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Value chain analysis of the fishery sector in Ghana

with focus on quality, environmental, social, sustainable, food safety, organic requirements and its compliance infrastructure

US/GHA/06/005 - Contract No. 3000018889

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Executive summary

Ghana fish production from marine, inland reservoir and aquaculture sources has been fluctuating around 440,000 t over the last 10 years. Although there is strong growth in aquaculture production - MOFAD estimates that the production for aquaculture has risen from 5,000 t in 2000 to nearly 28,000 t in 2012 - it remains small and has not kept pace with the demand for fish in Ghana, estimated at about 1 million t. Women play a key role along the fish chain since the gender ratio is about 80/20 in the handling and grading, distribution, processing subsectors and 60/40 in marketing sub-sector while in the production it is 30/70 which reflects the predominance of males in this sub-sector only. For the foreseeable future, Ghana will therefore continue to import fish such as sardinella and mackerel to supplement the domestic supply.

Among all the public institutions concerned with fishery product quality and safety and also export, the Ghana Standards Authority (GSA) emerges as a quality and safety reference, while at the same time being responsible for establishing the standards, conducting inspections, testing on accredited and proficiency proof equipment and certifying products and management systems. The Certification Division and the Inspectorate Divisions are in the process of obtaining conformity assessments for their domains.

As a result of the major importing partners of fishery products being European countries, the Competent Authority (CA) for fish control was established in 1998 under the Inspectorate Division as the Fish Control and Export Development Project. Further to the last FVO audit mission conducted in 2013, traceability measures have been put in place (authorised canoes, landing sites, monitoring communication with other CA). While standards are well enforced for exported products, there is still some room for improvement to accomplish the national standards.

Ghana adheres to the Harmonisation of the Food Safety Measures Agreement, particularly the SPS measures regarding fishery products, launched by East African Community for all Africa. Currently, the GSA receives strong support from the Swiss funded UNIDO TCB programme, the EU TRAQUE Programme, the INS ISO Programme and the Better Training for Safer Food. Competent Authority fish inspectors are undertaking, according to the EU fishery product regulations and their standards, operations for approval of fishery exporting establishments (fishing vessels and processing plants), regular monitoring inspections and HACCP auditing of their premises and fishing vessels, consignment inspections before exports and issuing Health Certificates.

To date, a total number of 65 approved establishments have been allowed to export their fishery products to European Countries: 50 fishing vessels belonging to 17 fishing companies and 15 processing plants. A significant share of the market is held by the tuna vessels and tuna processing plants. In general, the value chain includes production, processing (and packing, labelling and storage), transport, marketing and final market. The major associations concerned by export and quality are Ghana Tuna Association, National Fisheries Association of Ghana, and Ghana Export Promotion Authority.

From the three fish chains selected in this study, the tuna fish chain is the most important from all point of views as it involves the most industrial components of the Ghanaian fishing industry and represents one very important source of income from

international trade with about 50,000 t of tuna products exported every year. The non-conformity to international rules such as the non-transhipment at high sea has caused a major disruption in 2013 with the effects of having many containers refused in European ports. The industry is currently implementing new procedures such as VMS and other control measures to make sure that the fishing fleet complies with international rules.

Overall, the employment in the Tuna fish chain is about 6,500 (1,100 in the fleet; 3,200 in processing and 2,200 in the upstream and downstream sectors). Upstream employment comprises of workers dedicated to supplying both fishing fleets and plants with all kinds of inputs (goods and services). Downstream employment is linked to the people working in the products distribution, marketing, product transportation, etc. The annual value added generated by the tuna industry can be estimated at around EUR 100 million. The catch value is about EUR 91 million while the direct value added of the catch sector is about EUR 35 million. The processing sector, with a selling value of EUR 120 million generated a value added of EUR 44 million.

On the international market, Indian Ocean and Latin America countries gain a better average price per kg than Ghana does while on the other hand, Asian countries get a smaller price. There is therefore some margin of progress to make here in order to reach the Seychelles and Columbia prices. Better quality products and products differentiation are options currently being developed by the two exporting companies (PFC and Myroc) to improve Ghanaian performance on the international market.

From the quality and hygiene point of view, the CA Fish Control and Export Project Department staff from the GSA takes care of the quality sustainability requirements all through the chain of production to processing. Moreover, should all the necessary guarantees requested by the European standards be respected, CA inspectors can sign a health certificate accompanying the consignment to be exported. The CA Fish Inspectors and/or laboratory staff from the GSA are in charge of the sampling. Approved tuna establishments, as part of their monitoring (own-checks), are also taking samples at each step.

The smoked fish value chain represents, to date, six small companies working at industrial level, exporting mainly in Europe (against two plants in 2007). Their market is the African Diaspora living in European Countries, longing for smoked fish products. The smoking industry employs overall 90 people plus casual workers. Their products reach Europe mainly by airfreight. Companies are not active in local trade and few are on regional markets. The peculiarity of smoking establishments is that they rely on small scale fisheries for their raw material: they get it from authorised fishermen and canoes selected by them on very precise EU based criteria. Both the plant and the CA regularly monitor them during their landing site monitoring. CA inspectors must check both raw material and processed products and also sample them for official controls. To meet the European Commission requirement on the very low level of carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs), companies had to invest in expensive equipment based on the separation of drying phase and smoking phase and/or on indirect smoking. Not only the expense of the equipment, the establishment have also to bear with costly tests. Indeed, as there is no machine settled and accredited for PAHs and *Listeria* sp in GSA or Ghana, own-checks and official tests must be sent to Europe to an accredited laboratory. Only a low detection limit GS-MS/MS analysis method is able to detect

the PAH threshold requested by Europe, equipment that the GSA doesn't have. On the 1st September 2014, the value will decrease from 5 to 2 ppb/kg of fish.

Smoked products have nevertheless a high value-added. It would be worthwhile to support this processing industry. Usually, smoking industry in Ghana is characterised by up to 50% capacity utilisation. Offal is generally sold to livestock and aquaculture feed farms. Quality requirements of smoked products are not only PAHs level, but also *Listeria*, histamine (for some species) and *Clostridium*. Further attention should be given to the Food Research Institute that currently tries to reach the EU threshold by an improved Chorkor smoker (FAO prototype). Some projects are supporting the artisanal smoking industry but currently the industrial smoking private sector has no direct external assistance.

Farmed tilapia products are currently not exported but locally consumed. However, there is a potential for export if processed as smoked and salted. In 2012, about 28, 000 t of tilapia were supplied to the local market. The bulk of the supply came from cage culture (85%) with the remaining coming from ponds and dugouts. About 98% of tilapia is supplied directly to the local markets whilst 2% is family consumed (subsistence).

There are a total of 19 hatcheries (3 public and 16 private) producing 80 million fingerlings annually. The marketing channel involves farmers selling to wholesalers/retailers to consumers/hotels. The processing technology is generally low (mainly sun drying, small size smokers).

In terms of quality sustainability requirements, there are a number of requirements which must be met including, revising the aquaculture policy by making sure that the dispositions of hygiene general requirements and HACCP set up in the European rules (EC Regulation 852/2004) are incorporated and a link with the Competent Authority, legal document stipulating veterinary medicines are allowed/prohibited to use in Ghana should be at least equivalent to the European dispositions.

Additionally, there is a general lack of human skills in the aquaculture sector. More research institutions and universities must be set up to train qualified personnel in the aquaculture sector.

Nine recommendations have been made and discussed during the second workshop in Accra in February 2014.

- Completion of required documentation is time consuming for the industry. The implementation of a single entry point for fish product exports with one dedicated person per case will ease and speed up the document acquisition process. This system has been put in place successfully for many years in Canada and could therefore represent an example to follow.
- As product identification and differentiation is fundamental for improving market penetration and recognition from consumers, Ghanaian companies have to develop a common label with the Export Promotion Agency.
- In order to enlarge Ghanaian tuna industry market with high value addition, some activities of research and development are required. A joined research and innovation centre based on a public/private partnership should be set-up for example at the Ghana Tuna Association.
- , Documentation, database, information, etc. on fishery products should be recorded by the Fisheries Commision and available online for general public

purposes and more specifically the private sector who will gain from the visibility. Strong collaboration between all the institutions will make it possible. This online centre should also provide information on export procedures and requirements as well as updated list of all exporters with detailed contact information.

- Stronger collaboration between public institutions and between donor programmes in relation to fish quality and export should be enacted to bring more sanitary guarantees on the fish value chain, beneficial to fish industry.
- Further capacity building for the GSA in areas of inspection, standardisation, testing and certification will bring conformity assessment. In particular, CA inspectors have to be trained in the ultra-low freezing technology, recently launched in Ghana, as well as established standards.
- To be able to analyse PAH, and pesticides/veterinary medicine residues when aquaculture products will be exported in Europe, the low detection limit GCMS/MS equipment is needed in the GSA and this equipment accredited.
- Capacity building for public institutions to export aquaculture products should be strengthened. Given the acquired strength of the Fisheries Commissions and the GSA, it is recommended that discussions are initiated. This will avoid both institutions acquiring similar capacities in exactly the same thing but rather in different areas related to aquaculture.
- There is the need to develop a practical guide for aquaculture exporters by the relevant stakeholders. Aquaculture operators in Ghana should be trained and guided on how to export their products in the EU markets. Strengthening aquaculture personnel to work in aquaculture farms is also required.

Contents

Abbreviations

CA	Competent Authority
CSIR – FRI	Food Research Institute
DWF	Distant water fleet
EU	European Union
FAPAS	Food Analysis Performance Assessment Scheme
FDA	Food and Drugs Authority
FPR	Fishery Products Regulation
FVO	Food and Veterinary Office
GCMS	Gaz Chromatography Mass Spectrophotometer
GEPA	Ghana Export Promotion Authority
GSA	Ghana Standards Authority
GTA	Ghana Tuna Association
HACCP	Hazard Analysis Critical Control Point
HPLC	High Performance Liquid Chromatography
ICCAT	Tuna International Commission for the Conservation of Atlantic Tuna
IUU	Illegal, Unreported and Unregulated Fishing
MESA	Monitoring for Environment and Security in Africa
MOFAD	Ministry of Fisheries and Aquaculture Development
MoTI	Ministry of Trade and Industry
MoU	Memorandum of Understanding
MRL	Maximum Permissible Residue Level
MSC	Marine Stewardship Council
NAFAG	National Fisheries Association of Ghana
OHSAS	Occupational Health and Safety Management System
PAH	Polycyclic Aromatic Hydrocarbons
RASFF	Rapid Alert System for Food and Feed
TCB	Trade Capacity Building Project
TRACES	Trade Control and Expert System
TRAQUE	Trade Related Assistance and Quality Enabling Programme
UNIDO	United Nations Industrial Development Organization
WARFP	West African Regional Fisheries Programme

Introduction

The fishery sector of Ghana has two major components: marine (sea and lagoons) and inland (lakes, rivers and reservoirs). The aquaculture sector is also becoming more widespread in the country. The marine sector in turn is made up of small-scale/artisanal sector, semi-industrial/inshore, industrial/deep-sea and tuna sector. The inland fishery is considered wholly small-scale/artisanal.

Ghana fish production from marine, inland reservoir and aquaculture sources has been fluctuating around 440,000 t over the last 10 years. Although there is strong growth in aquaculture production - MOFAD estimates that the production for aquaculture has risen from 5,000 t in 2000 to nearly 28,000 t in 2012 - it remains small and has not kept pace with the demand for fish in Ghana, estimated at about 1 million t. For the foreseeable future, Ghana will therefore continue to import fish such as sardinella and mackerel to supplement the domestic supply.

Fish is the preferred and cheapest source of animal protein in Ghana; about 75 percent of the total annual catch in the country is consumed locally. The per capita consumption of fish is estimated at about 25 kg per annum, representing 60 percent of animal protein intake by Ghanaians. Ghanaians prefer consuming fish in smoked form because of its flavour and delicacy. Fish species such as horse mackerel, chub, sardinella, anchovy, herrings, tunas, are popularly consumed when smoked. Other traditional methods employed to preserve and process fish for consumption and storage include drying, salting, frying and fermenting and various combinations of these.

Aside from being consumed locally, some fish and fishery products are also commodities for the export business (regionally with the neighbouring countries, internationally with the European Union mainly. They are currently 60 approved establishments in Ghana that are authorised to import fishery products in EU: 10 processing plants and 50 freezer vessels. The quality and safety of the fishery products are under the control of the Competent Authority at the Ghana Standards Board, including the exporting establishments.

The FVO (Food and Veterinary Office of the European Commission) indeed regularly carries out missions to ensure that the official controls put in place by the Competent Authority are in line with the requirements of the European Union legislation regarding the conditions of production and are complying with the standards set by the EU. The last mission took place at the beginning of 2013. According to information provided by Eurostat fishery products exported to the EU amounted to 34,000 t in 2012, mainly composed of canned tuna (90%). Other commodities were fresh and frozen fish including cephalopods (8%) and a very small proportion of smoked fishery products (less than 1%). The main importers are UK, France, Spain and Netherlands. Furthermore, actions are taken to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU) by strengthening fisheries monitoring, control and surveillance (MCS) systems.

In Ghana, UNIDO implemented in 2007 the Trade Capacity Building Project[1] (TCB) on Agro-Industry, oriented to strengthen the capacities of public bodies in terms of quality, productivity, safety, health and environmental issues and to enhance the capacity of enterprises for production according to international market requirements. The TCB Project is currently supporting Ghana's trade and export sector to link key export products such as fruits and vegetables, fish, wood and cocoa to international markets. It also aims to improve the country's conformity assessment institutions to enable them provide best services in the area of standardisation, testing, certification and inspection to ensure that export products meet the expected quality standards.

The objective of this study is to conduct an in-depth value chain analysis of the fishery sector to identify particular areas of intervention and development opportunities in fostering standard compliance and trade capacity building. To do so, it seeks first to identify products for which issues are paramount in terms of consideration of environmental, social, sustainability, food safety and food security, capacity, compliance with regulations and standards of organic farming and other international rules. According to the ToR, this study addresses four key points:

- Make an inventory and assessment of the fisheries sector in Ghana
- Set priorities and make a choice of products requiring detailed analyses
- Conduct a mapping and a detailed performance analysis of the industries of the selected products
- Identifying levers and making recommendations.

Information was collected during a field visit in Ghana in February 2014. Following the inception workshop (12th of February), 4 fish chains were selected (tuna, smoked fish from inland fisheries, tilapia from aquaculture and cephalopods) numerous interviews were undertaken with stakeholders operating along each fish chain as well as with the supporting institutions and management bodies. The analysis of the current functioning of each fish chain, their trends and bottle-necks has led to the drafting of recommendations that UNIDO can take into account for the design of a short term implementation plan (3-4 years). The validation workshop held on the 26th of February, provided opportunities for stakeholders to discuss and agree with the main conclusions and recommendations.

The expert team faced two major constraints during its mission in Ghana. The first one was the time allocated to the search and collection of information that was too short due to a certain geographical dispersion of the stakeholders. The second one was linked to the difficulties to access the information from public bodies. In that context, priorities have been given to the 3 fish chains that can take better advantage of the UNIDO interventions and whose effects can impact production process of products for domestic market. The cephalopods fish chain, fully dedicated to the export market, already reaches a high level of quality while the possibilities of value addition is miniscule since international markets for cephalopods go for frozen whole

[1] The UNIDO Project "Trade Capacity Building for Ghana" (US/GHA06/005), set up in March 2007, is funded by the SwissConfederation through the State Secretariat for Economic Affairs(SECO). For further details, see: http://www.unido.org/fileadmin/user_media_upgrade/What_we_do/Topics/Quality_and_compliance/tcb_ghana_26.04.2013w.pdf

products mainly. Therefore, cephalopods fish chain analysis is not presented in this report.

The report contains 5 chapters. Chapter one presents the global context of fish production and trade in Ghana as well as stakes and opportunities for the fishery and aquacultures sectors. Chapter two provides an overview of the way fish chains have been selected. Chapter three gives the institutional landscape of bodies involved in quality, certification, monitoring and inspection along the fish chain. Chapter four presents the analysis of each of the three chain studies and major conclusions while chapter five provides the main recommendations compatible with short term implementation.

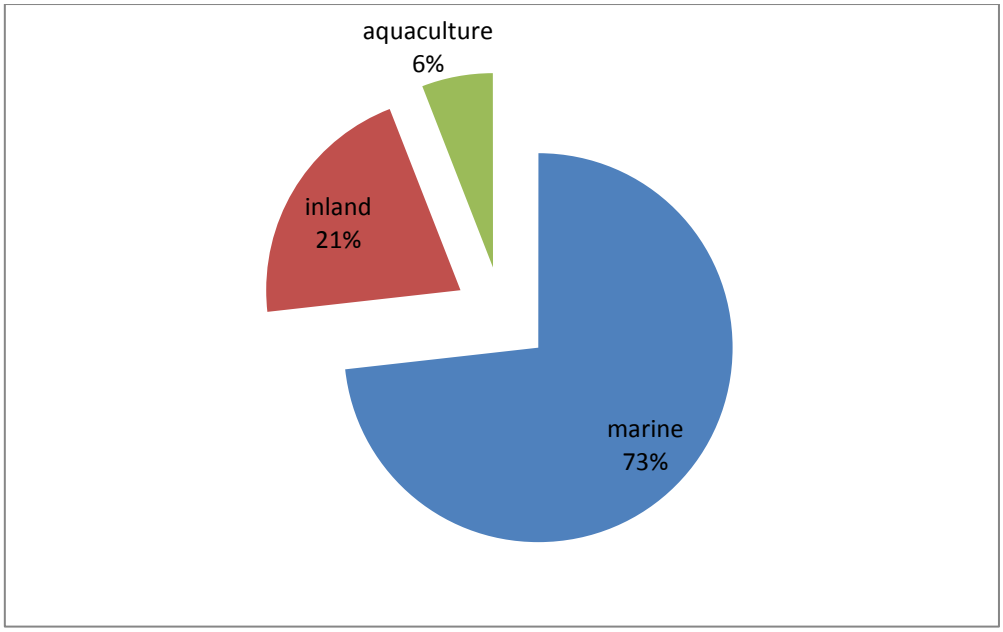
1 Global context of fish trade, stakes and opportunities for Ghana

1.1 Key indicators

Ghana has a coastline of about 550 km and a total continental shelf area of approximately 24,300 square kilometres. The Exclusive Economic Zone (EEZ) waters extend up to 200 nautical miles from the shore. Marine fish production in Ghanaian coastal waters is driven by the oceanography of the western Gulf of Guinea, a seasonal coastal upwelling. This consists of a yearly major upwelling of about three month's duration (July – September) and a minor upwelling of about three weeks duration (December – January or February – March).

The fishery industry in Ghana comprises mainly of the marine sector and the inland sector. The marine fisheries sector is the main source for fish production, with 73 percent of the total catch (Figure 1 below). The inland sector (wild and aquaculture) accounts for the remaining 27 percent of Ghana's fisheries production, exploiting a large number of rivers, irrigation dams, ponds and lakes including Lake Volta, one of the largest man-made lakes in the world, with a total surface area of 8,700 km².

Figure 1: Contribution of Marine, Inland & Aquaculture Sub-sector to Total Fish Production



Source: Fisheries Commission

Ghana is endowed with significant and valuable fish stocks. Annual fish production (from marine, inland and aquaculture) is average 440,000 t. This fish production is worth in excess of US$1 billion in income annually. The Volta Lake, reservoirs, aquaculture and coastal lagoons are the main sources of inland or freshwater fish. Marine fishing is an important traditional economic activity for the coastal communities and contributes over 70% of the total catch. The average fish production figures from the main sources are indicated in the following table.

Tableau 1: Fish Production in Ghana

Type of production	Production/Year (t)
Marine	326,000
Inland	95,000
Aquaculture	19,000

Source: Fisheries Commission

Fisheries production, mainly from capture fisheries has been following a decreasing trend over the past decade (FAO, 2013). Fish production from the marine sector has declined from 343,000 t in 2008 to 333,000 t in 2012. However, there has been an increase in the aquaculture sector from 5,000 t in 2008 to 28,000 t in 2012. This is a clear indication of a booming aquaculture.

Tableau 2: Marine Fish Production from 2008-2012 (t)

Fleet/Year	2008	2009	2010	2011	2012
Artisanal	254,133	226,755	203,000	228,000	213,452
Inshore	6,140	12,048	9,823	9,337	10,482
Industrial	19,594	20,837	18,856	19,762	19,763
Tuna	64,000	66,470	77,876	69,446	90,000
Total	**343,867**	**326,111**	**309,558**	**326,545**	**333,697**

Source: Fishery Commission (2013)

Tableau 3: Inland Fish Production from 2008-2012 (t)

Sector	2008	2009	2010	2011	2012
Inland (Wild)	87,000	70,796	83,126	95,353	95,791
Aquaculture	5,594	7,154	10,000	19,092	27,450
Total	**92,594**	**77,950**	**93,126**	**114,445**	**123,241**

Source: Fishery Commission (2013)

Tableau 4: Number of Vessels and level of motorisation

Sector	Number of vessels
Artisanal	13,000
Semi-industrial (Inshore)	559
Bottom trawlers	168
Tuna vessels	30
Level of motorization	58%

Source: Fishery Commission (2013)

The fisheries sector, which includes aquaculture, accounted for nearly 7 percent of Ghana's agricultural GDP and 1.7 percent of the national GDP in 2011 (GSS, 2012). The fisheries sector contributes enormously to the economic and social development of Ghana. The fishing industry plays a major role in sustainable livelihoods and

poverty reduction in several households and communities. The fisheries sector is largely rural in character, as artisanal fishers dominate the industry. One in ten Ghanaians depend on fisheries. It is estimated that a total of 370,000 fishermen, fish processors, traders and boat builders are employed in the fisheries sector and it is a source of livelihood for about 2.2 million people.

Fish and fishery products are now the country's most important non-traditional exports accounting for over 50 percent of earnings from non-traditional exports. Approximately 50,000 t of fishery product is exported from Ghana to the European markets. The major fish species for export is tuna (which is usually processed as tuna flakes, tuna chunks and tuna mash). Fish contributes 60 percent of animal protein intake of Ghanaians, making fish a preferred source of animal protein in Ghana.

1.2 Current structure of the fisheries sector

The fishery sector has two major components: marine (sea and lagoons) and inland (lakes, rivers and reservoirs). The aquaculture sector is also becoming more widespread in the country. The marine sector in turn is made up of small-scale/artisanal sector, semi-industrial/inshore, industrial/deep-sea and tuna sector. Inland fishery is considered wholly small-scale/artisanal.

1.1.1 Marine Fisheries sub-sector

1.1.1.1 Industrial Fisheries (offshore/distant waters)

The industrial fleet is currently made up of 48 trawlers, 7 pair trawlers, and 2 shrimpers (Amador, 2014 personal communication). The vessels operate from Tema and Takoradi where there are deepwater ports. Originally, the industrial vessels operated in more productive waters outside Ghanaian waters but the extension of the EEZ to 200 nautical miles by other countries along the coast of the Gulf of Guinea, has restricted these vessels to operate solely in Ghanaian waters where the continental shelf is rather narrow and coastal upwelling lasts for a maximum of about five months. The trawlers and shrimpers exploit demersal and semi-pelagic species. As deep-sea vessels, these trawlers are required by law to operate in waters deeper than 30 m (Fisheries Act 625 of 2002).

1.1.1.2 Tuna fisheries

The tuna fishing vessels catch mainly yellowfin tuna (*Thunnus albacares*), skipjack tuna (*Katsuwonus pelamis*) and bigeye tuna (*Thunnus obesus*). Recent assessments undertaken by the International Commission for the Conservation of Atlantic Tunas (ICCAT) indicate that yellowfin and bigeye tuna resources in the Atlantic are being optimally exploited while skipjack tuna is underexploited. Most tuna vessels are operated on joint-venture basis, with Ghanaian owners having at least 50 percent of the shares, as required by the Fisheries Act 625 of 2002.

1.1.1.3 Semi-Industrial Fisheries (Inshore)

The semi-industrial or inshore fleets consists of approximately 560 locally built wooden vessels fitted with inboard engines of up to 400 HP and have lengths ranging between 8 and 37 m. Vessels with lengths less than 12 m are referred to as small-sized while those between 12 and 22 m are referred to as medium sized vessels. The vessels are multi-purpose and are used for both purse seining and bottom trawling.

1.1.1.4 Small-scale or Artisanal Fisheries (canoe)

The artisanal fishery is characterised by the use of several gears. These include purse seine nets, beach seine net, set nets, drifting gillnets and hook and line. These gears are operated from wooden dug-out canoes in 334 landing beaches and 195 fishing villages along the coast of Ghana. There are over 13,000 canoes and 140,000 fishers (2013 Census). The main species exploited are anchovy, sardinella, mackerels and burrito.

1.1.2 Inland Fisheries sub-sector

All the inland fisheries are mainly artisanal. There are about 80,000 fishermen and 20,000 fish processors and traders engaged in the Lake Volta fishery. There are 17 500 canoes actively fishing in the Lake Volta. The fishing gears used are: cast and gillnets, hook and line, traps, spears, *atidja* (brush park).

1.1.3 Aquaculture sub-sector

Aquaculture is one of the inland fisheries even though its potential is largely under-exploited. Currently, there are no mariculture activities in Ghana. Fish farming has become an alternative for increasing the fish production in Ghana since the marine and inland capture fisheries production has reached its maximum sustainable level. Available data suggests that, there are about 4,800 ponds in Ghana covering about 705 hectares. Both extensive and semi-intensive cultures are practised in the aquaculture facilities in Ghana. Extensive culture is associated with dams, dug-outs and small reservoirs which are fished and restocked. Fish is cultured semi-intensively in earthen ponds either as monoculture or polyculture of tilapia (especially, *Oreochromis niloticus*) and African catfish. Cage and pen culture are practised in lakes, lagoons and rivers.

The Fisheries Commission (FC) is the lead government agency for aquaculture development, and the Water Research Institute of the Council for Scientific and Industrial Research (CSIR) is mandated to carry out aquaculture research. To promote fish farming and generate employment, imports of farm fish are not allowed.

1.3 Gender issues in fish value chain of Ghana

Women play a vital role in the Ghanaian fishery value chain, spanning from production, processing and marketing. Their roles are present both in the large and small-scale fisheries sectors. Women's role in fish marketing: handling, grading, packing and retailing is very important for timely distribution of the catch. In the capture fishery production, women play non-significant roles because of culture belief. Men do more fishing while women do more processing. However, in the growing aquaculture culture sector, women roles are significant.

In the aquaculture sector for instance, women are involved in activities in the hatchery, grow-out production and processing. For example, at Ainoo- Ansah Recirculation Farms at Okyereko in Central Region of Ghana, Theresa Ainoo-Ansah is the Assistant Farm Manager working in the hatchery and grow-out ponds. Many women are gradually entering the tilapia fish value chain as fish farmers. The table below shows staff numbers at Aquaculture Research and Development Centre (ARDEC), Akosombo with respect to gender.

Tableau 5: Number of Vessels and level of motorization

Category	Male	Female	Total
Scientific staff	5	0	5
Technical staff	5	2	7
Labourers	13	2	15

Source: ARDEC

In general, a similar trend is observed in the aquaculture industry. On the contrary, the tuna processing plants have more women than men. For instance, Cosmo Seafoods Ltd, has a total of about 600 workers at full operation with about 80% females and 20% males.

Tableau 6: general channel based value chain scenario of the fishery sector of Ghana

Value chain process	Women	Men	Female: Male
Production ↓			30:70
Handling and grading ↓			80:20
Distribution ↓			80:20
Processing labour ↓			85:15
Marketing ↓			60:40
Consumption			55:45

Source: field work investigation

In the case of aquaculture production the women often buy the fish directly at the farm gate. The fish bought by the women are either sold in the fresh form or as

chilled packed in ice which normally undergoes further processing by smoking before it is sold. Thus, in the aquaculture sector, women play key roles in buying, processing and marketing.

In capture fishery, women are involved from when the fish is landed at the landing site which subsequently undergoes some basic or extensive processing, after which the first set of wholesaler women sell to other women/men retailers who in turn sell to consumers. The women wholesalers have more funds for the business than the retailers.

It should be mentioned that, mobile phone technology has also enhanced women's role in the value chain. With over 60% mobile phone usage nationally, fish traders are now able to target their supply to market condition meeting consumers' preferences about taste, quality and other standards. Some consumers in Europe and other parts of the sub-region such as Nigeria and Cote d'Ivoire are now able to contact their suppliers for specific products (Personal communication, Development Action Association).

It is worth mentioning that, opportunities exist for women to expand their activities in the value chain such as training to enter into the farmed tilapia[2] value addition in a form of smoking and salting. These opportunities will go a long way to help in terms of food security, nutrition, employment and poverty reduction.

1.4 Current trade trends

1.1.4 Exports

Ghana is a major exporter of fish and one of the countries in the West African sub-region that export fish and fishery products to the EU. As an economic policy, the government allows export of fish from Ghana in order to ensure that the country derives maximum benefits from its fisheries. The Ghana Standards Authority (GSA) is mandated to certify the fish and fishery product for export from Ghana. GSA also gives advice to exporters on how to ensure quality, issue certificates and ensure standardisation. The Ghana Export Promotion Authority (GEPA) is mandated to develop, promote and monitors Ghanaian exports, including fish.

Fish export from Ghana over the last five years has been unstable. In 2011 for instance, fish exports from Ghana were around 44,000 t, valued at US$ 254 million (the highest value during the last 5 years) with an estimated 80% to the EU market. A total of 63,000 t of fish and seafood products valued at US$210 million was exported during 2012 against 57,000 t (US$210 million) in 2013. Exports are mostly derived from the industrial fisheries; very little fish caught by small-scale fisheries is exported. The types /species of fish exported are: frozen tuna, canned tuna (into tuna flakes, tuna chunks and tuna mash), dried or smoked fish and other assorted demersal fish such as cuttlefish, crabs and lobsters and other small pelagic including crustaceans, cephalopods (Table 6). Tuna contributes to the largest share of the exported fishery products (averagely 50,000 t annually). Between 2009 and 2012 for instance, canned tuna contributed between 47-68% of exported fish and seafood products (Table 6). The Fisheries Law authorises that at least 10 percent of landings of commercial tuna vessels must be sold on the local market.

[2] http://edition.myjoyonline.com/pages/news/201301/99771.php

Tableau 7: Fish export quantities and value (2009-2013)

	2009	2010	2011	2012	2013
Exports (t)	57,621	62,750	44,144	62,984	56,626
Value (US $)	158,709,973	165,709, 645	254,429,334	209,246,963	209,795,314

Source: Fisheries Commission

Some of the countries that Ghana export fish and fishery products to include, EU (Germany, Spain, United Kingdom), Cote d'Ivoire, Liberia, Togo, China and Japan.

Tableau 8: Exports of Fish and Seafood Products (2010-2012)

	2010		*2011*			*2012*		
	Weight (t)	*%*	*Weight (t)*	*%*	*Value (US$)*	*Weight (t)*	*%*	*Value (US$)*
Fresh or chilled fish	7,976	7.74	9,066	18.07	17,191	10,297	16.35	13,940
Cephalopods live,fresh or chilled	559	0.62	836	1.27	4,487	412	0.75	1,455
Dried/smoked/salted fish	118	0.19	86	0.12	183	155	0.25	77
Live ornamental fish	13	0.00	8	0.03	23	1	0.002	2
Tuna (Fresh)	4,707	32.88	37,421	10.66	10,268	19,798	31.43	44,999
Tuna (Canned)	30,193	57.32	116,419	68.40	220,697	30,134	47.84	146,888
Small pelagics (Canned sardine, mackerels, sardines)	543	1.06	1,510	1.23	1,095	2,153	3.42	1,781
Crustaceans	98	0.18	363	0.22	485	33	0.05	105
Total	44,145	100.00	165,710	100.00	254,429	62,984	100.00	209,246

Source: Fisheries Commission

1.1.5 Imports

With one of the highest fish consumption per capita (25 kg/cap./year) in the world, Ghana import fish from many countries globally (mainly Mauritania, Namibia, and Spain). Ghana fish supply is presently outstripping domestic demand, making Ghana a net importer of fish. In 2013, fish valued at US$135 million was imported to supplement local supply. For the foreseeable future, Ghana will continue to import fish such as sardinella and mackerel to supplement the domestic supply. Imports total approximately 190,000 t or about 40 percent of the domestic product consumed annually. With increases in aquaculture production in recent times, fish import has largely remained stable. Comparing 2013 (150,700 t) and 2012 (175,340 t) import figures, there was a decrease of about 14%. Most imported products are composed of frozen sardines, anchovies, horse mackerels and other mixed African species.

Currently, there is 15% import tax on seafood products to Ghana. Additionally, Ghana's aquaculture operators are protected by a policy of the Ministry of Fisheries and Aquaculture Development (MoFAD) which prohibits imports of tilapia from any source. This measure aims at reducing competition from (much cheaper) tilapia from China. The Customs Excise and Preventive service (CEPS) and the Monitoring Control and Surveillance (MCS) of the Ministry of Fisheries and Aquaculture Development monitor import of fish to Ghana.

Tableau 9: Fish Import Quantities and Value over Five Year Period (2009-2013)

	2009	2010	2011	2012	2013
Exports (t)	170,744	199,798	191,428	175,340	150,700
Value ($)	63,576,753	108,347,961	137,020,551	156,430,513	135,118,500

Source: Fisheries Commission

1.2 Stakes and Opportunities

Fish is one of the most valuable agricultural commodity traded by Ghana internationally. Annual sales from fish export is valued at nearly US$ 209 million and increasing each year (Fisheries Commission, 2014). For a developing country such as Ghana, fish exports to markets in developed countries, especially in Europe, are a major source of foreign exchange revenue, and help the country to derive maximum benefits from its fisheries.

Fish and fishery products are now Ghana's most important non-traditional exports accounting for over 50 percent of earnings from non-traditional exports and increasing each year. Approximately 50,000 t of fishery product is exported from Ghana to the European markets.

The Ghanaian fisheries sector contributes 1.5% to GDP, accounts for 7% of the agricultural GDP and 10% of the labour force. The canned tuna industries are highly developed targeting the European markets. Tuna sales account for 14% of non-traditional exports from Ghana and are the single largest contributor. Locally, the canneries in Tema as well as the industrial smoking companies provide considerable employment for a large female workforce.

There are 30 tuna vessels owned by 11 companies operating in Ghana. Stocks of skipjack tuna in Ghanaian waters are underexploited while bigeye and yellowfin tuna are overexploited. 40% of the MSY of East Atlantic tuna stocks lies in Ghana's EEZ.

There are three tuna canneries in Ghana, all located in Tema. 90% of Ghanaian exports of canned tuna go to the EU and 54% of these to the UK (most of the balance going to Germany). Exports to ECOWAS states account for around 8% of exports.

Some of the major limitations affecting Ghana's competitiveness are the high labour and energy costs as well as relatively high shipping costs compared with its competitors (Senegal, Cote D'Ivoire, Asia). The problem for IUU has been a major hindrance in Ghana's fish trade to the European Union in recent times.

2 Fish chain selection

2.1 Criteria and method for the selection of fish chain

The selection of fish chains has been made using the 8 following criteria:

- Current and potential domestic consumption
- Current and potential export
- Current and potential upstream and downstream economic activities
- Competiveness
- Regulations, certification and other measures
- Environmental and social impacts
- Short term impact potential
- Potential for import substitution

For each criteria, one or two sub-criteria were specified in order to better assess the performance of the fish chains. A total of 14 sub-criteria were used. Priorities levels have been allocated to each sub-criteria to give more weight to important factors such as the potential for exports and for investment along the fish chain, the capacity to alleviate poverty and the aptitude to provide a short or medium term return on UNIDO investment on quality improvement.

Each fish chain is assessed against the criteria and their sub-criteria using marks from 1 to 5 (smaller to higher). For sub-criteria with priority level 1, the mark given by participants is multiplied by 2 to reflect its importance (see table next page). The final mark is given by adding all marks attributed to each sub-criteria.

2.2 Key stakeholders validation of product prioritisation at workshop organized by UNIDO

During the workshop, participants identified the main fish chains linked to exports (in brackets net weight average figures for 2008-2012):

- Tuna fish chain for various products such as canned tuna, frozen tuna, tuna loins for European Market (about 35,000 t to the EU market and 15,000 t landed in Abidjan)
- Smoked anchovies for neighbouring countries(export figures unknown)
- Smoked inland fishes (tilapia, cat fish, etc.) for European market (around 250 t in the last 5 years)
- Cephalopods for European market (about 3,000 t of frozen octopus, cuttlefish and squid)
- Shrimps for the European market (negligible for these years as the fleet collapsed)

The farmed tilapia has been added to the list as it was perceived as having a strong potential for export.

Each of the 6 fish chains selected has then been marked against criteria. Results are presented in the table below.

Table 1: Fish chain selection

	Criteria	Quotations	Priority level	Tuna brine frozen	Cephalo-pods frozen	Aquacul-ture Tilapia	Shrimps	Smoked Anchovies	smoked inland fish
Criteria 1: Current and Potential Domestic Consumption									
1	Current Fish and Fishery Products Production	**1 : Low**: Current production is low with regard to current demand, possibilities to increase the production doesn't exist, there is no long-term vision, no awareness campaign exist to eat Ghanaian fish rather than imported ones. **2 : Risky**: Current production could be increased by better fishing techniques / better management but the possibility stays unreliable (fish stock unreliable, funding is difficult to find to increase production, fleet, fishing gears, equipment are old, training in the new technology is costly, feed is expensive). **3 : High**: Current and potential production are high, the stock is sustainable, fleet and fishing gear and equipment are new, feed is local and/or cheap.	2	2.75	2.00	2.00	1.00	2.50	2.50
2	Health conditions of the products (fresh, frozen, smoked) when arriving to the end consumer	**1. Poor**: Bad condition of the products due to non-compliance of the FBO with sanitary regulations and their implementation, bad state of the roads, loss of post-harvest losses and short comings seen in the cold chain (spoilage, breakdown of equipment, cross contamination), bad storage or packing conditions. **2. Just acceptable**: the products are alright but the date of expiry (pre-emption) is imminent. **3. High:** Condition that reflects high compliance with sanitary rules and also longer delay.	2	3.00	3.00	2.00	-	2.50	3.00
Criteria 2 : Importance for Current and Potential Export									
3	Current Fish and Fishery Products Export	**1: Low:** FBO has hardly no product to export due to the lack of compliance with the regulations, bad market opportunities, bad strategies, bad production, few countries **2: Risky:** FBO has some products to export but the market is not powerful enough and this market hasn't been developed for a long time. Perhaps it doesn't concern a lot of countries. **3: Good:** FBO has several partners, large quantities of products concerned, high compliance with sanitary regulations, high conformity assessment. The company is well known.	**1**	6	6	2	6	4	4

	Criteria	Quotations	Priority level	Tuna brine frozen	Cephalo-pods frozen	Aquacul-ture Tilapia	Shrimps	Smoked Anchovies	smoked inland fish
4	Potential investment in processing, packing, cold chain equipment, smoking equipment	**1: Important**: investing to create AV to the product requires heavy funding, no confidence in the return **2: Possible but do have risks:** investing to create AV to the product is possible but subjected to many issues that can could put the FBO in danger (cost too high, decrease in the number of clients, products is not trendy anymore). **3 : Good:** FBO are already equipped, investment will be quickly reimbursed, technology is not too complex.	**1**	2	6	6	2	4	4
Criteria 3: Current and Potential Upstream Downstream Processing (value addition / bulk commodity)									
5	Quality assurance techniques	**1 : None**: The FBO has not run a conformity assessment for the product **2: Some** : Some chain links for the product of the FBO are followed by conformity assessment **3: All:** All the chain links for the product of the FBO are checked under a conformity assessment	2	3.00	3.00	1.00	1.00	2.00	2.00
6	Possibility to create value added production in processing it and putting it on the market	**1 : Low:** the product is mostly consumed fresh, possible processing but at an expensive cost **2: Possible:** fish product consumed fresh and processed but the processing requires important modifications **3: High:** product is processed and the way of processing is totally under control, the required investments have been made and we are in a productive stage.	2	3.00	3.00	3.00	2.00	2.00	2.00

Criteria 4: Competiveness									
7	Competiveness level of the fish products in local markets, regional and international	**1: Low:** fish product is present in informal business, in small quantity and there would be a lot of effort required to increase the productivity and widen the range of commercialisation circuit. **2: Limited:** fish product is present on local and regional markets but the concurrence with other origin is tough and the way to increase the competiveness of the product is expensive. **3: High:** fish product is present on regional and international markets; perhaps it would need to diversify the partners and the value added chain.	2	3	3	2	2	1	2
Criteria 5 : Regulations, Certification and other Measures									
8	Enforcement of fishery products regulations, or any other regulations	**1: Hardly any:** No control body is inspecting regularly if there are enforcements **2: Some** : There is some control of some of the chain link **3: All /nearly all** the chain link of the value chain are submitted for inspection	2	3	3	2	1	1	2
9	Certification schemes are followed	0: the value chain doesn't have any link certified by a certifying body 1: some chain links are certified by a certifying body 2: all /nearly all the chain link that needs certifying are under certification by a certifying body	2	1	0	0	0	0	0
10	Some reliance on IUU fishing	**1 : Exist:** There is proof that over 50% of the fishing fleet practise IUU fishing (at least one convicted last year, has been reported as relying mostly on IUU fishing the previous years, is black listed, has paid a fine) **2 : Risky:** There has been evidence that between 30 - 50 % of the fleet has been reported IUU fishing 2 years ago but not in this last year 3 **: None**: none of the fleet were ever reported as practising some IUU fishing, the FBO is holding certificate of best practices (or the like)	2	2	2	3	2	2	3

Criteria 6 : Environmental and social impact									
11	Environmental impact	**0 : High:** fish value chains are detrimental to environment or the environmental impact is non-measurable **1 : Risky**: fish value chains have an environmental impact under some control **2 : Without consequence:** fish value chain doesn't change the environment **3 : Positive:** the fish value chain contributes to the preservation of the environment	2	2	2	2	1	2	2
12	Poverty reduction is achieved	**1: Little**: investing in the value chain will create hardly any difference regarding poverty reduction, gender balance wouldn't be achieved. **2 : Noticeable:** some impact is noticeable as some jobs will be created / sustainably maintained by investing for the value chain. **3 : A lot:** investing in the value chain will create more jobs for the vulnerable including women, on a sustainable basis.	**1**	6	4	6	4	6	6
Criteria 7 : Short Term Impact Potential									
13	Potential investment could show results within the next 3 years in processing, packing, cold chain equipment, smoking equipment, training, certification	**1: Low probability:** investment needs some more time to show such results because the investment is too high, little margin will be gained from this new technology/ training / certification **2: Possible but risky**: investment for the product might not be sustainable, some other regulations might appear and need to be complied with, other issues might arise **3:High probability:** the investment was not much, the rest of value chain has proved to be sustainable.	**1**	6	2	6	2	4	4

Criteria 8 : Potential for Import Substitution									
14	Imported products are being processed and re-exported	**1 : Rarely: T**he FBO requires sometimes to import products to processed. **2: Regularly:** The FBO requires small amount to process and to re-export. **3: Vast majority:** The majority of the processing that goes for export in done with products imported to Ghana.	2	2	1	1	1	1	1
			Total	**44.75**	**40**	**38**	**25**	**34**	**37.5**

Note: marks for sub-criteria with priority level of 1 are double.

Source: Own realisation

Regarding the final marks, four main fishery value chain should be taken into account for the present study:

- Tuna
- Cephalopods
- Aquaculture tilapia
- Inland smoked fish

The main characteristics of these value chains are presented below, including elements that could jeopardise investment in these fishery products:

- Tuna represents the main fishery product currently exported (nearly 90% in 2013).Stocks, managed by the ICCAT can sustain current levels of catches from industrial purse seiners or pole-and-line vessels. Tuna is mainly exported in cans to Europe. A modern technology, using the conditioning at minus 60°C, is about to start in Ghana for the export sashimi market.
- Frozen cephalopods (octopus, cuttlefish and squid) represent the second export fish chain in terms of quantities exported (about 3,000 t to the European market). Cephalopods are not consumed in Ghana. Whereas mostly caught by the industrial trawlers, small-scale fisheries make a significant contribution using pots. However, the state of these stocks, their seasonality and their correlation to the quality of the upwelling limit the possibilities of increasing exports.
- Tilapia is a product not currently exported, but some tilapia farmers are keen to join the export. In 2012, nearly 30,000 t of tilapia have supplied the domestic market. This chain seems to represent a niche export market. However, the price for tilapia in Europe is low due to the fierce competition of Asiatic countries that floods Europe with tropical fishes (Pangasius, Tilapia, etc.) at very low prices. If it is exported, attention should be given to the value addition (smoked or any other processing).
- Inland smoked fish represents a small part of the exports though in 1997, the number of smoking units exporting to Europe amounted to over 1000. However, since the EU has put its regulations on Polycyclic Aromatic Hydrocarbons (PAH) forcing the companies to respect 5‰ levels in PAH, the number has decreased to 5 companies currently. Until now, over the meaningful cost of the smoking equipment, the fish samples are sent to Europe to be tested by the European laboratories, implicating substantial additional costs. Beside this drawback, it represents a niche market linked to the African diaspora in European countries. It will be enlarged to smoked fish as a whole in the study.

This report was collated through interviews conducted during the course of this study (live, telephone or email exchanges) and thorough analysis of additional documents, reports and websites. People met during the course of the field analysis are displayed in Annex 1.

3 Institutional dimension of fish trade in Ghana

3.1 Overview of key institutions

The main institutions concerned by fish trade, export and/or quality are the Ghana Standards Authority (GSA), the Ministry of Trade and Industry (MoTI), the Food and Drugs Authority (FDA), the Fisheries Commission (FC) and the Customs. The following table gives an overview of the responsibilities of key institutions and their links to trade and quality of fish products. Their mandate and accomplishments regarding fish products control, certification and trade procedures are presented in sub-sequent sections.

Tableau 10: Key institutions related to Trade, Export and Quality of Fishery Products

Public Institution	Responsibilities	Link with Trade and Quality
Ministry of Trade and Industry	• Trade and Industry Policies Developing, monitoring and assessment. • Advice to the Government on these issues as well as to the private sector (18 projects) • Coordination, monitoring the implementation of programmes for private sector • Advocacy within Government for the Private Sector.	• Trade strengthening with open countries • Market and product diversification in the export trend (regional and international) • Making sure that domestic trade is conducted in a smooth and organised manner.
Standards Board Authority	• Reference institution when quality, health and safety of a product is concerned • Formulation of Standards • Inspections for agricultural and non-agricultural products • Laboratory testing (most accredited) • Certification of products and quality management systems (Sept. 2014)	• Supporting domestic, regional and international trade • Competent Authority for Fish Control when fishery products are to be exported to Europe
Food and Drugs Authority	• Regulation of the Food, Drugs, Food supplements, veterinary medicines etc. • Is concerned by quality of the domestic, imported and exported products • Conducts inspections in domestic manufacturing industries	• Is currently interested mainly in quality of the imported products and in products manufactured locally.
Fisheries Commission	• Providing fishing licence. • Approving the catch certificate • Enforcing MSC plan (traceability) • Institution taking in charge aquaculture & fish safety (disease)	• Providing fishing licence. • Catch Certificate • Traceability
Customs	• Verifying documents and good quantity at export and import at the main border points	• GC-Net entering export and import figures

Source: own realisation

3.2 Ministry of Trade and Industry (MoTI)

The MoTI establishes policies so that trade and industry grow competitively within domestic, regional and international markets, specifically including economic growth and employment creation for the vulnerable groups. The MoTI wishes to promote Ghana as a major manufacturing, value-added, financial and commercial centre in West Africa by the year 2015.

The MoTI has in particular developed a Logistics and Value Chain Division that employs 4 people. This Division is interested in all activities that can bring value and be competitive to the country. More specifically, the Division concentrates on key areas including fish, mango and rice and is turned towards exports.

3.3 Ghana Standards Authority (GSA)

The GSA is under the Ministry of Trade and Industry and employs around 3,500 people on its various sites. The GSA mandate is to establish the standards, to undertake inspections on the agricultural and non-agricultural products and to run laboratory testing as well as to certify products. The GSA was established by the Standards Authority Act in 1973. Structured into different divisions, the GSA has evolved into the public institution of reference when food quality and safety are concerned. One of the major issues handled by the institution is linked with export promotion. A field survey was conducted in February 2014 by the GSA. Regular interviews and questionnaires based on the UNIDO check-lists are presented in Annex 5.

3.3.1 Certification Division

This Division has been mandated to undertake conformity assessment activities providing a mark of conformity or label. The Certification Division is composed of three entities, including the Product Department, the System Department and the Industrial Department, all these representing 20 employees.

Certification is a task by which a third party gives assurance that products or systems are conforming to specified requirements, usually specified in a standard. While the Product Department certifies between others exported products (i.e. canned tuna), the System Department can certify management systems operated by fish exporting industries: quality management system ISO 9001:2008 (accreditation in 2012) and food safety management system ISO 22000 (accreditation in 2013).

The GSA has become, thanks to UNIDO TCB phase I project, the Statutory Certification Body under this Division (further information about the topic is readily available in the section 3.11 below).

Apart from UNIDO, the European programme TRAQUE (Trade Related and Quality Enabling Programme), has also been assisting the MoTI since 2011, 9 million EUR has been supplied to various issues: trade facilitation, capacity building with a focus on the private sector development, Economic Partnership Agreements and the National Quality Institutions. After funding the accreditation in BRC Global Standard for Food Safety, TRAQUE has just started, with the aim to enlarge the scope of accreditations, to prepare GSA, and particularly the Certification Division for the environmental management system accreditation (ISO 14000). The Terms of Reference to find an accreditation body, preferably European, have been released lately. TRAQUE has also been supporting the GSA to be accredited for the well-recognised British Standard OHSAS 18001 for occupational health and safety management systems.

In the near future (from September 2014), the GSA together with the Ministry of Trade and Industry, wishes to inform the Ghanaians that a number of products, engineering and non-engineering, manufactured or imported in Ghana, among which is the plastic used for packaging materials, will be placed under mandatory certification (local news, Daily Graphic, 19th February 2014). Those packaging materials are to be used in the fishery industry.

The Division is considering organic certification (fruits) but in the medium-term future; in respect of sustainable certification such as the well-known Marine Stewardship Council (MSC), the first step to reach should be for Ghana to clear the IUU issue. Bearing MSC ecolabel on tuna cans certifies buyers that tuna was caught under sustainably fishing practices. This certainly leads the people's choices when buying seafood, as this is a growing trend in European countries. MSC label could be interesting to promote in a near to medium-term future.

Conformity assessment links the various branches: inspection, testing, certification and accreditation. The Division is now preparing to be accredited in September 2014 to ISO/IEC 17065/17067, in other words, leading to conformity assessment as the GSA wants to be the Ghanaian body providing audit and certification of management systems.

The Division meets some challenges, particularly in the area of specific training issue of its pertaining inspectors in product certification, and the organisation of a study tour to visit an accreditation body in environmental management system.

3.3.2 Inspectorate Division

The Inspectorate Division is composed of the three departments representing 58 employees – the Fish Inspection Department, the Product Inspection Department and the Destination Inspection Department.

Under the assistance of the UNIDO TCB project, the whole Division is in the process of being accredited to ISO 17020:2012. Based on the Standards, the Division have established a Quality Manual setting out the requirements to inspect bodies, including various procedures linked to the determination of competence of inspection personnel, training for inspections, monitoring of performance of inspectors, etc. Currently, they are collecting reports of their activities.

Operations carried out by the Division aim to ensure the conformity with the requirements stated by the Ghana standards on quality of goods, and hence samples will be on a regular basis randomly drawn for laboratory analysis. The points of entry in which the Division is present are mainly the Ports (Tema, Takoradi, Kotoka International Airport and for some departments, also at major border points).

Departments of interest in the scope of fishery products export and quality strengthening are the Destination Inspection Department dealing with imported products and the Fish Inspection Department.

3.3.2.1 Destination Inspection Department

In 2003, the MoTI appointed the Destination Inspection Department as the Competent Authority in charge for the inspection of selected imports of "High Risks Goods" that have serious health and safety implications on the consuming public.

Imported frozen fish into Ghana is included in the list of selected imports as it could represent a safety risk for the population. It is therefore an important concern for the Competent Authority (see next sub-paragraph) since some of imported fish are

transferred to fishery approved establishments willing to export to European countries. Upon arrival, imported fish will mainly be checked for the following:

- visual inspection of the label and assessment of the relevant quality attributes,
- checks of the accompanying documents (i.e. Certificate of analysis or Conformity from an authorised agency, permit from other agencies, declaration through GC Net to the Customs Division. It must come from a country allowed to export to Europe and have all requested documents.
- depending on the inspection results, the inspectors may take random samples.

Customs Division of the Ghana Revenue Authority will clear the consignment after the GSA Inspector has endorsed it. A

3.3.2.2 Fish Inspection Department

Ghana has been authorised to export fishery products to European countries since 1998. Exported fishery products from Ghana have mainly European partners and to some much lesser and occasional extent, North America, Asia (Japan) and some other African countries.

The Competent Authority (CA), currently the Fish Control and Export Project Department under the Fish Inspection Department, has been selected as the competent body dealing with fish exports from approved establishments[3]. This department is comprised of ten inspectors and one administrative manager.

The main duties of the CA are to verifying that the quality and safety of the product will not affect the consumer, based on the regulations and standards that are in application to import fishery products in European countries. Operations of the CA consist of monitoring, verifying quality and safety assurance of both approved establishments (fishing vessels and processing plant) and their products and to issue health certificates.

The Competent Authority has set a mandatory series of training for new official fish inspector. Trainings consist in Auditing and Inspection procedures, EU food and feed law, organoleptic examination, Quality Manual and HACCP. Some of this training was provided under the Strengthening Fishery Products and Better Training for Safer Food European programmes. Official fish inspectors have a right to request, through the Head of the Competent Authority, for more training at the Training Division. The latter is relying on government funds and also, the current programmes (i.e. UNIDO TCB). Relevant training subjects are, among others, fish technology (canning and smoking), export certification systems, food safety management system ISO 22000, TRACES system, Assessment of HACCP etc.

3.3.3 Metrology Division

The Metrology Division is linked to the Testing Division since the glassware, temperature, and weight (etc) have to be calibrated regularly.

This division has been established by the Weights and Measures Decree, NCRD 326, 1975 in Ghana. National primary Standards are traceable to the Dentscher Kalibrierdienst (DKD) Laboratories in Germany. It undertakes activities in Legal, Scientific

[3] Approved establishments (fishing vessels and processing plants) or Food Business Operators (FBO) were approved by the Competent Authority as fulfilling EU fishery product regulations. Approved establishments are included in the list of establishments authorized and officially communicated by the CA to the Commission.

and Industrial Metrology towards the development of a national measurement. Furthermore, some equipment does not come with certification and Ghana has to certify them.

3.3.4 Standards and Regulations Division

The GSA is the National Standardisation Body and establishes standards for the fishery industry (Annex 3). Concerning fishery products, product standards have been established for:

- Canned tuna
- Smoked and dried fish
- Salted fish
- Fresh and frozen fish

This Division has also the standards related to the Codes of Practices and the Management System ISO 9000 / 9001 and ISO 14000 (management standards) and those linked to food safety (ISO 22000, HACCP, ISO 17025). This Division is currently receiving assistance for the project ISO INSP (Institutional Strengthening National Programme).

Technical committees, including in food, chemicals, materials and industries are helping the Division to put the standards in place. Currently, they are working on an energy management.

While fish export product standards are properly enforced by the Competent Authority - and implemented by the approved fishery industry, there is still some improvement needed for the application of national standards.

In a regional perspective, the East African Community (EAC) is currently implementing the Harmonisation of Food Safety Measures in Africa on the Food Security Action Plan (2011-2015). Particularly, the EAC is applying the Sanitary and Phyto-sanitary Protocol (SPS). The SPS measures are in four volumes including one dealing with SPS Volume III—measures and procedures for Fish and Fisheries and SPS Draft Harmonised Food Safety Measures. As EAC seeks collaboration with other regional economic communities of Africa (ECOWAS, COMESA) and African Union Commission, Ghana is involved in this and follows this issue very closely.

The main challenges that meet this Division are the financial constraints and the funding to revise the standards.

3.3.5 Testing Division

Concerning the testing of fishery products intended to be exported, the CA relies on either the GSA accredited laboratories to perform the analysis, or choose an EU reference laboratory located in Europe.

The Testing Division has received the assistance of the UNIDO/TCB project in accreditation to ISO 17025.

3.3.5.1 Microbiology laboratory

In October 2009, a German Accreditation Body (DACH) accredited the microbiology laboratory to the ISO 17025. Since the renewal is due in October 2014, the accreditation body will conduct the audit in July 2014. Quality manual and facilities of the laboratory are adequate. Internal audits are regularly carried out.

Both CA inspectors and some FBOs use the microbiology laboratory, but some FBOs use another accredited microbiology laboratory such as the CSIR-FRI.

The analyses are regularly undertaken on fishery products and swabs for these parameters: Total plate counts at 30°C, *Faecal coliforms, E. Coli,* yeast and moulds, *C. perfringens, Staphylococcus aureus, Salmonella.*

A few analyses are still not in line with EU rules in respect to reference method. It is the case for:

- *Clostridium perfringens* is not in line because the ISO method the laboratory currently in use does not have the capacity to detect spores. It is also not forecasted in the scope of the upcoming renewal of accreditation. However, successful proficiency tests under FAPAS (Food Analysis Performance Assessment Scheme) are conducted. Therefore, it gives a certain level of confidence in the analysis performed.
- For *Listeria*, occasionally present in fish, CA send samples of fishery products to an ISO 17025 laboratory in Europe which uses the EU Reference method. The laboratory has purchased the reference media but it requires time to build expertise in the laboratory in performing the test.

Water and ice are analysed 3 times per year in the high production establishments and once a year in the others. These parameters are analysed: Total plate counts, *faecal coliforms, E. coli, C. perfringens, Coliforms bacteria, Pseudomonas, Streptococcus faecalis*. The latter is an indicator of the presence *of Enterococcus.* All these analyses are in the scope of accreditation except *Clostridium perfringens, Pseudomonas and S. faecalis.* The water and ice monitoring is based on the EU Council Directive 98/83/EC.

The method used to analyse water for Coliforms bacteria, *E. coli and faecal coliforms* is an ISO method (ISO 9308 – 2) but not the EU reference one (ISO 9308 – 1).

The method used to test *S. faecalis* is a reliable indicator of *Enterococcus* but it is not in the scope of accreditation.

Challenges for this laboratory consist in keeping up-dated with the EU reference methods that are frequently changing. It sometimes requires new equipment to be purchased, if not new media, and to provide training on them.

3.3.5.2 Histamine laboratory

Histamine testing is now using an HPLC (High Performance Liquid Chromatography) equipment, repaired through UNIDO. Proficiency Testing analyses are being conducted for histamine testing in fish with FAPAS. The histamine laboratory is preparing its accreditation to ISO 17025 for July 2014 by the German Accreditation Body (DACH).

Histamine analyses are undertaken 3 times a year in the fresh and frozen EU listed establishments and 4 times a year in canneries. FBOs working in tuna processing usually have their own internal laboratory in histamine.

It was reported that the HPLC equipment given by the SFP project never worked. Europe already sent an expert to assess the problem but the laboratory is still waiting for further action to be taken.

As the FVO 2013 report described, frequent delays in delivering the results of histamine testing still occurs. Although some improvement has been noted since then, they are still holding back the CA from taking appropriate measures and are detrimental to fish

business exporters as well. Nevertheless, fresh tuna has granted an express histamine analysis to be performed to allow for export (maximum three days).

To completely solve the problem and to speed up the issuance delay, more daily equipment (glassware etc) and reparation of the HPLC equipment was requested. Maintenance equipment and specific training to operate these has also been pointed out as a solution.

3.3.5.3 Heavy Metal laboratory and other contaminants

Heavy Metals analysis methods (Hg, Cd, Pb) are the same as those of the British Standards Institute (EU rules) using EU methods (BS EN 14084:2003 and BS EN 13806:2002) equivalent to those set out in Regulations (EC) No 1881/2006 and 333/2007. For those analyses, heavy metal laboratory has been accredited in 2011 by the same German Accreditation Body, and they are waiting for renewal in July 2014.

Analyses are carried out in fishery products by both FBO and CA. Some FBOs are relying on their own internal laboratories. Although heavy metals analyses are done in GSA laboratory, there is still some delay registered, impeding both CA and FBOs to take adequate measures. However, globally, since 2013 FVO report, histamine and heavy metals laboratories have made some progress in the issuance of their result. While the FVO audit reported an extended delay of a few months (2-3), it has now come down to 3 weeks (still too long for the some FBOs).

CA inspectors have arrangements to sample at least once a year in all the EU listed establishments for analysis in Hg, Cd, Pb, PAH/benzo[a]pyrene (smoking establishments twice a year), PCB and dioxins. For contaminants other than heavy metals, fishery products samples are sent to an ISO 17025 European laboratory to test PAH, PCB and dioxins.

Concerning the PAH testing, the equipment very much needed is a GCMS/MS (Gas Chromatography Mass Spectrophometer/Mass Spectrophometer) that has a very low detection limit (<10 ppb per kg). The current European regulation threshold for PAH content is 5 ppb per kg. Moreover, on the 1st September 2014, this limit is about to decrease again (Commission Regulation n°835/2011) from 5 to 2ppb per kg.

3.3.5.4 Pesticide Residues laboratory

In 2008, the Pesticide laboratory was accredited for a period of six years for 30 pesticide residues through the support of UNIDO TCB. The actual equipment is a GCMS with a limit of detection of 10 ppb.

Concerning fishery products, the pesticide laboratory is dealing with the Environmental Monitoring Programme in water, collected by the fish business operators in their fishing area. The CA conduct the same analysis on fish samples issued from approved establishments.

3.3.6 Summary of GSA

The Ghana Standards Authority is a comprehensive Statutory Body in charge of the national quality infrastructure embracing Metrology, Standards and Conformity Assessment (Certification, Inspections, and Testing). The Certification Division and the Inspectorate Divisions are in the process of having conformity assessments in their domains. Particularly, the GSA has evolved as a food quality and safety reference for Ghana and for Ghana exporting partners (agricultural products, especially fishery products). While for exported products, standards are well enforced, there are still some

improvements to accomplish for national standards, Further to the last FVO audit mission conducted in 2013, traceability measures have been put in place (authorised canoes, landing sites monitoring, communication with other CAs). In respect of regional trade, Ghana participates in settling of Harmonisation of the Food Safety Measures, particularly on SPS measures for fishery products, launched by East African Community for all Africa. Currently, the GSA receives strong support from the Swiss funded UNIDO TCB programme, the EU TRAQUE Programme, the Better Training for Safer Food and the INS ISO Programme.

Major importing partners of fishery products are found to be European countries. Thus, the Competent Authority for Fish Control was created in 1998, under GSA Inspectorate Division, as the Fish Control and Export Development Project. The latter are undertaking, according to the EU fishery product regulations and their standards, operations of approval for fishery exporting establishments (fishing vessels and processing plants), regular monitoring inspections and HACCP auditing of their premises and fishing vessels, consignment inspections before exports and issuing Health Certificates. Various samples of fish, water, ice and swabs are drawn for analysis by the inspectors or laboratory staff according to the procedures in place. Testing occurs in the GSA premises since GSA has developed microbiological and chemical, histamine, heavy metals and pesticides residues testing laboratories, mostly all accredited or on proficiency proof equipment. A few analyses for the fishery products require samples to be sent to European accredited testing laboratories. Results authorising the clearance must be obtained before the consignment of fishery products is allowed to leave. Furthermore, the GSA has been recognised as the Competent Authority for Imported Products (in Ghana), including frozen fish.

3.4 Food and Drugs Authority

The Food and Drugs Authority (FDA) was established in August 1997. It is the National Regulatory Authority charged with the regulation of food, drugs but also food supplements, herbal and homeopathic medicines, veterinary medicines, cosmetics, medical devices, household chemical substances and tobacco.

The FDA Ghana's legal mandate is found in part 6 (Tobacco Control Measures), part 7 (Food and Drugs), and part 8 (Clinical trials) of the Public Health Act, Act 851 of 2012.

It is also an authority in the import and export of goods although it is mostly recognised for its role in the domestic market and imported goods to Ghana. The activities of the FDA are carried out at the various entry and exit points of the country through mainly Tema Port, Takoradi Port and Kotoka International Airport. The main concern for the FDA is that imported food and drug products that reach the consuming public are safe, of good quality and efficacious (in the case of drugs). The agency seeks to achieve the above through the following:

- Confirming the authenticity of registered imported regulated products through inspections at the port.
- Identifying unregistered imported regulated products for registration.
- Continually widening the scope of regulation at the ports of entry to include **all** imported products that fall under the FDA's Ghana purview as per the Public Health Act 851 of 2012.

Regarding fishery exports, and the sanitary guarantees international exporting partners aim is to protect consumers in European countries, the role of the FDA currently seems

not to be as deep-rooted compared to GSA responsibilities. Although FDA approval is necessary to export fish products to Europe, it is not sufficient.

3.5 Fisheries Commission

The Fisheries Commission is mandated by the Fisheries Law, Act 625 2002, to regulate and manage the use of fisheries resources in Ghana and to coordinate the policies in relation to them. It employs approximately 380 people, both in centralised and decentralised body on the coastal and inland landing sites. The Fisheries Commission has also launched the Ghana Aquaculture Regulations 1968 (2010) in the Ghana Fisheries Regulation LI 1968 (2010).

The Fisheries Commission is in charge of:

- Issuing a licence to fish (where size mesh, allowed gears are spelt out) for the four types of vessels including for the foreign vessels licence,
- Taking statistics on the catches (species, quantity, size, price, exports, imports),
- Monitoring fishing vessels with focus on Safety Certificates, Certificate of Competency of crew, fishing logbooks, fishing license, fishing gears and other relevant documents.
- Having the responsibility for the local post-harvest fisheries (auctions, markets),
- Controlling aquaculture, hatcheries, fish breeding and harvesting as well as the fish safety (monitoring fish disease), and
- Setting-up the measures related to the sanction for any infringements with the Fisheries law and
- Is responsible for Monitoring Control and Surveillance and Enforcement.

Picture 2: Patrol vessel in Tema

The Fisheries Commission have been assisted lately by various projects (2012 MOFAD Annual Report, 2013) presented hereafter.

In response to the challenges that are arising as a result of the declining fish stocks for the marine capture fisheries, the Fisheries Commission has put in place management measures to check illegal fishing. Some of these measures include the establishment of a Fisheries Enforcement Task Force. With the support of ICCAT, new Iridium VMS transponders were installed on the industrial fishing vessels from October 2012. Their reports are registered at the Enforcement Unit in Tema 24h/24 run by the FC and the Ghana Marine Authority Force. This has improved the Ministry's capacity to monitor some infractions and violations at sea. It will soon be expended on to the inshore vessels, through the support of the WARFP programme. There is also another possibility of expanding the VMS coverage to a more sophisticated VMS (space-based AIS). ECOWAS Coastal & Maritime Resources Management, as a branch of the European programme MESA (Monitoring for Environment and Security in Africa) funded until 2017, will assist in research in coastal surveillance systems from the University of Legon.

Very important for the Fisheries Commission and the Fish Exporters is the topic of the Catch Certificate. From the 1st January 2010, a "Catch Certificate" certifying that fish was caught legally in application of both EU requirements for the EC Council Regulations 1005/2008 to prevent, deter and illuminate illegal fishing, unreported and unregulated fishing (IUU) fishing and Commission Regulation 1010/2009 to implement the EC 1005/2008 are mandatory documents for Europe. Objectives of the certification scheme are to ensure product traceability at all stage of production, from catch to processing and marketing, to be a tool for compliance with conservation and management rules and to support cooperation between flag states.

The Catch Certificate must be signed by the fishing master of the vessel and endorsed by the Director of the Fisheries Commission. This signed catch certificate must be supplied by the FBO to the CA with the bill of lading, as part of the documents provided to accompany the consignment. Only then, a Health Certificate can be signed by the CA for the consignment to be exported.

In early 2013, a series of infringements to these regulations it were reported to the EU (transhipping, fishing without licence in the EEZ of another neighbouring country), leading to penalties for some fishing companies. Ghana has now settled the case in taking appropriate measures, including an approved action plan established by the FC. One of the actions consists of negotiating with the neighbouring countries a free zone fishing licence to be authorised to fish in Ivory Coast, Togo, etc.

Another project assisting the Fisheries Commission is the West Africa Regional Fisheries Programme (WARFP/WB, Goulding, 2014) until 2017. It is surely the strongest support and covers inland and coastal landing sites, artisanal to industrial areas. It includes five components, along which Component 3 relates to increasing the share of the fish resources to the national economy. Activities such as restoring landing sites and improving the fish trade and information systems have already started. Two other WARFP components are worthy of note. Component 2 concerns the reduction of IUU fishing as a matter of high interest. It will soon support the Fisheries Commission to put in place VMS on inshore vessels. Inland aquaculture development is the topic of Component 4 aiming to set the framework for aquaculture increased investment. Achievements of the WARFP project, working on some important issues for Ghana fisheries, is worth following closely by both GSA and UNIDO TCB.

The TCP/FAO funded Aquaculture Development Programme is on-going between 2012 and 2017 (MOFAD, 2012; GNADP, 2012). Aside from improving the practice, the management and development of aquaculture as a viable business, this programme is analyzing the relationship between public and private sector and setting-up activities to implement them. The project is focusing mainly on tilapia and catfish aquaculture strengthening, but aims also at other species feasibility research such as clams, shrimps, grey mullet and tuna bait. This project will support the upgrading of the aquaculture standards at national and international level. In the near future, Ghana will be able to reach export markets for aquaculture products and will need support for private aquaculture business operators willing to export.

The Government of Spain is currently assisting the Development of Artisanal Cold Chain Network programme, which consists of settling down six cold stores in marine and inland fishing communities. The cold stores are nearly all settled.

To summarise, the role of the Fisheries Commission at the level of exported fisheries products in Europe appears very much to be in the issuance of the fishing licence and the Catch Certificate matters, two essential stages without which no export would be possible. Proving the fishery products are traceable, the Catch Certificate is indeed a mandatory document for the Health Certificate, accompanying the consignment of fishery products for Europe, to be signed by the CA. For the moment, the WARFP financed by the World Bank is a powerful support for the Fisheries Commission aside with the ICCAT assistance and the GNADP.

3.6 The Customs

The Customs Divisions belong to the Ghana Revenue Authority. They are responsible for collection of various taxes, particularly Import Duty, Import VAT, Export Duty, Import Excise and other taxes. In turn, the taxes are used to finance the country's budget and development projects in health, education, housing and transport sectors. This is achieved by physically patrolling the borders (Tema Port, Takoradi Borders and Kotoka Airport) and other strategic points, examination of goods, and search of premises, as well as documents relating to the goods.

As part of the process in trading fishery products, exporters or importers have to declare different details including quantity, fish species, vessel they are loaded to or unloaded from through the single electronic online network GC-Net MDA of the Ghana Trade Net. The Users will be able to track their consignment. The GC-Net declaration is taking more and more importance but has not reached its total capacity yet.

3.7 Sanitary aspects of the value-chain

The main sanitary challenges for the CA and for the private sector in all stages of the value-chain (production, processing, marketing and export) will be presented in the Figure 2 below. Our focus will be on fishery products exported to Europe.

A few rules govern this value-chain: an established legislation, specific standards and procedures, regular fish inspections to approved establishment, analysis of the products and an export process.

3.7.1 Established legislation

All fish exporters wishing to export fishery products to the EU need to comply with a certain number of rules and regulations, compiled as standards, in line with the European Regulations. They also provide supporting regulations establishing the Competent

Authority and setting the implementation rules for fishery approved establishments as follows:

- Fishery Products Regulations 2007 (GS/FPR 1:2007)
- Amendment 1 (AMD.1:2011) on the Maximum Admissible Limits of Cadmium and Lead.
- Amendment 2 (AMD.2: 2013) on the families subjected to histamine as Regulation (EC) No 2073/2005 states (bill).

3.7.2 Specific Standards and Procedures

A system of inspection and approval of establishments and vessels was established by the CA, and as part of the system, seven (7) Codes of Practices were also developed. Now the Codes of Practices are consolidated in the Fishery Products Regulations (FPR) as standards:

- dried and smoked fish,
- canned tuna,
- fresh and frozen fish,
- live lobster,
- freezer vessels on board,
- cold store,
- quality control systems for the production product of fishery production.

Together with the FPR, a Quality Manual has been developed as a procedure manual containing checklists for inspections of EU approved establishments, assessment of HACCP and other forms.

The CA has powers, independence and supervision given by the FPR 2007 and the CA Quality Manual. During the last visit by the FVO team in 2013, the power to withdraw approval and of suspension of an establishment has been witnessed by the team of auditors. The CA is responsible for all official controls of EU listed facilities and for the pre-checks for certification.

The regulation implies the fact that transparency and confidentiality should be respected by the CA. Thus, when official staff take up functions, he/she signs a declaration related to conflicts of interest and anti-corruption practices. Official controls are carried out by a team of two inspectors, randomly chosen. No premises have a team or an official agent assigned. They are regularly trained to stay up-dated, organised either by the Training Division of the GSA or externally with the approval of the Head of the CA. A training programme is planned for every new inspector containing as mandatory subjects such as Pre-Requisite training and HACCP.

3.7.3 Regular Fish Inspections

There are several types of inspections:

- Approval inspection: is carried out on initial approval or following an approval withdrawal inspection;
- Renewal inspection occurring once a year;

- Audits: when you have to evaluate the HACCP in place in the establishment or if there was a substantial modification in the HACCP plan, at least once a year;
- Monitoring inspection: happens every 2 months for the establishments and on arrival of every vessel to monitor if the requirement for which they have been approved is still in place. Processing water and samples of product shall be drawn for analysis on a quarterly basis; Monitoring inspections can contain an HACCP audit;
- Permits for unloading at each arrival of an approved fishing vessels after the inspection;
- Consignment inspection: on every export consignment except in canneries (1/week) are carried out before a shipment. Several documents are necessary including the Health Certificate, the bill of lading and Catch Certificate endorsed by the Fisheries Commission.
- Delisting /suspension will happen if conditions for which approval were given to the approved establishment have deteriorated and the shortcomings were not rectified within the given time frame. No Health Certificate will be given during the inspection.

Inspection reports should always be documented in the CA office. Furthermore, a copy of inspection report should be send to the approved establishments and eventual follow-up organised.

3.7.4 Precise Analysis

Concerning the analysis, except the organoleptic checks of the fishery products for freshness performed by the CA staff for official checks, the CA relies on either GSA accredited laboratories using an EU reference method, laboratories under successful proficiency test (FAPAS) or choose an EU reference laboratory located in Europe.

Organoleptic checks are carried out :

- At establishment stage (before processing) and before the fishery products go for export (fresh),
- On frozen vessels at unloading time and at the time of exports,
- On importing vessels by the CA before unloading.

According to the EU rules, these following parameters have to be tested on fishery products and/or water and ice with the sampling and testing method recommended by EU: organoleptic tests, microbiology (total plate count, *Faecal coliforms, E. Coli,* yeast and moulds, *C. perfringens, Staphylococcus aureus, Salmonella, Pseudomonas, Streptococcus faecalis*, *Listeria*), histamine, heavy metals (Pb, Cd, Hg), PCB, dioxins, PAH analysis. An Environmental Monitoring Plan is conducted once a year. Samples of fishery products, swabs, water and ice are collected by CA or laboratory staff (official checks). FBOs undertake analyses (own-checks) on a regular basis through their own internal laboratory, or external laboratories (GSA, CSIR, or else).

3.7.5 Export Process

To be authorised to export fishery products to European Countries, several steps must be undertaken beforehand.

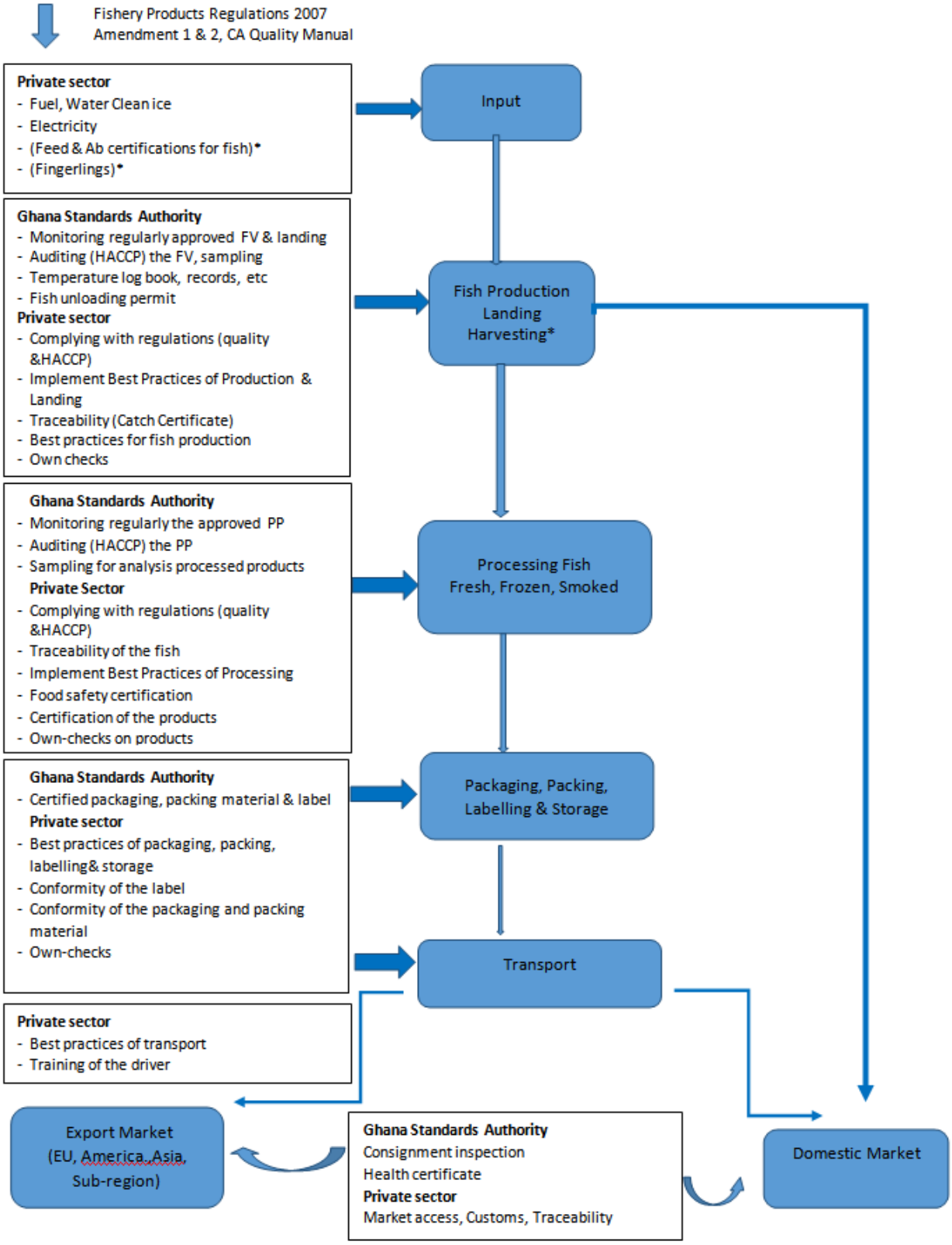
The fish exporter must first of all apply to be on the list of Approved Establishment of the DG SANCO/FVO. The premises and facilities have to be thoroughly inspected by the CA, sampling of the products and testing have to be undertaken. If there is a non-compliance, the exporter shall be informed in order to rectify and a new inspection visit is then

planned. As said before, inspection reports shall be generated for each visit. A copy of the inspection report shall be submitted to the applicant for the necessary corrective actions to be taken.

The approval is granted if the inspection report is classified good or excellent. The approved establishment shall receive an approval number, which shall be submitted to the EC for confirmation and subsequent approval. Only after the positive reply from the EC, the exporter shall be allowed to export (approximately within 30 working days).

An inspection of each consignment has to be carried out before export, and a Health Certificate has to be issued, compulsory for each successful inspection.

Figure 2: Sanitary issues met in all stages of the value chain for both GSA and the private sector



* Related to aquaculture value chain ; Source: own production

3.8 Global organisation

The organization of the CA will be detailed hereafter in this chapter for the production and processing phase. Our focus will be on fishery products exported to Europe. The last FVO report (2013) and the actual mission will be the base of the observations.

3.8.1 Production

The first phase concerns the primary production of fish**:** fishing from a vessel or breeding the fish for a fish farm (through the hatchery phase). It also comprises all associated operations (slaughtering, bleeding, heading, gutting, removing fins, refrigeration and wrapping, etc) leading to place them on the market either directly or through a processing establishment.

In 2013, the sample of fishing vessels visited by the FVO team presented from adequate structural, equipment and hygiene conditions view point to not fully compliant due to the absence of HACCP plan. Further to the remarks of the auditors, all fishing vessels have to present a yearly HACCP manual describing their company and if any change in products, equipment, procedures occurs, the manual must be amended. Currently, freezer vessel HACCP manuals are now being revised and audited for their implementation.

Fish landing has been described in the Fishery Products Regulations. In the FVO report, the auditors witnessed the landing was in line with the EU Regulations.

At each berth of a fishing vessel, before discharging the content, CA fish inspectors come to check the good state of maintenance of the vessel and take a print-out of the temperature records for the entire voyage. For example, in tuna vessels, sampling is done both by the company and the CA inspectors. They take randomly 9 samples (fish) for histamine and 10 samples for heavy metals analysis. After some time sampling skipjack (with nil analyses), CA inspectors are now targeting yellow-fin for it is growing bigger accumulating more heavy metal. If no irregularities are discovered, a landing permit is issued and they are allowed to proceed in the establishment.

Raw material can also be imported in Ghana by the processing company (i.e. tuna from Senegal). In this case, the CA inspectors proceed the same way (temperature records, samples) and check the documentation accompanying the consignment. Samples are taken similarly.

For tuna, the documents required must contain at least:

- Bill of lading
- Dolphin safe certificate (mandatory)
- Health certificate from the country of expedition
- Name of the species and quantity
- Analysis of the sample by a recognised laboratory from the importing country (histamine, heavy metals).
- Catch Certificate.

Further to the remarks of the FVO auditors in 2013, communication between Competent Authorities has started, in particular with each importing country to Ghana.

Usually, the fish content is bought by a processing plant. In this case, the content has to wait for the analyses results to come out before they can be processed. Fish has to wait

in large cold stores. A long delay is sometimes necessary to obtain the result from GSA laboratories.

In the case of smoking establishments and to a lesser extent, establishments processing cuttlefish, the plant has to provide the CA with a list of authorised canoes and fishermen whom they obtain their raw material from. Establishments have to select canoes according to quality and maintenance criteria present in the FPR (extract in Annex 4). According to the action plan the CA has drawn after the observations from the FVO 2013 auditors, the CA has set a landing site monitoring plan for specific landing sites (selected according to criteria stipulated in the regulations) where some authorised canoes supplying approved establishments are berthing. The CA is currently performing monitoring on those landing sites and inspecting authorised canoes from a sanitary point of view. Nonetheless, they wish that the Fisheries Commissions will take over. Fisheries Commission local officers have a far better relationship with small-scale fishing communities as the Fisheries Commission settled Community Based Fisheries Management Committees, managing landing sites.

3.8.2 Processing

Industrial processing of fish refers to any stage that produces fishery products. It may also deal with value-adding to produce a wide variety of products (canned, smoked products). In Ghana, fishery products currently being exported are different types: fresh (fresh steaks, whole fish on ice), frozen (whole fish, steak or loins or pouches, fillets), canned (canned fish) and also smoked or dried..

Fishery processing establishments are relying on marine and freshwater resources:

- Tuna Canneries
- Fresh and Frozen (cephalopods, shrimps, crabs, demersals, pelagics)
- Smoked fishery products

CA fish inspectors must give the go-ahead to FBOs before the processing can start.

They undertake regularly inspections (monitoring inspections and auditing) in each of the approved processing plants. Further to the discoveries of non-compliances in the establishments during the 2013 FVO visit, there was a review of all the HACCP Plans and an auditing programme was also settled for the processing plants. Some spontaneous, on the spot inspections are conducted by the inspectors as well so they can see the plant in action.

When the consignment is ready to be exported, CA inspectors perform a consignment inspection. Documentation requested are the species of fish, organoleptic qualities, and the complete packing list, label marking (with an example), bill of lading, the catch certificate number, batch number between others.

The Heath Certificate is composed of the EU Health Certificate, EU Catch Certificate, transport details (batch number), packing list, name of species, and name of authorised canoes, gear, and fish quantity between others.

3.8.3 Marketing and Exporting

While marketing is solely the responsibility of FBOs, random inspection at consignment arrival in the European countries can be tracked down if there is a health matter detected through RASFF (Rapid Alert System on Food and Feed) that might affect the consumer (or animals).

The CA has a procedure in place for the follow-up of RASFF notification that consists in monitoring the FBO investigation and correctives measures. From January 2013, there were seven RASFF calls reported to Ghana:

- Two related to poor temperature control of frozen skipjack rounds,
- One to spoilage of chilled products and improper health certificate
- Four (since May 2013), to high levels of benzo[a]pyrene (from 33 ppb/kg to 61ppb/kg) in smoked fish products.

3.9 Key stakeholders

Private stakeholders mentioned here are the EU listed establishments or approved establishments. The latest list is valid from the 23 February 2014 and includes 65 approved establishments among which 50 fishing vessels and 15 processing plants, including an important share of the market devolved to tuna. The list is presented in Annex 2.

Fish exporters have to implement the FPR 2007, Quality Manual and HACCP to be approved. As part from this background, in 2014, training is available for them at the GSA, such as Introduction to the ISO 22000, Introduction for Internal Auditors in ISO 22000, HACCP course. Each of the training session contributes to a greater recognition by the buyers, being a competiveness tool. Furthermore, establishments have their own training programme: they are being approved by the Quality Management ISO 9001, BRC, and Environmental Management System ISO 14001, International Seafood Sustainability Foundation (foundation concerned by tuna sustainability) amongst others.

3.10 Professional organisations

The private sector are known to rely on the main professional organisations specialised in export and quality for fishery products presented in the following table (Table below).

Tableau 11: Professional organisations in export promotion and quality

Name	Branch	Observation
GTA (Ghana Tuna Association)	Tuna vessels and Tuna canneries	* raise concern of tuna vessels and canneries * strong association * works closely with the Fisheries Commission
GEPA (Ghana Export Promotion Authority)	Export Promotion in general (gold, cocoa, timber, fish)	* Traceability Body (UNIDO)
NAFAG (National Fisheries Association of Ghana)	Umbrella association	* dominated by the capture fisheries * welcome infrastructure investment for the handling of locally produced fishery products
FAGE (Federation of Associations of Ghana Exporters)	Exports in general	* Food products including seafood

Source: own realisation

In general, the value chain includes production, processing (and packing, labelling and storage), transport, marketing and final market. There are to date, 65 approved fishery establishments authorised to export their products to Europe (50 fishing vessels belonging to 17 fishing companies and 15 processing plants), a significant share of the market being held by the tuna vessels and tuna processing plants. The major associations concerned by export and quality are Ghana Tuna Association, National Fisheries Association of Ghana, and Ghana Export Promotion Authority.

3.11 Results of the UNIDO Trade Capacity Building Project – Phase I

As a result of the Swiss-funded UNIDO project TCB phase I to the GSA and the GEPA, the services that could be provided to fish exporters will be highlighted.

The GSA has now new departments to provide conformity assessment and standardisation services to exporting enterprises. With the other institutions and enterprises, they have the documents to assess compliance against the standards.

The Standards Division staff of the GSA trains the exporting enterprises on international standards such as ISO 9000, Food Safety, ISO 17021 and ISO 17025 and ensures they are competent to develop/adopt the future standards required (i.e. inspection manuals required to evaluate conformity, revision of the pre-requisite on food safety). Moreover, the EU funded UNIDO West Africa Quality Programme (WAQP) was created to assist each enterprise wishing to implement ISO 22000.

A Ghana Certification Body for the Quality Management Systems was set at the GSA, and prepared to be the accredited West African Certification Body. A number of staff are now able to certify Quality Management Systems including for ISO 22000 and ISO 9000. In case of enterprises, it has to be on a voluntary basis (sustainability). As a result there will be a reduction in the cost of the certification for the enterprises as well as for the government and academic institutions which will attract regional interest.

A National Traceability Committee was created at the Ghana Exporting Promotion Authority (GEPA) that enhances traceability for export and import and is linked to the Ghana Customs Net (GCNet) as a pilot phase. As the number of users increase, it is becoming more and more efficient. The National Traceability Systems will assist Ghana to strengthen its food value chain, and ensure the quality, safety and traceability of its food exports. Their staff is competent to implement a traceability system in the exporting enterprises and include them in the system. This traceability is very important as it is one of the major requirements for EU, which traces backwards all its imports, among which is fishery products.

UNIDO TCB project has assisted on accreditation of some laboratories, including the GSA laboratories. For example, three laboratories that could be used more extensively by the fish exporters:

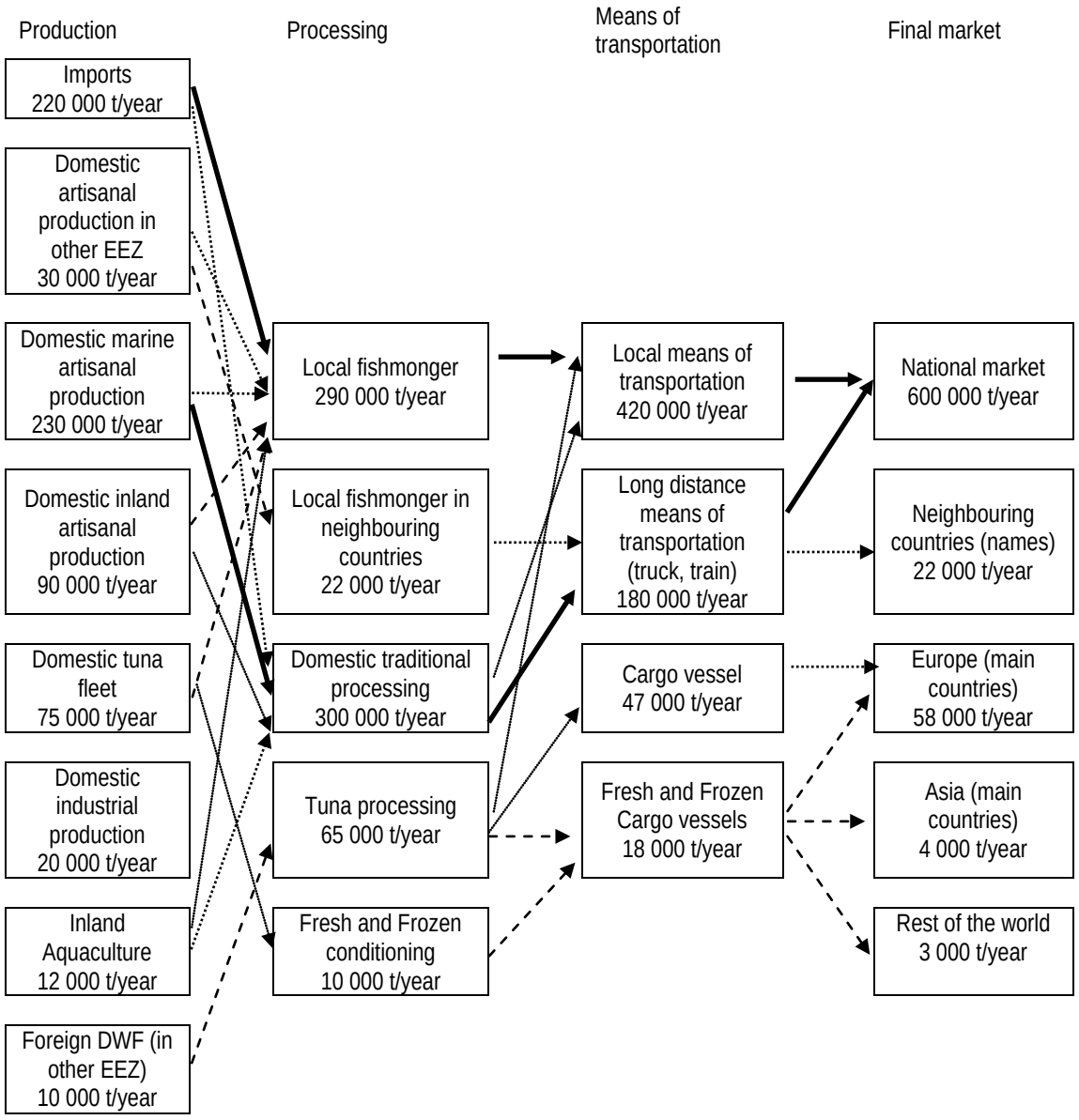
- The Pesticide Residue Laboratory was accredited by DACH in Oct 2009: 30 pesticide residues can be identified in local and exported fish and Maximum Permissible Residue Level (MRL) detected .
- The Microbiology Laboratory was accredited by DACH in Oct 2009: microbiological contaminants can be detected in food in general including fish / fishery products, water, animal feeding stuff and environmental swaps.
- The Chemical Laboratory is upgraded to provide competence and skilled capacity, including for the testing of export products. It also provides a test for histamine.

4 Fish chain

4.1 Overview

Over the last 5 years, on average, Ghana produces annually 440,000 t of fish from marine, inland fisheries and aquaculture production, export 65,000 t of fish product and import 230,000 t (all figures in live weight equivalent). The net supply is therefore around 600,000 t which corresponds to an annual domestic consumption of 25 kg per caput.

Figure 3: Flows of fish from production to consumption (live weight equivalent)



The main fish chains operating in Ghana are the ones supplying the domestic markets (fresh and traditionally processed marine and inland fish, frozen imported fish processed or not and fresh farm fish). The fish chains orientated toward the export markets are the ones organised around the tuna and to a lesser extent around the fresh fish.

4.2 Fish chain 1 : Tuna

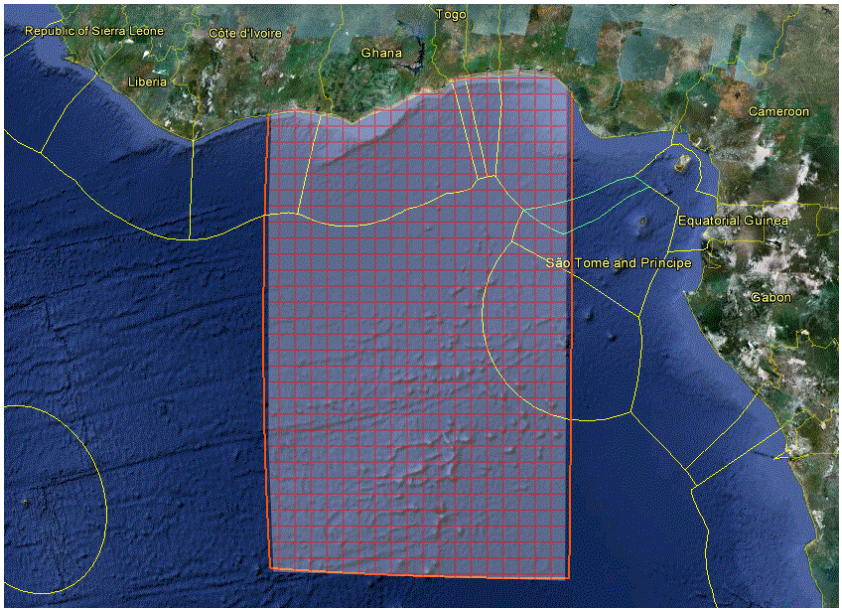
The EEZ of Ghana is located on the route of the seasonal movements of three of the main tuna species of Atlantic (Skipjack, yellowfin and bid eye). With the development of a purse seine fleet in the late 1990s, Ghanaian catches are estimated at about 60,000 t to 80,000 t per year, making the country one of the major components of the tropical fishery operating in the Eastern Atlantic Ocean alongside Spain.

Inshore activities, including processing, have grown over the last two decades. The political instability in the neighbouring country, Ivory Coast, has significantly contributed, from 2004 to 2011, to promote Tema as one of the major tuna fishing harbours of the African Atlantic coast. Distant water fleet (DWF) from Spain and France for instance are now frequently seen uploading in Tema.

Despite this development success, Ghanaian tuna industry hasn't been able to implement a rigorous policy to cope with international fishing standards and the government failed to implement an effective action plan against the illegal, unreported and unregulated fishing. As a consequence, in March 2003, some countries in Europe placed a ban on Tuna from Ghana (UK mainly), citing lack of adequate supervision to check illegal and unregulated fishing of tuna in its waters. This temporary ban on imports has affected the Ghanaian fishing industry, inducing an estimated financial loss of EUR 15 million in 2013. Since the industry is now able to provide full guaranties of compliance with international rules against IUU, exports are retrieving their normal level.

The other major event that affect recently the Ghanaian fishing industry is the closure of fishing area in the Guinea gulf during January and February each year (starting on the 1st of January 2013) for fishing activities using fishing aggregating devices (FAD). The figure below shows the area concerned. This area is the main fishing area of Ghanaians purse seiners. They were unable to operate during the two first months of 2014.

Figure 4: closing area for FAD fishing of yellowfin and big eye tuna



Source : ICCAT[4]

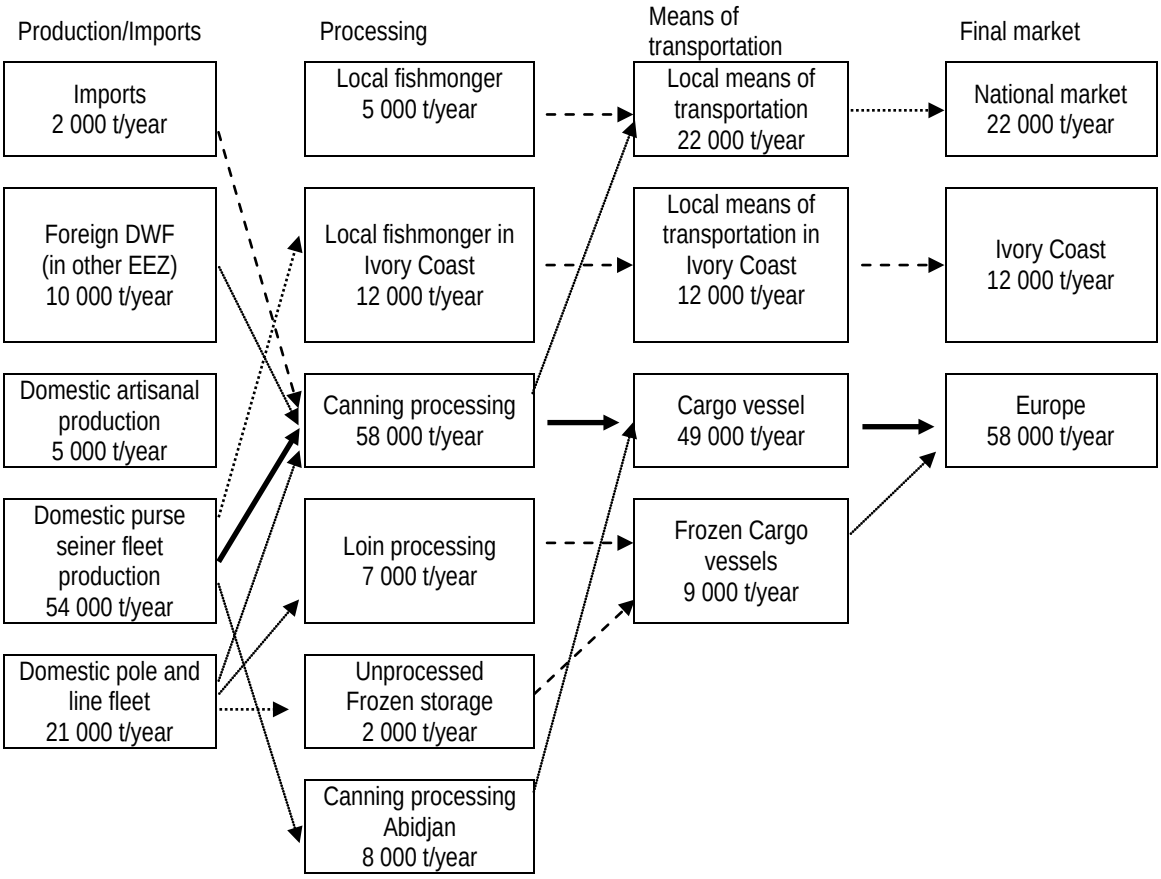
[4] www.iccat.es

4.2.1 Graphical representation

The Ghanaian tuna processing industry is mainly supplied with raw material coming from national vessels, both purse seiners and pole and line. The former provide tuna (skipjack and yellowfin tuna) for canning whilst the latter provides raw material for high value tuna cans and loins.

DWF (mainly from Spain and France) land in Tema from time to time but more frequently during the closing season of FAD fishing (January and February each year) as the price is attractive due the lack of supply from the domestic fleet. During these two months, imports of tuna from Senegal and Ivory Coast also occur. The tuna is mainly tuna from the pole and line fishery operating in the Senegalese, Mauritanian and Cape Verde waters. It is used to produce high commercial value cans using the label of "line fishing tuna".

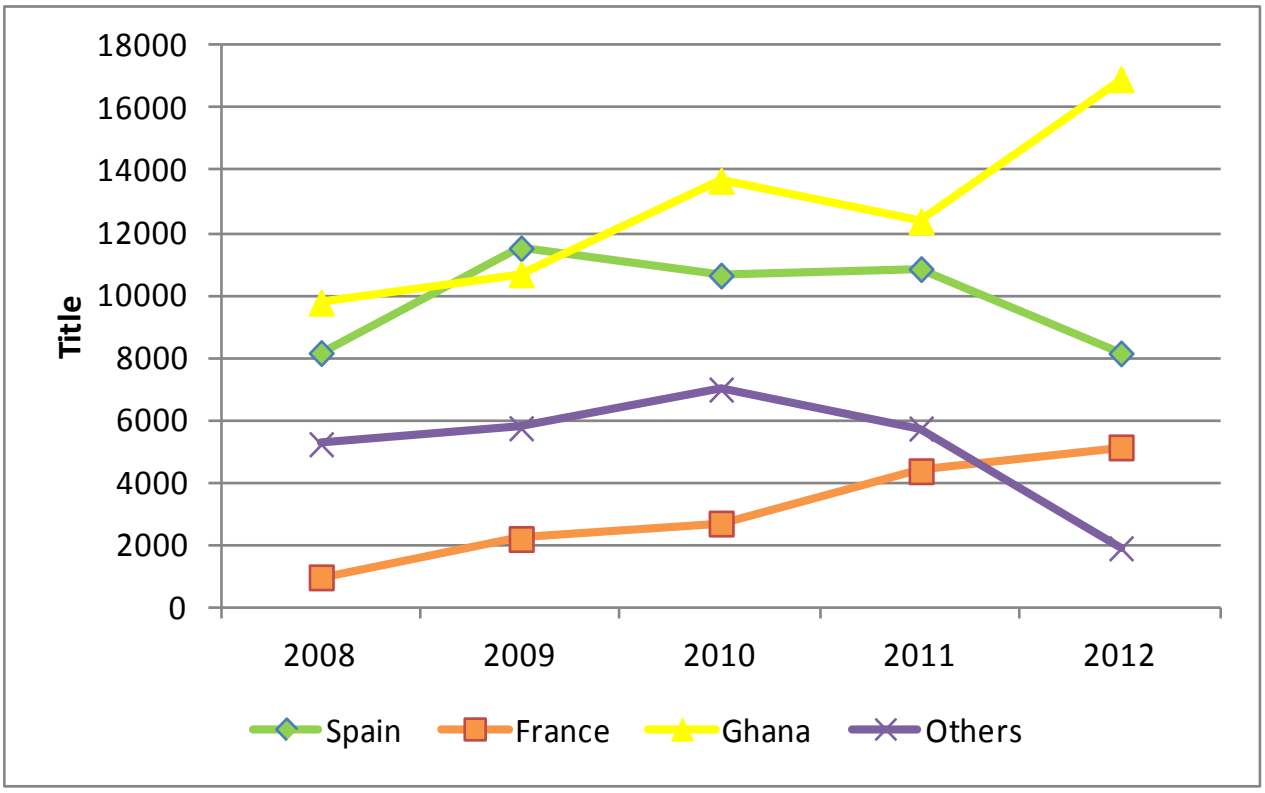
Figure 5: tuna raw material and product flows (live weight)



The main markets for the tuna product are firstly the EU, secondly the national market and thirdly the Ivory Coast where a substantial amount of tuna is landed every year by Ghanaian vessels for both canning and local market purposes. Figures from the Ivory Coast national Oceanographic Centre (for ICCAT purpose) show that the average volume of tuna landed for the Abidjan market is about 12,000 t per year (see figure below). These landings are composed of tuna which is under size for processing

purposes[5] (usually referred to as "faux thon" since composed of a mix of by-catches but mainly small skipjacks).

Figure 6: landing of tuna ("Faux thon") in the port of Abidjan



The landing of Ghanaian vessels for the Abidjan market reached 16,000 t in 2012 (2013 figures not available yet) due to high prices, sometime better than the ones offered by the local canning factories and always better than prices in Tema. These amounts don't appear in the national statistics despite the fact that to land in Abidjan an authorisation is requested from the Fishery Commission. Furthermore, in the current context of a deficit of fish product supply to the Ghanaian market, these landings are socially not acceptable.

4.2.2 Mapping of actors

The tuna fishing fleet belong to about 10 companies that are Clear Skies Company, Afko Fisheries Company, Trust Allied Fishing Limited, Rico Fishing Company Limited, D-H Fishing Company, Panofi Company Limited, TTV, World Marine Company, Agnes Pack Fish Company Limited and G-L Company Limited. These companies owned about 30 vessels all together[6]; 16 of them are EU approved (see list at the annex 2).

All three of the major commercial processors are based in Tema: Pioneer Food Cannery Ltd. (PFC), Myroc Foods Ltd, and COSMO (that took over Ghana Agro-Food Company). These companies buy most of the industrial tuna catch and process it into tuna flakes, tuna chunks and tuna mash which were canned and mostly exported. These three companies have all together an annual processing capacity of 120,000 t.

[5] The minimum size is about 1.5 kg. Below that workers spend too much time removing flesh from the skeleton and overall, the cost of processing is too high.

[6] Afko 4 vessels; TTV 4; Rico 2; Panofi 8; Clear Skies 5; Agnes Park 2; Trust Allied 2; D-H Fisheries 2; G-L Fisheries 1.

Pioneer Food Cannery (PFC), formerly owned by Mankoadze Fisheries and its partners, StarKist, became a wholly-owned H.J. Heinz Company in 1994 to primarily engage in tuna processing and canning for export. Today, PFC Limited, producers of StarKist Tuna, John West, Petit Navire and other quality Tuna Products is the Ghanaian affiliate of MWBrands[7] (Marine World Brands) are currently under the Thai Union Frozen Products (TUF) PCL[8]. Following the expansion and subsequent foreign direct investment (FDI) of over 10 million US dollars in expansion, training and modernisation of the production plant, the capacity rose from 50 metric tons per day with 500 employees in 1994 to 160 per day in 1996 and is currently capable of processing 240 tons per day. PFC new target is to grow PFC to 300 tons by 2014. The company is a leading supplier of top quality branded canned tuna as John West, Tesco, LIDL, REWE, Petit Navire, Mareblu, Royal Pacific to the EU and Star-Kist to the ECOWAS markets. The company also sells tuna to the local market under the brand name of Star-Kist. The company adds value to 95% of landed tuna in Ghana. It offers direct employment to more than 1,800 Ghanaians with a 5-fold economic multiplier effect.

Myroc Food Processing Company Limited is a German/Ghanaian company established in the mid 2000 that has a production capacity of 100 t per day. More than 800 workers are active on site. Until now the company exported all its production but since the difficulties entering the EU market met since March 2013 the company is seeking to invest in the domestic market as well as neighbouring country markets such as that of Nigeria. Belonging to a free zone company, Myroc is allowed to sell at least 30 percent of its products in the Ghanaian market while exporting the remaining 70 per cent. In this direction, the company is in the process of registering with the National Agency for Food and Drug Administration and Control in Nigeria to explore the possibility of exports to that country.

[7] http://www.mwbrands.com/production-sites

[8] MWBrands, formerly owned by Lehman Brothers Merchant Banking, took over the ownership of Heinz European Seafood Business, a core division of the H.J. Heinz Company. The Thai Union Frozen (TUF) acquired 100% of MWBrands holding company that is controlling the plants, the tuna fishing company in Ghana and the commercial business units across Europe. This transaction has allowed TUF and MWBrands to become the largest seafood producer in the world (outside Japan) with a global tuna processing yearly capacity in excess of 500,000 tons of whole round fish; as well as a truly global and vertically integrated seafood player with sales, production, and leading brands across Asia, the US, and Europe.

Picture 5: tuna canning process

COSMO[9] is a new company that refurbished the site of the Ghana Agro-Food Company in 1991 and started to operate in mid 2013. It is a joint company with shares from one Taiwanese company and two Korean ones including Panofi Company Ltd. Its capacity production is currently about 60 t per day and all its production, tuna cans under the brand name of Royal Atlantic, is dedicated to the domestic market. COSMO is currently expanding, developing a sister company called Esteban that will occupy a production site next door to the COSMO one. This new plant will concentrate on loins as well as sashimi and high quality products. They will use the high-tech modern technology of processing tuna at minus 60 degree Celsius. The value added of these products is very high due to the elevated selling price. COSMO has received the accreditation to export in February 2014. It should start very soon to export to EU and US markets.

Tuna processors buy the main part of their raw material from companies that they are linked with such as TTV and PCF and Panofy and COSMO. These companies are under the same ownership umbrella. Other quantities of tuna are bought from the tuna fishing firms.

Overall, the employment in the Tuna fish chain is about 6,500 that can be split between:

- Fleet: 1100
- Processing: 3200
- Upstream: 1500 and Downstream: 700

Upstream employment is comprised of workers dedicated to supplying both fishing fleet and plants with all kind of inputs (goods and services). Downstream employment is linked to the people working in the products distribution, marketing, product transportation, etc.

The annual value added generated by the tuna industry can be estimated at around EUR 100 million. The catch value is about EUR 91 million while the direct value added of the catch sector is about EUR 35 million. The processing sector, with a selling value of EUR 120 million generated a value added of EUR 44 million.

[9] http://www.cosmoseafoods.com/about.html

4.2.3 Performance of the processing industry and competition

Over the last 5 years, the processing plants used 50%, on average, of their production capacities. In 2013, due to the export difficulties with the EU, capacity utilisation was less than 30%. In 2012, the Ivorian tuna industry went back into operation (after closure due to the political instability) and landings from EU vessels started again affected the supply of the Ghanaian plants in Tema. In that context, storage capacities are also underused.

Currently raw material provided by national vessels is not enough to have the plants operating at more than 60% of their maximum capacity. Canneries are therefore trying to attract DWF in order to complement national landings which induce a fierce competition with canneries located in Abidjan.

Landing of national vessels in Abidjan, despite being done on a one to one authorisation accorded by the FC, is more and more common due to the better price that fishing companies can get over there both for the tuna designated for canning and for immediate consumption by locals.

At the other end of chain, the major constraint that is currently affecting the Ghanaian tuna fish chain is the reduction in Europe, since 2012, in the consumption of tuna from a can . Furthermore, on that market, Ghanaian tuna industry faces great competition from other countries in Asia (Thailand, Philippines, Papua New Guinea to name a few) and South America (Ecuador and Colombia to name a few).

Table 2: Top 10 EU tuna can suppliers in quantity (t)

	2 008	2 009	2 010	2 011	2 012
Ecuador (GSP) (ANDEAN)	93 631	63 721	62 024	71 452	73 636
Thailand (GSP) (ASEAN)	63 001	62 231	66 177	73 089	45 430
Mauritius (GSP) (ACP)	37 895	35 431	44 166	43 868	46 846
Seychelles (GSP) (ACP)	42 788	42 318	40 984	43 548	43 735
Philippines (GSP) (ASEAN)	54 450	54 044	45 405	35 609	30 892
Ivory Coast (GSP) (ACP)	37 745	31 471	26 249	25 726	34 616
Ghana (GSP) (ACP)	29 437	26 471	27 387	25 853	26 107
Papua New Guinea (GSP) (ACP)	8 739	14 626	15 898	15 632	19 534
Colombia (GSP) (ANDEAN)	17 859	12 746	11 403	13 281	12 218
Indonesia (GSP) (ASEAN)	9 804	11 056	9 019	12 989	14 170

Source: Eurostats

Table 3: Top 10 EU tuna can suppliers in value (EUR)

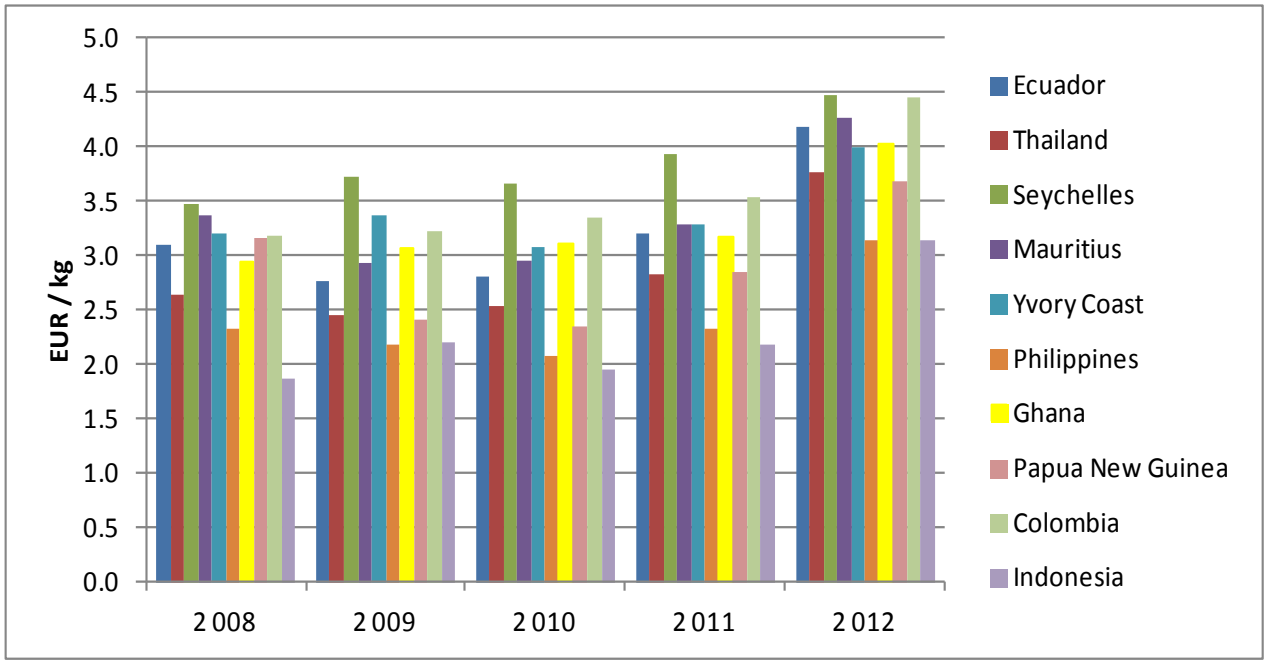
	2 008	2 009	2 010	2 011	2 012
Ecuador (GSP) (ANDEAN)	290 130	176 339	174 039	229 248	308 581
Thailand (GSP) (ASEAN)	166 689	152 787	168 031	206 371	170 623
Seychelles (GSP) (ACP)	148 967	157 741	150 090	171 513	195 282
Mauritius (GSP) (ACP)	127 482	104 027	130 191	143 983	199 379
Ivory Coast (GSP) (ACP)	120 870	106 347	80 804	84 420	138 612
Philippines (GSP) (ASEAN)	127 213	118 346	94 485	82 659	97 309
Ghana (GSP) (ACP)	86 860	81 294	84 973	81 852	105 351
Papua New Guinea (GSP) (ACP)	27 672	35 242	37 353	44 556	72 022
Colombia (GSP) (ANDEAN)	56 740	41 172	38 139	47 079	54 367
Indonesia (GSP) (ASEAN)	18 335	24 399	17 617	28 434	44 491

Source: Eurostats

All these countries benefit from the generalised system of preferences[10] (GSP) that EU has with ASEAN, ANDEAN or ACP groups of countries. For the ACP countries such as Ghana it means an entry to the EU market without any duty fees and quantities restriction.

From 2008 to 2011, the price per kg of fish imported in the EU remained more or less the same (all types of products together). In 2012, due to the constriction of the supply, it went up from 3 EUR / kg to 4 EUR / kg. Within that period of time, Ghana has remained in the same position, comparatively, to other countries: at the middle of the rank.

Figure 7: average price per kg of fish imported to the EU



Indian Ocean and Latin America countries gain a better average price per kg than Ghana does while on the contrary Asian countries get a smaller price. There is therefore some margin of progress here to make in order to reach the Seychelles and Columbia prices. Better quality products and products differentiation are the options currently developed by the two exporting companies (PFC and Myroc).

A more radical option, also taken by these companies and COSMO is to develop other types of products such as loins and sashimi quality products knowing that average export price for the different categories of products are:

- frozen = 700 EUR / t;
- loins = 2980 EUR / t ;
- canned = 2760 EUR / t

[10] The Generalised System of Preferences, or GSP, is a preferential tariff system which provides for a formal system of exemption from the more general rules of the World Trade Organization (WTO),). Specifically, it's a system of exemption from the most favoured nation principle (MFN) that obliges WTO member countries to treat the imports of all other WTO member countries no worse than they treat the imports of their "most u" trading partner. In essence, MFN requires WTO member countries to treat imports coming from all other WTO member countries equally, that is, by imposing equal tariffs on them, etc

- frozen grade A sashimi quality 9000 EUR / t

Ghana at the moment exports to the EU market about 3,000 t of loins which is about 3 % of the total imports (led by Ecuador with 35 % of the market share). The competition is fierce with South American, Asian and Indian Ocean countries. So, alternatives have to be found. Prospects for frozen sashimi products seems to be more open. Despite the fact that annual consumption of sashimi in Japan is declining, the sashimi tuna market is becoming increasingly globalised, with markets expanding outside of Japan as consumers seek out healthy eating options and become more adventurous in eating international foods. A Japanese industry source explained “Once upon a time, Japan was the only sashimi eating nation – it was the ‘big stomach’. Now markets are developing elsewhere, so the future of the sashimi market is bright because of globalization!” An estimated 60,000-100,000 t is currently supplied to other non-Japanese sashimi markets. The first sashimi markets to develop outside of Japan in the 1990s were the US and Europe (particularly, the UK). Sizeable markets have since developed elsewhere in Asia, with consumption in Korea, China and Taiwan already exceeding that of the European Union. The growing popularity of Japanese food is also evident in Australia and New Zealand, with a huge boom in the past several years of fast-food retail sushi outlets.735 Markets are also emerging in Eastern Europe (i.e. Russia) and South America (i.e. Ecuador).

The other possibility of improving the performance of the tuna industry in Ghana is the development of by-products such as fish oil and fish meal using the raw material waste (tuna heads, bones, etc.). PFC is already running such a project and aim to make it at a real industrial scale. This will significantly help the reduction of waste and at the same time improve the benefit per kg of tuna processed. Overall, remaining competitive requires innovation projects for economic maximisation of the raw materials.

4.2.4 Quality sustainability requirements

The most important requirement for tuna is the permit for unloading the catches from the vessels as well as heavy metals and histamine analyses in the analyses schedule. Analyses must be cleared off before processing can start. Every processing company disposes of its own quality control system and its own laboratory.

Picture 6: laboratory in a processing plant in Tema

4.2.4.1 4.2.4.1. Production control for catches quality

At each berthing of tuna vessels or an imported vessel supplying an establishment, the CA fish inspectors must first issue an unloading permit after some checks are performed before the processing can start. The procedures include checking the cleanliness on board the vessel, temperature of products and a complete print-out of the temperature recording in all the hatches of the entire voyage.

4.2.4.2 Heavy metals testing

Heavy metals, in particular Lead (Pb), Mercury (Hg) and Cadium (Cd) are known to bio-accumulate through the food chain and have been tackled by European Union in one of the standards required for the imported products (EC COMMISSION REGULATION (EC) No 1881/2006 amended by the EC Commission Regulation No 629_2008).

Hence, carnivorous tuna being at the top of the food chain, is susceptible to contain these 3 elements. The Ghanaian standards giving the maximum authorised limit, is the AMD 2 the FRR 2007. The standard impose levels such as Lead (0,3 mg/kg), Cadmium (0,1 mg/kg) and Mercury (1mg/kg).

4.2.4.3 Histamine testing

According to European standards, histamine (EC Regulation 2073/2011) is to be checked in fish species that belong to one of these families: Scombridae, Clupeidae, Engraulidae, Coryphaenidae, Pomatomidae, and Scomberesocidae. At least for tuna (Scombridae family), it is hence mandatory. An update of this regulation has been published, modifying the histamine limit in fishery products and is currently in force: EC Regulation 1019/2013.

4.2.5 Value chain support institutions

Along with the governmental institutions that have been presented in detail in chapter 3 and are listed in the table in regards to the services they deliver and their limits, the Ghana Tuna Association (GTA) plays a major role in supporting the tuna fish chain. This

association operates under the umbrella of the National Fisheries Association of Ghana (NAFAG).

Table 4: governmental institutions supporting the tuna fish chain

Institutions	Current services	Limitations
Ghana Standards Authority	• **it is the CA for Fishery Products exported to Europe** • Undertakes inspections on board and on site • Has accredited laboratories	• Building capacity in the different sectors (inspection, testing, maintenance equipment) • Daily testing equipment
Food and Drugs Authority	• Regulates food quality on national level	• Building capacity to achieve its mandate incl. in quality • Strengthening capacity in laboratories
Fisheries Commission	• Concerned by post-harvest losses of domestic processing	• Requires to build capacity of personnel
CSRI - Food Research Institute	• Undertaking research on new technology including on food quality	• Building capacity in the quality of smoked fish –

Source: own realisation

The GTA acts as the voice of the tuna industry but it hasn't been in a position to influence the industry positively regarding the conformity to the rules against IUU. The former chairman, Mr. Joseph K. Kudjordji, alerted the industry back in 2001 of the possible ban of export due to non-compliance behaviour regarding ICCAT rules such as transhipment at sea, etc. but no significant improvement had been made until the end of 2013. During the export crisis, the new GTA chairman raised the issue of the EU export problem and strongly asked the tuna vessel companies to conform to the best practices and other regulatory instruments soon to be introduced by Government to protect the industry.

4.2.6 Level of commitments regarding quality

Commitment regarding quality is more and more on top of the agenda of the tuna processing companies. As mentioned earlier, quality is a guarantee of a better price for the same raw material processed. The industry is heavily engaged in high quality and standards. The three tuna processing companies have on site their own laboratory facilities in conjunction with a quality and hygiene checking routine. The Table below summarises the level of commitment from both producers and buyers.

Table 5: Level of commitment from producers and buyers in the smoking industry

Parameters	Producers	Buyers (mainly Europeans)
Social	More than 80% of the skilled workers are women at the plant.	High as social working conditions are now checked by NGOs
Quality	Authorised vessels and plants are monitored regularly for hygienic conditions. All workers are concerned about respecting the good manufacturing practices and good hygiene conditions. Training is provided by the three companies	At least the European standards for importing canned, frozen fish and loins in Europe and quality assurance HACCP
Environmental	At the processing plant, producers are conducting good waste disposal practices (small livestock farms / feed supplement)	Buyers are increasingly concerned about environment notably about the environmental friendly fishing techniques.
Sustainability	Producers are regularly implementing the required changes in respect of quality, hygiene and are also implementing a footprint measurement to define their sustainability performance.	Buyers are more and more concerned about sustainability issues and want to sell products coming from sustainable fish chains.

Source: own realisation

Quality, hygiene and more generally international standards are key issues that processing industries are handling on a daily basis. The last visit by DG-Sanco in 2013 highlighted the overall good level of conformity to EU standards which is a recognition of the industry commitment toward quality excellence.

4.2.7 Projects

Alongside the UNIDO TCB project, some projects and initiatives from local or foreign supporting institutions such as the World Bank are promoting the tuna industry value chain. The Table below summaries their interventions in relation with the industrial tuna sector.

Table 6: Other projects or initiatives involved in support of the smoking industry

Projects or Initiatives	Description
WARFP - World Bank Programme **(2013 – 2017)**	**Partners**: Fisheries Commission **Geographical area** inland & marine landing sites **Scope of intervention**: to increase the wealth generated by the exploitation of the marine fisheries resources of West Africa, and the proportion of that wealth captured by West African countries. **Major Activities related to the tuna industry:** - a review of the Ghana Tuna Industry to identify policy and infrastructure needs that threaten Ghana's hub status for the tuna trade - the implementation of the VMS to the tuna fleet in order to meet Ghana's international obligations; and - the implementation of international measures to ensure that Ghana meets its international obligation to have 30 percent observer coverage of the tuna fleet operating in its waters
Better Training for Safer Food **DG SANCO** **UEMOA** **(2010-ongoing)**	**Partners**: GSA / CA Fish Control Dept. **Geographical area** CA and Fish Exporters **Scope of intervention**: Continuous Training **Major Activities related to the tuna industry:** - Subjects: HACCP and Assessment of HACCP Systems, TRACES Systems => strengthen the CA

Source: own realisation

4.2.8 Human skills

The GTA has reiterated many times the wish to have support for the improvement of human skills in the tuna industry. The fleet suffers from the lack of national officers and the dependence on expatriate fishing personnel that hamper the emergence of national competences. Processing companies are not facing the same problems as key positions are held both by expatriate and Ghanaians. Recruitment of good skill workers has never been mentioned as a problem by industry representatives. Processing personnel receive their training on site which facilitates the continuous training and personal development.

4.2.9 Conclusion and prospective

Ghana has huge potential to increase tuna fish export to countries such as Japan, Singapore and Spain. The current data and statistics convey that tuna is the only resource that can be considered for significant expansion. Major highlights included the need to strengthen the knowledge base in tuna fishing, with particular emphasis on the sustainable management of resources, and to find ways of reducing by-catch species, unwanted or incidental catches, in any tuna fishing activity.

The need for the reinforcement of actions against IUU fishing is vital for the tuna fish chain. Following EU exports problems, Ghana has intensified its Observer Programmes On-board Vessel, re-established the vessel Monitoring System (MS) and strengthened

the Surveillance by the acquisition of more patrol boats, which will occasionally provide joint naval and fisheries patrols to further curb the mismanagement of our resources.

On the Trade side, the EU has recently given recently an ultimatum to sign Economic Partnership Agreements (EPAs) by October 2014 to three tuna exporting African countries or risk losing their privileged zero duty trade status tariffs. Ghana, Cote d'Ivoire and Kenya are among seven[11] African countries at risk of having to pay tariffs on exports to the EU if they fail to honour trade agreements signed with Brussels in 2007. The seven countries were granted extensions until next October by the European parliament to sanction their interim EPAs. Two years ago, the EU projected suspending the agreement if the countries did not ratify the EPA by January 2014. The European parliament then voted in a strong majority to extend the deadline to October 2014.

4.3 Fish Chain 2: Smoked Fish

4.3.1 Graphical representation

Industrial approved fish smoking industry is characterised by a high level of additional value between fresh fish and smoked products. It is a (very) small fish industry because the smoking sector has to be modernised to meet export standards, requiring both expensive equipment and continuous expensive testing costs: PAH, *Listeria* and/or *Clostridium* (as will be seen in more detail in paragraph 4.3.2).

Since the end of February 2014, products coming from six smoking approved companies are entitled to be exported to Europe (FVO, 2014). Two establishments produce dried fish as well.

To draw a quick overview of the fish smoking industry, processing plants buy fresh fish from authorised small-scale canoes and inshore vessels. In lean fishing season, they may on rare occasions, acquire fish also from imports in Ghana (i.e. frozen *sardinella* to process them).

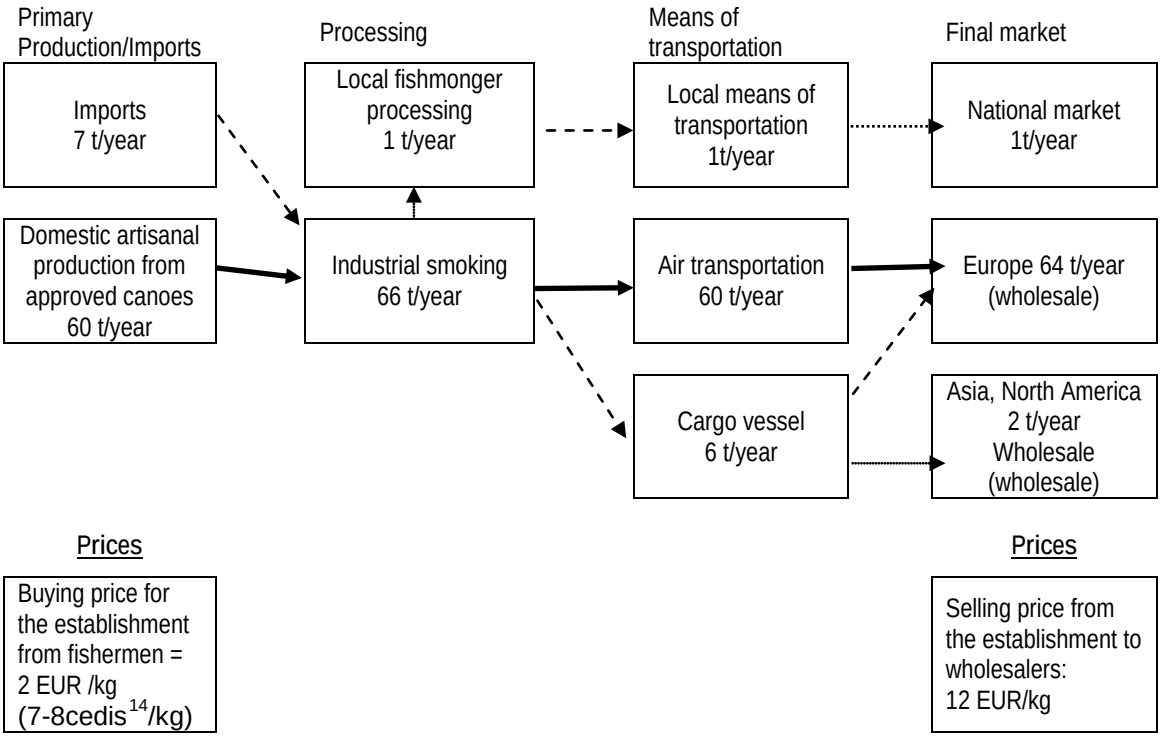
Before the processing can start, the processing establishment carries on own-checks (organoleptic and temperature checks) to verify fish quality. In addition, the plant must have authorisation from the CA inspector checking the quality before they can actually start. Some fish may be discarded for not being fresh enough to reach the exporting market. These fish go to domestic processing fishmongers for local markets or some to waste disposal practices with offal, (fish farming, poultry farming, piggery, solid waste). During and after the processing, own-checks by the factory take place as well as CA inspectors check and sample the final product.

Transport to the market is the third stage. Beside domestic smoking processors that use local means of transport to reach domestic markets or regional markets, industrial smoking companies themselves are completely geared towards Europe. Smoking products are mainly shipped by airfreight. Establishments contract agreements with wholesalers living in European countries; the latter will sell the fish to retailers, and the retailer to end consumer. In the study conducted by Ward in UK (2003), in most cases, importers of smoked fish were selling directly to retailers or even have a grocery themselves. Few of them were selling products to wholesalers. The graphical representation in the Figure below gives a global idea of the smoked fish value chain.

[11] Namibia, Botswana, Cameroon and Swaziland are the four other nations.

In 2013, the larger smoking company said approximately 20 t of smoked fish products was sent to Europe[12]. Converted in live weight, using the Eurostat conversion factor, that leads to a volume of export of 67 t (live weight), used in the Figure below.

Figure 8: Fresh fish and product flows estimation (live weight)[13]



According to Eurostat, smoked fish products imported from Ghana to Europe amounted 14,6 t in 2012. For 2013, it is estimated around 10 t as the imports in the first 11months were at 9.2 t. On the average over, 20 t of Ghanaian smoked fish are imported every year to EU.

Table 10: imported smoked fish from Ghana in EU 28 (net weight)

	2002 **	2003	2004	2005 **	2006 **	2007 **	2008 **	2009 **	2010 **	2011 **	2012 **	2013 * **	Ave.
Qty (t)	25,5	69,9	45,5	26,2	23,8	16	25	22,5	23,6	22,8	14,6	10	21

*: estimated figures and **: Average figures; Source: Eurostat[15]

The difference between the data collected from the processing plants and Eurostat can be explain by:

[12] Information on quantity and prices were collected from smoking establishments during the course of the field work of the mission in Ghana.

13 Euro stat Conversion Factor for smoked fish (into live weight) is 3.31. (Eurostat, 2014)

14 Production price was obtained through personal information. Cedis exchange rate in February 2014 : 1 EUR = 3,35 cedis

[15] See: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_databasehttp://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

- the fact that readjustments are constantly made in Eurostat;
- smoked products have been exported to another continent (North America);
- some part of the difference was lost/not counted by RASFF calls (four since January 2013 that concerned PAH levels, see later);
- smoked fish was mislabelled in the counts at the border, some approved smoking establishments are exporting dried fish as well and the results might have been mixed up.

This commodity has a growing trend in recent years: from 4 t in 2008 to 13,3 t in 2012. According to Eurostat import figures for 2012, Ghana was at the 5th place behind Gambia (74 t) and Thailand (80 t), with China (1,400 t) and Iceland (520 t) leading the exports. European market is flooded indeed by smoked fish products coming from Asia at a very low price.

4.3.1.1 Selected canoes for the small-scale fisheries

Smoked fish value chain is starting from small-scale fisheries since smoking establishments buy their fish from selected local fishermen, the authorised supplier.

Each authorised fisherman has to be selected by establishments on the basis of their reputation as fishermen, their use of some good hygienic practices when fishing, landing the fish and handling it. Those fishermen have to possess a canoe in a good state of repair and maintenance (authorised canoe). They have to be registered by the Fisheries Commission. They must have their municipal health card in order, giving proof of their good health.

Fishermen are trained by establishments in additional Good Hygiene Practices when fishing and landing the fish (on-site) complying with the regulation as referred to earlier. Special attention is given on proper icing methodology with clean flake ice. The process of their training includes a visit to the smoking plant to familiarise themselves with the process and what the fish establishments are looking for (species, freshness and smoking process). Authorised fishermen are given ice-boxes by smoking establishments, and are taught how to clean them with approved detergent and disinfectant. Most of the time, establishments supply authorised fishermen with some clean ice from the plant.

The choice of landing location where the authorised canoe is berthed is also important. It should be in line with European Regulations. It is fundamental that the landing location is well kept and clean by the fishing community/Beach Fisheries Committee Management and away from any source of contamination (dumping area, animals, and unhygienic practices on the landing site). Latrines should be provided. Electricity supply should be available 24/24h when smoking establishments have refrigerator and/or freezing equipment to keep fish in good condition.

In general, establishments are dependent on the requests from their client. Fish that are most commonly asked for are:

- Inland origin: *Chrysichthys* sp, Tilapia sp., *Lates* sp., *Synodontis* sp., *Hydrocynus* sp., *Carpio* sp. and *Clarias* sp.
- Marine origin: *Sphyraena* sp. *Caranx* sp, Sardinella, Herrings, *Penaeus* sp.

Concerning inspections of authorised canoes and landing sites, CA inspectors have set up a landing site monitoring schedule on six major landing sites (marine and inland), at the frequency of three times a year.

Smoking establishments are in charge of transporting the fish from the landing site to the processing site in a refrigerated van. It represents a cost for smoking establishments which are located some distance from the landing site.

4.3.1.2 Processing

A mandatory go-ahead is necessary to be obtained from the CA (organoleptic checks, temperature, samples) before any processing can take place.

According to the standards of smoked and dried fish established by the GSA (Annexe 3), and to the Code of Practices for Fish and Fishery Products (Codex, 2003), the procedure to prevent the PAH on smoked fish recommend to separate drying and smoking phase (different machines or different time) and to promote indirect smoking.

When the fish arrives at the plant, and the processing can start, the following stages will unfold:

- Cleaning fish in clean tap water, gutting sometimes (depending on species), slicing it (i.e. barracuda)
- Sometimes, the fish must be kept in a chiller cabinet (when the smoker is busy).
- Staking fish in the dryer (25-30°C) for 2 to 6 hours. A chimney evacuates the excess heat.
- Staking fish in the smoker (70-90°C) for 3 to 4 hours. It rotates. A chimney evacuates the excess heat. Smoking equipment works both with gas and wood.

Picture 7: industrial dryer in Achimota

Picture 8: industrial smoker in Achimota

4.3.1.3 Storage

Storage process steps are described hereafter:

- Leaving fish to cool down
- Packing process in brown paper and certified boxes with the labels.
- Storage beneath 2-4°C (to prevent the growth of *Listeria* sp.)
- An obligatory check of the final processed products and sample it. Particularly, testing for:
    - PAH benzo[a]pyrene analyses are organised. CA and smoking establishments must send it to an accredited PAH laboratory in Europe.
    - *Listeria monocytogenes* analyses are sent to an accredited microbiology laboratory that uses the referenced European method.
    - Clostridium, histamine (and heavy metals) for some species.

All the results must be satisfactory before the consignment is allowed to go.

Picture 9: Labelled packaging material in Achimota

4.3.1.4 Marketing

Since the PAH content is too high in traditional smoked fish, it can no longer be exported to Europe or in small quantities through individuals.

In the same way, exporting smoked products to neighbouring countries of industrial smoking establishments (producing a smoked fish below 5ppb PAH) does not meet the market requirement in terms of taste: other African countries would still prefer the traditional smoked fish.

However, to satisfy the demand of the African population living in European countries, exporting establishments must comply with the EU rules, especially the ones affecting quality and safety standards concerns to protect the health of the consumer. Hence, an industrial smoking establishment authorised to export in Europe must respect a low level of PAH. Consequently these establishments prefer to select Europe as their major importing partner.

4.3.1.5 End consumer

The African Diaspora living in European countries buys the industrial smoked fish produced in Ghana, even though it has taken some time getting used to the “different” taste”.

The major importing countries are Germany, Belgium, the Netherlands and the UK.

4.3.2 Mapping of actors

Industrial fish smoking sector (approved establishment) is represented by six companies having the following features in common:

- Mainly Ghanaian owners
- Relying mainly on marine and inland small-scale fisheries and occasionally on imports for the raw material
- Employing skilled processing employees

- Customers: mainly the African Diaspora living in European countries
- Employment: 90 people divided as follows:
  - Small-scale fishermen: 10 people
  - Smoking processors: 50 people
  - Upstream: 20 people
  - Downstream: 10 people
- Competitors : Africa (Gambia), Asia (China, Thailand), South America

Table 11: Details of the approved establishments working in the smoking industry

Name of the smoking establishment	Focal person name	Address	Telephone and email	Clients
Can & Kaa	Edmund Asiedu (Quality & Production Manager)	Achimota, Accra	+233 244 737633 Email : ohased@yahoo.com	Germany, Belgium, UK, the Nederlands
Liwon	Mrs Beatrice Mensah (CEO)	Tema	+ 233 243725968 Email: liwonltd@gmail.com	UK, Netherlands, Germany, Belgium, Switzerland, Norway & USA
Davappi Farms	Mr Asiema Samuel (Quality Assurance)	Kumasi	+233 248497755 Email: davappif@gmail.com	
Cipomaah	Mr. Stephen (Quality Assurance)	Kia	+233 275025261 Email: snyarko2@yahoo.com	
African Smoked Fish	Mr. Onumah	Legon, Accra	+233243576455 www.africansmokedfish.com	
Dzecks Hott Co. Ltd	Mr. Emmanuel	Accra	+233244642081	

Source: CA, 2014 (from the 23 Feb)

4.3.3 Performance of the processing industry

Performance of the processing industry was evaluated by a field survey conducted in February 2014 by a field visit, phone and email interviews on four establishments (2014). Regular interviews and questionnaire based on the UNIDO check-list are available Annex 5.

4.3.3.1 Value-added for smoking establishments

As earlier mentioned, the price of raw fish is 2 EUR/kg and the price of finished products to export is 12 EUR/kg. Industrial equipment needed to process the fish is around 300,000 EUR.

Table 12: value added of smoked fish industry

	Quantity	Unit Price	Value
Value of production	67 000 t	2 EUR	134000 EUR
Value of processing	20 000 t	12 EUR	240 000 EUR
Value added	**(1340000 + 240000) x .40 = 150 000 EUR**		

Source: own realisation

A brief survey in a major commercial street selling smoked fish in Brussels conducted in March 2014 (African area) gave an average price of smoked fish sold by retailers of 30 EUR/kg[16]. The price of the fish is multiplied by 15 from the landing site to the end retailer in Europe.

4.3.3.2 Performance index

Performance of the current smoking industry is presented in the Table below.

Table 13: Performance parameters for smoking industry

Parameters	Performance
Capacity utilisation	Up to 50%
Storage	120 m3
Logistics and marketing	Can easily be contacted by phone, email and a few, websites. Are easily found on Internet as partners of some projects
Labour productivity	Up to 1,3t/person/year
Technology and Processes	High technology equipment (bought in Europe, Nth America) in most cases composed of: - dryer - smoker - chiller
Waste material utilisation	Selling the waste to various farms (piggery, poultry and fish) to mix to their food
Products quality	Depending on species, and on the order of the client: either whole or sliced, gutted sometimes light brown to dark colour
Packaging and labelling	Packaging in brown soft paper, and in boxes, labelled with the approved number

Source: own realisation

Industrial smoking establishment have larger equipment than necessary (up to 50% capacity utilisation). 2013 has not been a good year in terms of exports. Smoking industry is relying on high cost equipment. They work on the order, intensively and they rely on casual workers. Their storage is filled in but they don't keep fish too long in case there is a shortage of electricity. Smoked fish is cooled down and then package in labelled cardboard boxes with brown paper.

4.3.4 Quality sustainability requirements

High quality sustainability requirements for smoked products are required by the European exporting countries. Beside the fact that all approved companies must comply

[16] Five shops selling smoked products of different fish species were visited.

with the regulations and standards and implement them, there are some particular requirements that smoked products should be cautious about.

4.3.4.1 Hygienic monitoring of the small-scale canoes

Smoking establishments have to regularly provide the CA with a list of their authorised canoes and fishermen. On a regular basis, CA fish inspectors perform landing site monitoring and canoe inspections. Check-lists are used both by CA fish inspectors and establishments and the monitoring is documented. If some non-compliance is observed, then there is a new inspection planned.

4.3.4.2 Testing smoked products for contaminants (PAHs, microbiological, histamine)

Studies have identified the PAHs as a probable carcinogenic, mutagenic and teratogenic. Benzo[a]pyrene belongs to the PAH family and is highly present in smoked fish. European Union has therefore tackled the PAH family and in particular the benzo[a]pyrene (EC Regulation 835/2011) prohibiting smoked fish import into EU, should the content be above the threshold limit (5ppb/kg). During recent years, to comply with the Regulation, industrial smoking equipment has evolved in separating drying and smoking phases and in evacuating the excess heat from the machines in such a way that does not allow PAHs to settle on the fish – in contrast, smoked fish found in the traditional market may have a PAH content of more than 100 ppb/kg.

Furthermore, the PAH level will once again be reduced from the 1st of September 2014 to 2 ppb/kg, meaning that establishments will have to adapt again their installations to that level.

In respect of the microbiological contaminants, smoked products may contain both *Listeria* and/or *Clostridium* spp (respectively EC Regulation 2073/2011 and EC Regulation 852/2004). Outbreaks of these diseases are serious and may cause death in extreme conditions. A control of hygienic conditions and proper storage at chilled temperatures are frequently referred to as good control measures.

According to European standards, histamine (EC Regulation 2073/2011) is to be checked in the fish species belonging to one of these families: Scombridae, Clupeidae, Engraulidae, Coryphaenidae, Pomatomidae, and Scomberesocidae. At least for sardinella and herrings it is mandatory. An update of this regulation has been published, modifying the histamine limit in fishery products and is currently in force: EC Regulation 1019/2013.

The CA Fish Inspectors and laboratory staff from the GSA are in charge of the sampling for official checks and so are smoking establishments, as part of their monitoring (own-checks).

4.3.5 Value chain support institutions

As it was exposed in detail earlier on (3.1.), there are a few institutions that govern quality in the smoking industry shown in the table below.

Table 14: Institutions concerned by the quality of smoked fish

Institutions	Current services	Limitations
Ghana Standards Authority	• **Is the CA for Fishery Products exported to Europe** • Undertakes inspections including for smoking private sector • Has accredited laboratories (microbiology analysis expect *Clostridium*) • Official samples of smoked fish are send to European accreditation for PAH and *Listeria* analyses	• Building capacity in the different sectors (inspection, testing, maintenance equipment) • Equipment needed & accreditation GCMS/MS with low limit of detection (PAH testing 2 ppb/kg smoked fish) • Daily testing equipment
Food and Drugs Authority	• Regulates food quality on national level	• Building capacity to achieve its mandate incl. in quality • Strengthening capacity in laboratories
Fisheries Commission	• Concerned by post-harvest losses of domestic processing (small-scale fisheries sector)	• Requires to build capacity of personnel
CSRI - Food Research Institute	• Carrying out research on new technology including food quality (small-scale improved smoking equipment –FAO) • Is conducting PAH sample testing to export smoked products to Europe (<2ppb/kg)	• Building capacity in the quality of smoked fish –

Source: own realisation

If GSA as a Competent Authority, has the greater involvement in relation to the export of smoked fish products to Europe, a lot of other institutions are concerned by smoked fish being a traditional meal in Ghana. GSA only deals with industrial smoked products. Most of them, such as the Fisheries Commission, are concerned about reducing post-harvest losses for the small-scale smoked fish processors.

Moreover, CSRI – Food Research is well aware of the danger that the PAH represents. With FAO partnership, the institution is now trying to achieve satisfactory results (<2ppb per kg) with an improved Chorkor smoker prototype. If such results are obtained, the gate could be again opened to small-scale smoked fish processors to export to Europe. It would represent a great step forward for Ghana and the region.

4.3.6 Level of commitments regarding quality

The Table below summarises the level of commitment from both producers and buyers.

Table 15: Level of commitment of producers and buyers in the smoking industry

Parameters	Producers	Buyers (including African Diaspora)
Social	Producers are training authorised fishermen good hygiene practices – fishermen can disseminate to their communities At the smoking stage, more than half the skilled workers are women.	Moderate
Quality	Authorised canoes and landing sites are monitored regularly for hygienic conditions by producers and CA. Workers are concerned about respecting the good manufacturing practices and good hygiene conditions.	At least the European standards for importing smoked fish in Europe and quality assurance HACCP
Environmental	At the smoking plant, producers are conducting good waste disposal practices (small livestock farms / feed supplement)	Few importers are concerned about environment.
Sustainability	Producers are regularly implementing the required change in respect of quality (PAH i.e.) and rectifying non-conformities.	Like dealing with long experienced suppliers in the smoking sector.

Source: own realisation

Producers are hard workers and keep up with any changes CA inspectors request in terms of quality. The last change they had to overcome was to trace the fish down to the landing site. Women are the most active personnel at the smoking plant. Smoking plants usually deals with offal and have a good waste disposal practice as are they have an agreement with livestock and feed farms.

Importers are consistent with the quality required by European standards but end buyers don't necessarily know. Whereas importers are interested by a good price, they also look at experienced suppliers that produce good smoked fish that meet the demand. Few importers are concerned about the environment. End buyers, mostly African Diaspora population (and some Asian population) are longing for the smoked product, coming from their region or country.

4.3.7 Projects

With the exception of UNIDO TCB, some other projects and initiatives from local or foreign governments are promoting at some level, the smoking industry value chain, mostly in the fish production phase. Most of them have already been mentioned during this report. The Table below summarises their description in relation with the industrial smoking sector.

Table 16: Other projects or initiatives involved in the support of the smoking industry

Projects or Initiatives	Description
WARFP - World Bank Programme **(2013 – 2017)**	**Partners**: Fisheries Commission **Geographical area** inland & marine landing sites **Scope of intervention**: to increase the wealth generated by the exploitation of the marine fisheries resources of West Africa, and the proportion of that wealth captured by West African countries. **Major Activities related to the smoking industry:** - additional value promotion for small-scale sector • develop improved landing sites • sanitary control at fishing and at landing sites => Improving sanitary control of the landing sites strengthen sanitary guarantees over the raw material reaching smoking plants
Artisanal Cold Stores Network Project – Spain Government (2011-present)	**Partners**: Fisheries Commission **Geographical area** inland & marine landing sites **Scope of intervention**: to promote the use of good hygienic practices at landing sites and building 6 cold stores and their management **Major Activities related to the smoking industry:** - building cold stores and promoting good use of ice at the landing site => Improving sanitary control of the landing sites strengthen sanitary guarantees over the raw material reaching smoking plants
University of Legon – Department of Nutrition and Food Science	**Partners**: University of Legon **Geographical area** Ghana **Scope of intervention**: Research into food safety and quality **Major Activities related to the smoking industry:** - development of food spoilage indicators, research into food safety and smoked fish

Projects or Initiatives	Description
Better Training for Safer Food **DG SANCO** **UEMOA**	**Partners**: GSA / CA Fish Control Dept **Geographical area** CA and Fish Exporters **Scope of intervention**: Continuous Training **Major Activities related to the smoking industry:** - Subjects: HACCP and Assessment of HACCP Systems, TRACES Systems => strengthen the CA
Rural Bank and Agricultural Development Bank	**Partners**: Fishery exporters **Geographical area** Fish industry **Scope of intervention**: Financial Support **Major Activities related to the smoking industry:** - fishing inputs

Source: own realisation

4.3.8 Human skills

Small-scale fishermen have not had proper training as most them where born in a fishing community, with father/ uncle involved in fishing. Most of the time, fishermen haven't finish school. They learned to fish when very young.

Authorised fishermen are a step 'higher' as they implement good hygienic practices in fishing, landing and using ice, partly through the training from the smoking establishment.

At the smoking plant, quality and production managers have finished school and gone on to higher education (high school, University of Legon, Cape Coast) in Ghana or further afield to experience proper training in food science, economics, etc. Moreover, now that they are working for an approved establishment, they have received complementary training about CA Quality and HACCP for instance through the CA or elsewhere.

Skilled workers at the smoking establishment have mainly learned on-the-job whilst working.

4.3.9 Conclusion

Smoked fish value chain represents, to date, six small companies working at an industrial level, exporting mainly to Europe (against two plants in 2007). Their market is the African Diaspora living in European Countries, desiring smoked fish products. The smoking industry employs overall 90 people plus casual workers. Their products reach Europe mainly by airfreight. Companies are not active in local trade and few are on regional markets. The peculiarity of smoking establishments is that they rely on small scale fisheries for their raw material: they get it from authorised fishermen and canoes selected by them on very precise EU based criteria. Both the plant and the CA regularly monitor them during their landing site monitoring. CA inspectors must check both raw material and processed products and also sample them for official controls. To meet the European Commission requirement on the very low level of carcinogenic Polycyclic Aromatic Hydrocarbons (PAHs), companies had to invest in expensive equipment based on the separation of drying phase and smoking phase and/or on indirect smoking. Not only the expense of the equipment, the establishment have also to bear the costly tests. Indeed, as there is no machine settled and accredited for PAHs and *Listeria* sp in GSA or

Ghana, own-checks and official tests must be sent out to Europe to an accredited laboratory. Only a low detection limit GS-MS/MS analysis method is capable of detecting the PAH threshold requested by Europe, equipment that the GSA doesn't have. On the 1st September 2014, the value will decrease from 5 to 2 ppb/kg of fish.

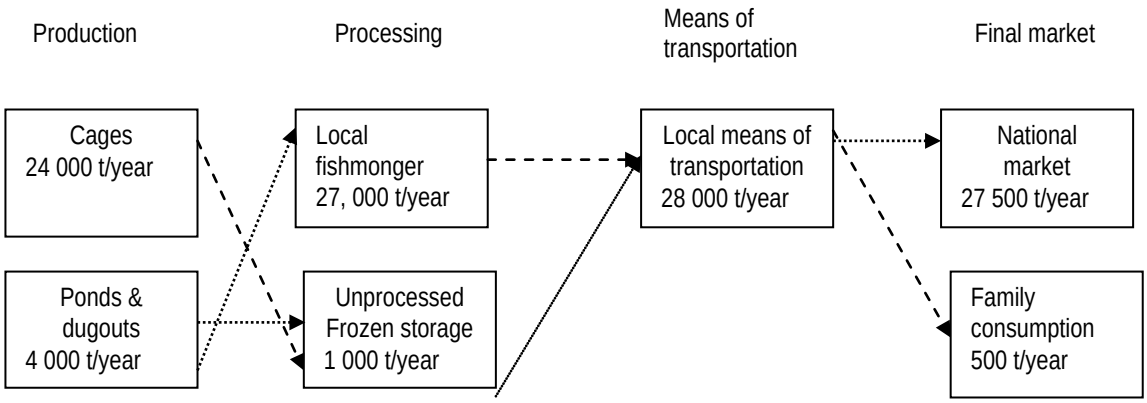
Smoked products have nevertheless a high value-added: 150 000 EUR. It would be worthwhile supporting this processing industry. Usually, smoking industry in Ghana is characterised by up to 50% capacity utilisation. Offal is generally sold to livestock and aquaculture feed farms. Quality requirements of smoked products are not only PAHs level, but also *Listeria*, histamine (for some species) and *Clostridium*. Further attention should be given to the Food Research Institute that currently tries to reach the EU threshold by an improved Chorkor smoker (FAO prototype). Some projects are supporting the artisanal smoking industry but currently the industrial smoking private sector has no direct external assistance.

4.4 Tilapia value chain

4.4.1 Graphical representation

Tilapia production in Ghana comes mainly from aquaculture (cages, dugouts and ponds). In 2012, aquaculture production was 28, 000 t. Cages, ponds and dugouts make 85%, 8% and 7% of the production, respectively. A field survey at Sunwoo Culturing Farm, Akosombo for instance indicates an annual production of 2,600 t. The largest aquaculture farm currently is the Tropo Farms with annual production of about 4000 t. There are about 3 000 fish farms but over 90% are non-commercial ponds. With respect to the culturing system, floating cages makes 3% whilst ponds make over 90%. There is existing policy in allocating 5% of irrigation areas for aquaculture business.

Figure 9: Flow of farmed tilapia from production to consumption



The main culture species is the *Oreochromis niloticus* (80%). Others species such as *Heterotis niloticus* and *Clarias gariepinus* are also farmed. The culture practice is based on monoculture and polyculture techniques. Tilapia is sold whole or fresh (degutted) to wholesalers, retailers or consumers. The farm gate prices of two major fish farms are presented below.

Table 17: Farm Gate Price

Size identification	Size description (g) (Sunwoo farms)	Size description (g) (Tropo farms)	Sunwoo farms (GH¢)	Tropo farms (GH¢)
S3	700-1000	600-800	8.00	8.60
S2	500-700	500-660	7.60	8.00
S1	350-500	330-500	7.20	7.80
Regular	250-350	220-330	6.70	7.80
Economical	Below 250	110-220	5.30	6.20

GH¢1= US$ 0.399 (Interbank exchange rate, Bank of Ghana, February 2014); Source: field survey

4.4.2 Mapping of actors

The high demand for fish and fishery products due to rapid population growth, declining capture fisheries and its cheapness compared to other protein sources, has resulted in the booming of the aquaculture industry of Ghana. Aquaculture is becoming the preferred option used by agro-based companies to produce tilapia on commercial lines (mainly cages) along the Volta Lake. The Volta Lake has a vast total surface area of about 8,700 km^2, thus, providing a substantial potential for cage aquaculture.

Picture 10: Volta Cages system near Akosombo (Water Research Station)

The Eastern region (mainly, Asuogyaman district) has 1,400 cages. The first table below shows the available aquaculture data whilst the second table below shows the three largest tilapia producers Ghana.

Table 7: Aquaculture Production

REGIONS	Pond production			Cage production			Others (Dugouts, Reservoirs, Dams)
	No. of Ponds	Total Surface area (ha)	Production (mt)	No. of Cages	Vol. (m^3)	Production	Production (mt)
Greater Accra	275.00	75.00	158.05	350.00	43,750.00	1,531.25	-
Ashanti	1,205.00	150.63	384.68	39.00	4,875.00	20.00	-
Northern	90.00	2.85	1.23				450.90
Eastern	292.00	30.23	75.58	1,473.00	179,222.50	19,768.38	
Brong Ahafo	1,393.00	64.66	260.00	-	-	-	-
Western	644.00	82.80	207.00	3.00	225.00	7.88	-
Upper East	49.00	13.39	34.70	-	-	-	599.34
Upper West	17.00	0.80	0.00	10.00	1,000.00	1.97	380.30
Volta	247.007	98.32	282.72	416.00	50,900.00	2,919.02	-
Central	537.00	184.92	367.54	-	-	-	-
Total	**4,749.00**	**703.66**	**1,771.56**	**2,278.00**	**279,972.50**	**24,248.50**	**1,430.54**
Production 2012 - 27,450.56 t							

Source: Fisheries Commission

Table 19: Major tilapia fish farms in Ghana

Farm	Location	No. of employees	Annual output (tons)	Potential for export
Sunwoo Culturing Farms	Akosombo, E/R	61	2,600	Yes
Tropo Farms	Asutuare, Mpakadan, E/R	120	4,000	Yes
West African Fisheries	Asikuma, E/R	50	2,000	Yes

Source: Field Survey and Fisheries Commission

There are three large commercial fish feed producers, namely, AgriCare Ltd, Ghana Agro Food Company Ltd (GAFCO), and Raanan Fish Feed Ltd. Both AgriCare Ltd and GAFCO are based in Tema whilst Raanan Fish Feed Ltd is located in Prampram. In addition to the feed production, Raanan Fish Feed Ltd also imports equipment for aquaculture. These feed mills produce about 1,500 t of feed annually with 70% of inputs sourced locally.

There are a total of 19 hatcheries (3 public and 16 private). The eastern region has the highest number of hatcheries with 14. These hatcheries produce about 79 million fingerlings annually and have witnessed increased production over the past years.

Table 8: Hatchery Operators

Region	Name of Hatchery	No of Fingerlings Produced	Species of Fingerlings Produced	Remarks
Greater Accra	Catfish Ghana Ltd	120,000	Tilapia and catfish	Private
	Ashaiman Aquaculture Demonstration Center(PAC)	1,872,000	All male tilapia	Public
Ashanti	Pilot Aquaculture Center (PAC)	70,000	All male tilapia	Public
	Kumah Farms	668,000	Tilapia and Catfish	Private
Western	John Kpemli Farms	279,970	Tilapia & Catfish	Private
Eastern	Adom Farms	2,347,219	Tilapia and Catfish	Private
	Fish Reit	3,000,000	Tilapia	Private
	Grace to Glory Farms	1,050	Tilapia	Private
	Jasa Farms	23,400,000	Tilapia	Private
	Lee Farms	216,000	Tilapia	Private
	Sun Woo Culturing System (Hatchery)	1,500,000	Tilapia	Private
	Triton Aquaculture Africa Ltd.	3,600,000	Tilapia	Private
	Data Stream Farms	1,524,000	Tilapia	Private
	Wilksaddo Farms	12,000	Tilapia	Private
	Water Research Institute	14,202,030	Tilapia	Public
	Crystal Lake Fish Ltd	14,968,000	Tilapia	Private
	Maleka Farm	600,000	Tilapia	Private
	West Africa Fish Ltd	1,400,000	Tilapia	Private
	Tropo Farms	9,600,000	Tilapia	Private
Total		**79,380,269**		

Source: Fisheries Commission

Internal demand for tilapia species is high mainly due to the growing middle class with taste for tilapia and rapid population growth (3% annually).Therefore, there are virtually no exports of fresh tilapia. On the other hand, evidence from the Customs Service at the Kotoka International Airport indicates that some salted tilapia (*koob*i) are exported to the EU and USA. This forms part of the bulk export of salted/smoked which is estimated around 115 kg or 0.3% of exported fishery products in 2012. On the other hand, salted tilapia from southern Ghana marketed in the midlands and north may eventually end up with consumers in Burkina Faso or westwards to Ivory Coast.

Picture 9: Tilapia fry near Akosombo (Water Research Station)

In modern tilapia marketing, fish farmers sell to the wholesalers or retailers and the retailers in return sell to consumers (Figure below). In some cases, the producers sell directly to the final consumers who come to the landing sites or fish farms. Sunwoo Culturing Farm for instance sells to about 5 major customers who in turn sell to other retailers. Tropo Farms sells to wholesalers and consumers.

Fish farmers ⟶ Wholesalers/Retailers ⟶ Consumers/ Hotel

Figure 10: Tilapia marketing channel

4.4.3 Performance of the processing industry

Currently, there is no industrial processing of aquaculture products in Ghana. Farmed tilapia and catfish are processed on a small-scale level such as smoked, fried, salted and fermented. There are an adequate number of processors available but technology applied to processing are generally low (example, sun drying, small size smokers). There is the need for innovation in the processing sector.

4.4.4 Quality sustainability requirements

According to information collected during the study, including interactions with a major tilapia farm owner (Sunwoo Culturing Sysytem), it does not appear that farmed tilapia would be of interest to the European market. Nevertheless, Ghana is known for its booming fish farming business, mainly tilapia, but also other species (African catfish, Heterobranchus, Heterotis and Volta perch) are also on the increase. Some of these potential farmed species might be potential exports to Europe. A careful move must however be observed in respect of species likely to have a market in Europe, as Asia and South America are heavily present with very low prices. A detailed market study should be conducted in this regard.

It is still necessary to set a brief framework in which Ghana will have to evolve if a farm breeding other species decides to export aquaculture products to Europe. The major points to achieve/ensure (Eurofish, 2012; BTSF website, 2014) are:

- For the Competent Authority:
  - the governing Aquaculture Policy should be revised to ensure that the European rules (EC Regulation 852/2004) for general hygiene requirements and HACCP are incorporated and a link with the Competent Authority has been established (EC Regulation 853/2004); it should include, at least, provisions equivalent to those taken in regard to animal health conditions and certification requirements (Commission Decision 2003/858/EC) and on the animal health conditions governing the market placing for aquaculture products, including traceability (Directive 2006/88/EC). The important traceability requirement is also described in the Food Law (Regulation EC/178/2002) and should also be included in the revised policy;
  - a legal document stipulating which veterinary medicines are allowed/prohibited in Ghana should be, at least, equivalent to the European provisions; that all the veterinary medicines allowed for use in Ghana on fish and crustaceans should be authorised for use in compliance with European regulations; that they should be only distributed by the registered organisation/person approved to do so;
  - labelling on approved veterinary medicines on all authorised products should be in line with EU labelling regulations;
  - Competent Authority should register all relevant feed producers in Ghana (local or foreign) and approv the feed, pre-mixtures and food compounds producers. Feed that is imported should be registered also. Feed producers shall be required to apply the Good Hygiene Practices and the HACCP, and Feed producers will comply with the EU Register on Feed Additives;
  - An environmental monitoring program and residue monitoring program shall be implemented in accordance with European provisions. The body assigned shall be in charge of planning, implementing and reporting the results on an annual basis to the European Commission including the legislation and the criteria in use, the list of approved laboratories, the methodology of the work carried out, etc. The purpose of it shall be to detect the eventual illegal use of prohibited substances, the possible misuse of allowed compounds and to take specific corrective actions to minimise recurrence. The groups of substances to be tested for are presented in the EU regulation on the aquaculture residue monitoring program and include chloramphenicol, nitrofuran metabolites, hormones and hormone-like substances, this list being non-exhaustive. An environmental contaminant monitoring program is already in place in Ghana by the Competent Authority as a requirement for the wild caught fish and includes pesticides, heavy metals, PCB, dioxins etc;
  - The Competent Authority should approve Aquaculture business in the same way that fishing vessels and processing plants are approved, after thorough inspection on the requirements outlined above and deal with them all in a similar way.
- For the Aquaculture Operators (private sector):

- Aquaculture operators would have to comply, amongst others, with the following:
- Private sector should apply the Good Hygienic Practices and Good Aquaculture Practices.
- They should apply the HACCP rules on their farm and retain all documentation.
- They should, amongst others, record information on product suppliers (feed and others), recipients, date of delivery, and product quantity or volume as well as evidence of the veterinarian medicines administered.
- They should keep a record of all movements of fish into or out of the farm, mortality, results of the risk-based animal health surveillance scheme.
- When transported, they should keep record of the mortality rate during transportation, any water exchange during transport.

4.4.5 Value chain support institutions

The following institutions provide support to the fish value chain, including fish exports and imports. They are all capable of meeting the required services in relation to tilapia value chain. However, they are limited largely in terms of logistics and manpower.

Table 21: Farmed tilapia value chain support institutions

Institution	Services offered
Fisheries commission	-fish production -fish processing -fish marketing -fish sanitary
Ghana Standards Authority	-fish health certification -fish traceability
Food and Drugs Authority	-fish traceability -fish products consumptions
Ministry of Trade and Industry	-innovation & technology (particularly on fish processing) -incentive regulations
Custom Excise and Preventive Service	-fish export and imports -examination of relevant documents related to imports
Ghana Export Promotion Authority	-promoting, coordinating & monitoring of fish export
Bank of Ghana	-monitor financial transactions of fish exporting companies
Food Research Institute	-fish processing
Water Resources Commission	-issue water use permit for aquaculture activities
Water Research Institute	-carry out scientific research on broodstock management, fingerlings production, water analysis and public advise on fish marketing

Institution	Services offered
Environmental Protection Agency	-environmental impact assessment
Federation of Association of Ghanaian Exporters	- promote the expansion and diversification of Ghanaian exports to foreign markets
Ghana Chamber of Commence	-local business promotion and trade opportunities including aquaculture

Source: own realisation

4.4.6 Level of commitments regarding quality

None of the tilapia producers in Ghana have laboratories to carry out detailed analyses on environmental and product quality. Tropo Farms, West African Fisheries and Sunwoo Culturing farms have probes to monitor basic environmental parameters (temperature, oxygen and PH). The Water Research Institute, Aquaculture Research and Development Centre, University of Ghana and other private laboratories carry out environmental analyses for aquaculture practitioners. The Environmental Protection Agency (EPA) demands environmental impact assessment before a permit is issued for fish farming.

Buyers of tilapia do not currently have any means to assess the quality of tilapia they buy from producers. There are no labels with the required information on tilapia being sold locally. The Fish Health Inspectorate Division of Fisheries Commission and the Food and Drugs Authority are tasked to ensure that tilapia consumed locally is of good quality. GSA usually carry out analyses of fishery products meant for export to the EU market and should be assisted to do the same if tilapia is to be exported. All the aforementioned institutions and producers are highly committed to ensure that tilapia meant for consumption are of the required quality.

4.4.7 Projects

A number of programmes and projects on fish value have been carried out in the past in Ghana whilst some are currently on-going. Table below shows some of the recent programmes and projects.

Table 22: Some Value Chain Projects

Programme/project	Year	Geographical area	Scope of intervention & major activities
West African Regional Fisheries Program in Ghana Project WARFP (Component 3)	2012-2017	Nationwide	-value chain development -fish product trade & information
NEPAD-FAO Fish Program (NFFP) supporting initiatives in the post harvest fish sector.	2014	Volta Lake	-post harvest losses
NORAD-FAO Project	2012	Nationwide	-value chain
The Agricultural Development and Value Chain Enhancement, USAID	2012	Nationwide	-grades & standards -value addition technologies -gender mainstreaming
USAID Integrated Coastal and Fisheries Governance Initiative for the Western Region, World Fish Centre	2011	Western Region	-fish smoking -fresh fish trade

Source: own realisation

4.4.8 Human skills

The aquaculture sector is limited due to a lack of skilled personnel. Water Research Institute is the only aquaculture research institute, although the universities also carry out research in aquaculture. There are about 30 aquaculture experts in the five (5) public universities offering training in aquaculture. There are no private aquaculture research institutions. The Fisheries Commission is in the process of establishing Post-Harvest Unit to coordinate value chain activities. There is a general lack of qualified aquaculture marketing personnel.

4.4.9 Conclusion

Farmed tilapia can be used to reduce poverty and hunger in Ghana. Currently the growing middle class of Ghanaians has a taste for farmed tilapia and there is a good and readily available market for all sizes of tilapia locally. These factors are a hindrance to farmed tilapia being exported to the European markets.

The aquaculture industry is booming but it is confronted with major challenges, *vis-a-vis*; poor standards, regulations, veterinary services, inadequate feed and seed supply and lack of skilled personnel.

It is important for Ghana's aquaculture sector to meet the EU acceptable quality requirements in order to export to EU markets. The marketing system (e.g. infrastructure, research, planning) is weak and must be improved for farmed tilapia. Moreover, farmed tilapia value chain institutions should play their roles effectively to enhance farmed tilapia trade with the regional and EU markets.

5 Recommendations

5.1 Recommendation 1: Single administrative entry point for the industry

The first recommendation concerns the completion of required documentation which is time and human resources consuming for the industry. The implementation of a single entry point for fish product exports with one dedicated person per case will ease and speed up the process of document acquisition.

With such a unique government interlocutor, the industry will save on human resources and costs and the government will improve the coordination among the various services and agencies involved within the fish export process. The industry in Canada has benefited greatly from such a system put in place several years ago.

Some synergy can be established with Recommendations 4 (online documentation center) and 5 (collaboration between institutions).

5.2 Recommendation 2: Ghana Product identification for the industry

The second recommendation is in relation to setting up a Ghanaian identification and distinctive label. Ghanaian products are traded under various brand names or under Ghanaian companies names but without any distinctive characteristics. Product identification and differentiation is fundamental for improving market penetration and recognition from consumers.

Ghanaian companies have to develop a common label with the Export Promotion Agency. The Export Promotion Authority should insist that the fish exporters discuss the following issues: goal, legal background, design, marketing, identification, visibility etc. Certification of the common label might be an issue to be examined with the GSA.

Beneficiaries will be all product importers and consumers, recognising the product straight away. The recommendation will attract investors and enlarge client base. Synergies with the Recommendation 4 (online documentation centre) will be possible.

5.3 Recommendation 3: Research and innovation centre for tuna fish chain

The third recommendation is regarding the lack of innovation both for product diversification and performance improvement that the tuna fish chain is suffering from. In Ghana, tuna is mostly canned whereas in other regions of the world, tuna is now caught by ultra-low freezing vessels and processed for high grade sashimi. One company has recently launched this technology in Ghana.

It now time for the private sector to follow the trend and to widen the markets. Value addition requires research and development activities. A joint research and innovation centre based on a public/private partnership should be set-up for example at the GTA, representing the tuna industry. A synergy with Recommendation 2 (common label) could also be demonstrated.

Furthermore, as tuna vessels are growing more and more sophisticated, they require more and more qualified personnel on board, another problematic issue as fishing masters or operating navigational instrument masters (etc.) are hard to find in Ghana. The center could fund the participation on training courses for pre-selected Ghanaian crew members either here, in Ghana (Regional Maritime University) or elsewhere. The center could propose a curriculum to the Regional Maritime University for a specifically designed course. This will prove sustainable for the region.

The beneficiaries will be the people involved with the development of the centre, which in turn will result in job creation for the new lines of products. In the tuna processing industry it is likely to be the women who will benefit from the jobs created. Finally, capacity building for the crew-members of the vessels should be observed.

5.4 Recommendation 4: Online documentation centre

This recommendation relates to the documentation, database, information, etc. on fisheries and fishery products that should be recorded and available online for general public purposes. The Fishery Commission or another institution should implement such an system. The online documentation centre should also provide information on export procedures and requirements as well as updated list of all exporters with detailed contact information.

This requires the collaboration between institutions and partner organisations (GEPA, NAFAG, etc) which will allow for easy and quick reference into the Ghanaian fishery sector.

The beneficiaries will not only be the general public but also specifically the private sector which will gain from global visibility on this comprehensive site as fish importers and investors.

Synergies with Recommendation 5 (collaboration between institutions) and Recommendation 1 (single entry point) will therefore facilitate the development of an online documentation centre and vise-versa.

5.5 Recommendation 5: More sanitary guarantees on the value chain for institutions and industry

This fifth recommendation concerns the public/private collaboration. A stronger collaboration between public institutions and between donor programmes in relation to fish quality and export should be enacted to bring more sanitary guarantees on the fish value chain. Areas of attention should be given to:

- The MoU between the CA and the Fisheries Commission should be ratified in relation to landing site monitoring. According to the traceability criteria set in the FPR, CA inspectors are currently monitoring some landing sites and canoes in terms of sanitary conditions where authorised canoes of approved establishments are berthing. However, local Fisheries Officers are better placed to be in charge of the landing site monitoring than CA inspectors as they regularly work on landing sites and have close working relationships with local fish authorities.

  Should Fisheries Officers need further training on sanitary aspects requested by the FPR at the landing site, training sessions by the CA Inspectors will be given. The WARFP may also bring further support to Fisheries Officers in these particular sanitary issues.

  The CA should be aware of landing sites currently rehabilitated by the WARFP (inland/coastal) and prioritise their recommendations for use to authorised canoes/establishments.

  Beneficiaries will be both establishments and CA as they will be able to give better guarantees on the quality their product. For the Fisheries Officers, the result will be further improving their capacity in the sanitary aspect. Impact at community level will provide a better environment for fish marketing to operate and in job creation.

- Current donor programmes (UNIDO, WB, FAO/TCP) working for fisheries and quality sector should increase their cooperation to inform each other of their objectives and their activities and to stay up-to-date of project progresses. To some extent, there is some overlapping in these sectors.

  Regular meetings (or roundtable, or workshops) to present each scope and results will enable project and institution to be more in line with industry needs.

  Although it is understood that one must look at capacity building for the whole country, it is sometimes more interesting to acquire competence in different sectors for better effectiveness for the country. These meetings will bring better coherence by their diversity.

5.6 Recommendation 6: Further capacity building for the GSA

This recommendation refers to the capacity building aspects. The following areas of the GSA should be considered in terms of further capacity building.

- Capacity building for the CA and standardisation: Additional support for training the CA inspectors should be given to build capacity in sub-freezing technology (-45°C to -60°C), recently launched in Ghana and to establish the standards. Also capacity building to new inspectors to perform all their training schedules and in the fish farming sector for the near future would be necessary.
- Testing capacity building in laboratories: Although delivery delays of results of histamine and heavy metals have improved since last year, the fishing industry still complains about it. The hindrance of analyses could compromise markets to be reached, and therefore, reduce Ghana's competiveness. Providing support for daily use, utensils and back-up equipment and supplying maintenance equipment activities will speed-up the delivery delay.
- Capacity building for certification and conformity assessment: Organising study tours to an accredited body for the GSA Divisions will be necessary to have an insight into the responsibilities and arising problems. Further strengthening in certifying products capacity for the Certification Division staff (canned products, MSC sustainable label) will be useful as only very few inspectors have been trained.

Beneficiaries of this recommendation will be GSA personnel but also fish exporters will benefit from a better service. This recommendation will facilitate Recommendations 3 (tuna research centre) and 7 (PAH testing equipment) et 8 (aquaculture public institution).

5.7 Recommendation 7: Equipment for PAH testing (GCMS/MS) and accreditation for the GSA

The seventh recommendation focuses on the PAH testing. For the support of the smoking sector, there is a need to equip GSA in PAH GCMS/MS (low detection limit) and to obtain accreditation and training. Such a recommendation is based also on the time needed to begin effectively running tests in the appropriate way. Not only will this equipment will be used for smoked fish analysis but also in a near future, when aquaculture products become ready to export to Europe, for pesticides residues monitoring and also veterinary residues (antibiotics, growth hormones) analysis from Ghana and the Western African neighbouring countries as well.

In the mean-time, in order to reduce the cost of PAH testing, smoked product samples could be sent to a nearby accredited laboratory in a neighbouring country such as

Benin[17], also approved by FVO to export fish products. It is therefore interesting to promote a regional laboratory rather than to send to Europe at an expensive cost.

However, for such an expensive investment it would be important to be cautious in respect of the assured use which for now, barely exist. Given the small number of approved Ghanaian smoking establishments (and small exports) - and not yet an exporting aquaculture sector that would benefit from it, it would not yet be worth the money invested. Therefore, UNIDO could look at this recommendation as a second priority when there is a sufficient demand emerging from the food industry or sufficient evidence that this need will be arising in a short period of time.

Beneficiaries of this recommendation will be GSA personnel but also Central Laboratory of Food Safety in Benin (LCSSAB) personnel and also smoking exporters.

Synergies will be found with Recommendations 8 and 9 related to aquaculture and will be facilitated by Recommendation 6 (capacity building for GSA).

5.8 Recommendation 8: Institutions capacity building to export aquaculture products (near future)

The eigth recommendation is related to the export capacity building. Capacity building of public institutions to export aquaculture products should be strengthened. Although aquaculture products are not yet being exported in Europe, some aquaculture producers might want to start soon. This requires public institutions to be ready to handle this and to be able to respond to the needs.

Given the acquired strengths of both Fisheries Commission and GSA/CA, some discussions between them in the presence of aquaculture supporting projects (WARFP and GNADP) should be formally initiated in order to set roles and distribute responsibilities. This will avoid both institutions acquiring similar capacities in exactly the same thing but rather in different areas related to aquaculture.

- In regards of aquaculture products export to Europe, matters that should be discussed are:
- Revising Aquaculture Products Regulations (from Aquaculture Regulations LI 1968 (2010).
- Strengthening growing-out techniques in aquaculture from hatcheries to fish farm.
- Expanding disease control of farmed fish, including use of veterinary medicines approved for Ghana and their labelling.
- Conducting similar monitoring of approved establishments for fishery products, aquaculture producers and/or feed producers.
- Running fish analysis (microbiology, heavy metals, and histamine) on local accredited laboratories.
- Undertaking Environmental contaminants monitoring, pesticide residue/veterinary medicines monitoring.

[17] Benin has received the support of the Belgian Technical Cooperation (BTC) together with UE to build a completely separate institution from the Fisheries Direction that acts as Competent Authority for the fishery exports to Europe (2010-2017), including a laboratory. The Central Laboratory of Food Safety in Benin (LCSSAB) is totally equipped. Currently, the laboratory is performing proficiency test with the French accreditation body COFRAC on several series of tests, among which PAH for smoked fish. There are hoping to get accredited at the end of the year 2014.

Beneficiaries of this recommendation will be the institution personnel who will have an increased knowledge and also the consumers, who will be assured they are eating safe products.

Synergies with the Recommendation 6 (capacity building for GSA) and Recommendation 9 (practical guide for aquaculture producers) can be demonstrated.

5.9 Recommendation 9: Practical guide for aquaculture exporters in terms of sanitary conditions (near future)

There is the need to develop a practical guide for aquaculture exporters by the relevant stakeholders. Aquaculture operators in Ghana should be trained and guided on how to export their products to the EU markets. Strengthening the capacity of personnel working on aquaculture farms is also required.

To be allowed to export aquaculture products in European Countries, aquaculture operators, authorised by Fisheries Commission, should be approved by the Competent Authority/FVO/DG SANCO.

In order to be approved, the producer and his qualified employees should be sure:

- To follow the Aquaculture Products Regulations.
- That their aquaculture location and premises conform to the sanitary conditions set in the Aquaculture Products Regulation.
- Their water is free of contaminants and pesticides / veterinary medicine residues.
- Aquaculture employees follow the Good Aquaculture Practices.
- To follow the Pre-Requisite training and apply the procedures.
- To apply procedures in the Quality Manual.
- To apply HACCP requirements and to document all evidence.
- Undertake regular analysis (own-checks) on fish, etc.

Beneficiaries of this recommendation will be the aquaculture farm personnel and aquaculture products consumers.

Close synergies with the Recommendation 8 (aquaculture public institution) and benefit of Recommendation 6 (GSA capacity building) have been recognised.

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Cornelius Adablah	WARFP (World Bank)	National Project Cordinator	cadablah@gmail.com	208128888
Comfort Adda	Development Action Association		-	
Universities				
George Wiafe	MESA - ECOWAS Coastal & Marine Resource Management	Director	wiafeg@gmail.com, wiafeg@ug.edu.gh	244657475
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Annex 2: Approved EU Establishments

Table 9: List of approved fishing vessels

VESSEL	CONTACT PERSON/ POSITION	PHONE NUMBER(S)	POSTAL ADDRESS	E-MAIL ADDRESS	PRODUCT(S)
BIG CATCH	SETH ATSU	0244228146	PMB COMMUNITY 1 TEMA		FROZEN FISH (TRAWLER)
LEGON FISHING	MR LUAN	0541820280	P. O. BOX 2610 TEMA-GHANA		FROZEN FISH (TRAWLER)
CLEAR SKIES	JOHN TETTEH	0244584539	P.O. BOX SC 171 TEMA-GHANA	clearskies111@yahoo.com	FROZEN TUNA
AFKO	MR BOATENG	0244160151	P.O. BOX 868 TEMA-GHANA	afko19782@yahoo.com	FROZEN TUNA
D-H FISHERIES	MR. DANSO	0244382186	P.O. BOX TT 531 TEMA NEWTOWN - GHANA		FROZEN TUNA
TRUST ALLIED	MR ARYEETEY	0208132660	P. O. BOX CO 1384 TEMA-GHANA	trustallied@yahoo.co.uk	FROZEN TUNA
RICO FISHERIES	MR. ADU GYAMFI	0243156086	P.O. BOX CO 2038 TEMA-GHANA	rico_fish@yahoo.cm	FROZEN TUNA
PANOFI CO. LTD	MR. FRANK AIHOON	0277474801	P.O. BOX TT 581 TEMA-GHANA		FROZEN TUNA
AGNES PARK	LEONARD	0249140012	P.O. BOX CO 1828 TEMA-GHANA		FROZEN TUNA
WORLD MARINE	MR ASEIDU	0244821016	P.O. BOX 8008 TEMA-GHANA		FROZEN TUNA
AFRIK SHANDONG	MR YU	0244088465 0203113565	P.O. BOX 1895 TEMA-GHANA		FROZEN FISH (TRAWLER)
YAW ADDO	EVANS	0243441106	P.O. BOX COD 3121 TEMA-GHANA	songjiliang@tom.com	FROZEN FISH (TRAWLER)
TTV	FELICIA	0501291880	P.O. BOX CE 11254 TEMA-GHANA	info.ttv@mwbrands.com	FROZEN TUNA
CONASH COMPANY LTD.	LOUIS	0244373917	P.O.BOX 5987, TEMA		FROZEN TUNA
IVONE	JERRY	0243755820	P.O. BOX CO 578 TEMA-GHANA	ivone.fishing@gmail.com	FROZEN FISH
G-L FISHERIES	MR BLANKSON	0208129647	P.O. BOX CE 11992 TEMA-GHANA	glfisheries@yahoo.com	FROZEN TUNA

Source : Competent Authority (GSA/ Fish Control Department)

Table 10: List of approved processing establishments

ESTABLISHMENT	CONTACT PERSON(S)	PHONE NUMBER(S)	POSTAL ADDRESS	E-MAIL ADDRESS	PRODUCT(S)
CONTINENTAL	MR. RA KESH MR. EMMANUEL OPPONG	0303-305709/O244096259	PMB C-1 TEMA	voltaseafood@voltaseafood.net	Fresh/frozen fish
KPONE LOBSTER	MR. IVAN DESUERE (MANAGING DIRECTOR)	0303-910407/0544353980	P.O. BOX AN 10509, ACCRA NORTH	info@kpone-lobster.com	Fresh/frozen fish/live lobster
PFC	MR. ALBERT (QUALITY ASSURANCE)	0303-205051/2	P.O. BOX 40, TEMA	info.pfc@mwbrands.com	Canned precooked tuna, canned raw packed tuna and pre-cooked frozen tuna loins
WEST AFRICA	MR. JAMES AKWETEY (MANAGING DIRECTOR)	027-552312/027-7550495	P.O. BOX TT 284 TEMA	N/A	Frozen Fish
CG ELMINA	MRS. LILIAN LISK EDGER KISK (DIRECTOR)	0303-200058/9 020-3413080	P.O.BOX CO 2610,TEMA		Fresh/frozen fish
MYROC FOODS	MR. EMMANUEL ASANTE (DIRECTOR) MR. MATHEW HORMENU (QUALITY ASSURANCE)	0303-206309 0303-206578 024-4572290	P.O. BOX 171, TEMA	myroc@ghana.com	Canned/pouched tuna
COSMO SEAFOODS	MR. CHRISTIAN DEDZO (QUALITY ASSURANCE)	0303-206101	P. O. BOX TT 581, TEMA	N/A	Canned Tuna
OCEAN PRODUCTS GHANA	MR. AMRISH (QUALITY ASSURANCE)	0543-423851	P. O. BOX 1632, ACCRA	oceanproductsghana@gmail.com	Fish oil from Tuna heads
ICHIBAN SEAFOODS CO. LTD.	MR. BENJAMIN (QUALITY ASSURANCE)	0243-863036	P. O. BOX TT 581, TEMA	N/A benkajowoode@yahoo.com	Frozen Tuna Loins
DZECKS HOTT CO. LTD.	MR. EMMANUEL (DIRECTOR)	0244-642081	P. O. BOX NT 166, ACCRA	N/A	Smoked fish
CIPOMAAH	MR. STEPHEN (QUALITY ASSURANCE) MS. ATTAAH	027-5025261 026-5962631	P.O. BOX 9685, KIA	~~N/A~~ snyarko2@yahoo.com	Smoked/salted dried fish
LIWON	MR. OSAE (DIRECTOR)	0303-205073/0243725968	PMB COMM1 POST OFFICE, TEMA	liwongh@yahoo.com	Smoked/salted dried fish
CAN & KAA	MR. EDMUND ASIEDU (QUALITY ASSURANCE)	024-4235786 0302-400746 0302-400663 024-4737633	P.O. BOX 15474, ACRA-NORTH	cankaa@ymail.com	Smoked fish
DAVAPI FARMS IMITED	MR. ASIAMA (QUALITY ASSURANCE)	024-8497755	P. O. BOX 372, KUMASI	~~N/A~~ davappif@gmail.com	Smoked fish
AFRICAN SMOKED FISH	MR. ONUMAH	0243-576455	P.O.BOX LG 618, LEGON ACCRA	www.africansmokedfish.com.	Smoked fish

Source : Competent Authority (GSA/ Fish Control Department)

Annex 3: Standards on Fish and Fishery Products

Table 11: Standards on fish and fishery products

Standard Numbers	Field
GS 174 : 1998	Packaging - Polystyrene Box for Fish Packaging
GS 233 : 1997	Fish and Fishery Products - Live Lobsters
GS 236 : 1997	Fish and Fishery Products - Quality Control systems
GS 305-4 : 1997	Fish and Fishery Products - Metallic Contaminants-Fish and Sea Foods
GS 361 : 2003	Quality Management Systems - Organic Farming
GS 568 : 2002	Fish and Fishery Products - Canned Fish
GS 675 : 2007	Spices and Condiments - Bouillon
GS 742 : 2003	Fish and Fishery Products - Lobsters - Frozen
GS 743 : 2003	Fish and Fishery Products - Finfish, Uneviscerated and Eviscerated
GS 744 : 2003	Fish and Fishery Products - Shrimps and Prawns - Frozen
GS 745 : 2003	Fish and Fishery Products - Dried Shark Fins
GS 746 : 2003	Fish and Fishery Products - Fish Fillet, Minced Fish
GS 747 : 2003	Fish and Fishery Products - Canned Sardine
GS 748 : 2003	Fish and Fishery Products - Canned Crab Meat
GS 749 : 2003	Fish and Fishery Products - Finfish - Canned
GS 750 : 2003	Fish and Fishery Products - Canned Salmon
GS 751 : 2003	Fish and Fishery Products - Fish Sticks, Fish Fingers
GS 752 : 2003	Fish and Fishery Products - Raw Squid
GS 753 : 2003	Fish and Fishery Products - Fish Fillets
GS 754 : 2003	Fish and Fishery Products - Shrimps and Prawns - Canned
GS 755 : 2003	Fish and Fishery Products - Salted Fish

Standard Numbers	Field
GS 929 : 2008	Fish and Fishery Products - Handling and Processing of Fish
GS CODEX STAN 94 : 1981	Fish and Fishery Products - Canned Sardine
GS FPR 1 : 2007	Fish and Fishery Products - Regulations
GS ISO 6887-3 : 2003	Microbiology - Food Animal Feeding Stuffs
GS ISO 6887-4 : 2003	Microbiology - Food and Animal Feeding Stuffs
GS CODEX STAN 119	Specification for Canned Finfish

Source : Standards Division, GSA

Annex 4: Hygienic conditions for the fishing vessels

Source: CA Fish Control and Export Project Department (extract)

General Hygienic Conditions application to Fishery Products (FP) on board all fishing vessels

1. **Conditions concerning construction and equipment**

A. The section of the vessels or the containers reserved for the storage of FP must not contain objects or products liable to transmit harmful properties or abnormal characterics to the foodstuff. These sections or containers must be designed as to allow them to be cleaned easily and to ensure that melt water cannot remain in contact with FP.

B. Equipment used for gutting, heading and the removal of fins and containers and equipment in contact with the FP must be made or coated with a material which is water proof, resistant to decay, smooth and easy to clean and disinfect.

2. **Conditions concerning use and maintenance**

A. When used, the section of the vessels or the containers reserved for the storage of FP must be completely cleaned and in particular must not be capable of being contaminated by the fuel used for the propulsion of the vessel or bilge water.

B. After the FP have been unloaded, the containers, equipment and section of the vessels that are directly in contact with the FP must be cleaned with drinking water or clean sea water.

3. **Conditions concerning use and maintenance**

A. The working decks, the equipment and the holds, tanks and containers shall be cleaned each time that they are used for this purpose. Disinfecting, the removal of insects or rats shall be carried out whenever necessary.

B. Cleaning products, disinfectants, insecticides and all potentially toxic substances shall be stored in locked premises or cupboards. Their use must not present any risk of contamination of the FP.

C. Storage of the fishing equipment on the deck.

4. **Conditions regarding handling and storage of FP on board**

A. Ice for chilling of FP must be used in such a way and in such quantities so that, by unloading of FP, they have still temperature of melting ice.

5. **Conditions concerning personnel**

Ship owners or their representatives shall take all the measures necessary to prevent persons liable to contaminant FP from working on board and handling them, until there is evidence that such persons can do so without risk.

(Point 1, CA has made mandatory fibre-glass lining if a wooden-box is used as fish container, and holes to allow melted-ice to be evacuated)

Annex 5: Questionnaires

I. Ghana Standards Board

UNIDO / TCB project phase II - Fishery Products Value Chain Analysis - February 2014

The TCB phase II has selected 4 value chains (fruits&vegetables, cocoa, wood, and fish) to be supported after a value chain assessment to identify the areas of interventions. And improvement of the quality of these key export value chains will to match the needs, expectations and requirements of exporters and consumers as well as those of the regulatory authorities in the local and export market.

A team of consultants is now there to carry out investigations of the Fishery Products Value Chain Analysis. Your assistance would be needed to answer these questions. Thanks very much in advance!

CA

- Any problems that you see arising in your work and for the 4 value chains that we could integrate in our report for UNIDO?
- The Amendment 2 is concerning the missing families that subjected to histamine but what does happen to this other remark found in the report of the FVO 2013 concerning the requirement missing equivalent to Article 5 of the Regulation (EC) no 852/2004 related to the HACCP in freezer vessels.
- What criteria do you use to control the small scale sector providing the establishment? Fish, fishermen, canoe?
- Have the consignment inspection form includes traceability information including batch numbers? (see certification)

Health certificate

- As for the health certificate, what sort of documents have to be checked by the documentary evaluation by the CA? And what is checked for the consignment inspection (testing, sampling) by the CA?
- What are the documents and evidences to be provided by the FBOs to the CA?
- At what stage are we after the EU ban on Ghanaian fishery products because lack of guarantees of the origin of the products (IUU) ? Action of the CF and the CA?
- Has the communication with the sub-region CA started? Evidences?
- Has the consignment inspection form includes now a batch number.?
- Do the FBOs provide correct information (correctly filled in catch certificate and bill of lading) to the CA?
- What happens to imported raw material being processed ? What inspection do you carry out?

Questions on the standards and regulations

1. What are the standards required at each step (input, production, processing, packing, storage, transport, export)?
2. What are the International regulations and standards (ISO standards, EU regulations, American Regulations, Private Standards) per categories (products

standards, process standards, management standards, private standards on quality, food safety, organic, social and environmental) enforced?
3. Is the GSA the national standardization body?
4. What the number of employees of the GSA? And under your division? Trainings and objects?
5. Law or decree that has enabled the creation of this institution?
6. Do you have technical committees to put in place those standards?
7. Expect fish exporters, what area is using the standards?
8. What is required for a fish product to export in Togo for example?
9. What projects are currently assisting you?
10. What interventions have you to tackle in this near future?
11. What are the constraints?

Question on certification structures

1. What are the certification structures required all along the value chain (accredited certification bodies for specific standards)?
2. What is the situation private certification (international), ISO standards for Certification required all along the value chain?
3. What are the other international standards related to certification (products standards, process standards, management standards, private standards on quality, food safety, organic, social and environmental)?
4. I read the Ghana Standards Authority is the West African Certification Body. Is it completed?
5. What are the Ghanaian standards related to certification ? Are you in charge of this also?
6. Is there a difference between following just the standards and being certified? Can you explain.
7. Which is the name and nationality of the structure that certified you and under which object of the certification?
8. What projects are currently assisting you?
9. Number of employees under the division. Training and object?
10. What interventions have you to tackle in this near future?
11. What are the constraints?

Questions about conformity assessment

1. What the conformity assessment is intended to do at each level in the value chain (input, production, processing, packing&labelling, transport, export)
2. Is it required for the local products as well or only those for export?
3. How are you working for each step?
4. Are you assessing the conformity of equipment for instance? What else?
5. Nb of employee in your division? Trainings?
6. What projects are currently assisting you?
7. What interventions have you to tackle in the near future?
8. What are the constraints?

Questions for the laboratories

I am sure that you have evolved on some points. Could I please know which one are solved?

Microbiology laboratory

- What are the main problems ? What the plans for the future?
- Still FAPAS / completely accredited?
- Next accreditation (after Oct. 2014) should be improved with Clostridium perfringens in water and FP should be put in the scope of accreditation with the EU reference method
- The analysis of Coliform bacteria, *E.Coli and faecal coliforms* in watershould be done with the right EU reference method
- In Enterococcus analysis, the GSA lab should put in the scope of accreditation the presence of S. faecalis, a reliable indicator, which they are already using *Listeria* should be put into the new scope for accreditation with the EU reference method.
- What is the weight of having a successful proficiency testing by FAPAS of the microbiology lab against accreditation? Is it accepted by the EU?
- How often/who is in charge should be the checks in external ice plant supplying primary production vessels supplying EU listed establishment?
- Confirm if the accreditation concerns all microbiology lab (2009 – 2014).

Histamine

- Still FAPAS / completely accredited?
- At what stage are we currently in for the histamine laboratory accreditation? When is the accreditation date foreseen?

What are the mains problems? What are the plans for the future?

Heavy metals

What are the mains problems? What are the plans for the future?

- Still FAPAS / completely accredited
- Still FAPAS / completely accredited
- The accreditation of heavy metals is it fulfilled yet? And when does it ends? If not, at what stage are we?
- Has the GSA carried out the analysis of inorganic tin in 2013? Is the analysis under the scope of accreditation in Ghana or performed by the EU lab?
- Is the Atomic Absorption Spectrophotometer repaired?
- PAH content is still done outside on the country? Are you thinking about accreditation for this one also? Discussion

Pesticide lab

Is the pesticide lab accredited?
Are you carrying on all of the Environmental Monitoring Programme or some analysis have to be carried out outside?

All of them

The FVO 2013 reported extended delays particularly in heavy metals and histamine analysis, delays that hamper the adequate actions from the CA / FBO.
As a result, several decisions have been taken:

- Samples from the CA and the FBOs will coming first on the list of priority.
- The lab staff will have extended working hours in order to deliver a result in time
- In case a timely results cannot be met, samples may be send to other approved laboratories certified by CA to get the result in time.

➔ Is it working? What are the mains problems? What are the plans for the future?

II. Private sector

Ghana Tuna Association

1. Company :
2. Products:
3. Species caught/used (%) :
4. Quality management system / food safety: (names)
5. Number of employees :
6. Total annual input :
7. Value-added (production x price – intermediary consumption) per year:
8. Degree of exportation :
9. Capacity utilisation:
10. Production system (industrial tuna, inshore, canoe, imports) (%) :
11. For the vessels (nb pole and hook/ nb purse seiners) (meters):
12. Types of Input:
    a. Local/regional:
    b. Outside:
    c. Certified (names)
13. Production (tons per year):
14. Importing to process (tons a year)
15. Processing (tons per year) :
    a. Process (what is certified):
16. Assembling materials (packaging/packing/labelling) :
    a. Certified : (what)
17. Transport (refrigerated truck/ refrigerated container / vessels/ others specify)
    a. How?
    b. Own?
    c. How many?
    d. Capacity each? (approximate)
18. Storage :
    a. Overall capacity?
    b. Chill room? (nb)
    c. Cold room? (nb)

19. Exports of 5 last year (2008 – 2013) per species/products
20. Exporting to where? (specify countries)
21. Clients : (indicate the proportion)
    a. Wholesalers
    b. Retailers
    c. Processing companies
    d. Distributors:
22. Testing / analysis
    a. Internal lab (what lab)
    b. GSA lab (how many analysis per year)
    c. Oustide lab (specify the countries)
23. Plan for near future:
24. Overall PROBLEMS (explain).

Smoked Fish

1. Is the owner of the company Ghanaian or foreign?
2. Name of the species you are interested in : marine and inland fish.
3. What are the type of vessels you get your fish from?
4. Are you relying on the imports? If yes, what species? When? Percentage of the total fish you get?
5 Average export quantity last year (2013)
6 Do you sell locally or regional (if yes, what percentage of the total production)?
7. Average price you are selling smoked fish to the export per ton/kg?
8. Processing capacity
9. Number of people working for you
10. What do you do with your waste?
11. Who is your main competitor
12. How much do you pay a year for your own checks all included (test)? (rough estimate)
13. What are your constraints?