Management Project (SFMP) due to its fuel-efficiency and less smoke emission advantages over the chorkor smoker. Yet unacceptable levels of PAHs were found in fish smoked in this kiln. This resulted in its discontinuation and encouraged a new phase of research and development to better understand PAH issues about fish smoking technologies (CSIR and Kwarteng, 2016). The research resulted in the development of Ahotor kiln in 2016 (Figure 7).

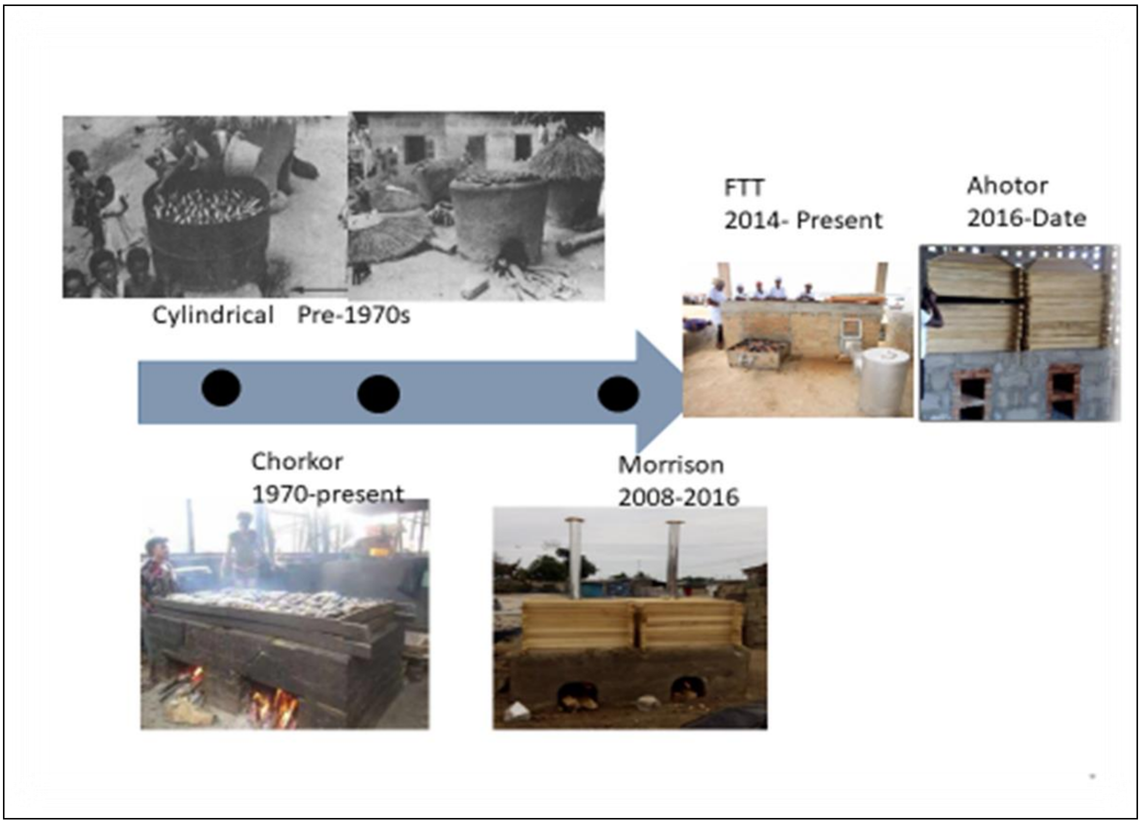

Figure 7: Development of fish smoking technologies (cylindrical, Chorkor, Morrison, FTT and Ahotor) in Ghana (Antwi & Beran, 2017).

The Ahotor kiln is comparatively fuel efficient, emits lesser smoke, easy to use and with lower PAH than the earlier kilns. The current challenge with the Ahotor oven is its cost, which prevents small-scale fish processors from purchasing it as the local markets are not willing to pay more for improvement. This indicates that research needs to be carried out to assess the higher market and consumer knowledge on improved fish smoking technology, and their ability to pay more for the improvement of the fish product.

Table 2: Summary of attributes of Smoking Technologies in Ghana

Attributes	**Cylindrical (Drum/Mud) kiln**	**Chorkor kiln**	**Morrison kiln**	**FAO FTT Thiaroye Kiln**	**Ahotor kiln**
Capacity	low capacity in smoking especially bumper season	high capacity in smoking	same capacity as chorkor	low capacity as compared with Morrison and chorkor	high capacity as chorkor kiln
Fuel	inefficient in fuel usage	inefficient in fuelwood consumption as compared with cylindrical	lower fuelwood consumption as compared with chorkor	higher energy efficiency (uses charcoal to produce heat)	high energy efficiency
PAHs	high Polycyclic Aromatic Hydrocarbons (135.7 ug/kg)	high Polycyclic Aromatic	unacceptable levels of Polycyclic	lower Polycyclic Aromatic Hydrocarbons(	although Polycyclic Aromatic Hydrocarbo

		Hydrocarbons (394.5 ug/kg)	Aromatic Hydrocarbons	1.5ug/kg) below the European Union standard of 12ug/kg	ns is within European Union limit, there is still research ongoing
Smoke	emits high smoke into the environment	emits less smoke as compared to the cylindrical	emits less smoke	no smoke as smoking is indirect (separate cooking and smoke flavouring unit operations	emits lesser smoke as compared to Chorkor
Safety of products	health of fish processors at risk	health of fish processors at risk	better health conditions than chorkor	better health conditions	better health conditions
Handling	very laborious and produces poor quality fish	cheap to make, easy to use, produce poor quality fish	very difficult to use as the interlocking trays causes problems for fish processors	complicated to use and maintain, expensive to build and produces quality fish	easy to use and maintain but quite expensive than Chorkor
Time		shorter smoking times			

3 THE VALUE CHAIN CONCEPT

3.1 Value chain in the small-scale sector in Ghana

The concept of value chain analysis is a pathway to acquire more value or profit from products. Put differently, value chain concept places emphases on the importance of value creation at each stage of the value chain (UNIDO, 2009).

Porter (1985) recognises that a business could be divided into segments to carry out activities in transforming inputs to outputs in order to identify the source of competitiveness. Moreover, these activities can be classified generally as either primary or support activities that all businesses must undertake in some form. Primary activities fall into inbound logistics, production, and outbound logistic, marketing & sales, and after-sales services. The supporting activities include secure infrastructure, human resource development, technology development, and procurement.

Small-scale fisheries around the world are gradually getting recongnition for the contribution they make to food security and poverty alleviation (FAO, 2015). Nevertheless, this sector faces many challenges in the fisheries value chain.

The FAO, 2015 *Voluntary Guidelines for Securing Small-Scale Fisheries in the Context of Food Security and Poverty Alleviation,* advocates for "reductions of post-harvest loss and supports investments in local, cost-efficient technologies and innovations that produce good quality fish for both export and domestic markets in a responsible and sustainable manner". To gain better value chain advantage in Ghana, for instance, the small -scale sector needs to work together to invest in cost-efficient technologies and innovations such as fish processing machines and equipment to derive better output thereby increasing their returns.

Hempel, 2010 noted that to analyse the value chain for a successful result the following needs to be considered:

- The company must be market-oriented. Preferably, marketing should be ahead of production, because one must produce what the customer wants.
- One must take records of the costs at each level, and work continuously to reduce it wherever possible without compromising on quality and safety.
- There should be efficient and working linkages backwards and forward in the value chain.

3.2 Mapping out the value chain

Value chain analysis starts with the process of mapping out the value chain. Mapping a chain means creating a visual representation of the connections between businesses in value chains as well as other market players (Thien, 2011). Mapping a value chain is a crucial component within a Value Chain Analysis. This is because it can sometimes be difficult to see the relevant interdependencies in a complex system without mapping them first. Mapping a value chain can lead a structured discussion between the various actors about the opportunities and constraints that producers and other actors face as well as what could be done to address them (Stein & Barron, 2017). Therefore, to identify the dimensions to be mapped depends on a firm's directives, its available resources and its scope and objectives.

According to Young, (2006) fish markets consist of many different market segments, which reflect a broadening array of consumers' characteristics and preferences. With growing competition in the seafood industry, it is better to understand marketing, consumer reactions, preferences, and behaviour in the entire market structure. Identifying and understanding the market trends in the seafood industry is also a significant factor in the value chain mapping. As indicated by Knutsson, (2015) a market-responsive business model is driven by consumer wants and problems to produce high-value branded products. It could be said that in Ghana, fish producers focus much more on the production aspect of the value chain instead of putting energy on means to create value at all stages of the chain according to market specification. This mentality has, among other things, contributed to the overfishing and overexploitation of Ghanaian fisheries resources.

3.2.1 The role of key actors in the small-scale smoked fish value chain of Ghana

In mapping out a value chain it is necessary to identify the key actors and the role they play in the value chain in order to identify the source of competitiveness (figure 8).

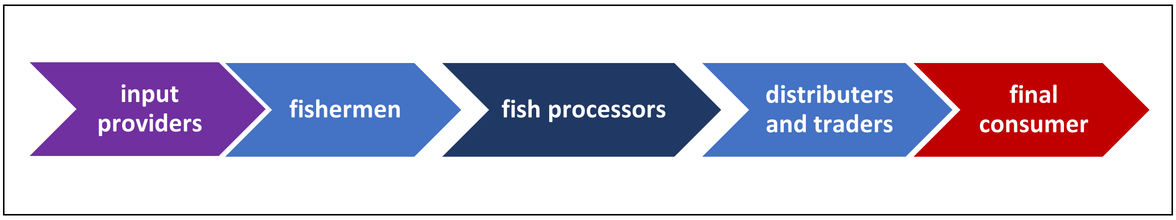

Figure 8: The key actors in the small-scale smoked fish value chain in Ghana.

Input providers: Input providers play a crucial role in supplying fish to cater for consumer needs. In Ghana capture fishery, these actors could be described as the boat/canoe owners, the financiers of fishing trips, gear owners etc. They ensure that items needed to harvest fish are made available for fishermen. Financiers are mostly women who are known locally as "fish mummies/ konkofo" also known as middle women (Nunoo, Asiedu, Kombat, & Samey, 2015).

Fishermen: It is a long tradition in Ghana that only men are mandated to fish in the marine sector. It is a taboo for women to fish. As such, men dominate such activity. The burden of providing raw materials depend on them. Fishermen spend number of days to catch the quantity of fish needed.

Fish processors: Fish processing in Ghana is dominated by women. Processors play a significant role in the Ghanaian fisheries value chain. Fish processors add value to raw materials. The major challenge in the processing part of the value chain is that most processors do not have facilities to process fish. This makes work very difficult for some processors as they hire most of the equipment for processing. However, through the support of USAID under the Sustainable Fisheries Management Project, compliance facilities have been built for the fish processors to enhance their work. (Pemberton-Pigott, 2016).

Distributors and traders: In Ghana, fish distribution and trading is normally done by the processors. However, there are some people in the supply chain who buy directly from the processors and retail. These traders distribute the fish to restaurants, schools, and food service companies. Other traders also retail the product in the informal market. Fish distributors are affected by poor transport facilities, high cost of transport and poor market facilities.
At the market, they scatter the fish where buyers can touch, feel, or taste which means being exposed to flies. Facilities at domestic fish markets are minimal, with poor hygiene and sanitation. The fish marketing systems are traditional and complex (Nunoo, Asiedu, Kombat, & Samey, 2015).

Consumers: Consumers play a vital role in product development. It is the role of the consumers to send feedback on product purchased to enhance its improvement or decision making. However, there is no mechanism in place in the local domestic market for consumers to send feedback on their product. As a result, fish processors are not able to understand the changes in consumer needs.

3.3 Markets and marketing

Marketing can be described as customer management. Marketing should relate the firm to its customers' everyday processes and practices so that value-in-use can be created in those processes (Gronroos, 2009). Put differently, marketing involves exploring, creating, and delivering value to satisfy the needs of a target market at a profit (Kottler, 2014).

Marketing plays an important role in any organisation which strives to remain at the top. The current trend in the international seafood market indicates that to be successful it means agreement with Kottler on focusing on market segmentation, targeting, positioning, needs, wants, demand, offerings, brands, value and satisfaction, exchange, transactions, relationships and networks, marketing channels, supply chain, competition, the marketing environment, and marketing programs.

A business minded person must be versatile to always meet consumer needs and demands. The small -scale sector in developing countries including Ghana, believe that adopting a new or improved technology or innovation will automatically come with a market premium without corresponding research on market and consumer requirement. Marketing in the traditional market of Ghana has remained “buy what is available, not what you want”. This restricts consumers’ choice and prevents them from sending feedback on the product to enable the processors and producers to work on its improvement. Meanwhile, marketing should be a network between a supplier and a consumer. As explained by Sophie Cantillon, (2006) the marketing concept involves activity which actualises the potential market relationship between the makers and users of economic goods and services. Thus, analysing all interactions that take place between actors the moment fish arrive in the market to the moment they are purchased. This helps to determine which types of fish and fish product consumers receive and use.

3.4 Market segmentation

Market segments may reflect on broad cultural and socioeconomic characteristics through a spread of influencing attitudes in a specific market (Young, 2006). Thus, a market can be subdivided according to age, sex, income, modern, traditional, health, conscious lifestyle etc. Similarly, in the fish market, a supplier must make a conscious effort to identify the type of market to enter. This will help producers to know their consumers better and always tailor products to meet their needs. Carmilleri (2017) showed that segmenting a market could also allow suppliers to evaluate the competitors’ strengths and weaknesses. This will uncover business opportunities in markets which are not served well. Market segmentation is an important tool that needs to be adopted by all small-scale fish processors in Ghana. To segment the demand market in order to reduce post-harvest losses among small scale fish processors, Ghana should consider supporting investments in local, cost-efficient technologies and innovations that produce good quality fish for that market segment in a responsible and sustainable manner. Although market segmentation is good, one must ensure whether it is easily measured, sustainable, accessible, and attainable.

3.5 Market trends

Market trends are characterised by globalisation and diversification. Young, (2006) indicated that increased income, consumer experience and buying power combined with increasing health awareness and cultural differences had increased the diversity of markets wherein competition may focus on product quality, taste, naturalness, and ease of preparation. Globalisation opens markets for products from established production lines.

However, the challenge is how to maximise market values of different product attributes. With the trend in the world trade today, it is important for every business to specialise, create value, communicate, and deliver products at a steady pace. In the fish industry in Ghana which is traditionally characterised as a production centre; for suppliers to win competitive advantage, then one must have special competence and be dynamic. Thus, a supplier must always research on means to meet changes in consumer tastes and preferences. Value addition is a vital tool in the marketing industry. A supplier must identify what, when, where, and how to add value that satisfies the consumer. Trondsen, (2001) calls the concept MOVA (Market orientated value adding behaviour) as market signals coming from the most attractive consumer markets.

Hempel, 2010 also termed it as market oriented. Preferably, marketing should be way ahead of production. Considering the market trend, small-scale fish processors must decide on marketing if they have sustainability in mind. The following are some major decisions that could be considered in the fish marketing system as published by (Jaideep, 2019):

- decide whether to market fish abroad
- decide which market to enter
- decide how to enter the market
- decide on the market programme to adopt
- decide on the marketing organisation
- decide on which marketing mix to adopt
- decide on which distribution channel to use.

3.6 Market targeting

Once the market is segmented, and the trend is identified, a supplier decision on which pathway to go set in. Now any untapped needs in the market where competitors have not yet identified should be adequately analysed. This could be done by identifying the most profitable option and decide which segments will be served (Carmilleri, 2017). In targeting such a market, some alternatives can be considered.

3.7 Product positioning

This marketing strategy involves the specific position a firm wants its product to occupy in their consumers' minds. Under this type of strategy, a firm always strives to attain the first position in terms of their product being the main rather than substitute (Leigh, 2018). This indicates that to be at the top, fish processors must ensure that, consumer perception on their product is always positive. The product must be unique, and the benefits should outweigh that of competitors. Small- scale fish processors who adopt this strategy must be reliable, trust wealthy, and always work towards meeting consumer demand and needs.

3.8 Consumer preferences

Understanding consumer preference is the starting point of knowing who the consumer is, their interests and wants. Knowing the consumer helps to ensure that there is enough product to meet their demand at their budget level. Observing the consumer critically shows that, consumers do not consume one type of product all the time. Every consumer wants a different taste and preference. One consumer may prefer whole smoked dry fish, others may prefer filleted smoked fish, and another may prefer whole fish, salted or dried fish. This means that when it comes to consumer preference change is constant.

Voicu, (2007) defined consumer preference as a positive motivation, expressed by the effective compatibility towards a product, service or trading form. Thus, preferences could be triggered by the features related to the material substance of the goods (shape, size, print, taste, colour, consistency, package, etc.). Therefore, product label, name and use instructions should be paid attention to in marketing a product. To determine consumer preference in today's market trend one should consider doing a preference test, acceptance test, ranking test, and difference test.

3.8.1 Preference test

A product preference test is used to determine if consumers prefer a product when compared to another product. Although, they may not necessarily like it. But this form of testing enables a supplier to identify what consumers may prefer when asked to select among alternatives. Preference test also helps a supplier to understand what users prefer and why before the product is completed.

3.8.2 Acceptance tests

An acceptance test is carried out to determine whether consumers approve a product or not. This will enable the supplier to know whether all specifications desired by the consumer are met.

3.8.3 Ranking tests

Under this testing tool, a consumer is asked to rank a list of products based on a scale of preference. This testing may not reveal how much more a consumer may like a product over the other. However, it gives a picture of how consumers will prefer their product by comparing it to another.

3.8.4 Difference tests

Difference testing tells how a consumer can differentiate between products. For instance, a supplier can ask a consumer to differentiate between fish smoked with Ahotor smoker and chorkor smoker in terms of colour, appearance and taste. Although this test does not reveal a preference, it could provide insight into products if used with other determinants.

3.9 Summary of the value chain concept

In general, the value chain concept describes how to link all steps in production, processing, and marketing to create value. These steps are analysed to identify the flow and the relationships in each step with the focus on the end user. Hempel, (2010) described the chain as the full range of activities needed to transform product or service from the beginning through different stages untill delivery to the final consumer. The value chain is influenced by upstream and downstream activities and industry´s activities.

The value chain mapping gives a picture of the connections, opportunities, components, linkages, and interdependencies that exist in a chain. It describes which dimensions one can focus on based on available resources, scope, and objectives. Marketing describes the strategies that could be adopted to satisfy customers, thereby getting value for invested resources. These strategies included market segmentation, market targeting, product positioning and consumer preference.

Market trend gives a broad overview of the dynamics that exist in a market. It emphasised on supplier’s own decision to stay competitive and sustainable. To understand the market trend, there needs to be constant research and development.

In summary, this concept could be adopted by small-scale fish processors as well as the Ministry of Fisheries in Ghana. The ministry could use it to regulate catch, landing beach activities, transporting, processing, and marketing of fisheries resources thereby contributing to sustainable utilisation of scarce fisheries resources in Ghana. Small-scale fish processors could adapt it to create value for the fish product that meets consumer needs and preferences. The market and marketing strategies provide an avenue for small-scale fish processors to understand how the market operates and strategies to adopt in order to stand competition and improve on production. Different strategies have been elaborated above such as market trends, marketing, market segmentation, consumer behaviour etc. The decision on which to adapt to enjoy better value depends solely on the processor. Details of how to implement these strategies will be explained in the final discussion and conclusion chapter.

4 METHODOLOGY

4.1 Study design

Primary data was collected using questionnaires (Appendix I). The questionnaires were administered by the officers of Central and Western Fishmongers Improvement Association who have more than a year experience in data collection in the fisheries sector. Questionnaires were distributed to two classes of respondents: representatives of supermarkets and consumers in each supermarket.

The data collection took place over a concentrated period and each respondent was cooperative. Semi-structured questionnaires were used to extract data from sampled respondents. Data collected from supermarkets representatives were analysed using excel spreadsheet format to discover market size, the fish product sold, demand and supply of fish product, quality of fish product, price and mode of payment, market requirements, and level of knowledge on improved fish smoking technology. Data collected from consumers were also analysed with excel spreadsheet to uncover consumer preference, accessibility of fish product, price and expenditure, quality of fish product and level of knowledge on improved fish smoking technology.

A quantitative method was used to give clearer picture of the trends and patterns in the intermediate market sector. This offers the option to be more flexible to formulate a general conclusion. The results have been presented in graphs, charts, and tables to aid understanding and guide stakeholders in decision making.

The conclusion was compared to a relevant and available literature review in order to establish important recommendations and benefits to be derived by key actors in the value chain. Also, an interview with a selected company in Iceland (Opal Seafood) was conducted to support the research.

Secondary information was taken from lectures, articles, and research done in related fields to supplement this research project. The following explanatory sequence adapted from Creswell, (2014) was used for the study (figure 9).

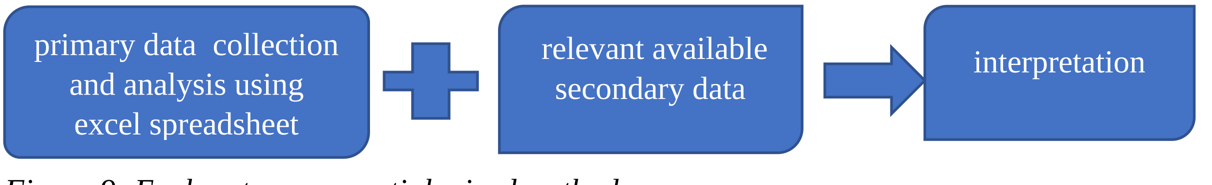

Figure 9: Explanatory sequential mixed methods.

4.2 Study area and sample size

The study area was supermarkets in Accra, the capital of Ghana, where the main consumption is centred. The sample size was ten (10) supermarkets and one hundred (100) random consumers (10 in each supermarket). The sampled supermarkets were Accra mall, West Hills mall, Achimota mall, Junction mall, Yoomart supermarket, Marina mall, Shop "N" Save supermarket, City supermarket, Koala supermarket, and Diplomatic supermarket. The respondents of the supermarkets were Shop Attendants, Shop Public Relations Officers and Sales Personnel (Appendix II). The ages and gender of the consumers are also attached (Appendix II)

4.3 Limitation of the study

The study was conducted over a short period of time. Therefore, this affected the actual monetary benefits key actors will gain from improvement in quality in the value chain as the monetary value (selling price) of the value-added product was not accessed at the time of the data collection. Hence, further study is needed to discover the selling price for value added products. Also, the consumers were only in the target supermarkets not in the traditional market. The classes of these consumers need to be identified in order to know the specific class willing to pay additional income.

5 THE RESEARCH FINDINGS

The research findings are divided into four parts. The first part discusses the demographic changes in the Ghanaian consumer market. The second part focuses on the findings from the supermarkets. The third part focuses on the findings from the consumers. Lastly, the fourth part focusses on the Icelandic benchmarking (Opal Seafood).

5.1 Demographic changes in Ghana consumer market behaviour

The population of Ghana is approximately 29 million (2.39 % increment of the 2018 population) with estimated 51% male and 49% female. It is estimated that 36.5% of the population are below age fifteen (15), 60% are between fifteen (15) and sixty-four (64) and 3.6% are above sixty-five (65). The adult literate of the population are about 14 million and 4 million illiterates. About 75% are Christians, 16% Islam, 5% traditional, 4% are religiously unafiliated (Ghana population, 2019). There are ten regions in Ghana with nine major tribes and ethnic groups. Ghana, (2019) shows that there are 81 listed individual languages in Ghana, however the official spoken language is English. In comparison with other countries, Ghana's growing population is greater than most West African countries after independence. Therefore, there is a change in trends of consumer market behaviour.

5.1.1 Consumer trend

Different criteria have been used to describe the classes of the population in Ghana. These include income level, expenditure level, culture, educational level and number of property owned although there is still no consensus on the definition (Defining Africa's middle class: a Ghanaian perspective, 2019). In general, Ghana population is classified into three categories. These are lower class, middle class and upper class. This research will rely on classification based on consumption level described below.

The lower class (poor class) is defined as people living between $1.25 to $2 per day and are estimated to be 21.61% of the population. The poorest class are people living below $1.25 and are estimated to be 29.99%. Ghana middle class (lower-middle and upper-middle class) is estimated to be 19.8% of the total population and 26.8% are floating middle class of the total population. The middle class is further described below. The upper (rich class) are the population living above $20 and it can be estimated that the upper class are 1.8% of the population (figure 10) (African Development Bank, 2011).

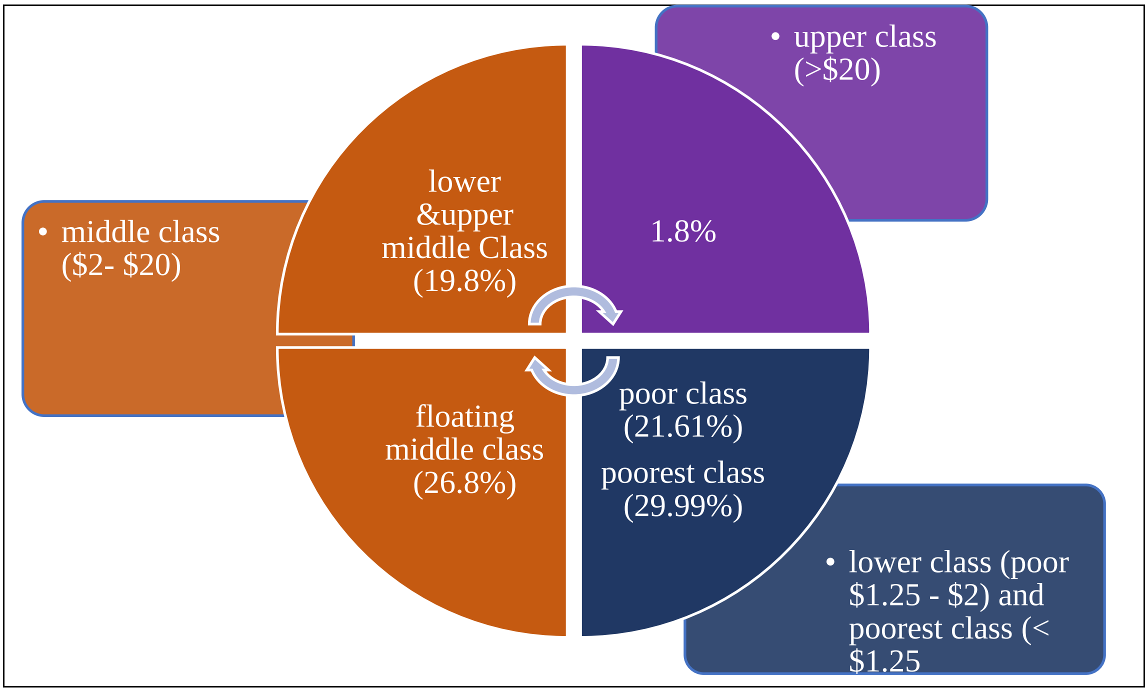

Figure 10: Summary of the classes of Ghana population and the per capita consumption in 2010

The African middle class including Ghana has been defined as individuals with per capita daily consumption of $2-$20. The criteria are sub-divided into "floating class" with per capita consumption levels of between $2-$4 per day and are 58% of the middle class size. This class have their level of consumption slightly above the developing-world poverty line of $2 per person per day. The lower-middle class per capita consumption levels are $4-$10 per day and are 29% of the middle class size. This class lives above the subsistence level. The other class is the upper-middle class with per capita consumption levels of $10-$20 per day and covers 13% of the middle class size (figure 11) (African Development Bank, 2011).

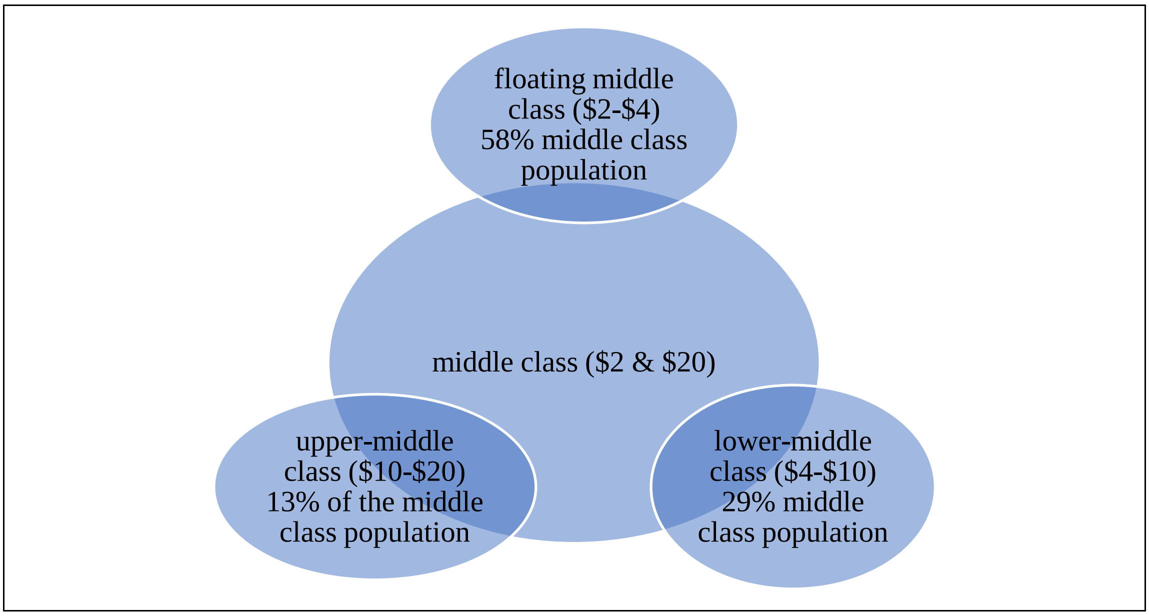

Figure 11: summary of the middle-class per capita income consumption.

Most of the Ghanaian population fall within the middle to low-income class and so price comes first in deciding what to buy (Firmus Advisory, 2017).

5.1.2 Market development

Traditional markets have been significantly important to Ghana economy in terms of access to foods and other daily goods. The traditional market provides employment to many Ghanaians, contributes to livelihood support and growth of rural communities. Traditional markets in Ghana are multi-purpose yet the major focus is general agriculture produce (Angmor, 2012). Trade in this market is done face-to-face with direct relationship between the seller and the buyer. Traditional markets are normally located in the centre of the town where one walks through a crowd and bargains for items in the open. Despite its contribution to the economy, traditional market is associated with many challenges; including under developed infrastructure resulting in spatial, poor drainage system, poor storage facilities, poor transport linkage service to and from the market centres etc. (Angmor, 2012).

To improve upon Ghana marketing in general, in the year 2007 Accra mall, the first large- scale shopping centre was introduced in Ghana to reduce these challenges. Since then the number of large scale- shopping centers keeps increasing. In 2013, Marina mall was opened, 2014 the Junction mall and West hills mall were also opened. In 2017, the Kumasi mall was opened and 2018 Tarkoradi mall was opened. (Ezebuiro, 2019). The enclosed fully air-conditioned large-scale shopping centres serve as hangout and meeting places for people. There are a variety of products including restaurants and “fast food” outlets which attracts shoppers away from the open market.

Report has shown that the rising middle class and the upper class of the population in Ghana shop mostly in the large-scale malls. This is because the younger generation with increased income level prefer to eat at restaurants as well “fast food joints” where access to food is very easy and saves time. (Shoping in Accra, 2019).

Although the lower-class also purchase items from the shopping malls, most of them prefer the traditional system of bargain due to their income level. The demographic changes in Ghana consumer market behaviour reflects in the findings from the supermarkets and consumer chain as well as the discussion chapter.

In summary, as the population of Ghana is increasing the middle-class size of the population also keeps increasing. This will push the population with increased income to the large-scale mall. As a result, the traditional system of marketing will eventually reduce in Ghana.

5.2 Supermarket chain of demand

5.2.1 Market size

To understand a supermaket chain of demand, it was necessary to get an overview of the market size. A market size can be observed in terms of total available market, total served market and share of the market. Defining a target market helps to determine the potential revenue that could be generated by a firm as well as getting knowledge about the existing product and what can be created. Table 3 shows the number of supermarkets that sell smoked fish and those that do not sell smoked fish. Out of the 10 supermarkets interviewed, six respondents of the grocery shops do not sell local smoked fish products in their supermarkets whilst four respondents of the other grocery shops sell the local smoked fish product.

It is interesting to analyse the differences between the supermarkets. The findings show that the six supermarkets that do not sell smoked fish in their shops target specific classes of the population and have quality issues with smoked fish product. The six supermarkets target middle and upper classes of the population. This is because the consumption level of the middle and upper classes is high as discussed under the consumer trends.

The respondents of the six (6) grocery shops in supermarkets that do not sell smoked fish added that they will accept selling smoked fish if it meets with their quality standards and consumer preference. The four that already sell smoked fish are willing to increase their quantity if the smoked fish quality improves.

Table 3: Sale of local smoked fish product

Respondent position	**Number of supermarkets**
No	6
Yes	4

From table 4, respondents of one grocery shop in the supermarkets that does not sell smoked fish said the people who visit the shop in a week are below 1000. Respondents of four other grocery shops in the supermarkets that do not sell smoked fish claimed that the average number of people that visit their supermarkets in a week ranges between 1000 to 40000 irrespective of their age and location. Respondents of another grocery shop in one supermarket that does not sell smoked fish said that on average, between 41000 to 80000 people visit the supermarket in a week.

Also, respondents of three grocery shops in the supermarkets that sell smoked fish said that the people who visit the supermarket were above 80000. Only one respondent of a sampled supermarket which sells smoked fish did not disclose it. With the huge variation in number of people who visit the supermarkets, it could be said that the supermarket with an average below of 1000 people visiting the shop in a week is a small market. Nonetheless, the variation in the number of people who visit the shop could also be attributed to the location of the supermarket and the class of the population who reside in that area.

Table 4 Average number of people who visit supermarkets in a week

The average number who access supermarket	**Number of supermarkets**
Below 1000	1
1000- 40000	4
41000-80000	1
Above 80000	3
Unknown	1

To evaluate the supermarkets' performance in terms of revenue generation in order to get a clearer picture of the size of the market, the supermarkets were asked about their weekly turnover. However, the respondents in the grocery shops in the supermarkets did not understand the term turnover. It was therefore essential to explain what turnover was. Turnover can simply be defined as net sales for a period. Figure 12 shows that three respondents of a grocery shop in the supermarket that sell smoked fish said that their average weekly turnover falls below 5000 Ghana cedis (below 948 US dollar). Respondents of one grocery shop that does not sell smoked fish said that their weekly turnover falls within 5000 to 20000 Ghana cedis equivalent to 948 to 3795 US dollars.

Also, respondents of four other grocery shops in the supermarkets that do not sell smoked fish said that their average turnover per week is between 21000 to 36000 Ghana cedis (3985 to 6831 US dollars). A respondent of one other grocery shop in the supermarket that does not sell smoked fish said their average weekly turnover was above 36000 Ghana cedis (above 6831US dollar). Only one respondent did not disclose the turnover. The difference in turnover could be as a result of the number of people who visit the shop as indicated in Table 4 above. However, the classes of the people who visit the grocery shop is important. The reason is that even if the people who visit the supermarkets are large in number, if they are within the lower class then their income level will be low which affect their consumption level as described earlier under consumer trends.

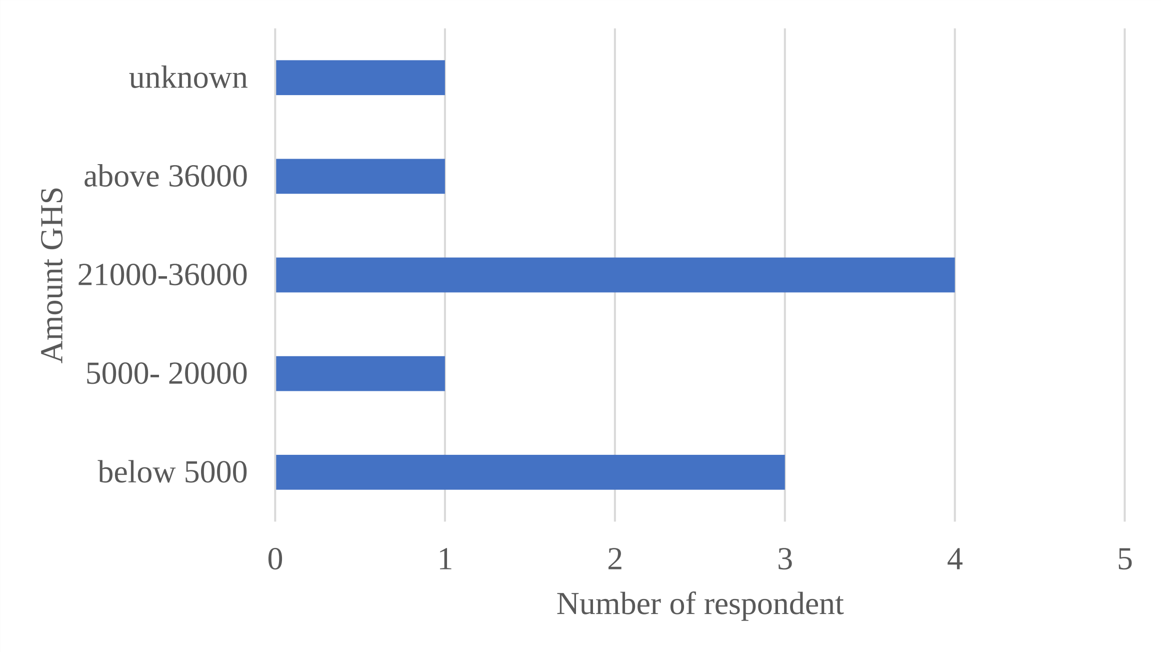

Figure 12: Average weekly turnover of the supermarkets.

The variation of the average weekly turnover of the grocery shops is reflected in figure 13 below. Respondents of four grocery shops in the supermarket that sell smoked fish said all calibers of people buy from the supermarkets. Also, respondents of another four other grocery shops in the supermarket that do not sell smoked fish said people who buy from the shop are within the middle class category whilst another respondents of two grocery shops in the supermarkets that do not sell smoked fish said people who buy there are within the upper class division.

The reason for the increased number (4) of “all classes” was as a result of the one respondent of a grocery shop in one supermarket who did not disclose the information about the number of people who visit the shop and the turnover but disclosed the classes of people who buy from the shop. Even though “all classes” size of the population that visit the supermarket is large, but majority of the people are within the lower- class category, their average turnover is low; below 5000 Ghana cedis (below 948 US dollar) as shown in figure 12 above.

The four grocery shops whose consumers are within the middle class have their average income between 21000 to 36000 Ghana cedis (3985 to 6831 US dollars) and number of people who visit the shops ranging between 1000- 40000 (figure 12& table 4). Although the people who visit the shop are not many, the average weekly turnover is quite good. Similarly, the two shops which indicated that the classes of the people who purchased items from their shops are within upper class category have their turnover ranging from 5000 to 20000 Ghana cedis equivalent to 948 to 3795 US dollars and above 36000 Ghana cedis (above 6831 US dollar) with number of consumers below 1000 and 41000-80000 respectively.

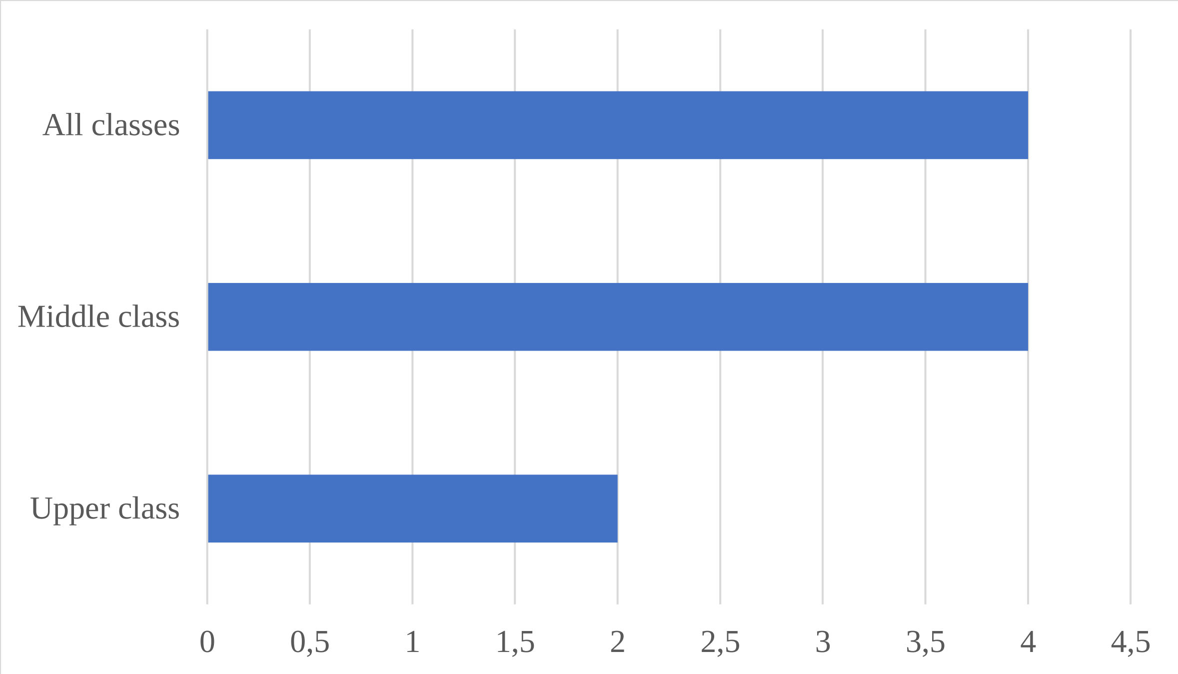

Figure 13: Classes of people who visit the supermarkets.

In summary, dividing the average turnover with the average visit per week, the answer should be the average expenditure per week. However, the answer was so low that a decision could not be taken on it. Therefore, a further investigation needs to be carried out to identify the true average turnover and visits.

5.2.2 Demand and supply of smoked fish product

Demand and supply play a key role in marketing, it was important to clarify all technical terms to aid understanding of the study. Demand can be defined as consumer desire and ability to purchase goods or services. Also, supply is the total amount of specific goods or services that are available to consumers. To identify the level of processed fish supermarkets will desire to sell, the respondents in the grocery shops in the supermarkets were asked to rank the levels of processed smoked fish. Presented in figure 14 in descending order (9 highest & 1 least) irrespective of whether they sell smoked fish or not, whole dry smoked was the highest followed by whole wet smoked, then sliced dry smoked up to the least preferred value -added which is gutted wet smoked fish. With the trend in the global market today, this suggests that the supermarkets are underdeveloped, or they want to follow the traditional system in Ghana where fish is sold in a whole piece.

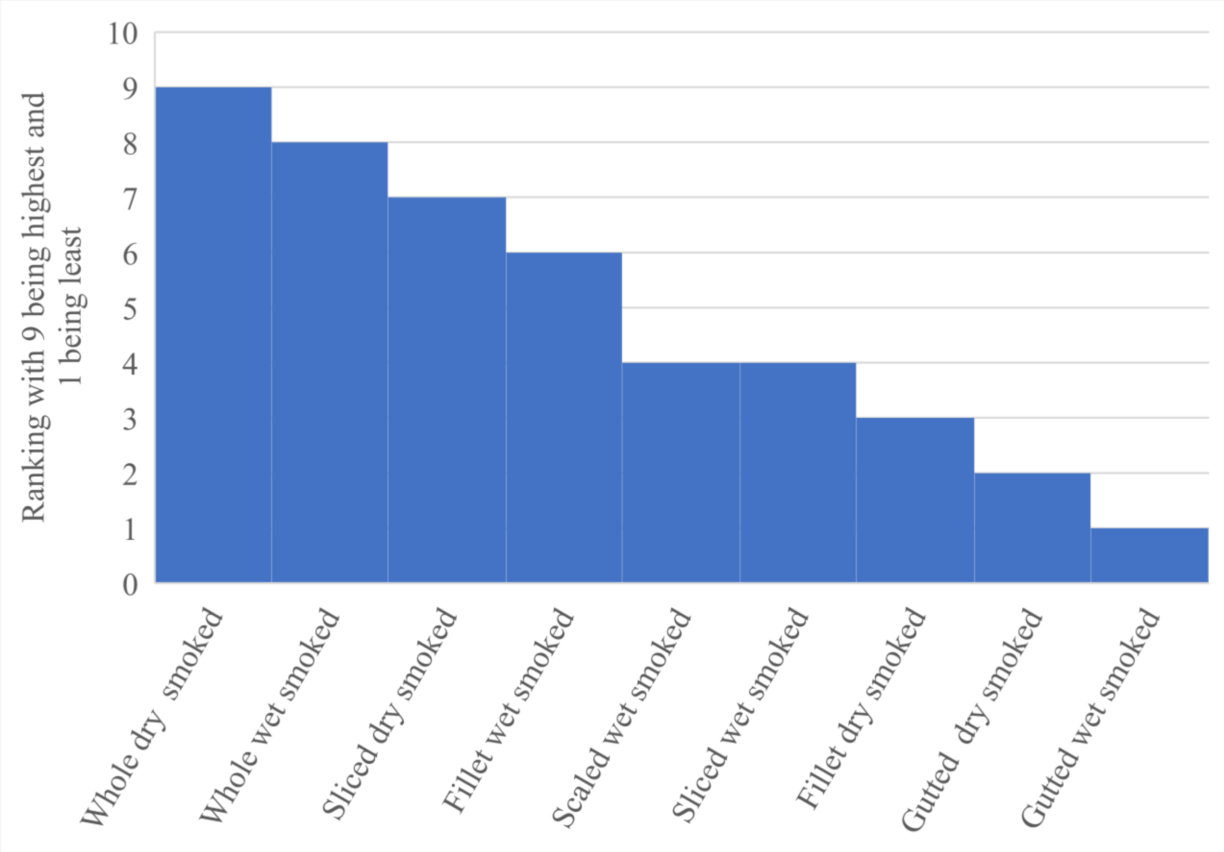

Figure 14; Level of value-added smoked fish supermarkets desire to sell in preferential order.

If whole dry smoked fish is the level of processed fish that grocery shops in the supermarket desire to sell, then from figure 15; as respondents of three grocery shops in the supermarkets that sell smoked fish said frozen fish is the most processed fish demanded by consumers that could also be in a whole frozen form. Another respondent from one grocery shop in a supermarket that sells smoked fish said whole wet smoked fish is the most demanded processed fish. Respondents of the six grocery shops in the supermarkets that do not sell smoked fish said canned fish is the most demanded processed fish.

This could be attributed to the classes of people who purchase items from the grocery shops. Shown earlier, six of the classes of the people who purchase items from the supermarkets are within the middle and upper class which is in line with the six shops which indicated that canned fish is the most demanded form of processed fish. As described under the market trend, the rising middle class and upper class of the population prefers easy to eat food.

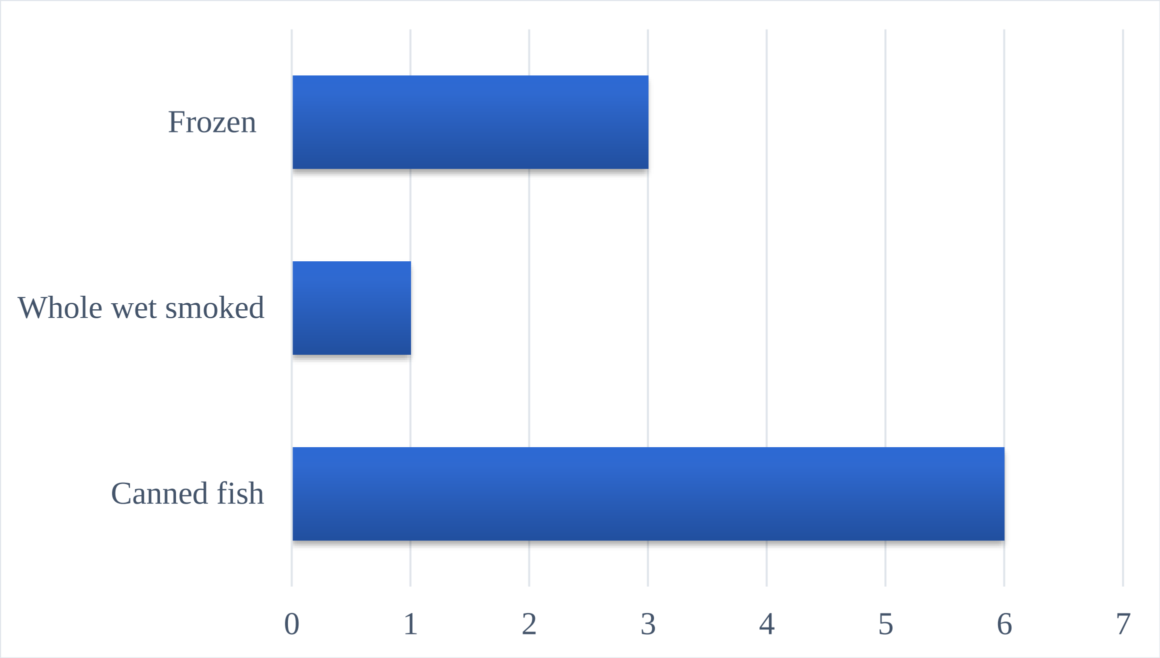

Figure 15: The type of processed fish demanded by customers

Figure 16 shows that, respondents of six grocery shops in the supermarkets out of the ten sampled, obtain fish irrespective of the processing method (smoked, fried, canned, frozen) from fish processors. Respondent of a grocery shop in the supermarket said the source of their fish is from middlemen. Respondent of another sampled supermarket said their current suppliers are wholesalers. The respondents of two supermarket who said "other" import their fish.

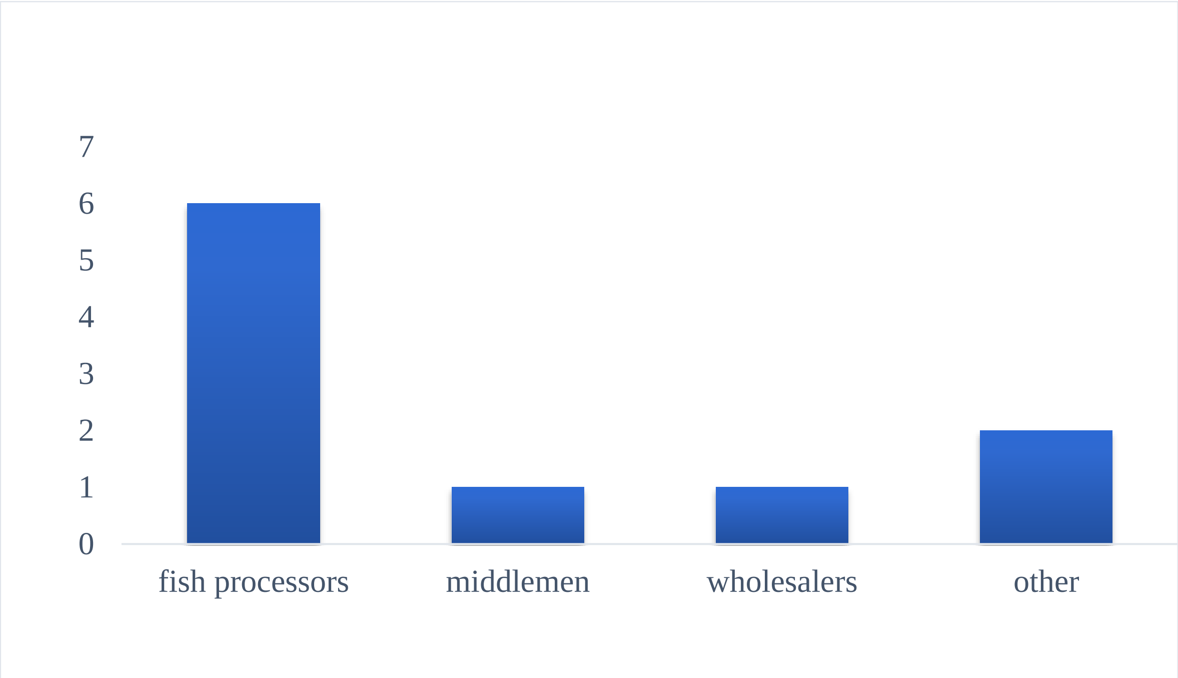

Figure 16: Supermarkets' current local fish suppliers

In line with figure 16, table 5 shows that seven grocery shops in the supermarket suppliers of fish are in Akosombo in the Eastern region of Ghana (100km) from Accra. Another respondent from one grocery shop in the supermarket said their supplier is in Cape Coast in the Central

Region (147km) from Accra. The “other” are those who currently import their fish. It could be assumed that the seven supermarkets whose suppliers are from the inland (Akosombo) do not trust the quality of fish produced from the coast or they may prefer fish caught from the lake or aquaculture fish. All the supermarkets were further asked whether their suppliers were reliable, all of them responded “Yes”.

Table 5: location of supermarkets suppliers

Number of supermarkets	**location of the supplier (Place)**	**kilometres**
7	Akosombo (Eastern Region)	100
1	Capecoast (central region)	147
2	other	0

5.2.3 Quality

To identify the supermarkets’ requirement for fish product, the respondents in the grocery shops within the supermarket were asked to rank the factors they consider before accepting a fish product to sell. Respondents ranked figure 17 in descending order (5 highest & 1 least), customer preference was the highest ranked option followed by quality, standard, easily accessible, and reliable supply. This shows that supermarkets are willing to sell a fish product that meets their customers’ needs and a product which is of good quality.

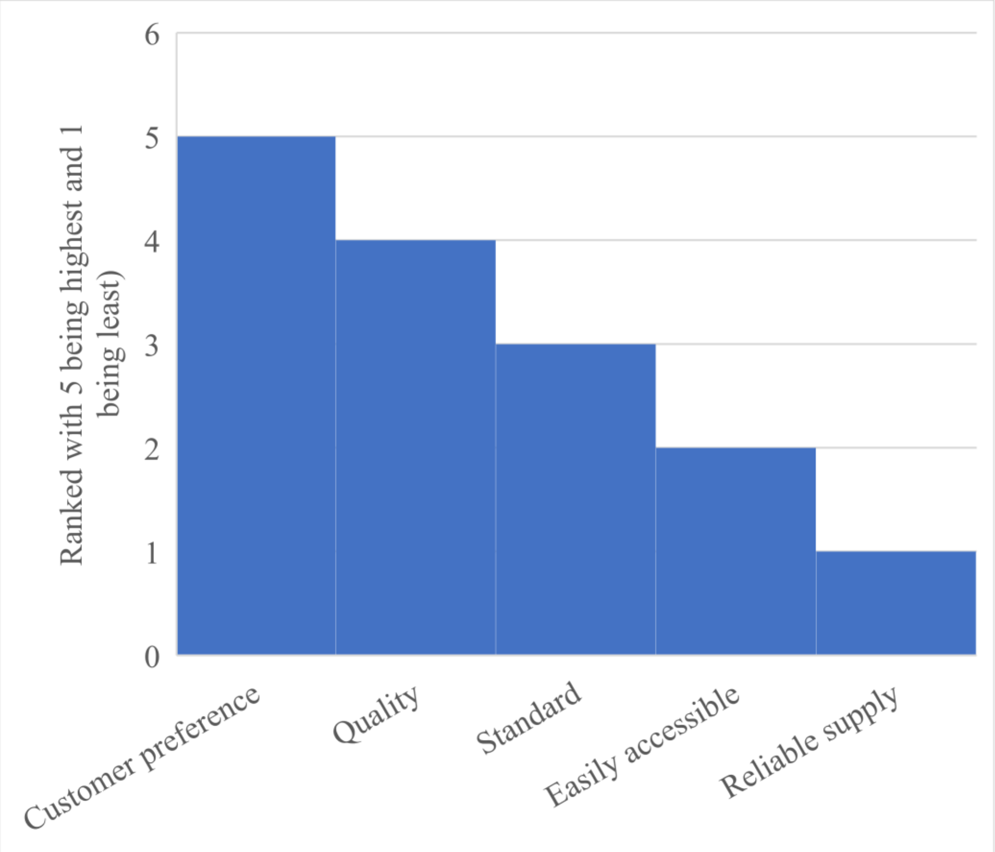

Figure 17: Supermarket requirement for smoked fish in preferential order

The respondents in the grocery shops in the supermarkets were further asked to rank the factors that deter them from selling smoked fish; figure 18 below is ranked in descending order (4 highest and 1 least). All the shops irrespective of what form of processed fish currently sold ranked poor quality as the highest factor, followed by low in demand in the supermarket to high price and easily perishable. It could be said that although some of the supermarkets sell smoked fish, they do not get the quality expected and this affected their average weekly turnover.

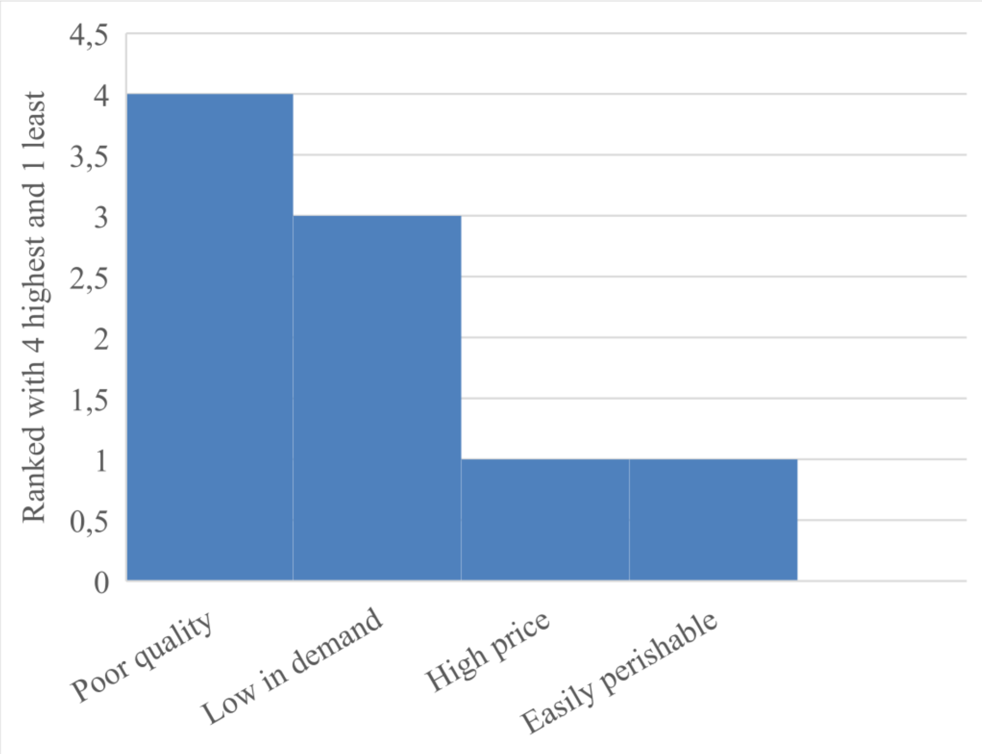

Figure 18: Factors that deter supermarkets from selling smoked fish.

5.2.4 Premium and mode of payment

Market premiums motivate suppliers to improve product quality or services. The grocery shops in the supermarket indicated their willingness to pay additional price for improvement in quality. In figure 19 below, six (6) of the grocery shops in the supermarket are willing to pay 2% increment per kg for a quality fish. Three (3) are also willing to pay 5% increment per kg of fish. Only one grocery shop in the supermarket is willing to pay 10% increment per kg of quality fish. The six (6) supermarkets that are willing to pay 2% increment are those that do not sell smoked fish and their target consumers are within the middle class and upper -class category. The three who are willing to pay 5% increment are among those who already sell smoked fish and their target consumers are all classes of consumers. Alternatively, it could be said that the six supermarkets which are willing to pay 2% do not want to take higher risk as the product will be new to their consumers and demand may be low.

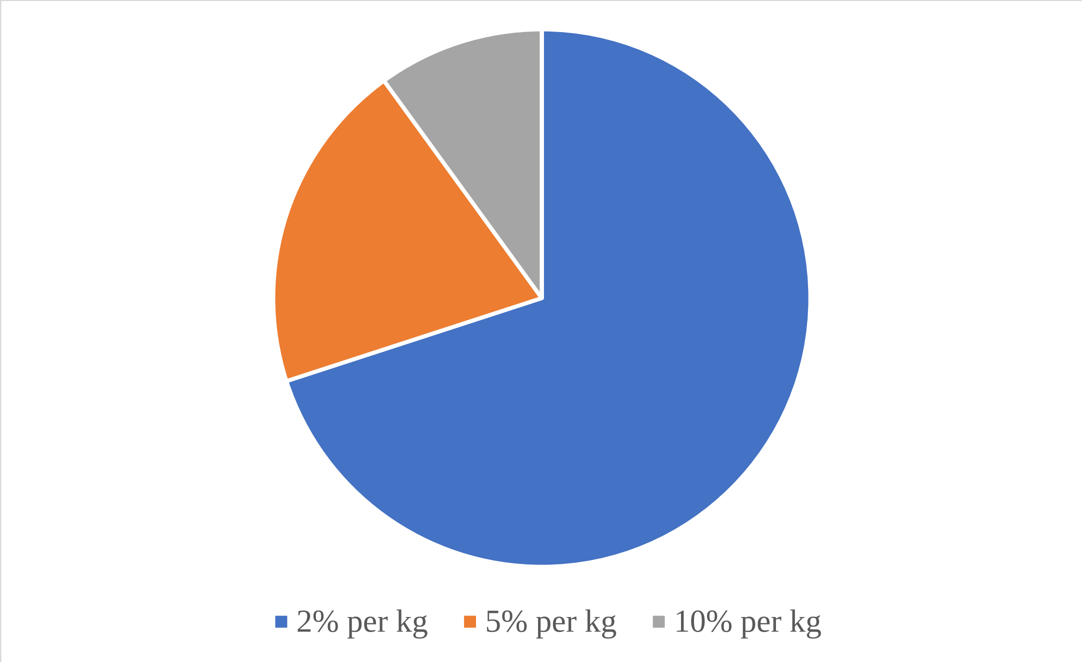

Figure 19: The percentage increments to be paid by supermarkets for higher quality.

As supermarkets have indicated their willingness to pay additional premiums, it was necessary to identify supermarkets payment terms to enable suppliers to know what to expect in the market as well as how supermarkets transact business. Figure 20 shows the grocery shop in the supermarkets' mode of payment for items. Seven sampled respondents of the supermarkets said they want their mode of payment for fish product in a written contractual agreement. One sampled supermarket prefers informal agreement, while only two sampled supermarkets want to pay in instalment basis.

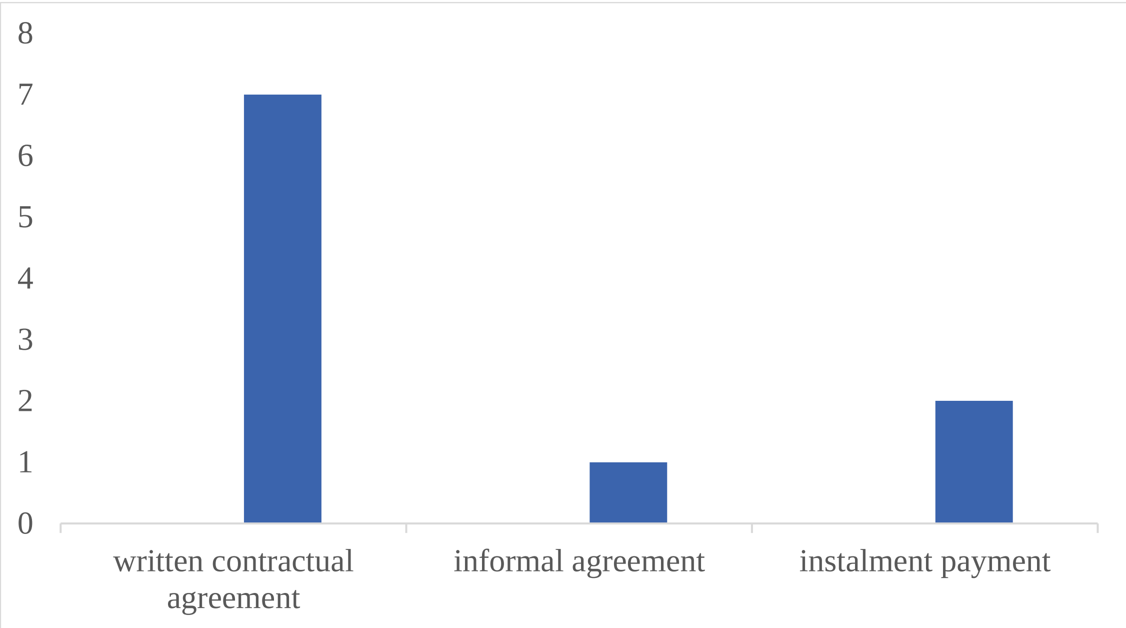

Figure 20: Supermarkets preferred system of payment.

5.2.5 *Fish smoking technologies*

Under this sub-heading, it was necessary to access whether the supermarkets have knowledge about how smoked fish is being processed and the level of development that has occurred in the fish processing industry. When the respondents of the grocery shops in the supermarkets were asked whether they were familiar with the fish smoking technologies used to smoke, the ten (10) respondents in the grocery shops irrespective of whether they sell smoked fish or not answered "No" to the question. Also, when the supermarkets were further asked whether they have heard or seen Ahotor oven recently introduced by Ghana's Fisheries Commission, for fish smoking, all (10) sampled supermarkets responded "No". Although, they are willing to see or taste.

5.3 Consumer chain of demand

5.3.1 Consumer preference

Knowing the consumer helps a supplier to produce a product according to their need and preferences. The 100 sampled consumers interviewed include local smoked fish in their diet irrespective of their age and status. In figure 21, fifty-five of the consumers said they fall within middle class category, thirteen said they are within the lower class and thirty-two said they are in the upper-class category. This affirms the earlier discussion that most population within the middle class and upper class visit the supermarkets.

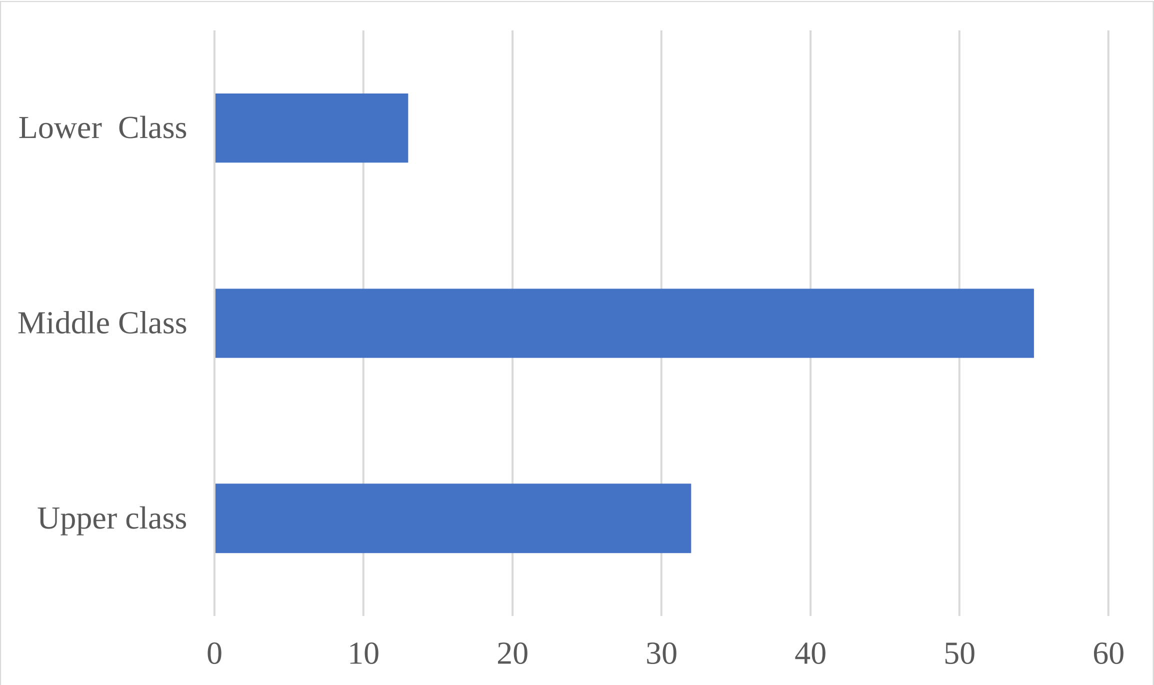

Figure 21: Classes of consumers who visit the supermarket

To test consumer preference for the level of processed fish, in figure 22 below, the consumers were asked to rank the level of processed fish they desire to buy irrespective of their age and class. In descending order (9 being highest and 1 being least option), the sampled consumers ranked whole dry smoked fish as the preferred level of processed fish, followed by whole wet smoked, scaled wet smoked in that order. This shows that the supermarket and consumers have similar preference for the levels of processing, and it is obvious that both respondents follow tradition and culture.

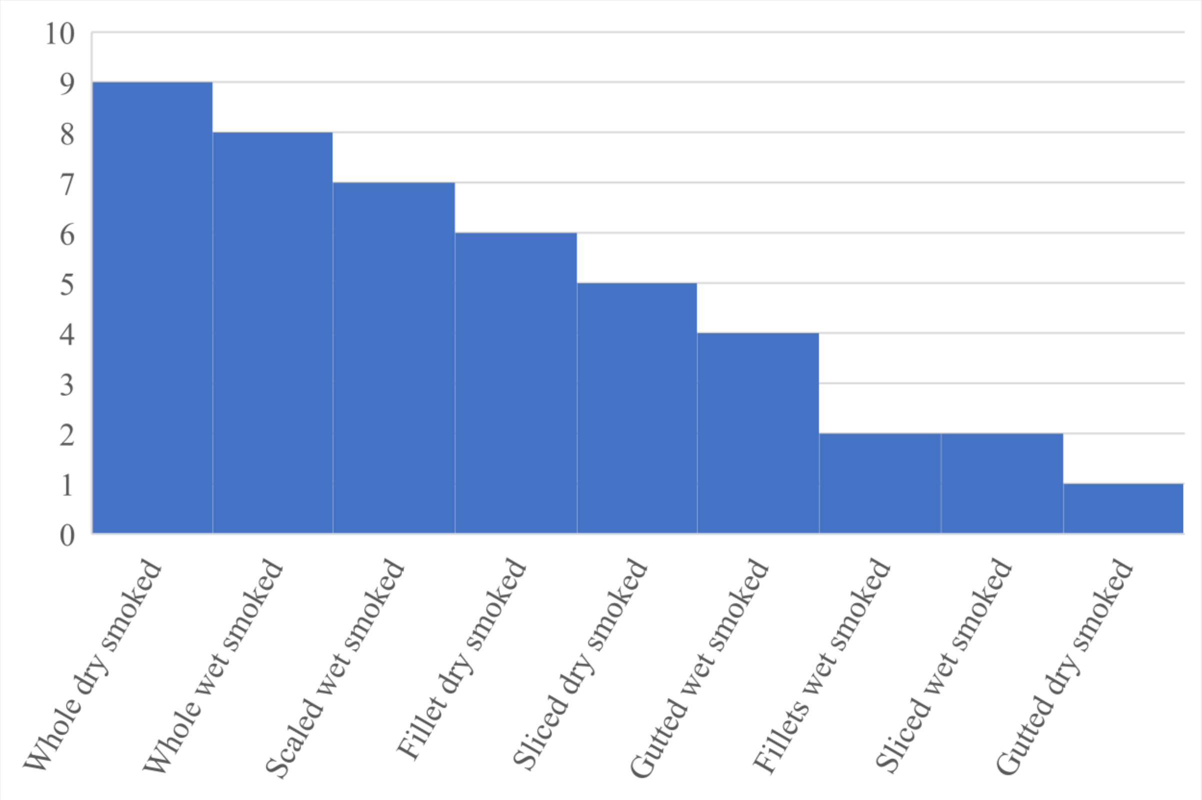

Figure 22; Level of value-added smoked fish desired by consumers

In order to understand the consumers better, they were further asked about the current level of smoked fish they consume. Demonstrated in figure 23 below, a large number of the consumers currently prefers their smoked fish in both wet and dry smoked form whilst less than 30 of the sampled consumers like theirs in only dry form. Less than 10 of the sampled consumers like a completely wet form of smoked fish. This is reflected in the ranking of the level of processed fish shown in figure 22 above.

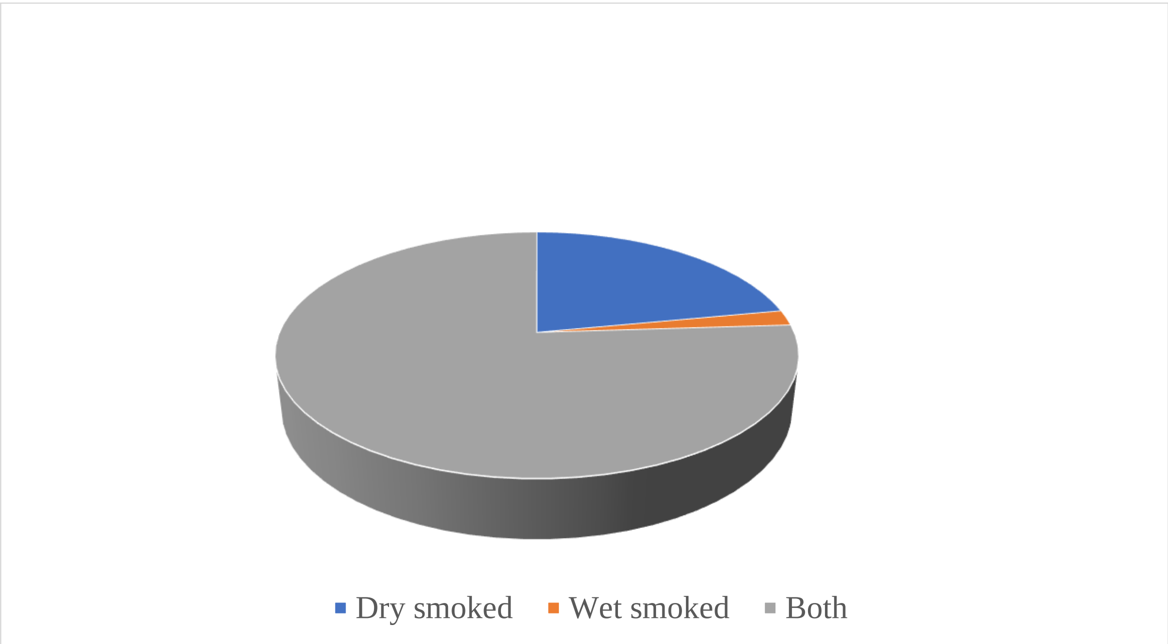

Figure 23:Current level of smoked fish demanded by consumers

The consumers were also asked to rank the factors that influence the choice of the current consumed smoked fish product irrespective of their age and class. In figure 24 below, ranked in descending order (5 highest and 1 least factor) the consumers ranked the taste of the smoked fish as the highest factor that influence demand for smoked fish, followed by quality, sold in large quantity and easily accessible. The least factor is the low price as compared to other processed fish.

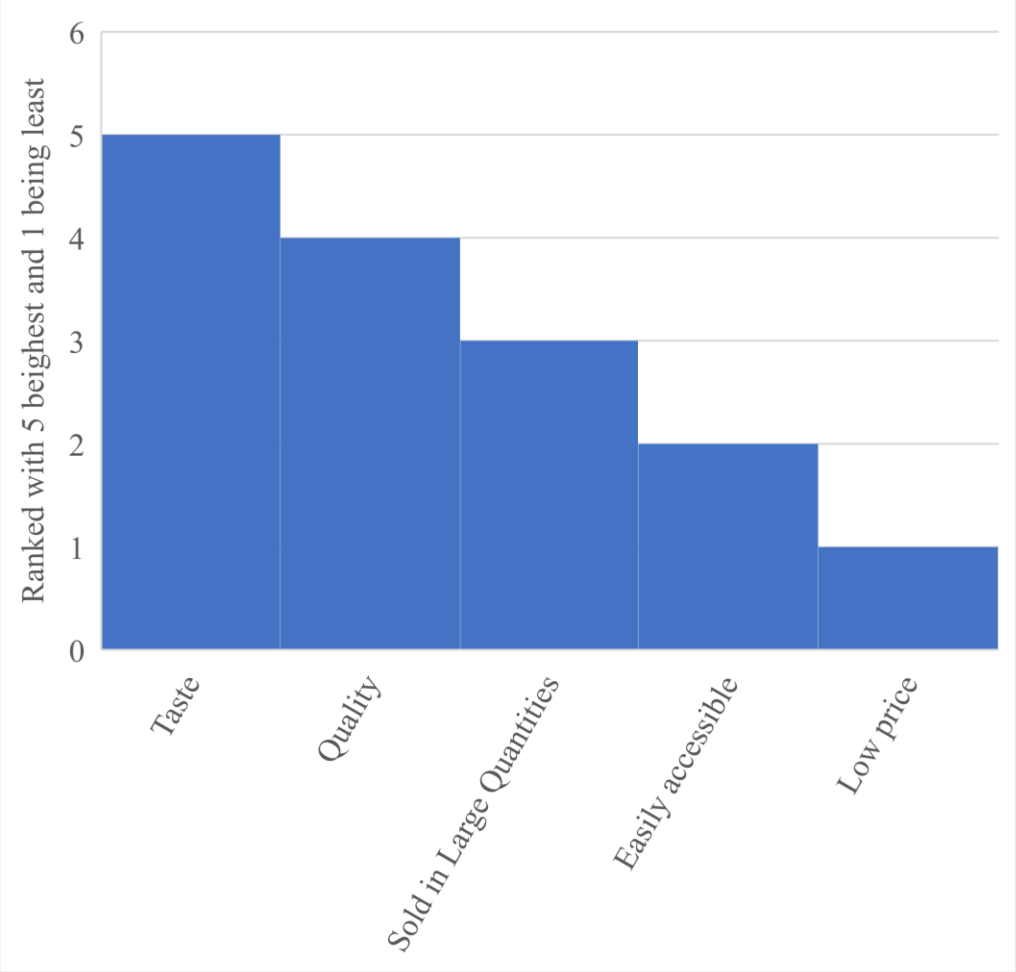

Figure 24: Factors that influence the current demand for smoked fish

5.3.2 Accessibility

It was also necessary to identify where consumers acquire their smoked fish product. Therefore, figure 25 below shows consumers current source of smoked fish. It was realised that 71% of the sampled consumers who purchase items from the supermarkets buy their smoked fish from the traditional market. Around 9% of the sampled consumers purchase their smoked fish from the supermarket, with 4% of the sampled consumers purchasing fish directly from the fish processors. Another set of 5% sampled consumers also purchase their fish from retail and wholesalers. The “Other” representing 11% consumers does not have a specific place where they purchase fish.

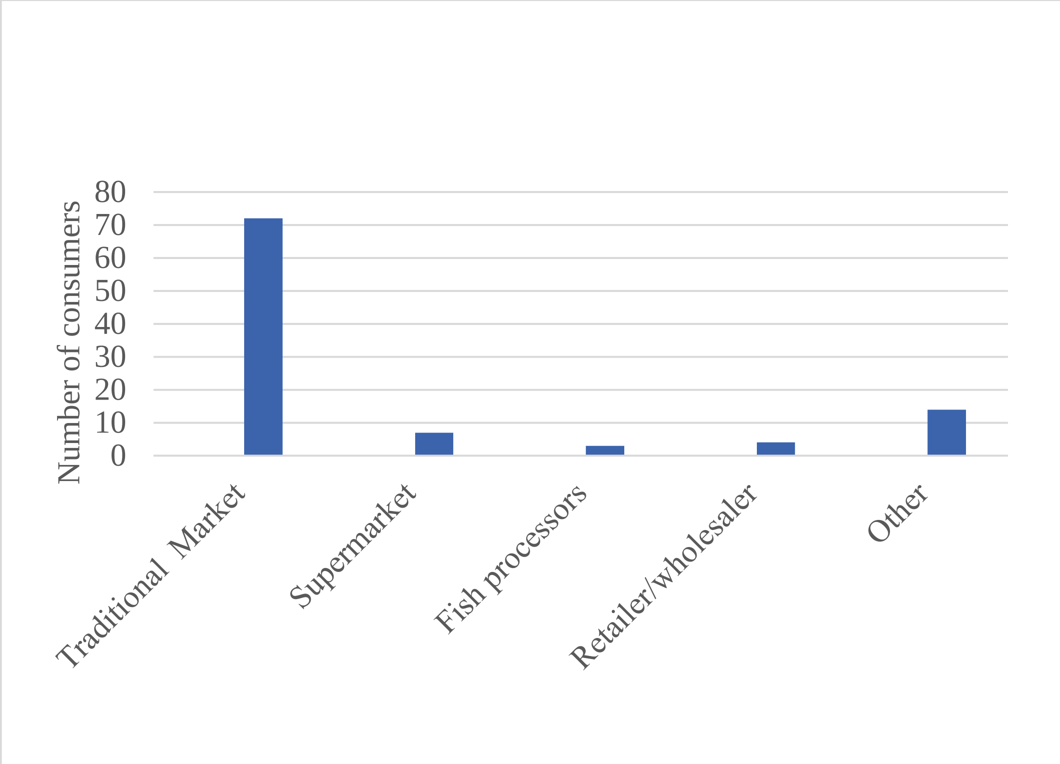

Figure 25: Current source of smoked fish.

5.3.3 Fish quality

Interestingly, 80% of the consumers get the quality of smoked fish they prefer. Less than 20% said sometimes, and 2% of the consumers said No to the question shown in figure 26.

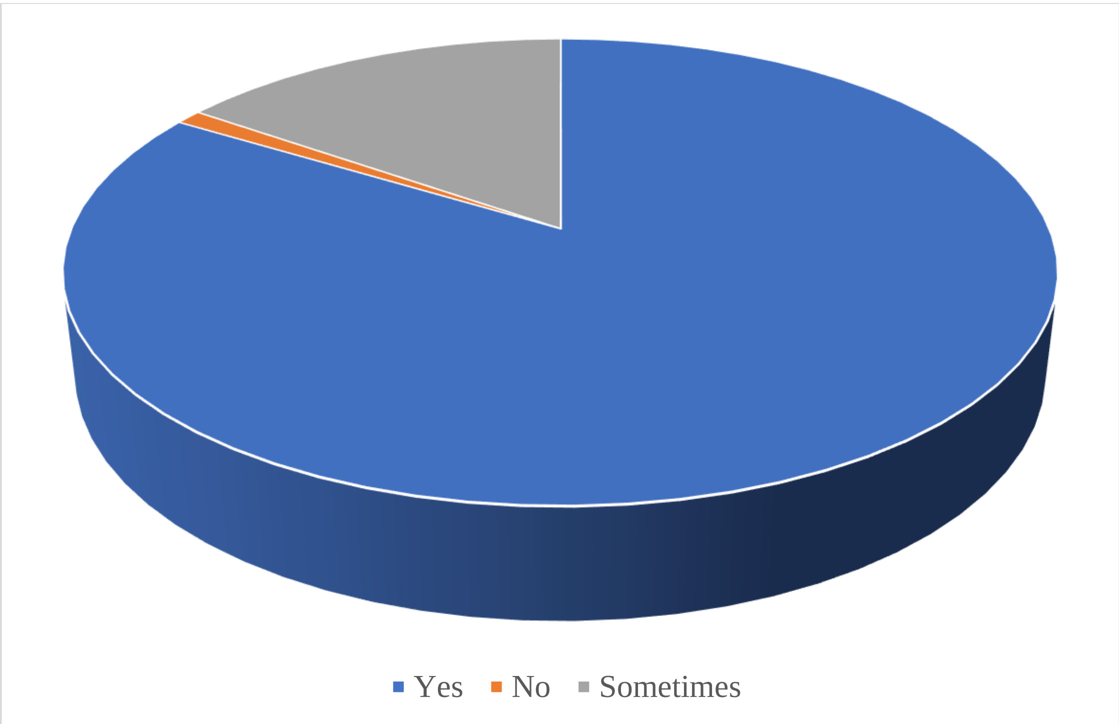

Figure 26: Ability to acquire the preferred quality of smoked fish.

To get a fair idea about the consumers' claim, they were asked to rate the quality of the current smoked fish they consume. In figure 27, 62% of the sampled consumers rated the quality of their smoked fish to be good, and 38% said the quality of the fish is very good.

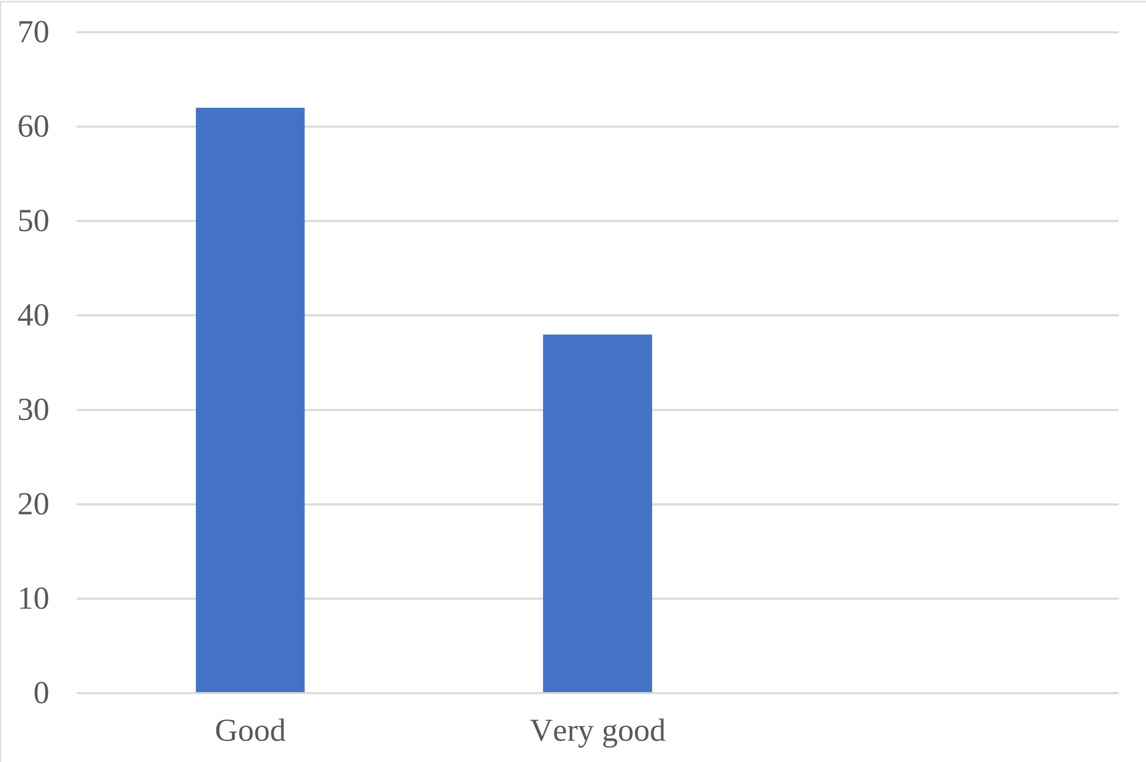

Figure 27: Current quality of smoked fish

5.3.4 Premium and expenditure

It was worth finding out whether the consumers would be willing to pay additional premiums for improved quality as well as identifying how much they spend on smoked fish. In contrast to the consumers' rating of quality of the smoked fish they currently consumed, about 90% (without the consumers who buy in the traditional market) of the sampled consumers were willing to pay an additional premiums for improvement in the quality of smoked fish whilst only 10% are not willing to pay any price increment for improved quality. It could be presumed that the quality of the current smoked fish available to consumers are not as they want but they have limited options. Alternatively, consumers may want to taste other smoked fish in order to draw their conclusion as to whether another type may surpass what they are already used to buying. However, the 10% who are not willing to pay additional premiums may fall within the lower-class category as such their income is low and consumption level.

It was also significant to get an idea about their expenditure level. Presented in figure 28 below, forty-one (41) of the sampled consumers spend 350 to 550 Ghana cedis (66 to 104 US dollar) on smoked fish in a month. Thirty-one (31) sampled consumers also spend between 100-300 Ghana cedis (19 to 57 US dollars) a month whilst twenty-one (21) consumers spend above 550 Ghana cedis (104 US dollars) on smoked fish in a month. The least average amount spent on smoked fish in a month is below 100 Ghana cedis (below 19 US dollars). Comparing the outcome with the average classes' monthly income consumption (middle class 60 to 600 US dollars, upper class above 600 US dollars and lower class 37.5 to 60 US dollars) then consumers spend high income on smoked fish alone. The share of consumers income and expenditure requires further investigation as there maybe misunderstanding from consumers on this question.

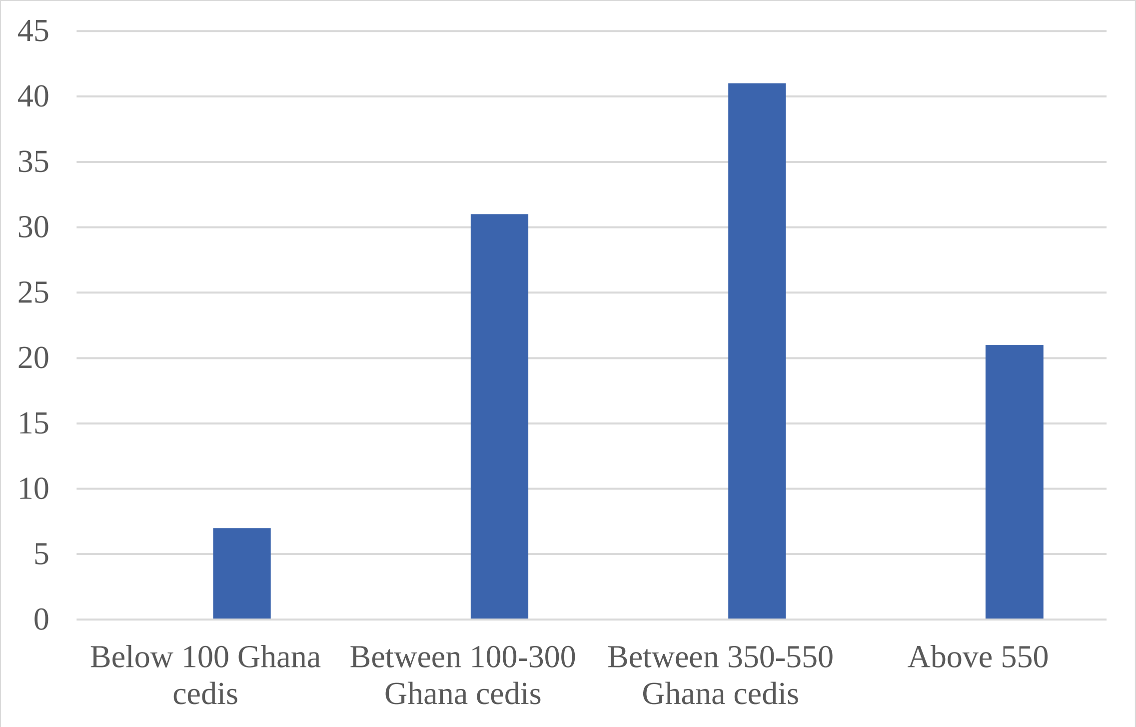

Figure 28: Amount consumers spend on smoked fish.

5.3.5 Smoking technologies

To access consumers knowledge about the improvement in the fish smoking industry; consumers were asked whether they are aware that Fisheries Commission of Ghana has introduced a fish smoking technology called Ahotor oven; ninety-two (92) of the sampled consumers are not aware, whilst eight (8) of the sampled consumers were aware of the new technology. The eight (8) who are aware said the fish looks more attractive and tastes better as compared to what they currently consume. However, the sampled consumers who have not tasted or seen the fish from Ahotor oven were willing to see or taste the fish.

5.4 The Iceland business model (Opal Seafood)

It is important to learn from other countries despite the different culture, education, tradition, or social status. Lessons learned could impact on small-scale fish processors in Ghana to embrace change since the world is global, and things are changing fast. Everyone needs to be updated and be dynamic in all aspects in order to stand competition or be at the top.

A small-scale family business located in Iceland named Opal Seafood was visited. Opal Seafood is produces seafood products. Opal started operation in the year 2012 in Iceland and has 12 employees. Smoking of fish is the major processing method used. Raw materials fully iced are obtained from the fish farmers. The fish is hand filleted; fillets are trimmed and dry salted. On average, Opal Seafood can process 200 tons of raw fish in a year with 95% Salmon, and the remaining 5% is Mackerel, Haddock, Cod and Arctic char. The salmon is smoked vertically (suspended from the tail), then sliced by hand. The smoking technology used is a metal kiln, built with separated combustion that uses sawdust. The technology has a smoke filter and a chimney. Attached to the kiln is a temperature regulator that monitors the temperature and air circulation in the smoking kiln. Although this technology works slowly, the fish has a great taste; the technology is less laborious to use as well as a safe fuelwood. It was observed that the fish is normally cold smoked.

In packaging the fish, a separate film is placed between slices to facilitate a stylish and appropriate serving. It was observed that the fish products were well labelled, standardised and easily traced (Figure 29). Storage facilities are well designed to avoid or minimise the risk of bacterial infection.

Opal strives to be dynamic as possible and follow market trends. For example, "ketogenic" diet is getting popular which makes consumers opt for more fatty foods. So, the production line of Opal has also changed. Opal has adopted a niche and developed mechanisms which have been put in place for information flow that leads to product improvement.

Currently, Opal sells its products in shops in Iceland, some portions are exported to Denmark, France, and Switzerland. Opal aims to obtain the best quality as possible and produce based on market needs and consumer preferences.

Figure 29: Sample of value added, and well-packaged products processed by Opal seafood.

The Opal business model could be adopted by small-scale fish processors to produce variety of value-added fish product for the market. Most of all, it is the packaging techniques (attractive, convenient, and well labelled) that meets local demand needs. As suggested by Opal, small-scale fish processors who want to achieve the best from the market need to be dynamic and follow market trends.

6 DISCUSSIONS

The idea of mapping out a demand-driven value chain might have seemed straightforward. Specifically, demand market identified, analysed and action implemented. However, transforming these maps into action is a complex and difficult task to achieve, as confirmed in the literature review on the concept of the value chain and market trends. Based on the findings from the literature reviewed, there are strategies one must adopt in order to be competitive. The research findings also revealed options that need to be fulfilled to achieve the best. This chapter will provide a discussion on the main findings from the research and where applicable links the literature to the research outcomes.

6.1.1 Determine the requirements and consumer preferences for smoked fish in the intermediate markets of Ghana.

The findings show that only four out of the ten supermarkets are currently selling smoked fish, six supermarkets do not sell smoked fish due to quality issues of the product and the classes of their target consumers. Although, supermarkets base their requirements for smoked fish on consumer preference, quality, reliable supply, accessibility and standards. All the consumers who purchase items from the supermarkets include smoke fish in their diet; and base their preferences on taste, quality, availability, accessibity and price.

The study revealed that the four (4) supermarkets that sell smoked fish target “all classes”of consumers. Nonetheless, the turnover of these supermarkets is the least eventhough a large size of the population visit these supermarkets. The reason is that most people in all the class categories are in the lower class and their income level is low.

The other six that do not sell smoked fish target middle class and upper class of the population and their turnover is high. This outcome is in line with the earlier description of the consumer trends. In the description of the *demographic changes in Ghana consumer market,* it was realised that the younger population with increased income prefer “fast food or easy to eat food” since they do not want to spend time on food.

Undoubtedly, 55% of the consumers who purchase from the supermarkets are within the middle class, 32% are within the upper class category and only 13% are in the lower class category. This manifests in their expenditure level presented in figure 28, although their expenditure on fish is high which requires further investigation. This suggest that since so many high-income custumers shop in the supermarkets, there is a potential for the smoked fish processors, but only if they manage to improve the quality and get into the six supermarkets that do not sell smoked fish.

Marketing should relate the firm to its customers’ everyday processes and practices so that value-in-use can be created in those processes (Gronroos, 2009). Among the two groups of respondents studied, the supermarket respondents (irrespective of whether they sell smoked fish or not) ranked “poor quality” as the major factor that deters them from the sale of smoked fish. This shows that the four supermarkets which sell smoked fish do not get the quality expected and would be willing to sell improved quality smoked fish. 62% of the consumers (lower, middle and upper) rated the quality of smoked fish as “good” and thirty-eight (38) rated it as “very good”.

However, the research shows that before the introduction of large- scale supermarkets, most of the Ghanaian population purchased items from the traditional informal market. Indeed, it is evident from the study that 71% of the consumers still buy their smoked fish from the traditional informal market. In contrast to the consumers own view that smoked fish is of a good quality, 90% of the consumers that buy smoked fish in the supermarket without the buyers at the traditional market are willing to pay additional premiums for improved quality of smoked fish. In view of this, it could be concluded that the consumers want quality that surpass what they already consume. Alternatively, consumers maybe willing to explore different smoked fish product in order to make a choice. With regards to the 10% who are not willing to pay additional premiums, it could be assumed that they are satisfied with the quality of their product or they fall within the lower class therefore their income is low.

In general, all the supermakets sell a form of processed fish (canned, frozen and smoked). They have already establish their supply pattern, as six supermarkets obtain the processed fish from fish processors whilst the other supermarkets either import, obtain from middlemen or wholesalers. With critical analysis, it could be said that the supermarkets trust in the quality of fish supplied to them. This is evident in the distance from which their suppliers are located (Table 7) and their respose that their current suppliers are reliable; Because Accra is a coastal city where all forms of fish species are caught but none of them acquire their fish from the coast of Accra rather the inland or import. This requires further investigation. However, for smoked fish to stand this competition, then there should be market segmentation and improved product that surpass what is already in the market. Voicu, (2007) explained that for consumers to change in taste or preferences, it should be triggered by the features related to the material substance of the goods (shape, size, print, taste, colour, consistency, package, etc.).

All these suggest that if value is created at all stages of the smoked fish value chain to make fish easy to consume, suppliers will also obtain better premium.

Given the status of small-scale fish processors in Ghana today, to meet with the current market demand, effort should be on quality improvement. Young, (2006) showed that increased income, consumer experience and buying power combined with increasing health awareness and cultural differences had increased the diversity of markets wherein competition may focus on product quality, taste, naturalness, and ease of preparation. Hence the diversification of the marketing system in Ghana, more and more of the population will also look out for a quick and easy way of shopping. This will eventually reduce the traditional informal market system of marketing in the country.

6.1.2 Assess intermediate market and consumer knowledge on improved fish smoking technologies in Ghana.

Among the most important outcomes of the research was the higher markets and consumers unawareness of the improvement in the fish smoking technologies.

The aim of technological improvement over the years has been to increase capacity, produce quality product, reduce processing challenges, advance fish processing, and increase market premiums. But the question is whether consumers are willing to pay an additional price for improvement. Yes, 90% of the consumers who purchase items from the supermarket are willing to pay additional premiums for improvement.

Use of advanced technology does not guarantee profitability Porter (1985), all the value chain components work together for value maximisation. The literature reviewed on the trends of fish smoking technologies in Ghana and the highlights of (Ottah, Nkansah, Avega, & Kwarteng, 2017) study on the Fisheries Commission adoption of certification scheme and improved fish smoking technology shows that most of the interventions in the small-scale fish processing sector have focused on the development of improved technology, yet there is limited data as to how the market is receiving the development.

This is evident in the findings as the respondents of the supermarkets said they are not familiar with the new improved fish smoking technology (Ahotor). Ninety-two out of the 100 consumers interviewed were not familiar with the Ahotor kiln. If neither the supermarket nor the consumers are aware of the improvements in fish smoking, then the question arises of what base did they use to rate the quality of smoked fish as being “poor or very good”. This suggests that there is a communication gap. There is limited information flow in the value chain.

Interestingly, the supermarkets are willing to pay percentage increment for high quality product that meets their specifications while 92% of the consumers are also willing to pay additional premiums for improvement that meets their taste and quality level. Although seven of the respondents in the supermarkets prefer payment in written contractual agreements while the three other supermarkets prefer instalment payment and informal agreements.

Also, the respondents of the supermarkets and the consumers ranked whole dry smoked fish as their first level of value-added fish prefered, followed by whole wet smoked. In line with the global market trend, for a market to sell a whole fish instead of filleted and sliced that market could be said to be underdeveloped.

The findings of this study shows that to achieve better outcome from investment in technology, the market and consumers are the integral actors to focus. This is confirmed in the Knutsson, (2015) report that a market-responsive business model is driven by consumer wants and problems to produce high-value branded products.

6.1.3 Establish a feasible pathway to meet with the requirement of the intermediate market demand.

The small-scale sector employs 90% of the world’s capture fishers and fish workers of which about half are women (FAO, 2015). This sector is valuable in terms of fish supply yet they suffer from post-harvest losses which reduces the monetary value of their fish. To support fish processors to obtain a monetary value for their product as well as meet market requirements, then their value chain needs to be cyclical (figure 30).

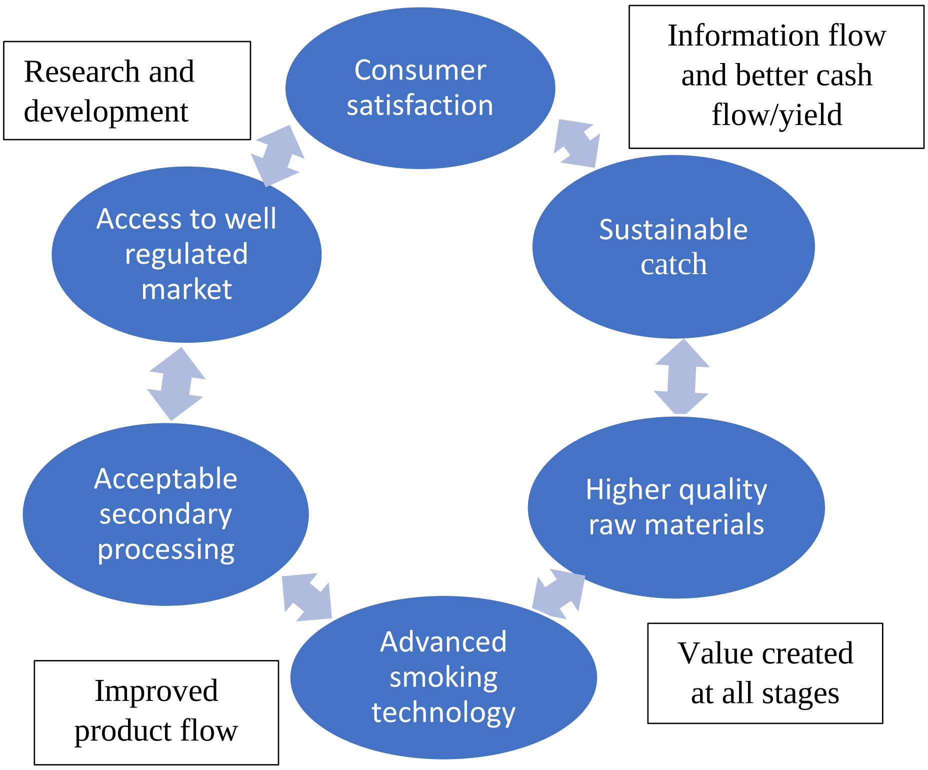

Figure 30: Adapted value chain model (Knutson 2018)

When this chain of flow is adopted post-harvest losses and challenges in the value of the fish product in Ghana would be reduced drastically with more focus on market-oriented value-adding supply chain. This cyclical flow shows that each stage in the production, processing, and marketing of a product is appropriately managed and are interconnected to the next.

Therefore, decisions about what to produce, correct specifications, appropriate quantities and the right times are well channelled from the consumer to the producer. In demand-driven chain quantities and quality of fish, product matches consumer needs, and preferences, thereby higher value will be obtained at each stage of the chain. In addition, this system will enable continuous information flow to foster market segmentation, product differentiation, product positioning and enable small-scale fish processors to exploit markets, follow market trends and be dynamic as possible to gain competitive advantage.

In order, to achieve all these, there should be a structural change in the Ghana small -scale fisheries sector. Suppliers of the fish product should adapt to market changes and not market rather adopting changes in production. Government and private organisations should support the small- scale fish processors through training, education, and finance to improve upon their businesses.

6.1.4 Estimate the benefits key actors in the value chain will derive by meeting market requirements and specifications.

The study is limited by the actual monetary benefits key actors will gain from improvement in quality of smoked fish in the value chain. However, all the supermarkets and 90% of the consumers who purchase items from the supermarket are willing to pay more for improved quality product. Key actors can be classified as those who play a key role in acquiring and processing raw materials into a form that can be usable by the final consumer. Meeting market requirements and maintaining effective value chain system will allow businesses to optimise several benefits. Key benefits are discussed below:

Input providers: Everyone aims for higher returns from investment. Therefore, if a practicable value chain that meets market specification is adapted, input providers will acquire better interest from their investment in fisheries activities.

Fishermen: Value creation can lead to sustainable utilisation of resources. Fishermen will get a better yield and higher premiums when the market pushes for fish product. Thus, when demand increases, price also increases. Likewise, when demand decreases, price also reduces.

Fish processors: Effective market- driven chain enables firms to improve product flow through precise demand, sales prediction and improve stock management. This minimises delays and allows full traceability of the movements of goods from the supplier to the consumer. Hence, fish processors will supply better quality product and get better cash flow for the value-added product.

Distributors and Traders: Practicable value chain will enable distributors to carefully evaluate their processes and identify the weakest links that hinder financial flow, and determine the right solutions to address the problems. By adapting to market specifications, distributors can create and grab new market opportunities and lessen risks that can negatively impact their entire business.

Consumers: A value chain that meets market specifications will enable consumers to get satisfaction from their product and send feedback to the producers. Thus, effective and continuous information flow addresses distortion and miscommunication and promotes enhanced collaboration and relationship among supply chain actors.

7 CONCLUSION AND RECOMMENDATION

Overall, the study aimed at identifying and exploring how market-driven value chain can lead to improved product quality of smoked fish to increase returns among small-scale fish processors in Ghana. The following are the key findings of the research:

As ten supermarkets were studied under this project, which are large- scale supermarkets in Accra specifically Accra mall, West Hills mall, Achimota mall, Junction mall, Yoomart supermarket, Marina mall, Shop “N” Save supermarket, City supermarket, Koala supermarket, and Diplomatic supermarket, each of these markets are characterised by different consumer targets and quality issues. While some target all classes of the population, others target a specific class. Thus, only middle- or upper-class categories. In addition, some are discouraged by the quality of smoked fish product produced in Ghana.

The study revealed that the six supermarkets that target the middle and upper classes of the population do not sell smoked fish. This is due to their presumption that smoked fish is of a poor quality. This gives an opportunity for small-scale fish processors to serve these markets with a better product that meets with their requirements. Besides, those four supermarkets that sell smoked fish are willing to also pay additional premiums for an improved product that is better in quality than what they already have in stock.

To enter these untapped markets, it is important for small-scale fish processors to follow the market requirement criteria for the market to build trust in the product. As noted earlier, poor quality products deter large-scale supermarkets. Therefore, these markets will not accept any product that does not meet their standard and specifications. Small-scale fish processors who are planning to enter these markets need to re-examine their value chain by mapping it out to identify the major problems that will prevent them from entering the market. The main requirements of the supermarkets are products that are in line with consumer preference, quality, reliable supply, easy accessibility and standards. Consumers use taste, high quality, availability,accessibility and price as the base of their preferences.

Also, the findings revealed that 90% of the consumers who purchase items from the supermarket are willing to pay additional premiums for improved quality. As explained earlier most of the people who purchase items from the supermarkets are within the upper and lower class division and their income level is high. This provides another opportunity that if the quality of smoked fish is improved small-scale fish processors will obtain better returns from their investment.

It was also realised in the study that there is a communication gap among the actors in the value chain as the supermarkets and a large size of the consumers are not aware of the level of improvement in the small-scale sector. This calls for intensive awareness creation and information flow within the fish value chain.To enhace information flow in the value chain, the study revealed a value chain model that explains the feasible ways to discover the market size, market trends, opportunities that exist in the market, and how information flow among the actors can improve.

This study has shown that large-scale supermarkets are increasing in Ghana as the population also increases. This trend will push many people with increased income level to stop shopping in the traditional market. Therefore, small-scale fish processors must endeavour to develop their business in order to meet the trend. Opal business model could be a yardstick for small -scale fish process to follow. Several recommendations that will help to reverse this trend have been discussed below.

The findings from this study and the literature review shows clearly that implementing a market- driven value chain in the small-scale sector to obtain higher premium is very challenging. As a result of unstable supply, unstable quality, lack of marketing connections and many suppliers. However, if effort is devoted to address those issues, the small- scale sector will also be competitive, and the actors will generate better returns from improved quality in the market.

7.1 Government level:

- Improved infrastructure in the small -scale sector that will sanitise the sector thereby leading to improved product flow in the fisheries value chain.
- Strengthened government and stakeholder support in terms of technical, and managerial training that lead to value creation that generate more income in order to reduce fish waste and losses.

- The ministry must allocate adequate resources and time to ensure effective implementation of market-driven chain to reduce the consistent fish production.
- The ministry must invest in research and development in order to be abreast with current trends and be dynamic as possible to ensure sustainable utilisation of the scarce fisheries resources.
- It is recommended that links be created among stakeholders (Trade Unions, Market leaders, fishers, fish processors etc.) and government institutions (Government, Researchers, Universities, NGOs, Fishers) for secure distribution of information and knowledge sharing.

7.2 Business level:

- To meet with current market demand, it is recommended that all actors in the chain improve in their activities especially the producers of the raw materials thereby obtaining the expected returns.
- It is also recommended that additional time and effort must be invested by producers to analyse their current chain to ensure that all elements/ available resources can meet the market needs.
- Small-scale fish processors need to focus on the market in order to always produce what the market demands. It is important to note that consumers always desire for different taste or preference. Therefore, improved value- added product that meets consumers demand will lead to price premiums or increased sales.
- It is recommended that small -scale fish processors should not in any way compromise quality and safety even though cost needs to be reduced. This could be achieved by adopting a practicable value chain where there are proper linkages in order to know when and how things needs to be done to prevent waste of resources that will lead to increased cost.

7.3 Further research

It is important for further research to be carried out on issues affecting the competitiveness of the value chain in the small-scale sector. This could be on issues like collaboration of actors in the value chain, the structure of the value chain and communication between levels in the value chain.

Furthermore, research needs to be carried out on the monetary value of value- added product to give a substantial idea of the benefits key actors will derive from their investment. Further research is also needed on the class categories of the respondents willing to pay additional premiums for improvement.

Research is also needed to be carried out in the traditional market on whether the consumers who purchase items from the market will be willing to pay additional premiums for improvement.

Finally, it is recommended that, further research needs to be carried out on the socio- economic benefits of improved fish smoking technologies among small -scale fish processors in Ghana.

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10. APPENDIX I

QUESTIONNAIRE FOR SUPERMARKET

1. Name of supermarket……………………………………………….…
   Location of Supermarket……………………………………………
   Name of Respondent…………………………………………...…
   Position/ Role of Respondent…………Date…………..……………
   Location of the supermarket……………………………………..….

2. Market size

a) Is this a big market? Yes ( ) NO ( )
b) On average, how many people access the supermarket per week?
c) How will you classify the people who buy from the supermarket? Lower Class ( ) Middle Class ( ) Well to Do ( ) All the classes; lower, middle and middle class ( ) other specify……………………….
d) On average, what is your weekly turnover?

3. Type of Fish product sold

a) Is local smoked fish sold here? Yes ( ) No ( )

b) If No, would you be willing to sell if you are supplied? Yes ( ) No ( )

c) If yes, which species? Mackerel ( ) Tuna ( ) Herring ( ) Grouper ( ) specify if other…………………………..

d) What kind of processed fish do you currently sell?…………………………………

e) If you are willing to sell smoked fish what level of smoking would you like to be supplied with? Please rank with 9 highest 1 being least

Whole wet smoked	
Whole dry smoked	
Scaled wet smoked	
Fillets wet smoked	
Fillet dry smoked	
Gutted wet smoked	
Gutted dry smoked	
Sliced wet smoked	
Sliced dry smoked	

4) Demand and Supply of fish product

a) Which type of processed fish do customers demand most?...............................
b) Are you able to meet their demand? Yes ( ) No ( ) Sometimes ( )
c) Who is your current local supplier? Fisherman ( ) Middlemen/Fish mummies ( ) Fish processor ( ) other specify ……….
d) Where is your supplier(s) located? (Place and km)

e) Is your local supplier reliable in terms of product quality and supply? Yes (   ) No (   )
f) Rank the factors that prompted you to sell any of the current product mentioned above (6 being the highest and 1 being least)

Reliable Supply	
Customer Preference	
Quality	
Reasonable price	
Stability in quality and supply	
Easily accessible	

g) What are/will be your requirement for the smoked fish product?   (5 being highest and 1 least   )

Standardisation	
Customer Preference	
Quality	
Reliable Supply	
Easily accessible	

5) Quality

a) Would you be able to sell high quality smoked fish for a higher price than medium quality smoked fish?   Yes ( )   No (   )
b) Rank the top five (5) factors that deter you from selling smoked fish (5 being highest and 1 being least)

poor quality	
low demand for smoked fish	
High price	
Easily perishable	

6) Price and mode of payment

a) Are you willing to pay a higher price for quality fish and better service? Yes ( )No ( )
b) How much increment are you willing to pay? 2% per kg ( )   5 % per kg   (   )   10% per kg ( ) 20% per kg (   ) other specify (   )
c) What type of payment mechanism would you prefer?   Written contractual Agreement (   ) Instalment payment (   ) informal agreement (   )

7) Fish smoking Technology

a) Are you familiar with the types of fish smoking technologies in Ghana? Yes (   ) No (   )
b) Can you mention one or two you are familiar with?

c) Can you describe the fish from that smoking technology?
d) Are you aware of a new fish smoking technology (Ahotor) introduced by Fisheries Commission? Yes ( ) No ( )
e) If Yes, what is/was your impression about the product from that smoker ( ) colorful appearance ( ) makes fish attractive ( ) better quality ( )
f) If No will you be willing to see/taste the product? Yes ( ) No ( )
g) Have you sold the product from this Ahotor technology in your supermarket? Yes ( ) No ( )
h) What is /was your customer's impression about the product?

QUESTIONNAIRE FOR CONSUMERS

Age………………………………..

Gender; Male ( ) Female ( ) Date

Where do you reside? ……………………………………….

How do you classify yourself? Lower Class ( ) Middle Class ( ) Well to Do ( ) other specify……………………….

a) Preference

1. Is local smoked fish part of your diet? Yes ( ) No ( )
2. Which species do you often buy? Mackerel ( ) Herrings ( ) anchovies ( ) Tuna ( ) other specify.

3. What kind of smoking do you desire? Rank with 9 highest and 1 least

Whole wet smoked	
Whole dry smoked	
Scaled wet smoked	
Fillets wet smoked	
Fillet dry smoked	
Gutted wet smoked	
Gutted dry smoked	
Sliced wet smoked	
Sliced dry smoked	

4. What kind of smoked fish do you normally buy? Wet smoked ( ) Dry Smoked ( ) Both ( )

5. Rank the factors that influence your purchase of smoked fish? (5 being highest and 1 least)

Taste Better	
Sold in Large quantities	
Easily accessible	
High quality	
Low price as compared to other processed fish	

b) Accessibility

6. Where do you purchase your smoked fish? Traditional informal market ( ) Supermarket ( ) Fish processors ( ) Retailer/ wholesaler ( ) Other specify
7. How far is the supply of smoked fish from Home? (how many km)
8. Are you able to always get the quality of your smoked fish you prefer? Yes( ) No ( ) Sometimes ( )

c) Price and Expenditure

9. How often do you purchase smoked fish per month? 1 – 5 times ( ) 5 to 10 ( ) 10 and above ( )
10. How much do you spend per month on average on smoked fish?
    Below 100 cedis ( ) between 100- 300 cedis ( ) between 350- 500 cedis ( ) above 500 cedis ( )
11. Is price of fish stable?
12. Will you be willing to pay an additional price for the improved quality and better service? Yes ( ) No ( )

d.) Quality

13. How will you rate the quality of your fish currently? Very poor ( ) Poor ( ) Good ( ) Very good ( )
14. Do you always look for better quality? Yes ( ) No ( )
15. How is your smoked fish normally packaged? Brown paper package ( ) Cement paper package ( ) plastic pack ( )
16. Please specify some of the factors that affect your choice. Financial constraint ( ) Poor quality ( ) Limited Supply ( ) other specify ( )

f) Smoking technology

17. Are you aware of a new fish smoking technology (Ahotor) introduced by Fisheries Commission? Yes ( ) No ( )
18. If Yes, what is/was your impression about the product from that smoker ( ) colorful appearance ( ) makes fish attractive ( ) better quality ( )
19. If No will you be willing to see/taste the product? Yes ( ) No ( )

10 APPENDIX II

Name of supermarket	**Position /Role of Respondents**
Shop'N' Safe Supermarket	Shop Attendant
Accra Mall	Shop Attendant
Marina Mall	Sales Executive
City Supermarket	Customer Relations Manager
Junction Mall	Public Relations Officer
Koala Supermarket	Sales Manager
Achimota Mall	Shop Attendant
West Hills Mall	Shop Attendant
Yoomart Supermarket	Shop Attendant
Diplomatic Supermarket	Sales Personnel

No.	**Gender of consumers**	**Age of consumers**
1	Male	71
2	Female	29
3	Female	49
4	Female	28
5	Male	54
6	Male	29
7	Female	36
8	Female	43
9	Female	25
10	Male	42
11	Male	33

12	Male	49
13	Female	41
14	Female	40
15	Female	29
16	Female	35
17	Female	32
18	Male	21
19	Female	51
20	Female	32
21	Male	27
22	Female	39
23	Male	71
24	Male	61
25	Male	35
26	Female	31
27	Male	49
28	Female	29
29	Male	43
30	Female	32
31	Female	43
32	Female	46
33	Male	43
34	Female	36
35	Male	46
36	Female	43
37	Female	29
38	Female	28
39	Male	42
40	Female	41

41	Female	39
42	Male	33
43	Male	57
44	Male	59
45	Female	27
46	Female	29
47	Female	35
48	Female	49
49	Female	29
50	Female	36
51	Male	29
52	Female	42
53	Male	64
54	Female	35
55	Male	32
56	Male	29
57	Female	33
58	Female	35
59	Female	34
60	Female	39
61	Female	59
62	Female	35
63	Male	39
64	Female	41
65	Male	39
66	Female	41
67	Female	46
68	Female	39
69	Female	25

70	Female	37
71	Female	28
72	Female	62
73	Female	29
74	Male	41
75	Male	28
76	Female	57
77	Female	38
78	Female	39
79	Female	46
80	Female	35
81	Female	46
82	Male	46
83	Female	39
84	Female	31
85	Male	41
86	Male	39
87	Male	39
88	Female	44
89	Female	50
90	Male	59
91	Female	29
92	Female	29
93	Male	30
94	Male	40
95	Female	36
96	Female	31
97	Male	42
98	Female	36

99	Male	54
100	Male	44