Kenya – European Union Post Lome Trade Programme (KEPLOTRADE)

COST OF IMPLEMENTING EU SANITARY STANDARDS ON FISH AND HAZARD ANALYSIS CRITICAL CONTROL POINTS (HACCP) SYSTEM (STUDY A.5.3)

FINAL REPORT [2 May 2005]

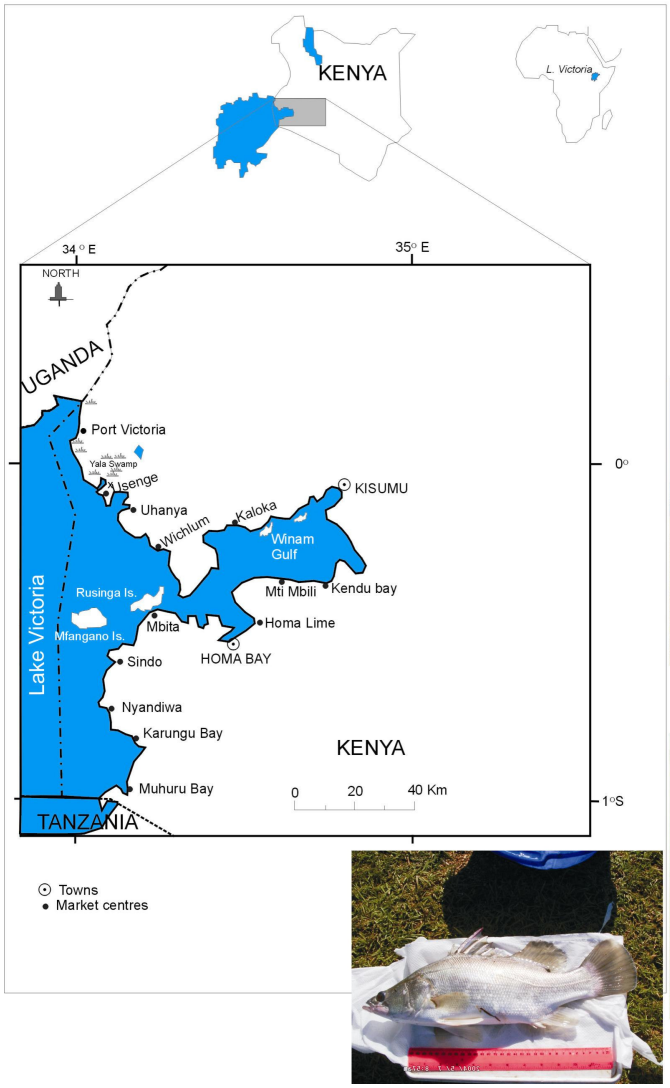

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Table of content

1. INTRODUCTION

This section introduces the study, giving the objectives and the terms of reference. It also gives an overview of the fisheries sub-sector, including the socio-economic importance.

1.1 Background

The African Caribbean and Pacific (ACP) countries, including Kenya, signed the Cotonou Partnership Agreement (CPA) in 2000, which provides for the replacement of the Lome Convention trade arrangement between the EU and ACP countries. The CPA is implemented through negotiating Economic Partnership Agreements between the EU and the ACP countries. Kenya will negotiate with the EU within the block of 16 Eastern and Southern Africa (ESA) countries.

This study was undertaken to provide relevant technical information to advise the Kenya Government on the appropriate negotiating position in the Kenya – European Union Post Lome Trade (KEPLOTRADE) negotiation process. The study is on the Kenyan fisheries sub-sector, one of the six clusters identified for ESA-EU negotiations. It focuses on the cost of implementing EU sanitary standards on fish and hazard analysis critical control points (HACCP) system. This report will complement the findings of three other studies on the fisheries sub-sector that were carried out during the same period, to advise the KEPLOTRADE negotiations, namely;

- Swot analysis of Kenya's marine fisheries industry and EU market access issues for negotiation under EPAs
- Analysis of the Kenya, EU, ESA and Developed countries fishery agreements and proposed negotiating position for Kenya-EU bilateral agreement with ESA fishery framework agreement
- Study on capacity building requirements of the Kenyan fishery sub-sector to develop its EEZ fishery.

This study is set on the background of recent bans on fish exports from Kenya (and other East African countries) to the EU between 1996 and 2002, due to unsatisfactory sanitary and phyto-sanitary conditions. To have the ban lifted, Kenya had to put in place systems to

ensure that fish exports complied with the EU sanitary standards on fish and HACCP. The implementation of this system involved significant capital re-investment both by the government and the private sector. This system has to be sustained, and further capital re-investment in infrastructure is necessary to ensure continued fish exports by Kenya to the EU and other export destinations.

1.2 Aims of study

The study aims at analyzing the opportunity cost of the recent ban on Kenya's fish exports to the EU and the costs of implementing the standards. Additionally, the study aims at assessing the benefits that ensued for the firms that have implemented the standards. Further, the study assesses the impact of the EU sanitary standards on exports of fish from inland waters. In particular, the study assesses the economic impact of implementing EU sanitary standards on fish and HACCP on the fish industry. On the basis of this assessment, the study proposes a development program to be negotiated with the EU.

1.3 Terms of reference

The following were the study's terms of reference;

i) Provide a detailed analysis of the structure of Kenya's inland water fisheries resource using a value chain analysis methodology
ii) Provide a trend analysis of the production and export of inland water fish species for the period 1998-2003. For export, the analysis should be by destination countries, where as export to the EU will be reported as a block.
iii) Provide a detailed analysis of the nature of the last EU ban on Kenya's fish export to the EU and the opportunity cost in terms of fish which would have been exported, investment and employment losses.
iv) Assess economic costs (in terms of investments into systems and equipment for ensuring compliance with the EU sanitary standards and HACCP) incurred by fishers, factories and the economy in general as a result of the last EU ban on Kenya's export.

v) Provide a generic breakdown of the investment needed by the inland water fishing industry to meet EU sanitary standards on fish and HACCP system. The breakdown should be categorised by fishers, factories, government and any other structures within the industry that is considered critical in ensuring compliance with the EU standards.

vi) Assess the extent of investments of inland waters fisheries industry (fishers, factories and government) in facilities and equipment geared towards compliance with the EU sanitary standards and HACCP system.

vii) Document the benefits of the current EU SPS standards to the fishery sector.

viii) On the basis of the documented investment, the size and structure of the industry as discussed above, and prospects for future development for purposes of increased exports to the EU, determine the resource gap among fishers, factories and government.

ix) Propose a comprehensive inland waters fisheries industry support program, to address the identified resource gap, to be negotiated with the EU under EPAs.

1.4 Method of data collection

Data and information for this report was collected from several sources and using a number of methods. Most of the data came from interview of key players in the industry, including;

- Fisheries Department officers in Nairobi, Kisumu and district headquarters
- Fishers in Busia, Bondo, Kisumu, Rachuonyo and Suba districts
- Fish agents in Busia, Bondo, Kisumu, Rachuonyo and Suba districts
- Six fish factories in Kisumu, Homabay, Migori and Nairobi
- Executive Officer of Fish Processors Association (AFIPEK)
- Researchers at KMFRI

The study also made use of existing secondary data in published and unpublished manuscripts. Soma data was obtained from existing databases, for example, the frame survey results and other data available at the Kenya Marine and Fisheries Research Institute. The complete list of people contacted is in section 8.1.

1.5 Overview of the fish sub-sector

Kenya's fisheries sub-sector is based on three main fish sources, namely; inland fresh-water, coastal marine and aquaculture. Of these, inland fresh-water fisheries are the most important, with Lake Victoria dominating fish production. This lake alone contributed 92% (equivalent to 142,000 tonnes) of an annual mean of 154,000 tonnes of fish landed in Kenya between 1998 and 2003. Besides Lake Victoria, the other fresh-water fish sources are lakes Turkana, Baringo, Naivasha, and Jipe and several dams and rivers spread across the country, which collectively produce 3% of total fish. Marine and aquaculture fisheries constitute only about 4% and 1% respectively of fish landed in the country.

Lake Victoria, which is the second largest fresh-water lake in the world, is known to have high fish diversity, with some reports putting the number of different fish species at 170 (Table 8.9 in annex lists some of the common species). However, only three species – Nile perch (*Lates niloticus*), 'dagaa' or 'omena' (*Rastrineobola argentea*) and tilapia (*Oreochromis species*) - are of commercial importance. In recent years, these three have constituted about 52%, 33% and 10% respectively of the total fish caught in Lake Victoria, all the other species contributing just about 5%.

1.6 Socio-economic importance of Kenya's fisheries sub-sector

Kenya's fisheries sub-sector has made important contributions in the socio-economic development of the country. The sub-sector is vital in creating employment opportunities, and because most of these jobs are rural based, it helps in reducing rural-urban migration. Fish is also a rich source of animal proteins for human consumption and provides raw material (fishmeal) for processing animal feeds. The fish industry contributes to GDP and has continued to be an important source of foreign exchange earned from fish exports. Besides, the fish industry contributes to the national and local council economies through payment of various taxes and levies. The sub-sector has also contributed directly and indirectly to the improvement of physical infrastructure and social facilities, such as roads, schools and hospitals, particularly in remote fishing communities.

1.6.1 Employment creation

The types of jobs in this sub-sector may be broadly categorized as direct (those in the core fisheries activities) and indirect (in activities that support, or which are linked to the core fisheries activities). The core activities providing direct employment include; Fishing, fish farming, artisanal fish processing, industrial fish processing, fish transportation and fish marketing. Indirect employment opportunities are many and varied, including for; Boat builders, net and hook manufacturers, outboard engine providers, fish vehicle providers and repairers, fuel suppliers, fish bait suppliers, ice suppliers and providers of containers and packaging material. These indirect jobs are based in the local areas, in cities such as Kisumu, Nakuru, Mombasa and Nairobi and in countries abroad that supply imported equipment used in the fishery.

There are no reliable and precise figures of the total number of people deriving livelihood from fisheries through direct and indirect employment. Recent studies have estimated that the fisheries sub-sector employs between 500,000 and 800,000 people directly and indirectly (Karuga et al, 2002; SMEC, 2002). Despite the lack of more accurate figures, what is certain is that the number of fisheries-dependent people is on the increase.

1.6.2 Export earnings

The fisheries sub-sector is relatively young in the export trade, compared to Kenya's traditional primary export sub-sectors. Fish export started only in early 1980s, with the establishment of the Nile perch processing industry. A report by Bokea and Ikiara (2000) indicated that during the last two decades, foreign exchange earnings increased tremendously from Ksh 18 million in 1980 to about Ksh 2 billion in 1999. Between 2000 and 2003, an average of about 16,831 tonnes of fish products were exported from Kenya per year, earning an average of about Ksh 3.5 billion per annum. In 2003 alone, the export revenue was approximately Ksh 3.9 billion.

The fish export industry is based on Nile perch, which account for over 95% of fish exports in quantity and value. Small quantities of marine fish products, mainly consisting of;

molluscs (mainly octopus and Squid), crustaceans (lobsters, prawns, crabs and freshwater crayfish), live fish mainly ornamental fish, dry shark fins, fish meals, marine shells, dried salted fish, Bonitos and *Beche-der-mers* constitute the balance of fish exports. The export industry is therefore built on the Lake Victoria fisheries, which is the source of Nile perch (some Nile perch is also found in Lake Turkana, but commercial exploitation is constrained by a number of factors discussed in Section 2.7.1).

1.6.3 Gross Domestic Product and Government Revenue:

The fisheries sub-sector also contributes to the country's cash economy through taxes on imported machinery, payment of fishing and fish trading licenses, payment of value added tax (VAT) on processed fish and local fish levies charged at the fish landing beaches (Table 8.1 in annex gives details of fees charged by the Fisheries Department). The Fisheries Department also charges a direct levy on exported fish, calculated at 0.5% of the free-on-board (f.o.b.) value of fish exports. In addition, the government earns revenue through licensing fish processing and fishmeal firms, registration of boats and court fines (fisheries offences), all which brings in an average of about US$ 2.2 million annually. The local councils and co-operative societies serving fish landing beaches also receive some amount levied on each kilogram of fish sold to fish factories. This is used to maintain the basic marketing and sanitary facilities on the beach and sometimes fund the communal services.

Fisheries contribution to GDP has remained small at just about 0.3%. However, considering the size of the sub-sector, its contribution is significant. With improvement in fish exports the fish sub-sector is expected to contribute more to GDP.

1.6.4 Fish as food

Fish has many advantages over the other foods, being one of the richest sources of animal proteins. Dried fish, such as 'dagaa', is very rich in vitamin A and D. Fish is also rich in essential fatty acids and minerals, especially calcium, phosphorus and iron, and is easier to process and store, for example by sun drying, compared to the alternative sources of animal protein. According to available data fish currently contributes about 10% of animal proteins

in Kenyan diets. The per capita fish consumption, though, remains low at 3-5%. Tilapia and 'dagaa' are the more consumed fish species domestically, while Nile perch makes little contribution to domestic diets. The pattern of fish consumption is such that more fish is eaten within the immediate hinterland of the production areas, although fish is increasingly being transported to the urban centres, including; Nairobi, Kisumu, Mombasa, Nakuru and Eldoret.

1.6.5 Fishmeal

A fishmeal industry was established in Kenya from the mid 1990s. Fishmeal is the protein ingredient in processing of animal feeds. The main inputs in fishmeal industry are 'dagaa' and Nile perch by-products (mainly fish frames after fillet removal). In this way the fish sub-sector plays a significant forward linkage role in providing inputs to the animal feeds industry, especially the beef, dairy and poultry sub-sectors.

2. THE STRUCTURE OF KENYA'S FISH INDUSTRY

This section provides an analysis of the structure of Kenya's inland water fisheries resource using a value chain analysis methodology (TOR i).

Lake Victoria accounts for about 97% of all fish produced in the inland fresh-water fish sources, and practically all exported fish. Hence, for practical purposes, an analysis of the Kenya's inland water fisheries resources can simply be confined to the situation in Lake Victoria. However, the potentials of the other inland lakes and the constraints that need to be addressed to achieve their full exploitation have also been discussed in Section 2.7.

2.1 Lake Victoria fish industry

Numerous small-scale artisanal fishers dominate fish production in Lake Victoria. They supply fish to several middlemen traders located at different stages along the supply chain. These supply fish to the industrial fish processing establishments, artisanal fish processing units and the domestic consumer markets.

Lake Victoria's fish distribution channel may be viewed as comprising of two main separate, but intertwined, sub-channels that feed into each other (See Fig. 2.1). First is the industrial/ export market sub-channel, which supplies fish to the fish processing factories and ultimately to export markets. The major players in this channel are fishers, fish buying agents, fish processing factories and fish exporters. In this channel, fish is bought by factory-contracted or independent collector agents located at various landing beaches. The agents mainly use factory-owned insulated trucks to transport fish to the factories. At the factories the fish is filleted and the main products exported, while by-products are supplied to the domestic market. This channel handles dominantly Nile perch.

The second one is the artisanal/ domestic sub-channel, which supplies fish to numerous domestic consumer markets in the country. This sub-channel's actors include fishers, artisanal fish processors and traders. The logistical arrangement in this sub-sector is quite simple, with fishers supplying fish to women or male traders at the lakeside, who then sell

the fish in the nearby market or to second level middlemen who transfer it to other distant markets. The mode of transport is also simple depending on the distant to market, with traders making use of either public passenger vehicles, bicycles or just walk. Some fish in this channel undergoes simple traditional preservation by sun-drying, smoking or deep-frying. The main fish products distributed in this channel are 'dagaa', tilapia, other fish species and Nile perch by-products.

2.2 The fishers

The term 'fishers (or fishermen)' usually refers to all the people involved in any aspect of fish harvesting. However, fishers may be categorized into distinct groups, depending on property ownership or the actual role they play in the fishing activity. The first category is the boat and gear owner, who often does not participate in the fishing activity but leases out the boat and gear. The second group consists of the fishing crew who are the 'hand men' in the fishing boat. Within the crew is a boat operator who directs the boat in the water and its fishing operation. Finally there is a boat manager who may or may not be part of a fishing operation, but who is responsible for selling fish and paying crew. There has also been an increase in 'absentee fishers' – gear owners who live and work away from the lake, therefore, employ other fishers whom they pay a wage.

The number of fishers in Kenya has consistently increased over the years (Fig. 2.2). The high rate of entry into the fishery is largely because of low prospects of employment in the other sectors of the economy. Recent statistics from the Fisheries Department and the Kenya Marine and Fisheries Research Institute (KMFRI) indicate that there are now about 54,000 fishers in Kenya, about 90% of them in Lake Victoria. The number of fishers on Lake Victoria has increased tremendously in the last four decades, however, there has not been as much increase in fishing pressure in the artisanal marine fisheries and in other inland Kenyan lakes, most likely due to their low productivity. About 50-60% of fishers target Nile perch for the export industry, while the rest target mainly tilapia and 'dagaa'.

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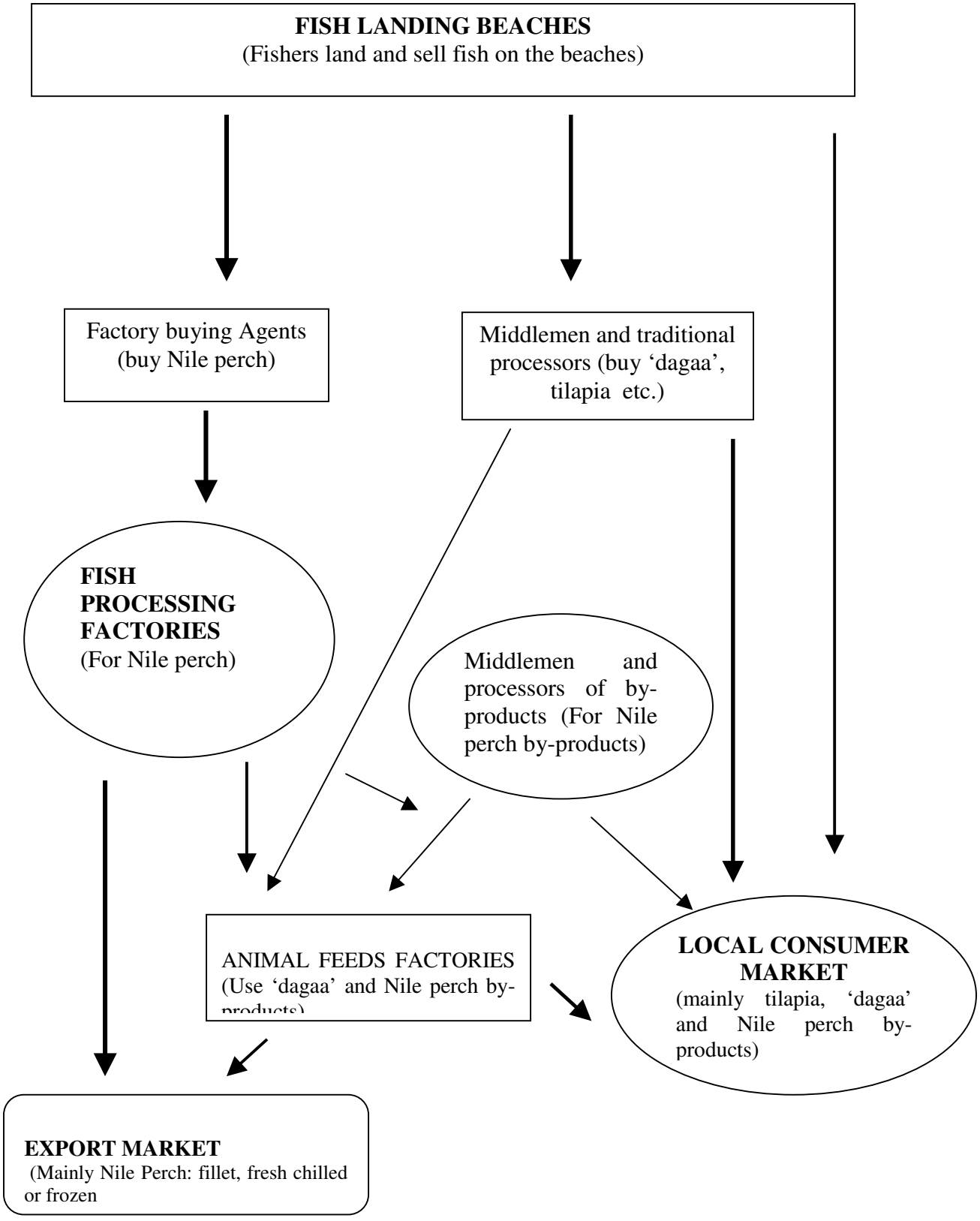

Fig. 2.1 Lake Victoria fish distribution channel

Source: Survey data

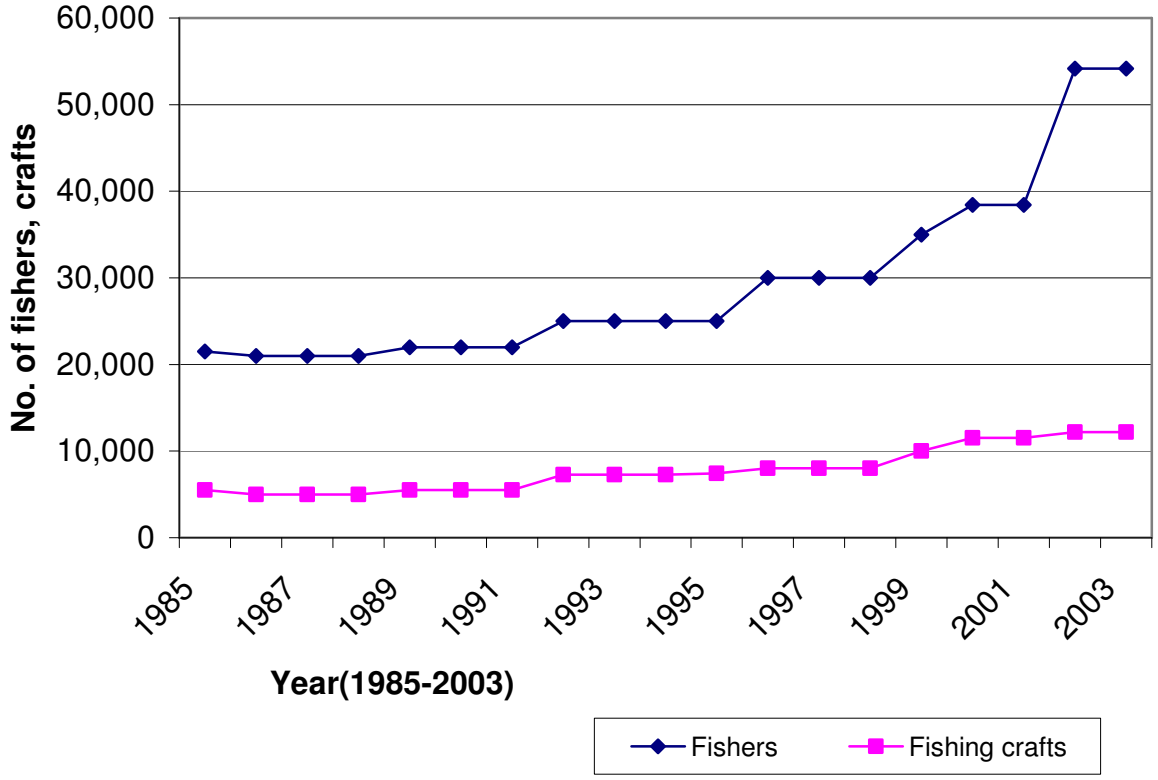

Fig. 2.2 Fishers and crafts on Lake Victoria (1985-2003)

Source: Department of Fisheries/ KMFRI frame survey data

The fishers are dominantly male and most of them in the age range of 25-45, although boat owners tend to be older than the crew. A typical fisher of Lake Victoria has very little education, if any, with nearly two-thirds having at most primary-level education. The fishers usually have large families, with more than three children, and a number of other dependant relatives. Some fishers and their spouses also engage in other income-earning activities, such as farming, keeping livestock, petty businesses or retailing foodstuff, including fish.

Boat owners remunerate fishing crew using one of three methods. The most common method is where, after deducting operational and maintenance costs, the boat owner takes 50% of the revenue from fish sales and the crew (usually an average of 3 per boat) share out the

remaining half of revenue amongst themselves. The earning in the fishery differs substantially among the fishers, depending on the number of boats and gear owned, the season and fish species targeted, among other factors. A fishing boat owner earns a gross income within the range of Ksh 10,000 – Ksh 24,000 per month per boat. Based on the remuneration formula, the fishing crew earn about Ksh 3,500 – 8,000 in a month.

2.2.1 Fishing gears and methods

Fishers use at least four types of boats, categorized by shape and size and known by the following local names; dugout canoes, 'sesse' canoes, 'parachute' boats and traditional rafts. Some canoes have a flat shape at one end, allowing them to accommodate an outboard engine. The number of fishing boats have increased rapidly over the years (Fig. 2.2). Currently it is estimated that there are slightly above 12,000 boats in Lake Victoria.

Table 2.1 Fishers and gears on Lake Victoria

		2000	**2002**	**2004** ()
Total boat numbers		**11,485**	**12,209**	**12,284**
Categorization by types of boats	Dugout canoes	3	29	7
	Sesse boats	1,501	1,966	1,145
	Parachute boats	8,854	10,124	11,004
	Rafts	1,127	90	128
Categorization by boat propulsion methods	Engine propelled	641	696	860
	Paddle propelled	7,531	6,816	6,566
	Sail propelled	3,313	4,697	4,858

Source: Frame Survey Data (2004)

Fishers use a variety of fishing gears and methods to catch fish. The main fishing gears can be broadly categorised into four types;

(i) Gill nets: Of various mesh sizes, although the legal standard for tilapia in Lake Victoria is 5" mesh stretched across the diagonal. The other lakes have lower accepted mesh limits for their fisheries. Similarly, the riverine fisheries require lower mesh sized nets. In the last 5 years, drifting gillnets (locally called 'tembea') became popular in some areas, though they damaged stationery gear set by other fishers.

(ii) Line gears: These use baited hooks placed at regular intervals along a nylon rope to catch mainly Nile perch, although simple angle-line is a cheap way to catch tilapia.

(iii) Seine nets: The seine net, though presently banned on Lake Victoria, still persists. It is indiscriminate, and targets mainly Nile perch and tilapines, but ends up with various other species of all sizes. Seine nets are particularly destructive when used around river mouths, where it catches anadromous fish on their way to spawn. Mosquito seine is a special kind of seine used to target 'dagaa', and which is the only kind of seine legally permitted on Lake Victoria.

(iv) Traditional gears: These are mainly used in river systems or areas of the lake close to river openings, and they catch mostly anadromous riverine fish species. Most of the traditional gears (e.g. weirs, barricades, baskets, traps) are no longer used in the lake, a part from near river mouths.

2.2.2 Investment costs in fishing

Fishing costs include the purchase (investment) costs and, for some, additional operational or maintenance costs. The total investment cost includes the cost of boat and gear. A medium size boat measuring 25 ft (which is most common in the Nile perch fishery) costs approximately Ksh 40,000 at current input prices (See Table 8.5 in annex). The costs of fishing gear depend on the number owned, with Nile perch fishers spending on average about Ksh 80,000 per boat. Thus, most Nile perch fishers have to invest about Ksh 120,000 at current input prices to enter the fishery.

2.2.3 Challenges facing the fishers

Fishers in Kenya face a number of critical limitations in their occupation. Among the problems facing fishers that, if addressed, would contribute to improved socio-economic status of fishers and better resource utilization are;

(i) Irregular, fluctuating and, often low, incomes
(ii) lack of access to credit
(iii) poor infrastructure (e.g. roads, electricity)
(iv) lack of cold storage facilities for their fish (e.g. ice and cold rooms)
(v) inability to organize themselves and improve their bargaining power
(vi) lack of information on savings options
(vii) inadequate savings facilities
(viii) lack of skills for alternative livelihood
(ix) Inadequate post harvest handling facilities
(x) Inadequate training and skills for post-harvest fish handling
(xi) Lack of business management skills
(xii) Use of traditional boats whose carrying capacity and efficiency is low

2.2.4 Value of fish at fish landing

The fish landing value, which is the total amount received by fishers, is a factor of the quantity of landed fish and the prevailing price at landing. To avoid effect of production cycles and fluctuations in quantities and prices, analysis has been done on amalgamated data for the last six years. Using mean quantities and prices for the period 1998-2003, the value of fish landed in the Kenyan part of Lake Victoria is estimated at about **Ksh 6.186 billion** per year (table 2.2).

Table 2.2 Value of fish at fish landing

	Mean annual quantities landed, 1998-2003 (tonnes)	Mean annual landing price, 1998-2003 (Ksh/ Kg)	Mean annual value of landed fish, 1998-2003 (Ksh)
Nile perch	73674	55.4	4,081,540,000
'Dagaa' (Wet weight)	46754	23.8	1,112,755,000
Tilapia	14168	48.7	689,982,000
Other	7084	42.6	301,778,000
Aggregate	**141,680**		**6,186,054,000**

Source: Compiled from Fisheries Department records

2.3 Fish buying agents

Nearly all fish factories of Lake Victoria get fish supplies through an intermediary. The typical fish supply arrangement involves the use of middlemen or 'fish agents', who operate between the factory and the fishers. Thus, the most common buyers of landed Nile Perch at the beaches are agents of the industrial fish processors. The processors normally provide and cater for transport, using insulated trucks (commonly 3-5 tons), although they do not take possession of the fish until it is delivered and selected at the processing plant. At the landing beaches, the agents assemble fish in two ways. By buying fish from fishers in the lake, in island-based beaches and also at the shoreline landing beaches. Agents go into the water and other beaches using relatively larger boats that are motorized to pick and assemble the fish and deliver to the landing beaches.

Buying prices may vary widely across the beaches, depending on availability and extent of market information among the fishers. The agents hire fish selectors at the point of buying (in the lake or at the beaches) to ensure that only specified quality and sizes are purchased and the fish is weighed, recorded and put into the truck in layers separated with ice flakes for preservation. Substandard quality fish and juvenile fish (below 50 cm) are normally rejected by agents and are sold to local markets at lower prices. Due to scarcity of Nile Perch, the purchasing agent often takes from 2-3 days around the beaches before accumulating enough fish to deliver to the processing plants.

The prices and quality are normally pre-agreed between the agent and the factory. In most cases there are long established business relationship between an agent and the factory. The fish factories accredit agents on the basis of their integrity, honesty and ability to deliver as per agreed supply contracts. In some cases the fish processors provide their agents with funds to purchase fish and fishing gears to supply to fishers. As competition has increased with the decline in Nile perch supplies from the lake, the agents (usually using funds provided by the fish processors) have become more innovative sometimes in the form of providing credit/cash advances to purchase fish, fishing nets, supply fishing gears, and engines to clients with whom they have well established trade relationships. The repayment of such credit in kind is normally done within an agreed time frame with deductions occurring at every time of fish delivery.

At the processing plant, the factory selectors will again select the fish delivered by agents. The agent is paid for the accepted fish and, for any rejects, the agent often sells to artisanal processors at lower prices. A typical agent handles 3-5 tonnes of fish daily, earning a gross margin or commission of about 10% of the purchase value.

2.3.1 Value addition by fish agents

Of the approximate 73,674 tonnes of Nile perch landed, fish agents handle only about 37,280 tonnes for processing, the rest being reject fish. From the previous estimated value of landed Nile perch of Ksh 4.08 billion (Table 2.2), it means that the agents handle about Ksh 2.06 billions. Using previous estimates that agents make an average of about 10% mark-up on the landed value, the value addition by agents on Nile perch is, therefore, about Ksh 206 million, giving a total value of Nile perch delivered at the factories by agents to be about **Ksh 2.3billion** per year.

2.4 The industrial fish processors

There are presently 19 fish processing and exporting firms in Kenya. Of these, seven are based on Lake Victoria fisheries specializing in the processing and exporting of Nile perch products while seven are marine-based. The latter include four shrimp processors, two firms

exporting various crustaceans, such as octopus, squids and lobsters, and the remaining one processing tuna. The Nile perch factories are East African Sea Foods Ltd, W.E. Tilley Ltd, Capital Fish Ltd, Peche Foods Ltd, Prinsal Ltd, Samaki Industries (2000) Ltd, Afromeat Ltd. Some of these factories have been operating on and off, depending on the available fish supplies and other factors.

With regard to Lake Victoria, Kenya pioneered industrial fish processing in the region, with plants set up in 1984-85 to process and export Nile perch (Uganda and Tanzania followed suit, with first factories being established in 1990 and 1992 respectively in the two countries). By 1985, fish processing firms in Kenya controlled less than 20% of the fresh fish trade, implying that much of Nile perch was still going to the local market. By 1987, the number of Nile perch processing factories in Kenya had increased to 10, which exported frozen fillet mainly to Israel.

The fish export business proved to be so profitable that more factories soon were set up in all the three countries sharing Lake Victoria. Some of the initial factories closed down, while new modern ones were established. It seems that the strategy of the fish processing industry has been to replace the old smaller processing units with factories having much larger processing capacity. As a result, the increase in export volumes over time has come as a result of larger processing units being established (so as to attain economies of scale) rather than increase in numbers of factories. The number of factories has remained nearly the same in the last decade.

The expansion in capacities of the factories has been so rapid that from mid 1990s there has been excess capacity in the processing industry. It is estimated that most factories are now operating at just about 50% of their established capacities. The main reason for under-capacity utilization has been fish supply problems, but for some factories, insufficient operating capital has also been a limiting factor. One of the strategies taken by the factories in Kenya to overcome fish supply problems has been to seek their fish from beyond Kenya's boundaries.

The Nile perch processing firms have been, to a large extent, vertically integrated through owning other enterprises at lower levels of the fish supply chain. Besides processing fish, the

factories own fish transport vehicles used to bring in fish supplies. Nearly all the factories also procure fish supplies through an agent whom they have much control over. Further down the channel, some factories have bought outboard engines, boats and nets, which they lease out to fishers to be repaid from the sale of delivered fish. To a large extent, these strategies have worked well for factories to ensure they get regular fish supplies.

2.4.1 Costs and revenues for Nile perch factories

The main sources of income for a Nile perch factory are the revenue from export of fillet and bladders and the sale of by-products such as fish frames and oil in the local market. The main direct costs they incur are workers' wages, costs of packaging, electricity, water supply and the raw material (fish). They also pay a number of fees and levies. A recent study (by SMEC, 2002) estimated the incomes and expenditures based on an average fish price of US$ 0.8 per Kg, for a typical Nile perch factory in Kenya (Table 2.3).

It should be noted that, according to these estimates, the cost of raw material (fish) constitutes over 80% of overall costs while the earning from fillet export generates 94% of total earnings. Therefore, net incomes are very sensitive to price of raw materials as well as price of fillet. Exporters can also benefit from fluctuating foreign currency exchange rates.

Table 2.3 Cost and income estimates for a Nile perch factory (2002)

Item	Estimated income (million US$)	Estimated costs (million US$)
Fish fillet export	5.07 (94%)	
Sale of by-products (maws, frames etc)	0.30 (6%)	
Workers' wages		0.32 (7%)
Packaging costs		0.14 (3%)
Cost of electricity		0.32 (7%)
Cost of water and sewerage fees		0.02 (0.4%)
Cost of raw product (fish)		3.68 (81%)
Fish export fee		0.03 (0.6%)
Export certificates		0.01 (.04)
Local authority charges		0.01 (.03)
	5.37	4.5
Net income (pre-tax)	0.87	

SMEC (2002)

2.4.2 Value addition by Fish processing factories

The fish factories exported fish products with an e-x factory (f.o.b) value of 3.98 billion in 2002 and 3.92 billion in 2003 (Table 3.3), giving an annual average of Ksh **3.95 billion** for the two years from exports. During the same period, the factories sold 20,504 tonnes of by-products at Ksh 5 per Kg, earning an additional Ksh 102.5 million. The gross value of Nile perch from fish factories is, therefore, Ksh 4.05 billion. This means that value added by the factories is Ksh 1.75 billion, representing 76% of the value of incoming fish.

2.5 Fishmeal production

The mid 1990s saw the establishment and expansion of fishmeal industry in Kenya using Nile perch frames [filleted body frame composed of the head, bones and a little flesh]. By this time, the fishmeal industry could only draw fish frames from what was already destined for human consumption, generating competition between the two uses. One of the main reasons for using fish frames in the fishmeal industry had to do with their poor quality.

The fishmeal industry in Kenya has continued to expand, stimulated by the need to export to the neighbouring countries. It is currently primarily based on Lake Victoria fisheries, with 'dagaa' and Nile perch by-products as the main inputs. This industry has continued to expand, with construction of additional capacity. For example, in 1999 another fishmeal factory with an additional capacity of 40 tonnes per day was constructed near Kisumu.

One of the most notable effects of the expanded fishmeal industry in the country has been import substitution. Kenya was importing high quantities of fishmeal in the 1980s, but the quantity has gradually declined as local fishmeal production picks up. In 1976 – 1980, Kenya imported fishmeal worth about US$ 1.5 million annually, but this figure had reduced by nearly 50% in 2000, at nominal prices. Local fishmeal production has, therefore, saved the country some amount of foreign exchange, although it has raised some concern with regard to food security for poor households. Pressure on Kenya's fisheries is expected to increase towards meeting the fishmeal demand. The local demand for fishmeal in Kenya is not yet satisfied leave alone the potential of expanded regional market.

2.5.1 Value of fish for fishmeal

There are no recent accurate estimates of the amount of 'dagaa' and Nile perch by-products that go for fishmeal production. However, a survey conducted from 1997- 99 indicated that about 40-60% of 'dagaa' and fishmeal were being processed. Using the lower end figures (to take care of a rapidly rising population and fish demand), the fishmeal industry uses a minimum of 12,600 tonnes of dry 'dagaa (converted from 18,000 tonnes of wet 'dagaa') and 8 000 tonnes of Nile perch by-products a year. The retail prices for dry 'dagaa' and Nile perch by-products are Ksh 30 per Kg and Ksh 5 per Kg respectively. These give a retail value of Ksh 378 million of 'dagaa' and Ksh 40 million of Nile perch by-products being used in the fishmeal industry per year.

2.6 Artisanal fish processors and traders

The artisanal processing sub-sector may be divided into three broad categories, namely; the processing system for Nile perch frames, the traditional processing systems for whole fish

and the fresh fish trade. The traditional processing system for whole fish handles tilapia, 'dagaa' and Nile perch rejected by fish processing factories. Over time, the traditional fish processing has declined along the lake as indicated by the disappearance or abandonment of the traditional fish smoking kilns. These used to be a standard feature in most fishing villages, particularly in Kenya; however, they have slowly disappeared over the last 10 years.

A typical artisanal fish processor-trader in Kenya, Tanzania or Uganda is likely to be female, with nearly half of them engaged in subsidiary activities to supplement the income from fish trade. Most of the traders normally sell their fish within a distance of 20 Km from the source. The processor-traders most often will transport fish to a market 2-3 days in a week while the other days are spent seeking supplies and processing the fish. Very few traders, if any, have received a formal training relevant to their trade. Artisanal processors and traders' incomes vary very widely between individuals, market sites, the type of activity, level of investment, seasons etc., hence, it is difficult to have an accurate representative income figure.

Because of the large variation in the scale of their business activity, it is difficult to have a representative cost structure for the artisanal fish trade. Previous attempts, for example by Gibbon (1997) estimated that a small-scale lake-based artisanal fish processor handling about 10 fish pieces a day, each piece giving a margin of US$ 0.36, would result in about US$ 109 in a month. After deducting costs the processor would remain with a net income of about US$ 42 per month. On the other hand, an artisanal fish processor at a larger scale handling about 1,000 pieces in a month would make a net income of about US$ 327 a month. Another study by Abila (1996) determined that a Nile perch frames processor in Kenya received a profit margin of 8-10% of the sale price, equivalent to about US$ 0.03 per Kg of processed fish frame. If 30,000 tonnes of frames were processed in a year by 2000 processors, then each artisanal processor would have an average profit of about US$ 400 in a year.

Among the important problems faced by artisanal fish traders are; low and unreliable fish supplies, fluctuating fish prices, lack of credit, high transport costs due to poor infrastructure, high taxes, decreasing sources of woodfuel for fish processing, lack of quality standards for domestic market etc.

2.7 Potentials of other inland fish sources

As previously indicated, besides Lake Victoria, the other inland fish sources produce only about 3% of the total landed fish. These inland fisheries presently do not contribute at all to international fish trade. However, they contribute significantly to output of fish for domestic consumption. To fully exploit the potential of these inland fisheries a number of constraints need to be addressed. The problems facing these fisheries are varied and are discussed below.

2.7.1 Lake Turkana

Lake Turkana is the second most important source of fresh-water fish in the country after Lake Victoria. There are about 48 documented fish species in Lake Turkana. However, only six dominate the commercial fishery of the lake in terms of catches and sales, namely; Nile perch (6%), various species of tilapia (24%), *Labeo spp* (28%), *Bagrus spp* (6%), *Barbus spp* (11%) and *Brycinus spp*. There are also insignificant quantities of *Clarias spp* and *Alestes spp*, while the rest comprise of a large number of unidentified species. The fish is mostly processed and sold dry owing to the remote location of the landing beaches, the position of the lake relative to main consumer centres and the plentiful supply of sunshine ensuring rapid drying.

Commercial investment in processing and exporting fresh Nile perch of Lake Turkana has been abandoned largely due to parasite infestations, which make the fresh fillets unmarketable. There are indications that Nile perch suffers from serious infestations of both ectoparasites and endoparasites, which have not been clearly identified.

In the past the fisheries of Lake Turkana remained under-exploited due to its remote location and lack of reliable marketing arrangement. The situation has changed in recent years as some of the produced fish is now transported to towns in Western Kenya, such as Kisumu, where there is a ready market. Among the problems that hamper full exploitation of the Lake Turkana fisheries include;

i) The stock size of Lake Turkana fisheries have not been determined.
ii) The parasite infestation on Nile perch whose scientific details are still unknown.

iii) Inappropriate fishing gear and boats that cannot fully exploit the fishery due to the size and weather of the lake.
iv) Poor infrastructure that make the lake inaccessible for the greater part of the year
v) The extreme heat and distance makes the maintenance of fish quality problematic.
vi) The lake is remote and faces problems of insecurity

2.7.2 Other inland lakes

These comprise of lakes Baringo, Naivasha and Jippe. In Lake Baringo the main fisheries are *tilapia spp* (17%)*, Barbus spp,*(8%), *Clarias spp* (25%) and *Protopterus spp*. (51%). Lake Naivasha has mainly tilapine species (65%), black bass (11%) and cray fish (24%), while in Lake Jipe there are mainly Tilapines constituting more than 90% of total catch and some amounts of *clarias spp* and sardines.

In the case of Lake Naivasha, the threat of over-exploitation led to the implementation of a fishing ban on the lake in 2001 – 2002, followed by attempt to control the number of boats and fishers. Similarly, Lake Baringo was closed for fishing between 1993 and 1994 but seemingly this did not result in significant stock recovery. Lake Baringo is also becoming shallower due to siltation from inflowing rivers and from run-off. For Lake Jipe the main problem is related to siltation and encroachment by water weeds which reduce navigation and total fishing space.

It is evident that the inland lakes now require similar management strategies being adopted in Lake Victoria. Periodic closed seasons lasting 2-3 years may help to recover some of the stocks, but this does not offer long-term solutions. More effective action should be taken in the direction of controlling mesh sizes, number of boats and gears so as to limit overall fishing effort. The silted lakes may need to be re-opened up through controlled excavation.

2.7.3 River-based fisheries

A large variety of riverine fish species have been identified in Kenya's rivers, particularly those entering Lake Victoria. Owing to their low abundance and due to the undeveloped

markets beyond the Lake region, these species have remained more valuable for their contribution to biodiversity rather than for commercial importance.

The river systems are quite vulnerable to over-exploitation and the adverse effects of environmental degradation. Fish catches in the rivers have been reducing since the 1940s. Studies conducted reveal that the total annual output from some of the rivers (e.g. Sondu-Miriu) have declined by up to 90%, compared to the catch levels in the 1950s and 1960s.

The main causes of the decline in the catches of riverine species include overfishing by destructive fishing methods, papyrus encroachment, habitat destruction, predation by Nile perch, poor management and pollution. However, Kenyan river fisheries are also prone to the effects of pollution, irrigation and hydropower development, for example, on rivers Kuja and Sondu-Miriu.

The suggested means to recover and conserve the riverine fisheries include;

(i) greater attempt to regulate minimum catch sizes using community-based authorities, such as clan leaders, chiefs etc
(ii) banning the use of small-mesh gillnets and beach seines during the fish spawning period
(iii) establishing and protecting the nursery grounds
(iv) creating bypass fish ladders or passes to allow ascent of anadromous fish through a hydro-power scheme. Such ladders, ideally, should be installed as part of the main dam rather than as a later addition
(v) managing water weeds, such as the water hyacinth, to provide sheltered nurseries
(vi) controlling pollution through waste treatment at source

2.7.4 Aquaculture production

Aquaculture still contributes just about 1% of the total fish landed in Kenya, and its growth has largely stagnated over the last decade (Fig. 2.3). Aquaculture, therefore, remains with huge potential for expansion. Considering that the natural sources of fish in Kenya are

already showing signs of over-exploitation, it would be justified to invest resources towards expanding and modernising aquaculture production systems. The main fish species presently produced in aquaculture in Kenya are *Oreochromis niloticus, Tilapia zillii, Clarias gariepinus* and *Cyprinus carpio.*

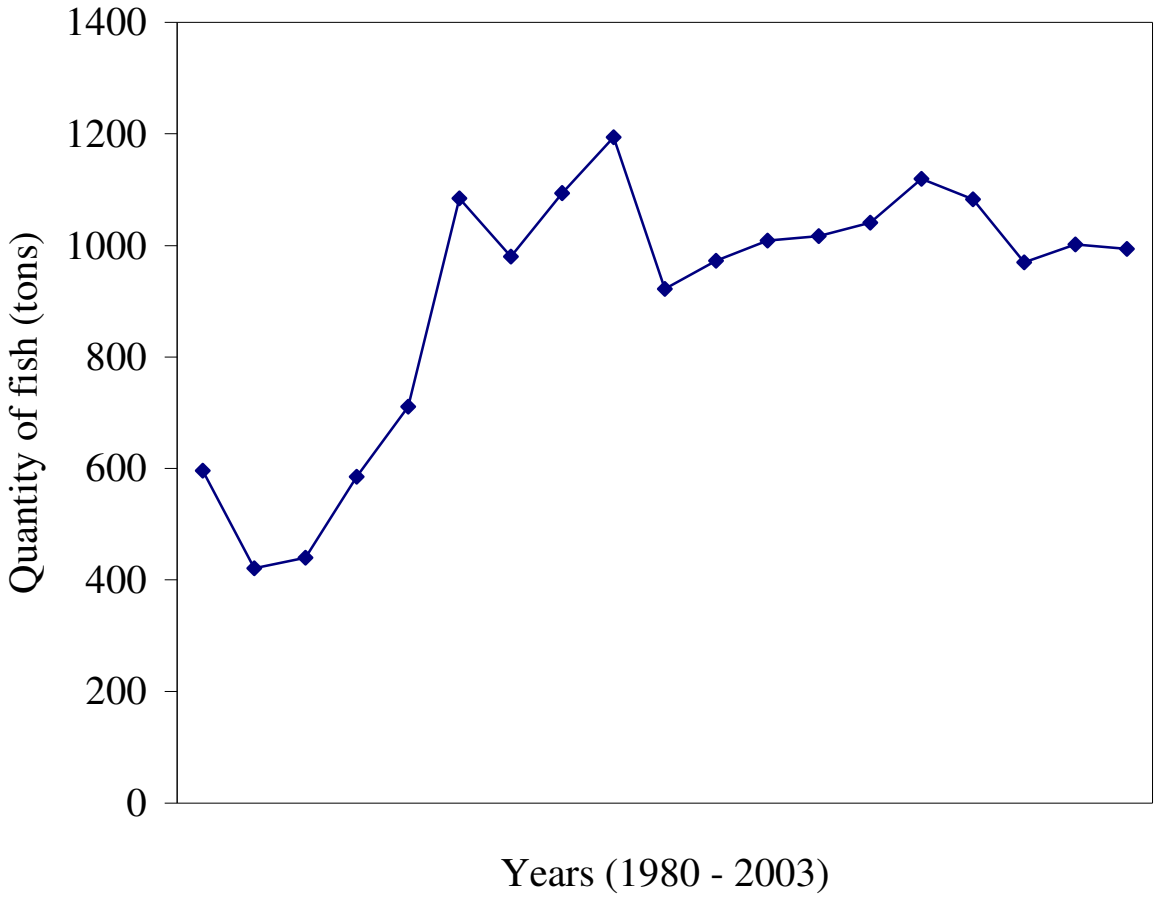

Fig. 2.3:Aquaculture production in Kenya

Source: Department of Fisheries data

At present aquaculture in Kenya is characteristically for subsistence, adopting low investment and, in return, getting low pond production. Fish-farming system in Kenya is relatively under developed, mainly using small earthen ponds. It is practiced at varying degrees of intensification using the following holding units;

(i) Pond culture: These mainly use earthen ponds for extensive or semi-intensive aquaculture. Most of Tilapines, catfish and common carp are cultured in such ponds

(ii) Raceway culture: These are rectangular ponds through which water flow continuously. They are either concrete or earthen, although the latter are more common in Kenya. This unit allows for high stocking densities because of the high water exchange rate and provision of a complete diet for the fish. Raceway culture is used in most trout farms.

(iii) Tank culture: Tanks are usually circular concrete structures with a central outlet. This system deploys continuous water flow and complete feeding with formulated feeds.

Aquaculture production in Kenya varies in the different provinces, the leading acreage under aquaculture being in Western Province, followed by Central and Nyanza provinces. These regional differences are largely attributable to physical suitability of soils and land topography, availability of sufficient water supply, attitude of residents towards fish farming, a tradition of fishing or fish farming and availability of extension and other support services. These issues, among other factors, must be addressed if aquaculture is to be developed and contribute more towards fish production in Kenya. However, the potential for aquaculture cannot be overstated.

Aquaculture is constrained by a number of factors; including, technology, feeds availability, trained staff and the failure of fish farmers to perceive it as a commercial, rather than subsistence, venture. Specifically, the constraints facing aquaculture development in Kenya;

(i) Limited government budget for aquaculture development

(ii) Lack of adequate and quality fish feeds and seeds

(iii) In effective extension services

(iv) Lack of co-ordinated approach to aquaculture research and extension

(v) Lack of farm-based research results for small-scale aquaculture development

(vi) Decreasing interest in fish farming due to low returns and uncertainties

(vii) No clear policy on fish farming

(viii) Competition by cheaper fish from capture fisheries, especially around\Lake Victoria

(ix) Poor book keeping and farm management

(x) The subsistence, rather than commercial orientation of fish farming

(xi) Lack of access to credit facilities

(xii) Poor marketing arrangements

The strategy for developing aquaculture should, therefore, aim at the following;

(i) Development of quality seeds and fingerling production

(ii) Commercialisation of the aquaculture sub-sector

(iii) Improving the farm management skills of fish farmers

(iv) Improved co-ordination of aquaculture extension services

(v) Increased research in to suitable aquaculture species

(vi) Market research for potential aquaculture products

3. TREND OF PRODUCTION AND EXPORT OF INLAND WATER FISHERIES

This section provides a trend analysis of the production and export of inland water fish species for the period 1998-2003. For export, the analysis is by destination countries, where as export to the EU is reported as a block (TOR ii).

3.1 The fish supply situation in Kenya

Lake Victoria is Kenya's dominant source of fish, contributing over 93% of all the fish landed annually in Kenya in the last decade (and nearly 97% of fresh-water fish output). Statistical data collected by the Fisheries Department indicate that the fish landings in Lake Victoria increased from 1976, when only 18,680 tonnes of fish landings were recorded, to 1992, when a peak of about 220, 000 tonnes were recorded. Since then, fish catches have indicated a general declining trend (Fig. 3.1). There have also been suggestions that the current low catches are just the depth of a cyclic production pattern, with the possibility of an upsurge in fish catches in the years to come.

Detailed analysis of the catch trend reveals four marked fish catch regimes since 1976. The first period extended from 1976 up to 1985, when less than 90,000 tonnes were landed each year. From 1986 to 1988 the annual catches ranged between 102,000 tonnes and 138,000 tonnes. The period 1989 to 1993 had record catches, largely attributed to the Nile perch boom. During this period annual catches ranged between 211,000 tonnes and 219,000 tonnes. There was a decline in catches from 1994 to 1998, the period of the Nile perch bans. The catches ranged from 151,000 tonnes to 193,000 tonnes per year within this time. The period after 2000 has experienced very low catches which are comparable to catches in 1986 to 1988 period. The most recent records show that just about 102,000 tonnes of fish were landed in 2003.

The catch decline is one indicator of over-exploitation, and has been a cause of concern especially for Nile perch, whose catch has gradually decreased since 1991 (only rising sharply in 1999 following the lifting of the ban on fish exports to the EU, then falling off

again). The declining catches is largely attributed to the use of small mesh nets, indiscriminate gears and mass-target fishing methods, which have been prevalent in Lake Victoria. In particular, there has been a gradual reduction in mean mesh sizes of gillnets used in the lake in the last decade. The other two commonly applied stock assessment indicators – mean catch sizes and catch per unit effort – have also generally declined in the past decade. It is, therefore, imperative that efforts geared towards developing the fish exporting industry must address the causes and consequences of over-exploitation in Lake Victoria.

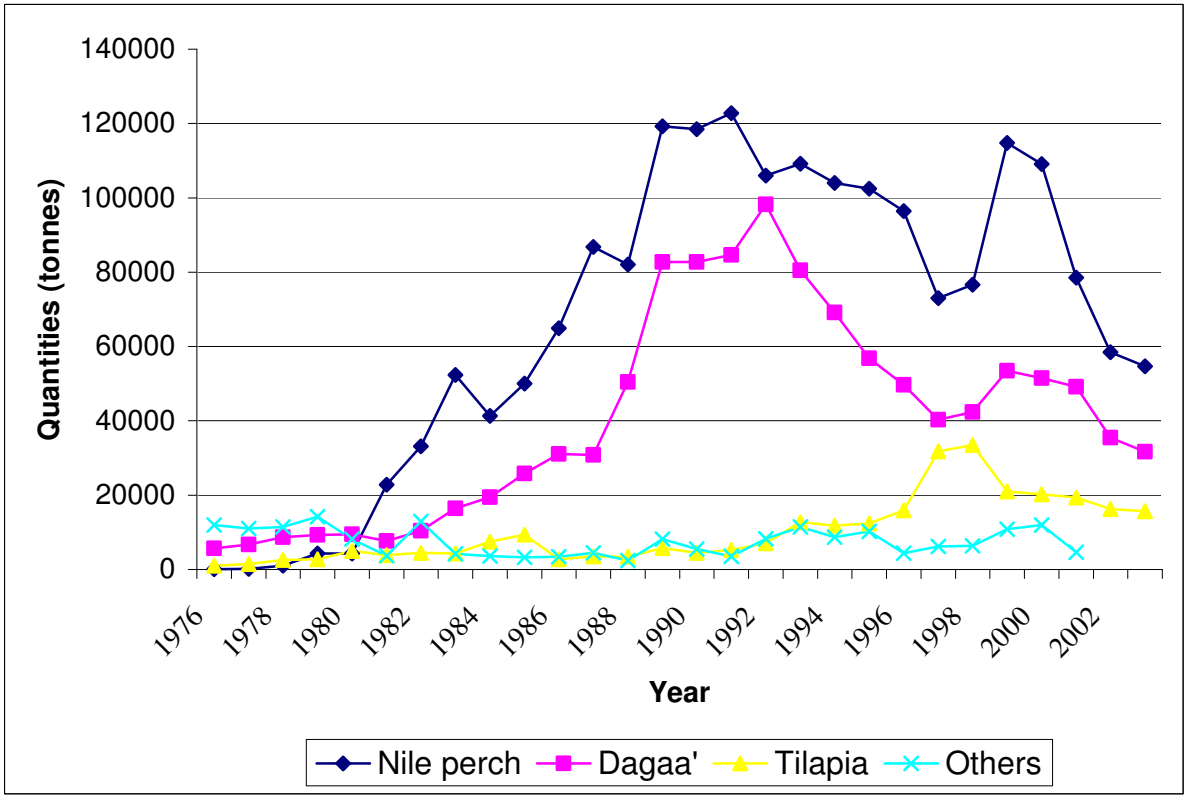

Fig. 3.1 Lake Victoria fish landing (1976-2003)

Sources: Fisheries Department statistics and KMFRI

3.2 Kenya's inland fish export products

Nile perch is the dominant fish species in the export trade, accounting for about 95% in volume and value of Kenya's total fish exports. The main raw material in Nile perch processing industry is whole Nile perch supplied from the various landing beaches of Lake Victoria. The raw fish is supplied to the factory usually chilled under ice. The processing involves de-scaling, filleting, gutting, beheading. The main products include; fillets (skin on and skinless), whole body (gutted, headless), fish maws and swim bladders. The by-products are fish frames, scales, skin, offals (fat deposits).

The frozen products are packed in polythene bags and finally in cartons, the chilled products being packed in Styrofoam boxes. In the cold stores, the finished products are stored at -5 ºC for chilled products and at –18 ºC for frozen products. The frozen fish products are then exported via Mombasa Port, while chilled products leave through Nairobi Airport. Most of Nile perch exports are increasingly in frozen form. Chilled fish products fetch much higher prices but require very stringent requirements in quality assurance. The chilled form should reach the market within 48 hours after landing, and its export was mainly supported by the efficient airfreight and logistical export system already in place for Kenya's horticultural products going to the same countries. However, following the three export bans of Nile perch, fish exporters left the lucrative fresh fish market for the less demanding and less paying frozen fish export trade.

3.3 The export markets

The number of export markets has expanded over the years. In 2002-2003, Kenya exported fish to at least 26 countries in different continents (See Table 3.1 and Table 3.2 for export distribution by quantity and Table 3.3 for export values). Available records for the years preceding 2002 did not categorize fish exports by destination. However, from 2002, the market areas have been assessed within three main blocks;

i) **The EU countries**: The main markets, in order of importance, are; The Netherlands, Italy, Germany, Belgium, Portugal, Spain, Cyprus, Malta, France and Poland. The EU countries

imported 34% and 37% of Kenya's fish exports in 2002 and 2003 respectively. The EU accounted for an average of 36% of the value of exported fish in the two years.

ii) **The Far East**: The main markets, in order of importance, are; Australia, Japan, Hong Kong, Singapore, Malaysia and China. This block imported 27% and 24% of Kenya's fish exports in 2002 and 2003 respectively. The fish imported by these country represented, on average, 26% of the value of fish exports.

iii) **The Middle East**: This is dominated by Israel as a single very important importer of Kenyan Nile perch. A small amount of fish is also exported to the United Arab Emirates (UAE). This block imported 33% of Kenya's fish in 2002 and 34% in 2003. Of these, Israel alone imported 28% and 32% in the two respective years, making it the most important single destination for Kenyan Nile perch. The fish imported by Israel accounted for 29% of value of total fish exports.

iv) **The rest of the world**: These include the USA, Venezuela, Colombo and Cuba. Available data indicate that some little fish have recently been exported to African countries, although the nature of fish export could not be verified. These countries accounted for 5-6% of fish exports both in terms of quantity and value.

3.4 Trends of Kenya's fish exports

Starting from early 1980s, fish exports had a steady increase till the mid 1990s. The 1997, 1998 and 1999 successive export bans of fish and fishery products from Lake Victoria to the EU, which was already importing about 87% of all fish exports from Kenya, interrupted this trend. The lowest intake by the EU was in 1999 when it imported only 6% of Kenya's fish. New markets emerged during the ban to replace the void created. Israel became the most prominent single importer of Kenya's fish. However, it should be noted that the EU has consistently offered the highest prices for Kenya's fish, hence, despite the emergence of new markets, the overall value of exports went down during the bans.

EU has slowly regained its position as the leading fish importing block. As Kenya improves its fish quality assurance status, the EU will likely become even a stronger fish importer. The post-2000 export trends (quantity and values) show the emergence of three strong importer blocks, almost sharing fish exports equitably (Tables 3.1, 3.2 and 3.3 and Fig. 3.2 and 3.3). Future projections are that the three main export market blocks (the EU, the Far East and Israel) will compete for Nile perch. Because of its strategic location, better fish prices and emerging trade partnership with Kenya, the EU has definite advantages to become the leading fish importer from Kenya.

Of the fish importing blocks, it is only the EU that has clearly documented the quality requirements for its fish imports, and provided elaborate institutional mechanisms to monitor and ensure compliance. The other importing blocks have not provided specific quality standards applicable in their countries. The assumption is that fish exported to those blocks have to meet some other standards such as the WHO/ FAO fish quality standards. In practice, due to elaborate mechanisms put in place, the EU standards tend to be more stringent and more strictly monitored, which has resulted in continued fish exports to those other blocks even during the EU fish bans.

Table 3.1 Kenya Fish Export by quantity (Kg)

Destination	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total exports	**11,698,000**	**12,518,000**	**15,826,000**	**17,947,000**	**17,106,762**	**16,444,929**
EU						
Belgium					626,463	393,294
France					-	39,702
Germany					678,170	393,543
Greece					490,724	383,593
Netherlands					2,508,785	3,304,870
Norway					-	**698**
Italy					672,408	896,194
Malta					40,308	55,308
Poland					-	16,002
Portugal					647,876	309,834

Cyprus					41,106	92,410
Spain					77,600	195,784
EU Total					**5,783,440**	**6,081,232**
The Far East						
Hong Kong					358,800	348,964
China					24,000	16,008
Malaysia					261,024	282,018
Singapore					236,424	297,002
Japan					2,170,947	870,542
The Far East Total					**4,646,789**	**3,888,368**
Australia	-	-	-	-	**1,595,594**	**2,073,834**
The Middle East						
Israel					4,799,245	5,340,813
U.A.E					790,852	245,781
The Middle East Total					**5,590,097**	**5,586,594**
Americas						
U.S.A					798,052	603,913
Venezuela					217,104	112,012
Colombo					52,800	-
Cuba					-	51,400
Americas Total					**1,067,956**	**767,325**
Africa						
Re-Union					18,000	19,000
D.R.Congo					480	92,410
Uganda					-	7,000
Other						3,000
Africa total					**18,480**	**121,410**
Total Exports	**11,698,000**	**12,518,000**	**15,826,000**	**17,947,000**	**17,106,762**	**16,444,929**

Source: Data from Kenya Fisheries Department

Table 3. 2 Nile perch exports grouped by market regions (Tonnes)

Year	Market destination			
	EU	**Far East**	**Israel**	**Others**
1996	10,388	1,801	3,431	1,120
1997	6,882	2,664	4,244	929
1998	2,320	2,201	5,252	1,349
1999	742	2,722	5,529	2,894
2000	1,680	4,146	7,185	2,468
2001	3,818	4,650	7,530	1,947
2002	5,783	4,647	4,799	1,878
2003	6,081	3,888	5,341	1,135

Source: Kenya Fish Processors and Exporters Association and Fisheries Department

Table 3.3 Value of Kenya's fish exports (Ksh)

Destination	**Value of exports (Ksh) per year**				
	1999	**2000**	**2001**	**2002**	**2003**
Total value	**1,669,417,000**	**2,721,560,000**	**3,784,335,000**	**3,981,652,576**	**3,922,354,979**
EU					
Belgium				157,787,154	105,708,887
France				-	7,103,050
Germany				175,228,893	90.378,604
Greece				119,652,390	93,707,084
Netherlands				634,188,519	819,266,033
Norway				-	377,434
Italy				194,923,422	219,976,805
Malta				7,988,903	15,133,200
Poland				-	3,124,390
Portugal				127,744,423	75,443,357
Cyprus				6,474,483	19,659,000

Spain				18,851,070	53,631,417
EU Total				**1,442,839,257**	**1,413,130,657**
The Far East					
Hong Kong				148,694,700	96,435,153
China				5,076,500	2,937,067
Malaysia				56,381,066	60,311,276
Singapore				50,945,818	57,899,432
Australia	-	-		304,653,095	510,960,621
Japan				494,012,823	242,677,227
The Far East Total				**1,059,764,002**	**971,220,776**
The Middle East					
Israel				1,066,071,545	1,254,866,306
U.A.E				175,674,468	57,748,192
The Middle East Total				**1,241,746,013**	**1,312,614,498**
Americas					
U.S.A				221,283,868	157,427,015
Venezuela				217,104	50,135,284
Colombo				10,375,200	-
Cuba				-	10,558,800
Americas Total				**231,876,172**	**218,121,099**
Africa					
Re-Union				5,332,500	5,197,500
D.R.Congo				94,632	-
Uganda				-	1,329,758
Other				-	740,691
Africa total				**5,427,132**	**7,267,949**
Total value	**1,669,417,000**	**2,721,560,000**	**3,784,335,000**	**3,981,652,576**	**3,922,354,979**

Source: Data from Kenya Fisheries Department

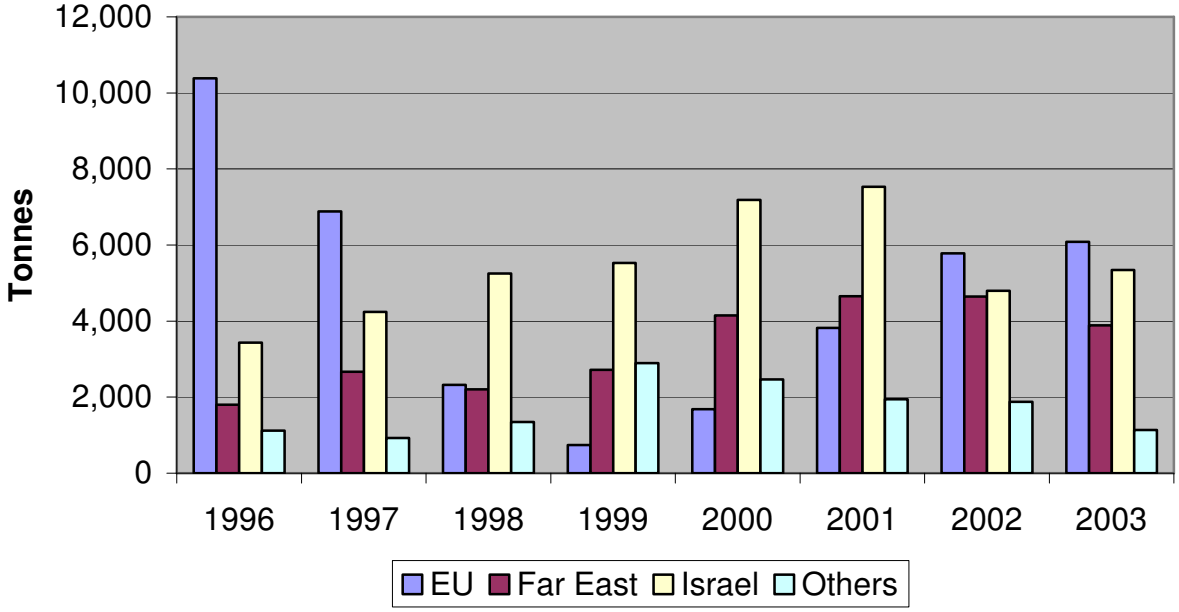

Fig. 3.2 Trends of Nile perch exports by market regions (1996-2003)

Source: Kenya Fisheries Department/ AFIPEK/ KMFRI

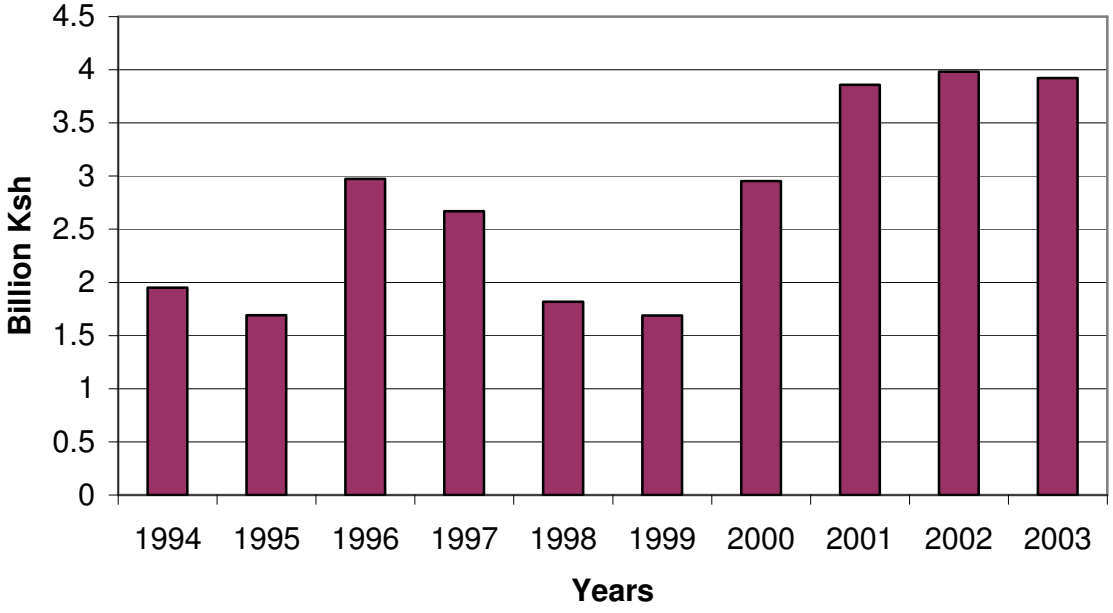

Fig. 3.3 Value of Nile perch exports (1994-2003)

Source: Kenya Fisheries Department/AFIPEK/ KMFRI

4. LAST EUROPEAN UNION BAN ON KENYA'S FISH EXPORTS

This section gives a background of fish quality legislation and provides a detailed analysis of the nature of the last EU ban on Kenya's fish export to the EU and the opportunity cost in terms of fish which would have been exported, investment and employment losses (TOR iii). It also assesses economic costs (in terms of investments into systems and equipment for ensuring compliance with the EU sanitary standards and HACCP) incurred by fishermen, factories and the economy in general as a result of the last EU ban on Kenya's export (TOR iv).

4.1 Fish quality assurance legislation

As Kenya's fisheries become more integrated in the global economy, so the industry has increasingly become subjected to international quality conditions. The international fish trade is very highly regulated. In Kenya, new local institutions have been created and equipped to ensure that fisheries products meet the high standards of the international markets. The Fisheries Department, which is the body legally mandated to manage fisheries, operates through the Fisheries Act CAP 378 and the Fisheries (Fish Quality Assurance) Regulation 2000. Because in the earlier years the department lacked the capacity to develop and implement food standards, the Kenya Bureau of Standards introduced its own sets of standards for fish processing and export, namely; Kenya Fish handling standards KS05-1516 and Specification for Drinking Water KS05-459. However, the most significant regulations for the fisheries sub-sector are those of the EU, specifically EU directives 91/493/EEC and 98/83/EC. These EU standards are enforced through the competent authority approved by the EU (the Fisheries Department) with periodic audits by EU inspectors.

4.2 Fish quality legislation

The fish industry in Kenya is governed directly by six sets of standards operated through three organizations:

(i) **Fisheries department**

a) Fisheries act cap 378 laws of Kenya and

b) The Fisheries (Fish Quality Assurance) Regulation 2000

These legislation are implemented and enforced through the Fisheries Department (the Competent Authority). The Competent Authority structure had to be developed and operationalised to ensure efficiency in assuring fish safety and quality.

(ii) Kenya Bureau of Standards

a) Kenya Fish handling standards KS05-1516 and
b) Specification for drinking water KS05-459. The requirements for drinking water and containerised drinking water.

These set of standards are implemented and enforced through the Kenya Bureau of Standards

(iii) European Union

a) EU Council Directive 91/493/EEC lays down the sanitary conditions for the production and the placing on the market of fisheries products from outside the EU.
b) EU Council Directive 95/71/EEC – 95 amends the annex to Council Directive. 91/493/EEC.

4.2.1 The Fisheries Department Legislation

These are the Fisheries Act cap 378 laws of Kenya and the Fisheries (Fish Quality Assurance) Regulation 2000. The legislations provide for the Fisheries Department as the technical implementing body of the Competent Authority for purposes of quality assurance of Fish and Fishery products in Kenya. The fish quality standards of Kenya are formulated around the EU regulations, which was adopted by the fisheries department and incorporated in the Fisheries Act Cap 378 and the Fisheries (Fish Quality Assurance) Regulations 2000. The standards cover the sub-sector across board from the fishing grounds, aquaculture to marketing of the fish and fishery products. The key feature of this Regulation is that it aims to achieve a health attestation of wholesomeness of all fishery products (whether fresh,

chilled, or frozen) and all support materials that come in the preparation, processing, packaging, storage and transportation of the product.

The regulation imposes strict recommendations on the fishing grounds for any pollutants; controlling of fish landing, handling and transportation; approving new fish processing establishments on building, construction, equipment, water purification and operation of Fish processing plants and factory vessels. The regulation also gives recommendations to the competent authority on inspection of operational fish processing plants to ascertain compliance with the Kenya standards for handling and processing; services of laboratories for microbiological, physico-chemical, pesticide and heavy metal analysis of fish products are used with a provision of a health certification of fish and fishery products on the basis of HACCP.

The regulation also lays down all the procedures to be followed for compliance with these regulations. It also gives guidelines on approving of establishments of fish markets; specifies conditions for placing on the market of fish and fishery products and maintaining a register of approved fish processing plants, auctions and wholesale markets and landing sites.

4.2.2 Kenya Bureau of Standards regulations

These are the Kenya Fish Handling Standards (KS05-1516) and the Specification for Drinking Water (KS05-459). This code applies to fish for human consumption and sets out the treatment that shall be applied to fish from the time it is taken from the source through all the stages in order that it reaches the consumer whether on the home market or export market in top quality condition. The document has adopted the EU directive 91/493/EEC with modifications to meet Kenyan export and import requirements. The Standards cover;

- Advice to traders on food labeling requirements
- Sampling of foods to ensure compliance with compositional standards
- Monitor use by dates on food
- Carry out food surveys for national and regional clients
- Visit retailers and manufacturers to ensure they comply with food legislation

4.2.3 European Union directives

EU Council Directive 91/493/EEC lays down the sanitary conditions for the production and the placing on the market of fisheries products from outside the EU. The Directive imposes strict recommendations on the building, construction, equipment, purification tanks and storage tanks. The premises are expected to have laboratories. Record keeping is paramount and there are clear guidelines on labeling of packaging material. The EU Council Directive 95/71/EEC – 95 amends the annex to Council Directive. 91/493/EEC.

4.2.4 Hazard Analysis Critical Control Point (HACCP)

Hazard Analysis Critical Control Point (HACCP) is a preventative system of hazard control rather than one of reaction or point inspection to decrease a hazard. Food processors can use HACCP to identify hazards, establish controls and monitor the controls in the case of harmful microorganisms or chemical and/or physical contaminants in food. The United States Food and Drug Administration (FDA) first required HACCP control for food processing in 1973 for canned foods to protect against *Clostridium botulinum*, and recently has been required for seafood in the United States. HACCP has also been endorsed worldwide by Codex Alimentarius, the European Union and by several countries including Canada, Australia, New Zealand and Japan.

The first detailed publication in the United States of how HACCP could be applied to the seafood industry appeared in 1977, and except for low acid canned food, few attempts were made before 1985 to apply HACCP to seafood products. The FAO Fish Utilization and Marketing Service began in 1985 to use HACCP in its training programmes and the United States National Marine Fisheries Service (NMFS) developed a HACCP based programme for seafood (Martin et al. 1993). The European Union formally shifted to the preventative systematic approach provided by HACCP in 1991 (EEC Commission Decision 1991b). The main technical characteristic of the new inspection and quality control procedures approved at that time was the adoption and enforcement of HACCP in European Union member

countries and in those countries that wish to export to the European Union (Lima dos Santos, Josupeit and Chimisso dos Santos 1993). HACCP is based on the following seven principles;

i) Conduct hazard analysis and identify preventative measures;

ii) Identify critical control points (CCP);

iii) Establish critical limits;

iv) Monitor each CCP;

v) Establish corrective action to be undertaken when a critical limit deviation occurs;

vi) Establish verification procedures;

vii) Establish a record keeping system.

4.3 Nature of the last EU ban on fish exports

The fish processing establishments were initially developed without consideration for safety and assurance. Yet the industry thrived and achieved tremendous growth in the 1980s and early 1990s without problems. The coming into force of the EU Directive 91/493 EEC, which set minimum requirements for fishery products entering the Union, became the turning point in fish processing and export business. The EU inspectors started monitoring the fish consignments from lake Victoria through sampling and testing at entry points. In 1996, Spain detected *Salmonella* in a fish consignment from the region and, together with Italy, immediately imposed a ban on fish originating from Lake Victoria on 27th November 1996; other EU countries continued to import fish from the region.

The EU imposed another ban on 23rd December 1997 for fresh fish products from the Great Lakes region and Mozambique due to *Cholera* outbreaks. Officially the EU imposed the ban citing a reported *Cholera* outbreak, inadequate quality assurance related legislation, poorly organized Competent Authorities, inadequately trained inspection personnel and lack of adequate laboratory facilities to monitor environmental contaminants in harvesting grounds. The ban was lifted on 30th June 1998. Starting 1998, the EU Food and Veterinary Division started sending inspectors to the region to assess fish production conditions throughout the supply chain. The inspectors also assessed the Competent Authority and testing laboratories.

The fish ban on 26th March 1999, which was occasioned by suspicion that obnoxious chemicals were being used in fishing, was the longest and the most harmful economically and socially. It lasted for 22 months for Kenya, and was officially lifted in November 2000.

4.4 Impacts of EU ban on the fish industry

The EU bans on fish exports resulted in loss of revenue to the Governments and stakeholders, decline in fish prices, loss of employment and disruption of other related and supporting businesses, petty businesses in fishing communities, among others. Some factories collapsed. The details of impacts of the EU fish export bans, and value of losses, are given in Table 4.1. The valued loss was mainly in terms of lost foreign exchange earnings. However, there were other non-valued losses including loss in employment, reduced domestic prices etc.

Table 4.1 Impacts of the EU fish export bans

Ban	Reason	Impacts	Value of loss (Ksh)
1996	*Salmonellae* outbreak	13.2% drop in foreign exchange earnings	456.2 million
		Other component losses • 33% drop in export to EU • 10% drop in Nile perch production • 10% drop in employment	
1997	*Cholerae* outbreak	24% drop in total fish exports from Kenya	829 million
		Other component losses • 66% drop in Nile perch exports to EU • 32% drop in value of fish exports • Employment losses	
1999-2000	Chemicals use in fishing	47% drop in Nile perch exports to EU	2.1 billion
		Other component losses • Employment losses	
	Cumulative loss from the EU fish bans		3.4 billion

Source: Adapted from Gitonga, Okal and Mutegi (2001)

The estimated cumulative loss due to EU fish bans could, therefore, have been in excess of **Ksh 3.4 billion**. An important lesson learnt from the export bans is the danger of market specialization. This has made industrial fish processors to diversify their markets rather than concentrate on the EU alone (Fig. 3.2).

4.5 Investments into improving sanitary and HACCP Implementation:

In order to stay in the fish export business much investments have been undertaken to develop or improve systems and equipment for ensuring compliance with the EU sanitary standards and HACCP. Most of these are private costs incurred by fish processing factories and fishers. However, there has also been public financing by the Government and development partners such as the EU and the World Bank The Government instituted a plan of action, which broadly involved the following areas of investment;

i) Developing the legal framework: Prior to the EU ban of fish exports, the inspection and certification of fish and issuance of health certificate and export permit was done by both the Ministry of health, Fisheries Department and Ministry of Trade. Proper coordination was lacking, making it necessary to set up a Competent Authority (CA). Legislation concerning the structure and draft sanitary control regulations for effective regulatory compliance was put in place. This resulted in Kenya Fish Quality Assurance Regulations 2000 being gazetted.

ii) Development of Codes of Practice for the fish industry: Comprehensive guidelines and local codes of practice were designed to meet the EU requirements by local industry practices under local conditions. The code of practice was to be used in the design, construction and hygienic operation of fish processing establishments and vessels and Implementation of HACCP-based quality assurance systems within firms involved in the processing, handling and distribution of fishery products. Stakeholders discussed the drafts before adoption. Estimated cost of this exercise was Ksh.1.5m. This process is not complete as it was to be harmonized in the three East African countries.

iii) Organization structure and technical support; Organization and management structure, technical support requirement for effective fish quality control service were put in place to ensure compliance with the legislation. Training of fisheries officers as prosecutors was conducted for enforcement of the regulations. Forms and other supporting documents for fish export were developed.

iv) Landing beached upgrading: This involved mainly fencing, paving reception area, improvement of drainage system, provision of insulated fish boxes (containers), improvement of the sorting shades (fish bandas). Another level of beach improvement involved provision of electricity and water, construction of landing jetties, modernization of fish reception and improvement of access roads.

v) Training of HACCP and quality inspectors Training of statutory inspectors and production of a compliance manual was conducted.

vi) Training of laboratory staff-

vii) Analytical Laboratories; For building infrastructural capacity of the Competent Authority construction of laboratory for chemical and microbiological analysis was initiated. A laboratory was constructed at Kisumu regional office to cater for the analysis of fish, water and sediment samples from Lake Victoria. Other associated costs include printing export certificates.

4.6 Costs of investments for compliance with standards

4.6.1 Funding by Government

The Kenya Government and development partners have contributed funds for a variety of development activities. The implementation of most of the activities is still going on. Funds have been (or will be) spent on the following development activities.

(a) Fish landing sites: Fencing of fish landing site; constructing Jetty, fish banda; building a dispensary; purchasing fish handling facilities e.g. trolleys, protective clothing.

(b) Infrastructure: Improving access roads; Provision of electricity, portable water, cold rooms, ice plants, toilets, telephone.

(c) Surveillance and monitoring: Purchase of patrol boats and vehicles and operating fuel; Sampling schedule and analysis.

(d) Personnel: Training fish inspectors, laboratory technicians, fishers and fish handlers.

(e) Miscellaneous costs: These include; printing health certificates, inspections, etc.

Table 4.2 shows that the Kenya Government did not allocate any money for sanitary standards and HACCP until the financial year 2001/02. All the allocated money were spent by the various districts to implement some of the above listed activities. Thus, the government's direct financial disbursement to the districts for improving sanitary standards and implementation of HACCP amounts to Ksh 23,118,314, over a 3-year period. This gives an expenditure of Ksh 7,706,105 for all districts or Ksh 963,263 per district per year. However, the trend suggests that the government contribution will be increasing over the years.

The specific expenditure projects accomplished through government financing are;

- Busia District: Landing beach improvement and cold storage/ ice pant construction
- Bondo District: Installation of radio communication; Improvement of fish landing sites and fish reception depot; Construction of cold room
- Kisumu District: Beach improvement at Dunga, Paga and Ogal beaches.
- Rachuonyo District: Improvement of fish landing site
- Homa Bay: Improvement of fish landing site
- Migori District: Installation of Radio communication, Improvement of fish landing sites.

Table 4.2 Annual financial allocation by the Government to riparian districts for improving sanitary standards and HACCP

District	Amount allocated per financial year (Ksh)						
	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	Grand Total
Busia	-	-	-	6,000,000	200,000	600,000	6,800,000
Bondo	-	-	--	-	1,250,000	4,350,000	5,600,000
Siaya	-	-	-	-	-	600,000	600,000
Kisumu	-	-	-	-	800,000	4,700,000	5,500,000
Nyando	-	-	-	-	-	-	0
Rachuonyo	-	-	-	-	600,000	1,000,000	1,600,000
Homa Bay	-	-	-	-	200,000	600,00	200,000
Suba	-	-	-	-	618,314	700,000	1,318,314
Migori	-	-	-	-	700,000	800,000	1,500,000
			Total	6,000,000	4,368,314	12,750,000	23,118,314

Source: Department of Fisheries records

Table 4.3 Investments in the fish quality laboratory in Kisumu

No.	Item	Specific item	Cost (Ksh.)
1	Fish Quality Laboratory-	Construction of Lab.	5,227,702
		Equipment and reagents	4,232,127
		Cold room	2,750,450
2	22KVA standby power generator	Purchase price	1,747,933
		Installation	436,950
3	Surveillance and monitoring- pesticide/ and heavy metals sample analysis – quarterly	1,280,000/year x 3 i.e. 2002/03/04	3,840,000
Total Ksh.			18,235,162

Source: ADFs office -Kisumu

4.6.2 Costs of fish quality assurance monitoring

In the absence of an operational laboratory, the Department of Fisheries conducts regular fish quality monitoring analysis by sampling fish, water and sediment from Lake Victoria after every three months and analyzing the samples at KEPHIS. The cost of each round of analysis is estimated to be;

Ksh. 320, 000 x 4= 1,280,000

4.6.3 Funding by development partners

In addition to the direct government financial disbursement, funds have also been provided by the World Bank sponsored Lake Victoria Environment Management Program (LVEMP). These funds, disbursed under the micro-project vote, go directly to the fisher communities to fund pre-identified community projects. Table 4.4 lists the benefiting community, the funded project and the amount disbursed in the last five years of the project. The modal allocation is Ksh 900,000 (Table 4.4).

Table 4.4 Funding by World Bank Project (LVEMP) towards improving sanitary standards and HACCP implementation

No.	Community/beach	Project	District	Total investment (Ksh)
1	Bumbe Beach Dev.Self Help Group	Sanitation	Busia	900,000
2	Bunyala Fish. Co-op Soc.	Sanitation	Busia	900,000
3	Usenge F/Co-op Soc.	Sanitation	Bondo	900,000
4	Kunya Beach Co.H/C	Health Centre	Bondo	900,000
5	Nyagoya Women Group	Cold storage	Bondo	900,000
6	Madundu F/Men S.H.G	Access road	Bondo	900,000
7	Kaloka Otiwa F/Group	Sanitation	Kisumu	850,000
8	Nyamware Youth Group	Fish Banda & Access Road	Kisumu	1,238,000

9	Dunga F/Com.S.H.G	Piped water & Access Road	Kisumu	900,000
10	Nduru F/Youth Group	Fish Banda	Kisumu	900,000
11	Asat Fisher Folk Group	Dispenasry	Kisumu	900,000
12	Mainuga S.H.G/	Access road	Rachuonyo	900,000
13	Awana F.M.G	Dispensary	Rachuonyo	900,000
14	Kendu Fisher Folks H.G.	Pharmaceutical outlet	Rachuonyo	900,000
15	Rakwaro Fishing Community	Dispensary	Rachuonyo	900,000
16	Miti Mbili S.H.G	Water & Sanitation	Rachuonyo	900,000
17	Alum Fishinh S.H.G	Dispensary	Rachuonyo	900,000
18	*Nyagoro Women Group	Intergrated fish farm	Rachuonyo	900,000
19	Chuowe Fishermen S.H.G	Dispensary	Rachuonyo	900,000
20	Shauri Yetu fishing Folk	Water	Rachuonyo	900,000
21	Ngura Women group	Fish banda	Homa Bay	900,00
22	Kaguto Women Geoup	Beach Sanitation	Homa Bay	1,300,000
23	Ngegu Fishing Group	Dispensary	Homa Bay	1,060,000
24	Ziwani Fishing Group	Beach Sanitation	Homa Bay	910,000
25	Ngimalo Fishing Const.S.H.G	Dispenasary	Migori	900,000
26	MuhuruCont.Dev.Project	Fish Banda	Migori	900,000
27	Gwassi F.Co-op Soc.	Fish Banda	Suba	900,000
28	Gembe F.Co-op Soc.	Fish Banda	Suba	900,000
29	Sukru Fishermen Traders S.H.	Water & Sanitation	Suba	900,000
30	Mfangano F.Co-op Soc.	Modern Fish Banda	Suba	900,000
			Total	**26,958,000**

Source: LVEMP Micro-Projects Report Fisheries Management Component & Fish/RSC.16/3/2vol IV.

4.6.4 Contribution by UNIDO towards improving sanitary standards and HACCP

A project funded by UNIDO trained staff from Kenya Bureau of Standards (KBS) and Kenya Plant Health Inspection Service (KEPHIS). Staffs from fish factories and Fisheries Department were trained on matters related to Fish Quality Assurance. Since the project was a multi-sect oral project it was not possible to compute financial contribution to the fisheries sub-sector in isolation. However, the project also made available **Ksh.10 million** for improvement of Luanda Kotieno landing beach in Bondo district to serve as a model beach. The quotations have been submitted to UNIDO and award for construction is being awaited.

The development of legal framework and the code of practice for the fish industry was conducted by the consultancy firm MEGAPESCA under funding of the UNIDO. The estimated cost of this consultancy was approximately **Ksh 10 million**.

4.6.5 Investment in human resource development

To improve the sanitary standards a lot of Human Resource Development has been done in the area of training, workshops targeting fish inspectors, factory workers, beach inspectors, and fishers. The list of these capacity building activities from 1999 to 2003, including the relevant costs, is shown in table 4.5 below.

Table 4.5 Investments in Human Resource Development through workshops, seminars and postgraduate training in local Universities and Polytechnics (1999 – 2004)

Period/Date	Venue	Target trainees	No. of participants	Cost (Ksh.)
1999	Usenge	Fishermen	50	400,000
1-8/12/99	Eldoret	Fish Inspectors	25	420,000
27-28/8/2001	Sunset	Regional fish quality w/shop	17	456,000
2001	Post graduate training Moi University	One officer from Fisheries Department-M.Sc.	1	520,000
From March2002	Kisumu polytechnic	FD-Laboratory technician	10	555,000

2002-05	Kenya Polytechnic	Technical staff	2	343,600
2002-05	Kenya Polytechnic	Technical staff	1	171,400
February 2002	Riparian beaches	Fish inspectors	2	34,000
May 2002	Tanzania,Kenya .Uganda	Fish inspectors	2	1,213,184
2002	ADF-Kisumu	Library documentation	1	19,800
2002		Enforcement of slot size		118,800
23-27th Sept.2002	Reef Hotel Mombasa	Laboratory mangement	4	212,000
2003	St.Annes	Fish Inspectors	25	579,900
2004 (3days)	St.Annes	Fish inspectors	25	250,000
Various dates	Tanzania/Kenya /Uganda	Harminsation of Fish Quality standards	3	513,618
Total				5,807,302

Source: Department of Fisheries records

4.6.6 Investments by fishers and agents

The main investment by fishers and fish collectors/agents has mainly centred on construction of collection boats, insulated containers, purchase of trays and ice. The main investment inputs for fishers and agents include;

- Construction of fishing boats,
- Purchase insulated containers
- Purchase appropriate gear
- Training on fish handling and preservation methods.

The biggest challenge will be in re-designing boats, each to accommodate a small-insulated fish hold that can carry ice and to train fishers on sanitary standards and HACCP. So far the number of boats with a fish hold are insignificant, if any, while very few fishers have been trained on fish handling and preservation methods. Fishers have made very little, if any, contribution to improvement of fish quality standards, and specifically, they have not made

investments towards meeting EU standards. Agents have contributed to meeting EU sanitary standards by installing insulated containers in fish collection boats.

The approximate number of collection boats fitted with insulated containers is 250 (personal communication with fish factories). The estimated cost of making one insulated container of capacity 1.5 tonnes is Ksh 75,000. Therefore, the total investment by agents in insulated containers is about Ksh 16.9 million.

4.6.7 Investments by fish processing factories

Because they are most affected, industrial fish processing factories have incurred the greatest costs towards fish quality assurance, improvement of sanitary standards and the implementation of HACCP. The investments involved are;

(i) Buildings: The improvements have been done to included tiling of walls, improving of ceiling, construction of modern laboratory, partitioning of the processing area, endorsing of the off-loading bay, reconstruction of modern toilets facilities, enclosing of the by-products area to bar birds etc.

(ii) Equipment and maintenance: Purchase of electronic scales, fly catchers, insulated trucks, thermographs, equipping the laboratory, chlorinator, U.V. system, knee operated taps, PVC pallets and PVC pallet boxes, ice plant, cold room, cold room doors, air conditioning of processing area.

(iii) Training: Internal training of workers to comply with HACCP and external training to put HACCP system in operation.

(iv) Wage bill: Due to implementation of HACCP system additional qualified staff had to be recruited to implement the HACCP and thus demand for high wages commensurate with qualification.

The costs incurred by individual factories to improve sanitary standards and implementation of HACCP, depend on capacity of factory, initial design and location, existing technical skills, among other factors. As an indicator, the costs that have been incurred by two fish processing factories to improve their sanitary standards and implement HACCP are shown in Table 4.6 below.

Table 4.6 Costs incurred by Factories to Improve Sanitary Standards and Implement HACCP

Investment item	Costs by factory (Ksh)		
	East African Sea Food Ltd, Kisumu	Peche Foods Ltd, Kisumu	
Building	4,000,000	5,000,000	
Plant and equipment	119,000,000	15,235,500	
Training staff (over 5 years)	180,000	432,000	
Wage improvement	9,000,000	9,144,000	
Total	**132,180,000**	**29,811,500**	

Source: Survey data

There are obviously very wide variations between the two factories presented above that make comparison difficult. There are currently 8 operating fish processing factories along Lake Victoria. Using the inputs of the two factories mentioned above, it might be estimated that to meet the EU sanitary standards and implement HACCP system the average cost per factory may be anywhere between Ksh 30 million and Ksh 150 million, depending on the particular factory.

Table 4.7 Summary of investments undertaken to meet sanitary standards and HACCP over the last 5 years

Funding source	**Details**	**Cost (Million Ksh)**
Government	Routine maintenance of quality assurance in 8 districts	23.1
LVEMP/ Government	Fish quality laboratory	18.2
LVEMP Microprojects/ Government	Improve facilities in riparian districts	27.0
UNIDO	Improve landing site facility on one beach	10
	Develop legal framework and code of practice for sanitary standards	10
CDTF	Construct cold room facility at Marenga Beach	15.5
Government	Construct cold room at Mbita Rusinga Beach	8.5
LVEMP/ Government/ NGOs	Human resource development through training at various levels	5.8
Private	Private developed beach at Uhanya beach	1
Factories	Investment by factories to meet sanitary standards and HACCP (assume average 40 million per factory at minimum)	280
Agents	Constructing insulated containers	16.9
Other initiatives by factories, AFIPEK, NGOs and communities and private individuals	Improve landing facilities, training etc.	8
Total		**424**

Source: Survey results

Therefore, about **Ksh 424 million** has been spent over the last 5 years in improving sanitary standards. The funds have been obtained from various sources (Table 4.7).

4.6.8 Benefits of compliance with SPS

A number of benefits will be obtained if the Kenya's fisheries sub-sector complies with SPS. They include:

i) Greater consumer confidence with Kenya's fish products, which will result in higher returns.

ii) Higher fish prices at all levels, resulting in better incomes to fishers and other players in the fish distribution chain.
iii) Investor confidence in the fish sub-sector, which will result in flow of resources in this industry
iv) Reduction of post-harvest losses
v) Indirect benefits to other sectors e.g. packaging, transport etc.

4.6.9 Resource and infrastructural gaps

The following have been identified as the resource gaps towards compliance with SPS and EU sanitary standards for Kenya's fish sub- sector;

i) Lack of proper fish landing sites. Most of the present landing sites lack electricity, portable water, cold room and provision of ice. The beaches are not fenced off and lack fish holding banda. There are no sanitary facilities, including toilets and wastewater disposal pits. The area around the landings are not paved to control dust and mud.
ii) Most beaches have no access roads for the greater part of the year.
iii) Some factories were not designed and appropriately sited as fish factories.
iv) Fishers lack appropriate fishing crafts. The boats are not designed to accommodate fishers, nets and ice without compromising quality and safety of the fish onboard the fishing vessel.
v) There are no fish quality assurance laboratories that are properly equipped to carry out relevant tests and staffed with well-trained analysts.
vi) There are insufficient trained fish inspectors, fishers, fish handlers, fish workers, fish agents, among others to comply with SPS.
vii) The Fisheries Department lacks logistical capacity to enforce SPS and compliance with HACCP. The department does not have sufficient vehicles, inspection instruments, funds and other logistical aspects to ensure effective implementation of fish quality assurance.
viii) There is lack of sufficient capacity for research on product development and marketing.
ix) Despite the great effort already undertaken in policy development, there are still gaps, especially towards regional harmonization of the policies and legislations.

5. INVESTMENTS NEEDED TO MEET EU SANITARY STANDARDS

This section provides a generic breakdown of the investment needed by the inland water fishing industry to meet EU sanitary standards on fish and HACCP system. The breakdown is categorised by fishermen, factories, government and any other structures within the industry that is considered critical in ensuring compliance with the EU standards (TOR v). It also assesses the extent of investments of inland waters fisheries industry (fishermen, factories and government) in facilities and equipment geared towards compliance with the EU sanitary standards and HACCP system (TOR vi), and documents the benefits of the current EU SPS standards to the fishery sector (TOR vii).

5.1 Current level of investments in facilities for fish quality

The current level of facilities in the fish landing beaches, and along the fish supply chain, are quite inadequate to meet sanitary standards and implementation of HACCP (Table 5.1). There has, however, been big improvement from 2000, largely due to investment by LVEMP in improving landing facilities (e.g. sanitary facilities) through its micro-projects.

Table 5.1 Facilities at fish landing sites

Facility	2000	2002
Landing sites	297	306
Beaches with proper fish bandas	80	72
Working cold rooms	1	0
Landing jettys	9	5
Beaches with potable water	0	29
Beaches with access to all weather roads	60	102
Beaches with basic toilet facilities	0	150
Beaches with electricity	29	15

Source: Secondary data

5.2 Investments needed to meet fish standards

To meet the requirements of EU sanitary standards and implementation of HACCP, the following investments need to be undertaken.

a) **Upgrading fish landing sites**. This should involve improving sanitary standard and enhancing the capacity to implement HACCP on landing sites. A few landing sites

(model beaches) should be selected and provided with; electricity, portable water, cold room and provision of ice. The beaches should be fenced off, the fish holding banda improved, and should be provided with sanitary facilities, including toilets and waste water disposal pits. The area around the landing be paved to control dust and mud.

b) Improvement of physical infrastructure to the landing areas. This should involve upgrading the access roads to the beaches.

c) Supply electricity to the beaches: The main fish landing beaches selected for Nile perch landing should all be supplied with electricity.

d) Establish ice-making plants: There should be at least six operational ice making plants around the lake to supply ice to fishers.

e) Factories: Factories need redesign to conform to fish processing standards. Critical areas include; cold storage, blast/plate freezers, water treatment systems tanks, UV, analysis laboratory and conditions of insulated vehicles for fish transport.

f) Assist fishers to acquire appropriate fishing crafts: Properly designed boats to accommodate fishers, nets and ice without compromising quality and safety of the fish onboard the fishing vessel. Upgrade fishing vessels to have smaller/ appropriate/ insulated fish holds. Upgrade fish collection vessels to have appropriate insulation**.**

g) Establish fish quality assurance laboratories: Properly equipped to carry out relevant tests and staffed with well trained analysts; Applying appropriate test methods; Internationally approved and accredited (compliant with ISO 17025). To start with, the laboratory already constructed in Kisumu should be made operational. Two additional laboratories should be constructed in Nairobi and Mombasa.

h) Human capacity building: There is need to invest heavily in training fish inspectors, fishers, fish handlers, fish workers, fish agents, among others.

i) Enhance logistical capacity of Fisheries Department: This includes provision of vehicles, inspection instruments, funds and other logistical aspects to ensure effective implementation of fish quality assurance.

j) Resources for environmental monitoring of contaminants: There should be sustainable funding mechanism to enable continuous monitoring. The funding should additionally afford the cost of corrective action where contaminants have exceeded minimum allowable limits.

k) Research on product development and marketing: Research that is designed to answer questions on different aspects of fish quality assurance including development and marketing of value added fishery products. This may be more suitably implemented through the Kenya Marine and Fisheries Research Institute, in collaboration with the Fisheries Department and the Processing factories.

l) The enabling policy and legislative environment. Much effort has already been expended on improving the policy and legislations to support fish quality assurance and sustainable fishing practices. Further effort should be towards regional harmonization of the policies and legislations.

5.3 Strategy for improving facilities at the landing beaches

The strategy of the Fisheries Department is to select a few beaches for improvement to meet EU standard and implementation of HACCP. For this purpose 18 beaches are earmarked for improvement. Table 5.2 gives the current status of facilities in those beaches.

Table 5.2 Status of facilities at the 18 beaches identified for upgrading

District	Beach	Fence	Jetty	Fish Banda	Paved	Sanitation	Water	Electricity	Dispensary	Cold room	Permanent access road
Busia	Marenga	√	x	√	x	√	√	√	x	√	x
	Osieko	x	x	x	x	x	x	X	x	x	x
Bondo	Luanda Kotieno	√	x	x	x	x	x	X	x	x	x
	Wichlum	x	x	√	x	x	x	X	x	x	x
	Uhanya	√	x	√	x	√	x	X	x	x	x
	Usenge	√	x	√	x	√	√	X	x	x	x
Kisumu	Ogal	x	x	x	x	x	x	X	x	x	x
	Dunga	√	√	√	√	√	√	X	x	x	x
	Asat	x	x	x	x	√	x	X	x	x	x
Nyando	-	-	-	-	-	-	-	-	-	-	-
Rachuonyo	Kendu Bay	√	x	√	x	√	x	X	√	x	x
	Rakwaro	x	x	√	x	√	x	X	x	x	x
Homa Bay	Koginga	√	x	√	x	√	√	X	x	x	x
	Ngegu	√	x	√	x	x	x	X	x	x	x
Suba	Nyandiwa	√	x	√	x	x	√	X	x	x	x
	Mbita Rusinga	x	x	x	x	x	x	X	x	√	x
	Mbita Gembe	√	x	√	x	√	x	X	x	x	x
Migori	Nyangwina	√	x	√	x	√	x	X	x	x	x
	Sori Karungu	√	x	√	x	√	x	X	x	x	√

√ - present, x - absent

Source: Survey data

Beach improvement involves provision of a number of facilities, in particular; fencing, jetty, fish banda, piped water, toilets, electricity, permanent/ all weather access road, cold room, dispensary. It will cost about Ksh 29.8 to provide all these facilities in one beach (Table 5.3). To improve all the above facilities in the targeted 18 beaches, therefore, about Ksh 536.4 would be required. However, on some of these beaches, a number of facilities have already been provided through government and donor funding (Tables 5.2, 8.6, 8.7, 8.8). Through this earlier initiative, it is estimated that about 10% of the total investment required for improving facility at the landing beaches has already been provided (Table 5.4).

Table 5.3 Average cost of improving facilities per landing beach

Facility	Cost (Ksh)
Fence	200,000
Jetty	500,000
Fish Banda	900,000
Piped water	1,700,000
Toilets	100,000
Electricity	2,000,000
Access road*	8,000,000
Dispensary/pharmaceutical outlet	900,000
Cold room - Building and equipment	15,500,000
Total	**29,800,000**

* Cost of providing and maintaining access roads in 5 years.

Source: Survey data, Secondary data

Table 5.4 Investment required for improving facility at the 18 fish landings

Facility	Total cost of required investment (million Ksh)	What has been invested so far (million Ksh)	How much more is required (million Ksh)
Fence	3.6	2.4	1.2
Jetty	9	.5	8.5
Fish banda	16.2	10.8	5.4
Piped water	30.6	8.5	22.1
Toilets/ sanitation	1.8	1	.8
Electricity	36	2	34
Permanent/ all weather access road	136	-	136
Dispensary/ pharmaceutical outlet	16.2	.9	15.3
Cold room - building and equipment	279	31	248
Total	**528.4**	**57.1**	**471.3**

Source: Survey data, Secondary sources

5.4 Improving capacity of fishers to meet sanitary standards

5.4.1 Upgrading fishing crafts

Re-designing the present fishing boats to accommodate an insulated fish hold that can carry ice will involve laminating the inside with an easy-to-clean material such as prefab layer or stainless steel. An insulated fish hold is constructed within the vessel. This is accompanied with training of fishers on fish handling and preservation methods. It is estimated that Ksh 33,000 is required to improve one fishing vessel to have an insulated fish hold (Table 5.5).

5.4.2 Costs of training fishers

The costs of training fishers on the EU sanitary standards and implementation of HACCP systems will be done through internal training sessions. The cost elements are mainly the transport costs for trainers, allowance for fishers and trainers and training materials (e.g. stationery). The assumption is that the training will be conducted by local Fisheries Officers and will be held on the local beaches where fishers live, in this way minimizing the costs. In this way the estimated costs of training 100 fishers for 1 day in a fish landing beach is about Ksh 58,000 (Table 5.6). Thus to train about 34,000 fishers (Nile perch and tilapia), the required amount is approximately Ksh 19.7 million per day of training.

Table 5.5 Estimated cost for improving fishing boats to meet sanitary standards

Item	**Cost (Ksh) per vessel**
Laminating inside of vessel	15,000
Constructing insulated fish hold capacity 50-80 kg	10,000
Ice boxes/trays	2,000
Labour charges	5,000
Other costs	1,000
Total per vessel	**33,000**
Total for 6,000 Nile perch fishing boats	198 million
Total for 8,000 Nile perch and tilapia boats	264 million

Source: Survey data

Table 5.6 Cost of training 100 fishers per day at the beach

Item/Activity	Cost (Ksh)
Travel costs	2,000
Fisher's allowance @ Ksh 500 per fisher	50,000
Trainer's allowance	4,000
Training materials	2,000
Total cost of training 100 fishers	58,000
Total costs of training 34,000 fishers	19,720,000

Source: Survey data

5.4.3 Improving Capacity of the Fisheries Department

The investments required to improve the capacity of the Fisheries Department include capital investments (e.g. transport facilities) and operational expenditures on fuel and personal emoluments (Table 5.7).

Table 5.7 Improving the capacity of Fisheries Department at district level

a) Capital costs for improving transport capacity	**Cost per district**	**Cost for 8 districts**
Purchasing 1 vehicle per district	3,200,000	25,600,000
Purchasing of 2 inspection motorbikes per district	300,000	2,400,000

b) Operational costs	Cost per district per year	Costs for 8 districts per year	Total costs over 5 years
Salary of 3 fish inspectors	840,000	6,720,000	**33,600,000**
Running costs of vehicle	600,000	4,800,000	24,000,000
Running cost of bikes	120,000	960,000	4,800,000
Total operational costs			**62,400,000**

Source: Survey data and secondary data

5.4.4. Investments to operationalise Kisumu Fish Laboratory

The Kisumu fish quality laboratory has already been constructed (see Table 4.3) but still not operationalised. Table 5.8 gives the estimated cost of operationalising the laboratory.

Table 5.8 Requirements to operate the fish quality laboratory in Kisumu

Cost item	**Details**	**Cost per year**	**Costs in 5 years**
Personnel	Wages	2,160,000	10,800,000
Equipment	Purchasing costs	4,320,000	4,320,000
Reagents	Purchasing cost	1,080,000	5,400,000
Sampling and analysis costs	Field sampling and analysis costs in Fisheries lab	240,000	1,200,000
Training	HACCP/analytical training	750,000	750,000
Total		**8,550,000**	**22,470,000**

Source: Survey data and secondary data

5.4.5 Investment for Nairobi Fish Quality Laboratory

Assuming that the Nairobi fish quality laboratory (which so far has only been proposed) will operate at the same capacity as the Kisumu laboratory then the expected investment will be as follows;

Cost of establishment	Ksh 18,235,162 + 10% contingency	= 20,058,678
Operational costs (5 years)	Ksh 22,470,000 + 10% contingency	= 24,717,000
Total investment for Nairobi Fish Quality Laboratory		= **44,775,678**

5.4.6 Investments by Fish Factories

The investments required by fish factories include; enhanced wages, training, equipment replacement and maintenance, improving the external environment etc. (Table 5.9)

Table 5.9 Investment requirements by 7 fish factories

Item	**Average cost per factory (Ksh)**	**Cost by factories per year (Ksh)**	**Costs by factories in 5 years (Ksh)**
Enhanced wages for more qualified staff	1,524,000	10,668,000	53,340,000
Training on sanitary standards and HACCP	252,000	1,764,000	8,820,000
Equipment replacement and maintenance	1,524,000	10,668,000	53,340,000
Building and environment maintenance	500,000	3,500,000	17,500,000

Source: Survey data

Table 5.10 Summary of costs of investments required

Level/ funding responsibility	**Cost item**	**Details**	**Cost in 5 years (m Ksh)**
Government	Improve facilities at landing beaches	Improve facilities for sanitary standards at 18 selected beaches	471.3
	Improve capacity of Fisheries Department to implement sanitary standards and HACCP	Provide basic transport facilities to Fisheries Department in 8 districts (i.e. 1 vehicle and 2 motorbikes)	28
		Additional operational costs for Fisheries Department in 8 districts	62.4
		Operating Kisumu fish quality laboratory	22.5
		Establishing and operating the Nairobi fish quality laboratory	44.8
	Train fishers	Provide training on hygienic fish handling and HACCP procedures to 34,000 fishers	19.7
Fishers	Improve fishing boats	Improve 8,000 fishing boats to have insulated holding facility for fish and ice	264
Fish factories	Improved wages	Improved wages for new and more qualified staff to meet sanitary standards and HACCP in 7 factories	**53.3**
	Training factory workers	Training factory workers on sanitary standards and HACCP in 7 factories	8.8
	Equipment replacement and maintenance	Cost of replacing and maintaining factory equipment for HACCP in 7 factories	53.3
	Building and environment maintenance	Cost of maintaining building structures and the environment for HACCP in 7 factories	17.5
Total cost of investment required			**1,045.6**

Source: Survey data, secondary sources

Assume 20% contingency to cater for inflation and other eventualities, thus, about **Ksh 1.3 billion** will need to be invested at various levels in the fish industry in the next 5 years in order to meet the sanitary standards and HACCP.

6. RECOMMENDED INLAND WATERS FISHERIES INDUSTRY SUPPORT PROGRAM

On the basis of the documented investment, the size and structure of the industry as discussed above, and prospects for future development for purposes of increased exports to the EU, this section discusses the resource gap among fishermen, factories and government (TOR viii). It then proposes a comprehensive inland waters fisheries industry support program, to address the identified resource gap, to be negotiated with the EU under EPAs (TOR ix).

6.1 Aims of Fisheries Support Program

This report recommends a support program for the inland waters fisheries industry that will ensure mobilization of sufficient resources to achieve the best standards of fish quality assurance, sustainable resource exploitation and poverty reduction of the fisher community. The program focuses on Lake Victoria and aims at achieving the following;

- Highest standards of fish quality assurance
- Optimizing the utilization of scarce fisheries resources
- Prevention of fish post harvest losses
- Control of health hazards associated with fish
- Maximizing financial benefits to fishers, fish processors/traders
- Meeting market requirements
- Minimizing customer complaints and sustaining consumer confidence
- Guaranteeing fish and fishery product safety
- Ensuring food security and reduction of poverty

6.2 Key stakeholders in program

The program identifies the following institutions or persons as key in developing and implementing the program of assuring fish quality and safety

- Fisheries Department/Divisions (Competent Authorities)
- Industrial fish processors
- Fishers
- Fish handlers along the chain
- Fish transporters
- Fish traders
- Local Government Authorities
- Testing laboratories
- Development partners e.g. the EU

6.3 What is required for effective fish quality assurance

To be viable and sustainable, this program needs to be driven by fish exports. Thus, the focus of the program should be on achieving the highest fish quality assurance and value addition. Fisheries resources must also be effectively managed, a lot of effort already being put in that direction. In order to ensure effective fish quality assurance, the following should be in place;

a) **Policy on fish quality assurance:** To Provide guidelines on development and implementation of quality assurance programs
b) **Legal framework for quality assurance operations:** Appropriate legislation to provide for the development, management, exploitation, utilization and, conservation of fisheries resources and application of quality assurance procedures.
c) **Institutional framework:** Agency to supervise fish industry in form of Competent Authority.
d) **Appropriate fishing crafts:** Properly designed boats to accommodate fishers, nets and ice without compromising quality and safety of the fish onboard the fishing vessel.
e) **Upgraded fish landing beaches:** Proper facilities for fish handling and preservation; Facilities for both liquid and solid waste disposal; Facilities to control access by animals and unauthorised individuals; Paving to control dust and mud to prevent contamination.
f) **Improved Fish transport systems:** Vehicles and vessels designed to transport fish and fishery products under hygienic conditions.
g) **Good Manufacturing Practices/Code of Practice:** Procedures that ensure activities along the whole chain are conducted to meet predetermined specifications (health and quality requirements.
h) **Capacity building:** Well-trained Quality Assurance personnel. Adequately sensitised fishers and other stakeholders; Fish inspection equipment and facilities; Facilitation and logistical support.
i) **Laboratories:** Properly equipped to carry out relevant tests and staffed with well trained analysts; Applying appropriate test methods; Internationally approved and accredited (compliant with ISO 17025)

j) **Resources for environmental monitoring of contaminants**: Appropriate Sampling equipment; Sampling regime/protocol; Sustainable funding mechanism; Mechanism for corrective action when contaminants exceed allowable limits.

k) **Research on product development and marketing:** Research that is designed to answer questions on different aspects of fish quality assurance including development and marketing of value added fishery products

6.4 Achievements made so far on fish quality assurance in Kenya

Following the fish quality problems experienced over the last decade, the government, through the Fisheries Department, has put much effort to achieve fish quality assurance. The implementation of fish quality assurance in Kenya has so far achieved the following;

a) Legal framework for quality assurance operations: Kenya already has put in place appropriate legislation for implementation of Fish Inspection and Quality Assurance.

b) Institutional framework: The Fisheries Department has been designated as the Competent Authority responsible for carrying out fish quality assurance activities. Beach Management units have been set up to reinforce the activities of the competent Authority.

c) Fish landing beaches: The Fisheries Department is implementing fish landing sites improvement programs in order to upgrade their standards. However, most of the landing sites especially those receiving fish for local consumption still lack basic facilities.

d) Fish transport practices: Insulated/refrigerated trucks are used for transportation of fish intended for the export market. This is fully implemented by the private sector.

e) Industrial fish processing practices: All operating Nile perch fish processing factories are already implementing HACCP programmes to ensure production of safe and high quality fish.

f) Capacity building:

i) **Training:**

The key Fisheries Department staff have been trained on a wide range of fish quality assurance aspects. Factories have also trained their workers internally. Other key stakeholders, including community leaders, Fishers, fish collectors and transporters, fish traders, artisanal processors, other fish handlers at the fish landing stations have, though, not been trained on fish quality assurance.

ii) **Logistical facilitation:** The Fisheries Department has been facilitated through provision of vehicles, inspection instruments, funds and other logistical aspects to ensure effective implementation of fish quality assurance.

g) Fish quality assurance laboratory: The physical infrastructure for a national fish quality control laboratory has been put up in Kisumu. However, the laboratory is not yet operational. In the meantime alternative arrangements have been made with other competent laboratories for testing of fish related samples

h) Environmental monitoring for contaminants: There is already a programme for monitoring of the fishing grounds for contaminants by the Fisheries Department. This complemented by research conducted by the Kenya Marine and Fisheries Research Institute.

i) Harmonisation: The process of harmonising fish quality assurance approaches and legislation by the three riparian countries (Kenya, Tanzania and Uganda) is still in progress. Full harmonisation of legislation has not been achieved.

6.5 Existing opportunities for improving fish quality assurance

The following are identified as key opportunities and strengths for the successful implementation of fish quality assurance program;

- The existing institutional and legal framework to comply with international market requirements
- International interest in Lake Victoria by development partners, including the EU
- Willingness of fishing communities and other stakeholders o participate in fish quality assurance
- Political goodwill
- Regional projects
- Potential for production of value added products and upgrading of traditional preservation, packaging and storage practice
- Growing demand for good quality fish (white meat)

6.6 Challenges for fish quality assurance

Despite the efforts put by the Kenya Government to attain fish quality assurance and optimal resource use that are discussed above, there are still a number of limitations that face the industry. The following are some of the challenges facing the attainment of fish quality assurance;

- Creation of a legal framework for the operations of the quality assurance systems.
- Restructuring of the competent authorities.
- Improvement of fish handling practices
- Introduction of quality management systems based on HACCP principles.
- Sensitisation of stakeholders on quality related issues
- Reduction of fishing effort e.g. time and number of boats
- Reduction of fish post harvest losses
- Improvement of traditional preservation methods
- Production of Value Added Fishery Products (VAP)
- Upgrading of fishing crafts
- Improvement of fish landing stations
- Facilitation of fish quality assurance activities
- Adequate laboratory services in the region
- Improving marketing conditions for the local consumers
- Fish quality issues are not easily appreciated by communities e.g. fisher folks and other dealers because of ignorance, inadequate sensitisation, persistent poverty and taboos
- Increasing human population and industrialisation around the lake catchments leading to pollution and environmental degradation which are not conducive to a healthy fish habitat.
- Use of illegal methods and gears such as beach seine produces fish with a high level of microbial load and other contaminants.
- Trade restrictions in form of export bans

- Responding to the increasing market demands for quality and safety especially in Europe and USA e.g. Bio-terrorism Act 2002, (America) and the Traceability Directive 178/2002EEC of the EU

6.7 Components of the Fish Industry Support Program

The Fish Industry Support Program should be a comprehensive program to maximize benefits from the fishery resource. It includes measures to improve fish quality, optimize utilization of fish resources and add value on fishery products. The program should be implemented through a number of development strategies, including;

x) **Upgrading fish landing sites**. This should involve improving sanitary standard and enhancing the capacity to implement HACCP on landing sites. To optimize use of available resources, only a few beaches will be selected from all eight riparian districts of Lake Victoria. The beaches will act as model landing sites, particularly for Nile perch, and will be provided with the necessary facilities to achieve fish quality assurance, including;

i. Electricity
ii. Portable water
iii. Cold room and provision of ice
iv. Fencing of the beaches
v. Improvement of fish holding banda
vi. Sanitary facilities, including toilets and waste water disposal pits
vii. Pavement to control dust and mud

The Fisheries Department has already identified the following 18 beaches for possible initial upgrading;

b. Busia District: Marenga and Osieko
c. Bondo District: Uhanya, Usenge, Luanda Kotieno and WichLum,
d. Kisumu District: Asat, Ogal, Dunga,
e. Nyando District: Nyamware

f. Rachuonyo District: Kendu Bay
g. Homa Bay District: Koginga
h. Suba district: Mbita/Rusinga, Mbita Gembe,
i. Migori district: Sori, Nyangwena, Nyadhiwa

xi) **Improvement of physical infrastructure to the landing areas**. This should involve upgrading the access roads to the beaches. A ring road should be constructed particularly in the Southern Lake Victoria, which should join all the major landing beaches. In particular, attention should be paid to Suba District, which produces the largest quantity of fish in the country, yet has one of the poorest road networks. The road network from Homa Bay to Mbita should be upgraded and tarmacked (to bitumen standard). A ring road running from Mbita through Sindo, Nyagwethe, Sori Bay to Muhuru Bay will ease transport in the Southern districts, including Suba. In most of the main Northern Lake Victoria beaches, there are reasonably good seasonal roads, but which need regular maintenance. The tarmac road from Kisumu to Bondo and to Usenge, though is dilapidated and needs to be redone. At least one other all weather (tarmac) road should be constructed, ideally joining Luanda Kotieno beach (where there is a ferry service) to Bondo – Kisumu road. Access roads to the smaller landing beaches should also be improved.

xii) **Supply electricity to the beaches:** The main fish landing beaches selected for Nile perch landing should all be supplied with electricity. The provision of electricity will accelerate establishment of cold rooms and ice making units.

xiii) **Establish ice-making plants:** Two fish landing beaches – Mbita and Port Victoria – already have constructed the basic physical infrastructure for making ice, although they both still lack the ice making facilities and the technical skills. Support should be provided to make these two ice plants operational. To adequately meet the ice demand in the lake, four other ice plants should be established, ideally in Muhuru Bay, Kendu Bay, Uhanya and Karungu Bay.

xiv) **Assist fishers to acquire appropriate fishing crafts:** Properly designed boats to accommodate fishers, nets and ice without compromising quality and safety of the fish onboard the fishing vessel. Upgrade fishing vessels to have smaller/ appropriate/ insulated fish holds. Upgrade fish collection vessels to have appropriate insulation.

xv) **Establish fish quality assurance laboratories**: Properly equipped to carry out relevant tests and staffed with well trained analysts; Applying appropriate test methods; Internationally approved and accredited (compliant with ISO 17025). To start with, the laboratory already constructed in Kisumu should be made operational. Two additional laboratories should be constructed in Nairobi and Mombasa.

xvi) **Factories**: Factories need redesign to conform to fish processing standards. Critical areas include; cold storage, blast/plate freezers, water treatment systems tanks, UV, analysis laboratory and conditions of insulated vehicles for fish transport.

xvii) **Human capacity building**: There is need for well-trained quality assurance personnel. Kenya Marine and Fisheries Research Institute has well trained personnel who could provide additional support for fish quality assurance in this program. Tailor-made fish quality assurance training programs for fishers, fish agents, fish handlers, BMU leaders, fish traders and other stakeholder should be designed.

xviii) **Enhance logistical capacity of Fisheries Department**: This includes provision of vehicles, inspection instruments, funds and other logistical aspects to ensure effective implementation of fish quality assurance.

xix) **Resources for environmental monitoring of contaminants:** There should be sustainable funding mechanism to enable continuous monitoring. The funding should additionally afford the cost of corrective action where contaminants have exceeded minimum allowable limits.

xx) **Research on product development and marketing:** Research that is designed to answer questions on different aspects of fish quality assurance including development and marketing of value added fishery products. This may be more suitably implemented through the Kenya Marine and Fisheries Research Institute, in collaboration with the Fisheries Department and the Processing factories.

xxi) **The enabling policy and legislative environment.** Much effort has already been expended on improving the policy and legislations to support fish quality assurance and sustainable fishing practices. Further effort should be towards regional harmonization of the policies and legislations.

6.8 Negotiating position for the Kenya Government

It has been estimated that about Ksh 1.3 billion is required to be invested at various levels in the fish industry in the next five years in order to meet EU sanitary standards and HACCP. Going by the level of contribution by the government over the last five years it is envisaged that the government may be able to finance up to 20% of this investment, while 10% may be funded by the private sector. The latter may be realized through innovative credit schemes availed to fish factories and individual fishers, where they can borrow to meet their development needs and pay back.

The Kenya Government, therefore, needs to negotiate for financial assistance, preferably in form of grant, amounting to 70% of the total investment cost i.e. **Ksh 910 million**. This amount should be used to improve facilities particularly geared towards achieving and maintaining high safety standards of fish. Where as the particular strategy may focus attention on fish destined for export, the spillover effect will contribute to raising safety standards even for fish in the domestic market.

The amount negotiated for, including contribution by government and the private sector, should be used to address and facilitate the following components of the fish industry support program;

i) Policy development

d) Development of a national fisheries policy, to incorporate fish quality issues

e) Harmonisation of fisheries policy among the three partner states

ii) Infrastructure development

a) Upgrade fish landing sites, by funding provision of electricity, portable water, cold room and ice making facilities; fencing beaches, constructing proper banda and sanitary facilities.

b) Improve and maintain access roads to fish landing beaches to ensure they are accessible throughout the year.

c) Construct two additional fish quality assurance laboratories, and operationalise the already constructed laboratory in Kisumu. The fund should meet the cost of hiring qualified laboratory analysts.

iii) Development of support programmes

b) Establish a credit scheme for fishers where they can seek loans to enable them upgrade their fishing craft so as to accommodate an ice-containing fish hold.

c) Establish a fund which factories may borrow to upgrade and maintain their fish processing chains and operations to ensure compliance with sanitary standards and HACCP.

d) Provide training to fish inspectors, fishers, fish handlers, fish workers, fish agents, among others to comply with SPS

e) Improve logistical capacity of the Fisheries Department to monitor and enforce compliance with HACCP, by providing vehicles, inspection instruments and other necessary facilities.

iv) Research

a) Further research on fish safety along distribution chain

b) Industry based research and market testing for value added products. Considering that fish production in the country, in particular fresh water fish,

is on the decline, value addition offers the best opportunity for increased returns per unit of product exported.

v) Market access

a) Shortening the fish value chain. The program should facilitate shortening the value chain and make it possible to export fish in a form that will directly be displayed and sold in EU supermarket. This would increase returns per unit of exported product.

It is envisaged that with all these proposals in place, Kenya's fish will achieve high safety standards and be readily demanded in the EU. The fish should be able to compete well with fish from within the EU and other parts of the world. To meet the objectives of huge investments in quality assurance, the Government should also negotiate for complete elimination of all barriers (tariff and non-tariff) that may hinder access of Kenya's fish into the EU market.

The proposal provides for a win-win situation for the EU, the Kenya Government as well as the industry players. The Kenya Government also needs to guarantee supply of high quality fish to the EU, up to 80% of all Kenya's fish exports. Considering that before the EU fish export bans, Kenya was already exporting about 87% of its fish to the EU, such levels are achievable again, given the relatively higher prices offered in the EU, as long as the EU can guarantee preferential markets access conditions.

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8. ANNEXES

8.1 Persons consulted

Mr.Matheus Wafula - Deputy Director of Fisheries

Mr.Okumu Makogola - Assistant Director of Fisheries –Western Region

.Mr. Arnold Omondi - Planning Officer, Fisheries Department

Mr. Daniel Mungai - Fisheries Officer I/C of Fish Quality Assurance

Mr. Vincent Ogwang – DFO, Homabay District

Mr. Charles Odende – DFO, Busia District

Mr.Otieno - F.O.1 i/c Fish Quality Western Kenya Region

Mr. Alfred Obayo - Fish Inspector –Bondo District

Mr. Jared Bogita – Deputy DFO, Rachuonyo District

Mr. Charles Komala, Fisheries Assistant i/c fish quality, West Karachuonyo

Mr.Muli - Accountant

Dr.Stephen Mbithi - Executive Officer, AFIPEK

Mr. Andrew Othina – Statistician, Kenya Marine and Fisheries Research Institute

Mr. Andrew Asila – Fish Stock Assessment expert, Kenya Marine and Fisheries Research

Mr. Julius Manyala – Fish Biologist, Moi University

Mr. Sebastian Xavier – General Manger, East African Sea Food Ltd, Kisumu

The General Manager – Peche Foods Co. Ltd

Fishers, Beach Management Units (BMU), fish agents and handlers at following beaches:

Mugabo and Sori Karungu (Migori District), Mbita and Kiumba (Suba District), Kendu Bay and Mainuga Beach (Rachuonyo District), Wichlum and Uhanya (Bondo District) and Port Victoria and Osieko (Busia District)

Table 8.1 License fees paid by the Fisheries Department

Type of dealers	Type of licence issued	Amount of fees paid Ksh /year
Industrial fishers	Distant fishing vessel	2.5 million
Local fishers	Fisher's licence	300
Rural fish trader	Fish traders licence	100
Urban fish trader	Fish traders licence	300
Transporters of fish for purposes of trade	Fish movement permit	500 for vehicles ≤3T, 1000 for vehicles > 3 1000 for boats ≤ 10 T 5000 for boats >10 T
Fish exporters	Export permit fees	0.5% market price
Fish importers	Fish import fee	5% ad valorem market price

Source: Fish sector analysis report (2003)

Table 8.2. Number and distribution of fishers in Kenya (1995 and 2000)

	1995		**2000**	
	Number of fishers	**Number of fishing vessels**	**Number of fishers**	**Number of fishing vessels**
Lake Victoria	30,000	8,000	33,037	9985
Marine fisheries	7,640	2,388	8,022	2,687
Lake Turkana	387	97	406	109
Lake Baringo	45	11	47	12
Lake Naivasha	78	29	82	33
Lake Jipe and dams	62	43	65	48
Tana River dams	503	225	528	253
Fish farmers	-	-		
Total*	**38,715**	**10,793**	**42,187**	**13,127**

*** Excludes figures for fish farmers**

Source: Fisheries Department

Table 8.3 Distribution of fish landing beaches of Lake Victoria by disticts (2002)

District	**No. of beaches in district**
Busia	23
Bondo	67
Kisumu	32
Nyando	6
Rachuonyo	38
Homa Bay	7
Suba	97
Migori	27
Total	297

Source: Frame survey report (2002)

Table 8.4 Lake Victoria fish landing prices (Mean for 1991 – 2000)

Year	**Fish prices (US$/ Kg)**		
	Kenya*		
	Nile perch	Tilapia	'Dagaa' (Dry fish weight equivalent. Adjust wet weight price by 0.7)
1989			
1990			
1991	0.16	0.11	0.08
1992	0.33	0.3	0.16
1993	0.35	0.33	0.13
1994	0.35	0.34	0.14
1995	0.41	0.42	0.34
1996	0.66	0.49	0.38
1997	0.5	0.48	0.35
1998	0.64	0.69	0.51
1999	0.64	0.73	0.47
2000	0.69	0.65	0.48
2001	0.83	0.68	0.47
2002	0.90	0.70	0.49
2003	0.98	0.72	0.49

* Prices adjusted for inflation
Source: Adapted from SMEC (2002)

Table 8.5 Costs of making a boat of length (25ft long) in 2003

Item (some in local names)	**Quantity**	**Price (Ksh)**	**Total amount (Ksh)**
Timber	14x1 x 15 ft x 14 pieces	1,380	19320
Keel ('mgongo')	30 ft	0	2530
Paddles ('manga')	6	230	1380
Keel cover ('raum')	2	288	575
Achor ('sambago')	1	173	172.5
Plain iron sheet ('mabati')	2	690	1380
Nails	3.5 kg	69	241.5
	8 kg	69	552
Bottom sheath ('Capera')	3 m	69	207
Putty	4 kg	29	115
Cotton	4 kg	69	276
Paints			2875
Construction labour			7475
Painting labour			2070
Total cost			**39,169**

Table 8.6 Status of facilities to improve sanitary standards in Homa Bay District

Landing site	Fence	Electricity	Access road	Fish Banda	Sanitary/ water	Cold room
Lela	X	x	x	√	X	x
Kananga	X	x	x	x	√	x
Koginga	√	x	√	√	√	x
Ngegu	√	x	√	√	X	x
Capital investment required to improve facilities: = Ksh 30 million						
Running costs: Ksh 5.4 million per year x 5 years = Ksh 27 million						
Total costs in 5 years: = **Ksh 57 million**						

√ - present, x - absent

Table 8.7 Status of facilities to improve sanitary standards in Rachuonyo District

Beach	Fence	Jetty	Banda	Paved	Sanitation	Water	Electricity	Cold room	Permanent Access road
Mainuga	x	x	√	x	√	x	x	x	x
Kodero	x	x	X	x	x	x	x	x	x
Tausi	x	x	X	x	x	x	x	x	x
Achoudho	x	x	X	x	x	x	x	x	x
Kawere	x	x	X	x	x	x	x	x	x
Alara	x	x	X	x	x	x	x	x	x
K/Bay	√	x	√	x	√	x	x	x	y
Siara	x	x	X	x	x	x	x	x	y
Rakwaro	x	x	Y	x	x	x	x	x	y
Obaria	x	x	X	x	Y	x	x	x	y
Kagwa	x	x	Y	x	x	x	x	x	y
Kasakiel	x	x	X	x	x	x	x	x	x
Kaimbo	x	x	X	x	x	x	x	x	x
Awana	x	x	X	x	x	x	x	x	x
Balarawi	x	x	X	x	x	x	x	x	x
Doho	x	x	X	x	x	x	x	x	x

√ - present, x - absent

Table 8.8 Status of facilities to improve sanitary standards in Busia District

Beach	Fence	Jetty	Banda	Paved	Sanitation	Water	Electricity	Cold room	Permanent access road
Osieko	x	x	x	X	X	x	x	x	x
Bukoma	x	x	√	X	X	x	x	x	x
Marenga	√	x	√	X	√	√	x	√	x
Bumbe	x	x	x	X	X	√	x	x	x
Mulukoba	x	x	x	X	X	x	x	x	x

√ - present, x - absent

NB: The cold room at Marenga has been built at cost of Ksh 15.5 million through funding by Community Development Transfer Fund (CDTF)/ EU. Three-phase power supply still needed at a cost of Ksh.340,000. A standby generator also needed at Ksh.1,748,000. Sanitary toilets were funded by LVEMP at Ksh 1 million.

Table 8.9 Fish species commonly found in Lake Victoria

Biological/ Latin names	*Local/ common names*
Schilbe mystus	Sire
Schilbe intermedius	*Sire*
Synodontis victoriae	*Okoko rachar*
Synodontis afrofischeri	*Okoko rateng*
Lates niloticus	Mbuta
Labeo victorianus	Ningu
Barbus altianalis	*Fuani*
Barbus neglectus	*Adel*
Barbus cercops	*Adel*
Barbus yongei	*Adel*
Barbus nyanzae	*Adel*
Tilapia zilli	*Silli*
Oreochromis niloticus	*Nyamami*
Oreochromis leucosticus	*Opat*
Mormyrus Kannume	*Suma*
Clarias gariepinus	*Mumi*
Clarias mossambicus	*Mumi*
Alestes sadleri	*Osoga*
Bagrus dogmac	*Seu*
Oreochromis variabilis	Mbiru
Barbus jacksonii	*Fuani*
Barbus Kerstenii	*Fuani*
Xenoclarias spp.	*Ndhira*
Mastacembalus frenatus	*Okunga*
Haplochromis spp.	*Fulu*
Aplocheilichthys eduardis	
Micropterus salmoides	
Protopterus aethiopicus	*Kamongo*
Petrecephalus cutostoma	*Obu*
Gnathonemus longiberbis	Odhore
Marcusenius grahami	
Alestes nurse	
Brycinus jacksonii	
Brycinus solderi	
Clenopoma muriei	

[Adapted from Whitehead (1959), Kibaara (1981), Ochumba and Manyala (1992),s Muli and Ojwang (1998) and Gichuki *et al* (2001)]