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QUALITY ASSURANCE REQUIREMENTS FOR FISH MARKETS IN THE GAMBIA

Isatou Tamba
Fisheries department, Gambia
6, Marina Parade, Banjul.
tambaisatou@yahoo.com

Supervisor:

Margeir Gissurarson (margeir@matís.is),
Matis
Vindlansleid 12, 113 Reykjavik, Iceland

ABSTRACT

In The Gambia, majority of fish from various landing sites are sold through fish markets, especially in Brikama which is one of the largest fish market in Gambia. Most fish that is intended for export are handled by the market. For securing the safety and quality of the fish sold at the fish market, it is necessary to have a quality management program in place. This study sought to increase the awareness of food safety in the Gambia through improved fish handling, quality, and safety of the fish product. Existing methods of fish handling in The Gambia were reviewed in consideration of the techniques used in the Icelandic fish market and how they could be applied in The Gambia. The research recommended improvement in fish handling, environmental hygiene, hygienic production of food sources, handling, storage and transport, pest control, cleaning, maintenance, and personnel hygiene to improve the quality of fish products, increasing nutritional value to consumers and profitability for the fish vendors.

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1. INTRODUCTION

The Gambia (Figure 1) is located in the highly productive up-welling zone of the Canary Current Large Marine Ecosystem (CCLME). Seasonal upwelling's and the flow of nutrients from the River Gambia (an estuary that attracts marine fish for feeding and spawning purposes) make the marine waters a highly productive area with rich fisheries resources, including both pelagic and demersal species.



Figure 1: Map of the Republic of the Gambia

With a population estimated at 1,700,000 inhabitants, The Gambia has one of the highest population densities on the continent. Fish is the principal source of animal protein with estimated average per capita fish consumption for the period 1994 to 2007 increasing from nearly 25 kg per person to about 28 kg per person within the urban and peri-urban growth areas. This represents about 40 to 50% animal protein intake. Fish also contribute 5% of the GDP and employs over 200,000 of the population (Jushua, 2015).

Fisheries potential to contribute to efforts aimed at reducing poverty and improving food security is however limited by inadequate fisheries infrastructure and facilities for handling, processing and storage as well as institutional capacity and private sector involvement. Furthermore, heavy reliance on external trade and foreign investment limited growth and the quest to alleviate poverty and address food security.

Recent estimates show that of over 90% of the raw fish material processed and exported from the Gambia originating from the artisanal fishery segments provides strong basis for promoting development of artisanal fisheries. Currently only 2% of total artisanal production potential is exported. This has been depicted in the current low volume of export of fish from the country.

Figure 2 shows the fishery production in The Gambia from 1998 to 2010. The figure shows that the main volume is coming from artisanal fisheries. Data on fisheries in The Gambia from 2010 easily accessible.

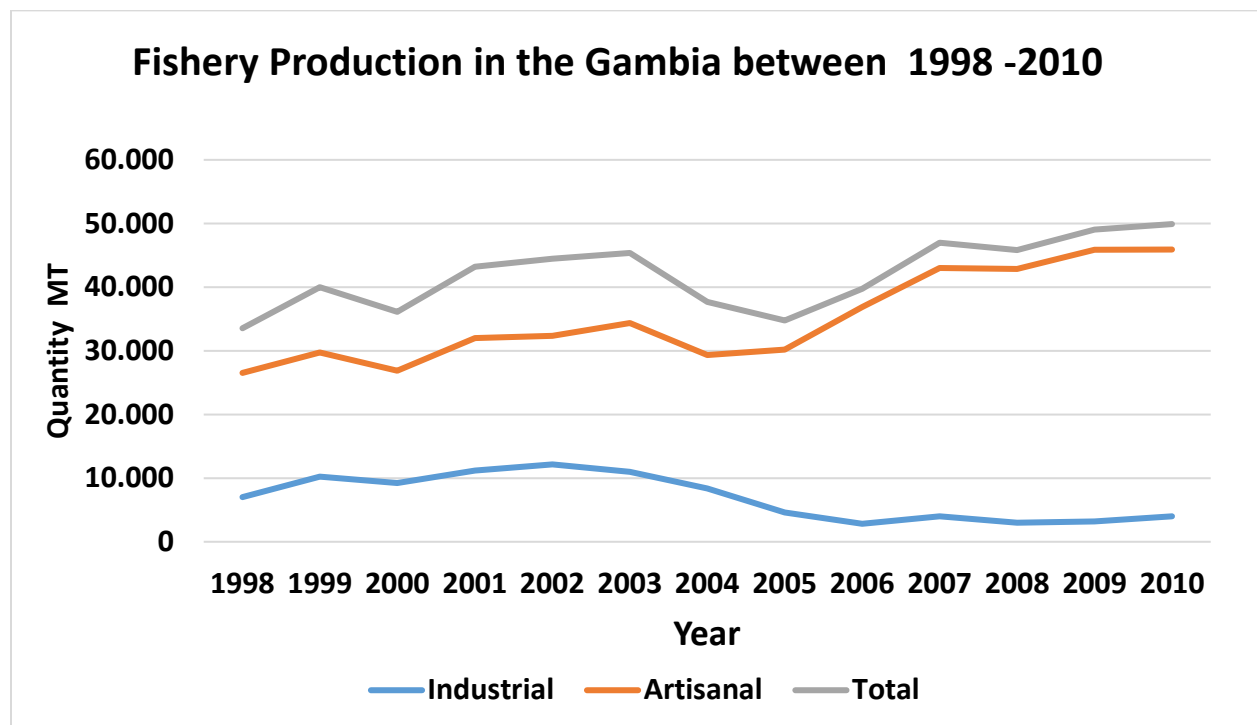


Figure 2; Fishery production in the Gambia 1998-2010

Government Strategic Action Plan for promoting the fisheries sector has thus identified major development needs for fisheries infrastructure, capacity development and creation of sustainable financing mechanism for the fisheries sector. Such development is expected to not only boost productivity but also create possibility for reducing staggering 40% of the total industrial fishing operations not landing or being processed in The Gambia (National Nutrition Agency, 2011).

The current development policy is based on the following fundamental objective: maximize the economic and social benefits that the country can draw from rational exploitation of fishery resources in its Exclusive Economic Zone (EEZ).

To attain that objective, the following priorities were defined: (i) increase employment possibilities in the sector; (ii) create and enable environment for the development of the national catch capacity and the private sector's ability to process and market seafood; (iii) attract foreign aid with which to develop the sector; and (iv) rationally manage the sector in general and fishery resources in particular.

Constraints to Fisheries Development despite considerable effort by the Government of the Gambia (with the support of development partners), the fishing sector is hampered by major

bottlenecks especially regarding surveillance, resource management and Illegal, Unreported and Unregulated fishing (IUU) (Department of Fisheries, 2007).

The policy, legal and management framework for fisheries in The Gambia is provided by: Fisheries Policy (2007 prepared with FAO support), 2007 Fisheries Act, 2008 Fisheries Regulations Fisheries Strategy (drafted and also prepared with FAO support), and 2009 Fisheries Management Plan for shrimp, sardinella, sole fish and catfish.

The fisheries sector is divided into two production sub-sectors, the artisanal and industrial components, although the two are inter-related at the processing level. Fishing is a multipurpose activity with a host of ancillary socio-economic activities. These activities range from boatbuilding, fish processing, fish retailing to market vending.

1.1 Artisanal fisheries

The artisanal sub-sector revolves around the use of small fishing craft, consisting mainly of a fleet of 1,785 canoes operating in both the marine and the River Gambia. The fisheries frame survey results revealed that over 200 000 people depend directly or indirectly on artisanal fisheries and its related activities for their livelihoods. The sub-sector provides direct employment to 6,104 fishermen (1,410 head fishermen and 4,694 assistant fishermen). Out of the 1,410 head fishermen, 805 were Gambians and 605 foreigners (UNCTAD, 2014)

The sub-sector is the major supplier of fish for the Gambian population and a source of fish for the fish processing establishments in the Gambia. The bulk of fish exports from the Gambia can be traced back to the artisanal sub-sector. This is because, if not all, most industrial fishing vessels are foreign owned and do not land their catch for processing and marketing in the Gambia.

1.2 Industrial fisheries

The industrial sub-sector is characterized by high capital investment and limited to the marine area while the artisanal fishery is dispersed and characterized by low capital investment and labor intensive activities.

The development of industrial fisheries has been relatively limited in the Gambia. Majority of the industrial fishing vessels operating in Gambian waters are foreign owned. These vessels land their catches in foreign ports where the fish is processed, packaged and labeled as products originating from those foreign ports. There are many locally registered fishing companies operating in The Gambia. However, only 9 companies have so far managed to invest in fish processing factories. Four of which have now been certified to process and export to EU countries. All these companies do not have their own fishing vessels. They depend solely on artisanal fish supplies (Department of Fisheries, 2006)

Fish processing in Gambia are conducted without following the quality standard for fish processing. Most of the fish from various fishing grounds and landing sites are sold in the fish market, specially Brikama which is one of the largest fish market in Gambia. A lot of people from different towns and villages meet to purchase their fish for various requirements such as business

and home consumption, some of the fish are processed at the market in chilled, frozen or in traditional method of processing such as splitting, gutting, frying and grinding are commonly applied. Due to poor preservation facilities and the fishers and fish processors lack of knowledge on quality issues the presence of post-harvest fish loss is high.

Pelagic fish are the dominating catch of the artisanal fishery (UNCTAD, 2014). Gear used in the pelagic fishery includes surround gillnets and purse seine nets and the main species that are caught are shads (Bonga), sardinella, anchovies, mackerel, catfish, barracuda and jacks. Demersal species are caught by artisanal fishermen using set/bottom gillnets, drift nets, traps, and hook and line. Various species of croakers, sole fish, cuttlefish, thread fish, grunts and groupers are captured with these fishing gears. Stow nets and drift nets (fele-fele) are especially used by artisanal fishermen for catching shrimp.

A survey conducted by the Japanese International cooperation Agency (JICA) in 2010 shows that almost 60% of the population of Brikama and the surrounding wants to have their fish fresh or frozen, therefore a proper storage facility was established within Brikama fish market which is located in center of Brikama west coast Region of the Gambia. The market is enrolled with more than 390 people. Brikama fish market is the major market of selling fresh fish, as about 40% of the annual artisanal catch is marketed and consumed fresh and/or smoke according (Njai, 2000) fresh products are either chilled or frozen. The main frozen or chilled fish sold in the markets are Barracuda, Bonga, catfish shark, Red tilapia, (Horse mackerel) and longneck croacker (*Pseudolithus brachynathus*) sole fish and sardinellas. However, studies have shown that the low levels of technical know-how in proper storage techniques, such as proper chilling of fishery product is more problem for fish retailers, that led to post harvest losses which are estimated to be around 20 - 30%.

With regard to fish marketing, about 60 percent of fishermen sell fish catches through Banabanas (fish dealers) and 31 percent sell directly to consumers (Department of Fisheries, 2006). The rest is sold through auctions. The artisanal fish catch is either sold in fresh state for daily consumption among the local coastal communities, but the bulk is for processing (drying and smoking). Fresh fish is transported and marketed in major towns and villages in the interior. Post-harvest losses are high due to a combination of oversupply, lack of preservation and lack of markets. Another issue is the high proportion of juveniles that are caught and sold at all landing sites

It is an established principle that the ultimate way to fish marketing and processing is the production and consistent assurance of quality standards. This requires the setting up of a quality system and management of quality. The market operators are aware of this as a prerequisite to success and the need for competitiveness and customer satisfaction. Thus, the quality assurance system of the fish markets will be based on a quality management system responsive to the requirements of the costumers and the consumers.

Establishing a Quality Management System (QMS) for the fish markets it is fundamental to compile a quality manual that includes work- and monitoring procedures to be carried out at the market to secure the safety and quality of the fish received and delivered at the market.

1.3 The fish markets

There are two major fish markets in the Gambia which were constructed through development assistance. Concentration will be mainly on Brikama fish market

Brikama Fish Market constructed by JICA

The Japanese Government in 2008 provided a grant-in-aid to The Gambia Government at a tune of US\$5.67 million for the construction of fresh fish retail market at Brikama Town, Western Region, which already started operations in March 2010. The operation of the market greatly improved the marketing, preservation and distribution of fish and fishery products in the Western Region. It also created employment opportunities and increase incomes of the beneficiaries. The facilities at the market hall include retail tables, Office space, Fish and Ice handling yard, Ice making machine/Ice storage (5 tons each) Chilled room (5 tons), Standby generator, Water treatment system, Water supply system, Public toilets, Security Guards room and cleaning staff booth, Elevated Water Tank Tower, Garbage Depots



Figure 3: Brikama fish market

2. OBJECTIVE

The main objective is to increase food security in Gambia through improved fish handling, quality and safety of fish.

The specific objective is to identify the hygienic requirements that need to be met at the fish markets in Gambia in order to deliver safe fish product and of acceptable quality.

3. SAFETY AND QUALITY OF FISHERY PRODUCTS

An effective national food (fish) control system is essential to protect the health and safety of consumers. Therefore, it is important in assuring that food (fish) conform to national requirement. It is an obligation on all actors along the value chain to implement and enforce risk based food

control strategies. Consumers are increasingly taking keener interest in the way food (fish) is produced, processed and marketed and are increasingly relying on national government to take more responsibility for food safety and protection of consumers (Ryder, Karunasagar, & Ababouch, 2014).

Food safety and quality control programs have been based on establishing effective hygiene control and monitoring performance. In the past, confirmation of safety and quality was achieved by end-product testing. Control of hygiene was by inspection of facilities to assess adherence to established and generally accepted codes of good hygiene practice (GHP) and of good manufacturing practice (GMP). Codes of GHP/GMP and inspection of facilities and operations are still the basis of food hygiene (Ryder, Karunasagar, & Ababouch, 2014)

GMP should cover every point of production from the starting materials, premises and equipment to the training and personal hygiene of staff. Detailed, Adequate procedures should be essential for each process that could affect the quality of the finished product. There must be systems to provide documented proof that correct procedures are consistently followed (ISPE, 2017).

Food safety is a major issue in food handling and processing because of its health and economical importance. Regulatory authorities and food handlers and processors are making efforts to improve the hygienic quality of food. The control mechanism for production of safe food is directed to safe production systems from the final product control. Based on this principle, prerequisite programs are the basic principles applied to maintain the certainty of safety in the final product.

4. PREREQUISITE PROGRAMS

Prerequisite programs are procedures that includes GMPs and GHPs in a food facility, which control the operation condition within the food establishment and promote environment conditions that are favorable to produce safe food. The prerequisite program is the foundation of a food safety system in any food establishment.

Certain programs and activities are required and must be in place if a HACCP program is to be effectively implemented. In this chapter, I will introduce the prerequisite programs, with emphasis on the Good Manufacturing Practices for the fish markets in The Gambia.

As a large proportion of spoilage in fish establishment is caused by contaminated fish and seafood during handling, processing or distribution, either from handlers, equipment, the surrounding environment or other sources such as cleaning water or ice, it is important to monitor the above mention items for contamination.

To prevent this contamination from occurring, GHPs should be applied at all stages of handling, processing, storage and distribution. The requirements for hygienic practices constitute the prerequisite programs that are essential for any food operation.

The basis for developing and implementing GHPs are the Codex Recommended International Code of Practice – General Principles of Food Hygiene (CAC, 2003), and the Codex Code of Practice for Fish and Fishery Products (Codex, 2008).

This chapter will concentrate mostly on requirements for primary production as fish markets are mainly primary producers. The fish market should concentrate mostly on the prerequisite requirements to secure the safety of fish going through the market. The requirement for primary production will be shown below and compared to the fish market in Brikama. The main objective is the prevention of contamination, pest, diseases from environment adopting different hygienic restriction. The requirement for a safe primary production include the following steps.

4.1. Environmental Hygiene

Potential sources of contamination from the environment should be considered. Food production should not be carried on in areas where potential contamination can occur in the food. The potential effects of primary production activities on the safety and suitability of food should be considered at all times. In particular, this includes identifying any specific points in such activities where a high probability of contamination may exist and taking specific measures to minimize those probabilities, such as,

- the control of contamination from air, soil, water, feedstuffs, fertilizers (including natural fertilizers), pesticides, or any other agent used in primary production;
- the control plant and animal health
- the protection of food sources from faecal and other contamination.

In particular, care should be taken to manage wastes, and store harmful substances appropriately. Brikama Fish Market is designed to provide a market for handling fresh fish as fresh food products. In the viewpoint of retaining the freshness of fish and maintaining hygienic condition, the facilities and equipment at the market should be designed taking account of the subtropical climate where temperatures is very high.

Heavy rainfall during the rainy season is likely to flood the roads around the Project site. Puddles and muddy patches are also created in the alleys of the Brikama Market due to inadequate drainage facilities.

Current situation and way forward

Brikama fish market is located in the centre of a town, west coast region, where the potential environmental risk of contamination is high. The fish market is surrounded by many business centres such as shops, petrol station, vegetable store and retail activities using simple building and wooden mobile stall. The area is surrounded with a public drainage, which is not properly constructed therefore causing overflowing of waste water to the fish market.

The fish market should be located away from environment polluted area and activities and area prone to infestation. The fish market should be in an area where waste can be removed effectively.

Government should implement an environmental monitoring program for the fish market to ensure a proper waste management system is put in place.

Taking these conditions into account, rainwater on the market area should be pumped out within the market site, and all market facilities and equipment should be designed to enable the smooth operation of the market without being hampered by rainwater. In addition, how to avoid the damage by lightning frequently arising with rainfall should also be taken into consideration when designing the facilities and equipment.

The hot and humid weather during the rainy season and the salty west wind from the Atlantic are also conditions to bear in mind; anti-corrosion measures need to be implemented when using metallic materials, such as steel, for the fish market facilities and equipment. Equally, measures should be taken to prevent termite from infesting wooden materials.

When considering the installation of skylights for sun control and natural illumination, it must be ensured in the design process that water leakage and other hazards will not be induced by the design.

4.2 Hygienic production of food sources

The potential effects of primary production activities on the safety and suitability of food should be considered at all times. In particular, this includes identifying any specific points in such activities where a high probability of contamination may exist and taking specific measures to minimize that probability.

Producers should as far as practicable implement measures to:

- control contamination from air, soil, water, feedstuffs, fertilizers (including natural fertilizers), pesticides, veterinary drugs or any other agent used in primary production;
- control plant and animal health so that it does not pose a threat to human health through food consumption, or adversely affect the suitability of the product; and
- protect food sources from faecal and other contamination.

In particular, care should be taken to manage wastes, and store harmful substances appropriately.

Current Situation and way forward

The fish market facility should have an adequate drainage and waste disposal system. They should be designed and constructed so that the risk of contaminating the fish or the potable water supply is avoided.

Waste collection is a concern to the fish market because the market is relying on the Municipal Council for collecting the waste, and if the council is not available the waste will be accumulated which can cause contamination to the fish product. There is a poorly constructed drainage system which surround the fish market premises and always cause flooding of waste water to various part of the fish market.

Suitable provision must be made for the removal and storage of waste as well as a properly constructed drainage system to ensure a safe fish handling system within the fish market. Waste must not be allowed to accumulate in fish handling, fish storage, and other working areas and the

adjoining environment except so far as is unavoidable for the proper functioning of the facility. Waste stores must be kept appropriately clean.

4.3. Handling, Storage and Transport

The following procedures should be in place:

- Sorting food and food ingredients to segregate material which is evidently unfit for human consumption
- to dispose of any rejected material in a hygienic manner
- to protect food and food ingredients from contamination by pests, or by chemical, physical or microbiological contaminants or other objectionable substances during handling, storage and transport.

Care should be taken to prevent, deterioration and spoilage through appropriate control of Temperature and humidity.

Current situation and way forward

Fish retailers preserve their fresh fish in baskets, which are woven with date palm leaves, or in plastic buckets, and they take fish out of such containers and display them on their stalls as sales progress. These containers do not have lids and are rather unhygienic with swarming flies around them. In addition, these containers are not insulated, and the temperature of stored fish therefore rises, deteriorating the freshness quickly. Furthermore, woven baskets are cheap to buy but because they are not waterproof, their durability deteriorates quickly and is thus not ideal for repeated use, making them a source of waste.

Fish transported to Brikama Market are put in woven baskets at the landing sites and transported by trucks or by buses to the market. The fish are then sorted by handlers at the fish handling area and taken to their stalls. The fish handling area is a facility necessary for accepting fresh fish into the market and it is located adjacent to the parking space for transport vehicles. The area is designed to provide adequate space for facilitating fish handling operations efficiently and rationally.

It is important that the temperature of fish is kept low by using ice to prevent large quantities of fish from being damaged along the handling process and to improve the quality of fish products. The fish market should have adequate cooling, refrigerating, and freezing facility for storing refrigerated or frozen fish. There should be an adequate monitoring of temperature and control of the ambient temperature to ensure the safety and suitability of the fish.

4.4 Pest control

Pest control system is a method of getting rid of insects and small rodents by removing, attacking, setting up barriers that will prevent further destruction of one's product, or forcing insect infestations to become visual. Pest infestations can occur where there are breeding sites and a supply of food.

Proper waste management and drainage of still water, will eliminate the breeding ground of many pests. Garbage provides food and shelter for many unwanted organisms, as well as an area where still water might collect and be used as a breeding ground by flies, mosquitoes and cockroaches. Rodents and insects carry pathogenic bacteria both internally and on their bodies. Birds sometimes may become a problem in food processing area and pose a potential public health hazard.

Current situation and way forward

There is no pest control program in the fish market and pests of primary concern are insects and rodents and they can easily spread disease through fish. The availability of fish and water encourages pest harborage and infestation in the fish market. Fish should be stored in pest-proof containers and/or stacked above the ground and away from walls. Establishments and surrounding areas should be regularly examined for evidence of infestation. Pest infestations should be dealt with immediately and without adversely affecting food safety or suitability. Treatment with chemical, physical or biological agents should be carried out without posing a threat to the safety or suitability of fish.

The fish markets always destroy pest by using chemical however, pests should be controlled without chemicals if feasible, because of the potential danger of pesticides. But these techniques are not always as effective as it should be. Therefore, it is necessary to use pesticides. The best method for the control of insect infestation centers on good sanitation with the use of pesticides under the supervision of a licensed operator. An integrated chemical control and sanitary practices can be more effective. Open drainage and gutter are ample breeding ground for various pests as well. By building and maintaining a proper drainage system, this problem is eliminated. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides.

Buildings should be kept in good repair and condition to prevent pest access and to eliminate potential breeding sites. Holes, drains and other places where pests are likely to gain access should be kept sealed. Wire mesh screens, open windows, doors and ventilators, will reduce the problem of pest entry. Animals should, wherever possible, be excluded from the grounds of facility. The fish market facility should have a properly constructed drainage and waste disposal systems and they should be designed and constructed so that the risk of contamination is minimized.

4.5 Cleaning, maintenance and personnel hygiene

Procedures and work instructions should exist to demonstrate an adequate level of maintenance of an establishment as well as efficient practices for cleaning, waste management, and pest control. Overall, these operations will support the ongoing control of potential food hazards that may contaminate fish. Adequate measures need to be in place to ensure that food handlers do not contaminate food. This objective can be attained by maintaining an appropriate level of personal cleanliness and following guidelines for personal hygiene.

Appropriate facilities and procedures should be in place for the fish market ensure that:

- Necessary cleaning and maintenance is carried out effectively

- An appropriate degree of personal hygiene is maintained

Current Situation and way forward

The fish market should put in place working procedures and instructions to demonstrate and ensure an adequate level of maintenance as well as efficient practices for cleaning, waste management, and pest control. These will support the control of potential risk that may contaminate the fish. Adequate measures need to be emphasized to ensure that fish handlers do not contaminate the fish.

In order to achieve this objective, it is necessary to maintain an adequate level of personal cleanliness by following guidelines for personal hygiene. Appropriate facilities and procedures should be in place for the fish market to ensure that cleaning and maintenance is carried out effectively and also appropriate degree of personal hygiene is maintained

The fish market has established a suitable cleaning procedure in the market. Cleaning is effectively done both morning and afternoon. After any operation in the market the cleaners must do a routine cleaning process. They should clean the whole market before the next session starts.

4.6 Training

Food hygiene training is fundamentally important. All personnel should be aware of their role and responsibility in protecting food from contamination or deterioration. Food handlers should have the necessary knowledge and skills to enable them to handle food hygienically. Those who handle strong cleaning chemicals or other potentially hazardous chemicals should be instructed in safe handling techniques.

Factors to take into account in assessing the level of training required include:

- the nature of the food, in particular its ability to sustain growth of pathogenic or spoilage micro-organisms
- the manner in which the food is handled and packed, including the probability of contamination
- the extent and nature of processing or further preparation before final consumption
- the conditions under which the food will be stored
- the expected length of time before consumption.

Current Situation and way forward

Training is important to any food hygiene system. Inadequate hygiene training, and/or instruction and supervision of all people involved in fish handling activities in the fish market can pose a potential threat to the safety of fish and its suitability for consumption.

Those engaged in fish handling operations that come directly or indirectly in contact with food should be trained in food hygiene to a level appropriate to the operations they are doing. All workers should be aware of their role and responsibility in protecting fish from contamination. Fish handlers should have the knowledge and skills to enable them to handle fish hygienically.

Those who handle strong cleaning chemicals or other potentially hazardous chemicals should be instructed in safe handling techniques.

Training programs should be considerate in the fish market. Worker should be trained to be aware of the potential growth of pathogenic or spoilage in the fish product as well as the manner fish is handle and the condition the fish will be stored.

Training programs should be routinely reviewed and updated. The market authorities should put a system in place to ensure that fish handlers remain aware of all procedures necessary to maintain the safety and suitability of fish products. The market authorities should put some periodic assessments of the effectiveness of training and instruction programs, as well as routine supervision and check to ensure that procedures are being carried out effectively. Managers and supervisors of fish market should have the necessary knowledge of food hygiene principles and practices to be able to judge potential risks and act to remedy deficiencies.

5. QUALITY MANAGEMENT SYSTEM

Quality management system is a system that requires all fish processing facility to develop and implement a proper QMP and GMP. It is a mandate for all establishment processing fish to be registered with the Government, and to become a registered fish processor is legally required to develop and implement a QMS of the facility following the QMP standard and submit it to the department of fisheries for review and acceptance and apply it to the processing operation.

The quality management system using the GMP ensure a safe food production and provide a high level of assurance that fish product as safe to eat. According to (Nordenskjold, 2012) a quality management system increases the security and safety for employees and management of the company applying it. The reason for this is that responsibilities and authorities are more visible, and that documentation of procedures has been developed. This leads to employees and management getting an increased consciousness of the demands on the products, production and activity of the company.

The advantage of certifying your food production is that business-to-business relations are improved. An implementation of a standard is a way to keep existing customers, in cases where a certificate is a request from the customer. It is also a way for the company to establish new contacts on other markets. The credibility of the company is improved by a certificate as well as the communication with their stakeholders. According to Nordenskjold, 2012, the main advantage of certifying a food production is the competitive advantage. Other supplies may not apply a quality management system and retailers often look for supplies with certification. Certifying a food safety in a food facility is important for the facility personnel to be trained professionals in the field of corrections and approved methods of food production, preparation, storage and quality testing. The professional is trained to deliver hygienic and healthy food following the correct and approved procedures to the public.

Certification is required by most important European retailer of suppliers included in their supply chain (Nordenskjold, 2012). If a supplier is not certified it is a competitive disadvantage. If a business is certified it proves commitment to producing safe food. In case defense in frames of due

diligence is provided. The certificate also enables the supplier to create and control a proper management system capable of helping the business to meet the food quality and safety requirement as well as legal compliance, especially regarding the food legislation applied in the countries where the finished product is consumed. A certified supplier can continuously develop its safety performance by improving key feature in the process. It also helps reduce product waste, product recall and reprocessing. According to (Nordenskjold, 2012) using the same method and ways of interpretation will make the work with system of quality management easier.

5.1 Implementing quality management system

Implementing a quality management system is a good way of ensuring the quality and hygiene of food production and it also increases the traceability of food product through the whole food chain. Food safety standard provides a method for preventing problems and crises and it can also help to handle requirements from authorities, the markets and others. The main purpose of food safety standard is to provide consumers with safe food (Nordenskjold, 2012) The quality of foods is often associated with the sensory, nutritional and economic aspect of food (Nordenskjold, 2012). But it is much more than that. The quality of food is also correlated to the product safety, for example the guarantee the producers gives to the consumers that the food is safe and will not cause any sickness or harm.

6. QUALITY AND FISH/FOOD SAFETY CONTROL SYSTEM

The most important aspect of fish/food control will be to enforce the food law(s) protecting the consumer against unsafe, impure and fraudulently presented food by prohibiting the sale of fish/food product, not of the nature, substance or quality demanded by the purchaser, but confidence in the food safety and chain of the food supply is an important requirement for consumers. Foodborne disease outbreaks involving contaminants, and problems within food safety will increase public anxiety food chain.

Food hazard control and prevention strategies ensure every food processed is safe and processed in hygienic conditions regarding quality inspection systems/manuals as an axiomatic part of all such efforts. To reinforce this point, requirements for food safety and hygienic processing are found in many food regulations or manuals promulgated by individual countries and food authorities (EU, 1991). Some food processing and marketing do not provide adequate safeguards for public health. Factors which will contribute to potential hazards in fish/foods include improper food safety practices. Poor hygiene at all stages of the food chain, lack of preventive controls in fish/food processing, preparation and operations, contaminated raw materials, ingredients and even water, and improper storage in the market contributes to major post-harvest losses which can be prevented if there is proper food control system.

6.1 Inadequate food safety management in fish markets

In the Brikama fish market in The Gambia there is no proper practicing of food safety management system. The fish market is operating under substandard hygienic conditions. The basic hygiene and good manufacturing practice are already in the regulations, but these are not applied effectively because there is no management system to control the prerequisite program.

Consequently, quality/inspection is limited to end product testing. The competent authority is not able to control and monitor production operations of the fish market. Corrective actions cannot be implemented at the right time. Fish is being processed under substandard hygienic conditions. Thus, the seafood is subjected to the element of risks and hazards. Lack of food safety management could affect the fish markets in the Gambia. The cause of the problem is shown in the next chapter below.

6.2 Main cause of inadequate fish safety management in fish markets

Ineffective fish quality system is identified as the main cause due to improper handling of fish from landing site. Most of the fisherman do not take ice during their fishing trips and the utensils used for fetching fish from the fishing canoes are source of contamination. There is a problem in the fish chain that needs to be addressed, and the implementation of quality management system must be observed to meet the EU regulation. With a proper quality management system in place, the authorities will ensure that there will be proper food safety for the consumer. The Department of Fisheries and water Resources (DOFWR) is responsible for enforcing the quality management system in fish facilities but as some of the facility offices were not reporting to the DOFWR and hence not following the instructions of the prerequisite program regarding hygiene and handling of fish the DOFWR were not responding to deviations.

Although Gambia fish regulation is governed by the fisheries regulation from 1995 and it is harmonized with the EU requirements and its implementation has undergone major steps towards becoming reliable, further upgrading is still ongoing regarding fish safety and quality management system.

The fish regulation provides many important legal requirements that fish facilities need to comply with. The requirement will be shown in the subsequent chapter of Harmonization of the requirement in the Gambia

7. HARMONIZATION TO INTERNATIONAL REQUIREMENT

The Gambia regulations on fish products have been in place since 1995. Requirements laid down in Article 46(1)(a) of Regulation (EC) No 882/2004 and Article 11(4)(a)(i) of Regulation (EC) No 854/2004. The regulations are harmonized with the EU regulations. Fish facilities that meet the Gambia regulations, also meet the EU regulations as well.

International harmonization of safety and quality requirements and equivalence of certification systems can facilitate international fish trade, increase transparency and prevent the use of these requirements as disguised barriers to trade. However, the safety requirements should be based on sound science to provide the appropriate level of consumer protection. Reconciling these objectives requires an international regulatory and technical framework to support the development of harmonized standards and equivalence recognition systems.

Although Gambia fish regulation (fisheries Act. 1995) is harmonized with the EU requirements and its implementation has undergone major steps towards becoming reliable, further upgrading is still going on in the fish safety and quality system.

The fish regulation provides many important legal requirements to be complied within the fish facility. These requirements cover fish Quality and Safety concerns in the following areas:

- i. Fish landing sites
- ii. Fish transport vehicles and vessels
- iii. Placement of fish and fishery products on the market
- iv. Fish processing establishments
- v. Collection, transportation and delivery of samples
- vi. Traceability and quality labelling
- vii. Fish Health Certificate and other areas as provided under the Quality Assurance Rules or as the competent authority regulates based on requirements provided by importing countries and international bodies.

The requirements for fish safety and quality system and the protocols for inspection provided in the current inspection manuals are of a general nature, hence are difficult to apply uniformly during Quality inspection and audit.

The self-assessment and third-party audits conducted at various levels of the Quality Management and control system revealed that the guidelines are not followed but will be updated to meet the requirement in the manual to interpretations in terms of what to look for and look at, procedures and methods of Quality inspection to be applied and tolerance limits. Thus, this is presumed to have led to significant differences among Quality inspectors in ensuring consistent and harmonious implementation of regulatory requirements as defined in the manual.

Lately, there have also been complaints from the industry regarding inconsistent non-conformity ratings by inspectors. The main cause is assumed to be due to the unreliability of the guidelines provided in the Manual for Standard Operating Procedures (SOP) for Fish Inspection and Quality Assurance (QA). Although accepting the significance of other factors, it was thought that there is a need for proper inspection and Quality management system (QMS) in all fish facility to ensure consistency and harmony in terms of the legal requirements, interpretations, methods and procedures for Quality Management system and limits, explanations and ratings, for each sub-rule in the regulation.

8. DISCUSSION AND RECOMMENDATION

Fisheries in The Gambia is an important protein source for the people. The stock is under risk of over fishing but at the same time the country is experiencing big post-harvest losses due to improper handling of the catch. If the regulatory requirement in the country would be implemented accordingly, post-harvest losses could be reduced or eliminated providing around 20.000 tons of fish available for human consumption.

The fishery resources are the property of the people of The Gambia and the fishing folk that are given access to that resource must learn to handle the fish with respect to minimize deterioration. In that regards the fishermen will need to invest in insulated boxes and must have access to ice at an affordable price to keep the fish fresh until it is landed and transported to the fish market. A way to enforce that could be to set minimum requirements before issuing fishing licenses. The fish market must have in place quality procedures that will secure the safety and quality of the fish until it is sold to the consumer or for other purposes. These procedures should be based on the Codex Recommended International Code of Practice – General Principles of Food Hygiene (CAC, 2003). In an EU audit carried out by SANCO several defects were observed:

1. Fish handling throughout the chain is not in accordance with prerequisite program. The boxes used to preserve fish is a source of contamination and its preservation is not in accordance with the requirements.
2. The existing ice production facilities is not enough for all fish vendors in the fish markets due to many vendors selling or processing fresh fish at the market, which causes a scarcity of ice. Although fishermen do carry ice to sea, the lack of ice production facilities close to the major coastal fishing centers increases the cost of ice for operators who must transport it long distances. This means that the fishermen often do not carry enough ice on their fishing trips. The lack of ice can result in loss of freshness or, at times, spoilage of fish. Fish are not gutted prior to landing, because customers will always doubt the freshness of gutted fish.
3. At some of the fish markets drainages are not properly constructed and causes overflowing within the fish market premises and that can easily cause contamination of the fish they are handling.
4. A great variability exists in the size and extent of handling in fish market establishments. Accordingly, the hygienic requirements and the design in fish handling areas may vary considerably but the principles of quality/ inspection shall be basically the same. According to Troller (2012), all the requirements commonly listed in the legislation and codes of practices are not equally important. The most important factors include facilities for water supply, waste disposal, and cooling and cold storage facilities and their capacity.
5. It is a major concern that the fish market management did not put the prerequisite program into consideration as required by the code of practice for fish handling and processing. Regarding this, it is important for the fish market to establish a system that will protect the consumer and the facility as well. A system that will monitor the facility as well as the personal hygiene of worker.
6. The main concern to the fish market is lack of capacity building of the staff and the facility users. Most of the facility users are not familiar with the prerequisite system of an establishment. The fish market not only lack appreciation and understanding of the important prerequisite for the fish safety and quality, but they also lack the capability to enforce such practices. The stakeholders using the facility don't have a knowledge of proper fish preservation or proper icing of the fish, and good hygienic practices. That affects the fish market and causes post-harvest loses.

To address the above-mentioned defects, it is recommended that the following actions should be taken:

1. The drainage canal around the market overflows frequently and always during heavy raining, flooding the market with the risk of contaminating the fish. Open drainage canals quickly collect trash that prevent proper drainage. There is an emerging need to invest in a closed drainage system that will prevent this problem. Once a sufficient drainage has been secured the fish market must establish income to maintain the structure in good condition.
2. Access control (for the vendors) – Clean cloths, keep the stalls clean and personal hygiene checks, will be done by the fish market management term in order to have standard control over the vendor.
3. Access to sufficient clean water – Paid by the market income.
4. Inspection of the fish market shall be done regularly due to large amount of people working in the market. Doing so will ensure a proper handling/handling and personal hygiene. Inspection can be done by the supervisor of the fish market upon having a proper training in the quality assurance system.
5. Ice making machine / ice storage- It is important that the temperature of harvested fish is kept low by using enough ice so as to prevent large quantities of fish from being damaged along the vending process and to improve the quality of fresh fish products. The currently used ice making machine is 5 tons capacity which is not enough for the fish vendors and not self-sufficient for the fish market as well. Moreover, bags of ice are made in ordinary refrigerators on Brikama Market premises, but this method cannot ensure stable supplies in regular quantities. In addition, since ice is made in blocks, block ice need to be crushed first before they can be used for fish storage. Hence, this method will be disregarded in the fish market. It will be acknowledged that once Brikama Fish Market has a provision of another ice machine, the producers of ice block will divert their interest to private demand both in and around Brikama Market, by which they will compensate for their sales to fish retailing. The amount of ice required for storing and selling fresh fish at Brikama Market is estimated based on the average quantity of fish delivered to the market per day (10t) and the quantity of fish delivered to the market in the evening, when the delivered volume increases; 2t Fresh fish will be basically stored in cooler boxes or in the chilled room, with ice, and the ratio of ice volume against fish weight is set to 0.5 to 1 kilo, no matter whether a cooler box or the chilled room is used for storage. Based on these factors, the amount of ice required at Brikama Fish Market is estimated as 10t per/day.
6. Training shall be done twice a month within the fish market vicinity and will be done by competent authorities from the fish market and the Quality Assurance term of fisheries Department of the Gambia. Training for fresh fish handling and preservation, personal hygiene and sanitation management and environmental issues, business planning, waste management etc. Doing so, 2 times a month will increase the awareness and the safety of fish in the market.

Collaboration should be initiated amongst fish vendor and government towards capacity building of fish vendor and improving prerequisite program, storage facilities for fish, and guidelines should be developed for implementing a proper prerequisite for the fish markets throughout the Gambia.

Strong extension service will also aid training and provide a forum for two-way communication. Thus, the needs of the fish vendors and processor and any lack of acceptability of improvements will be better understood. Lack of government implementing quality system in fish markets hampers efficient marketing and profitable making. The government needs to formulate a policy for the fish vendor in the fish market, pass comprehensive laws and regulations and develop an implementation strategy. This will help to create a conducive environment for the fish market to become more efficient, better organized and profitable.

Food safety is a science base activity that calls for the competence of multiple stakeholders, which include the food scientist, the policy makers, the food inspector, the food business operator and the consumer. To have an efficient food control system, these different stakeholders must interact to guarantee the efficiency of the system and install confidence in the consumer. In my own findings for this paper, it also indicates that the Ministry of Fisheries and Water Resources (MOFWR) is well endowed with adequate personnel necessary to carry out Quality inspection of artisanal landings, which are intended for domestic consumption but some of it is also exported. Numerous constraints limit the action of such controls among which we can identify lack of adequate knowledge of food hazard, adequate infrastructure, equipment and training.

Food safety is a global issue of increasing concern for governments, food producers, food processors and handlers, as well as consumers. Safe food supplies play a key role in ensuring the health of populations. Food safety is achieved by improving knowledge of the causal agents of food-borne illness, providing information on how to control these agents and, ultimately, reducing the occurrence of sources of food hazards that result to illness or death.

The approach to achieving food safety and quality in the fish market based on specification, however, is much better for the fish market to implement a prerequisite program to protect the consumer from any kind of illness. This approach seems to fit in well with prerequisite programs for GMPs and proper handling of the product. Government should therefore implement a standard food safety program in fish markets following the prerequisite program and its requirement. Prerequisite programs in fish markets of The Gambia are generally inadequate and result in major fish losses, improvements are needed. Hence, it is vital that emphasis be placed on increased awareness through training of vendor and processors on improving handling techniques that can result in high quality fish. The use of insulated containers and adequate ice at all stages is required and should be encouraged to help maintain the quality of the fish. However, the containers used to fetch fish or ice should be improved to meet the standard and in hygiene aspects. Building sufficient and effective ice production facilities at the major fish market and implement the prerequisite program and the quality system should be the government's priority in developing and improving the quality of fish production in various markets. Additionally, there is a need to improve education with regards to the importance of the resource and also the importance of improving processing, handling, storage and distribution. In addition, the quality system could be applied to all fish markets, where fish with high grades (high quality) will fetch high prices.

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