

FISHERY VALUE CHAIN ANALYSIS

BACKGROUND REPORT – KENYA

Manyala Julius Otieno
P. O. Box 2064, Kisumu, Kenya
manyalajo@yahoo.com
September 01, 2011

TABLE OF CONTENTS

LIST OF TABLES	III
LIST OF FIGURES.....	IV
LIST OF ABBREVIATIONS AND ACRONYMS	V
ACKNOWLEDGEMENT	VI
EXECUTIVE SUMMARY.....	VII
1.0 VALUE CHAIN ANALYSIS	1
1.1 CAPTURE FISHERIES.....	1
1.1 AQUACULTURE	2
2.0 PRODUCTION FROM CAPTURE FISHERY.....	4
2.1 LAKE VICTORIA BASIN	4
2.1.1 <i>Production of fish in the Lake Victoria Basin</i>	4
2.1.2 <i>Production Technologies</i>	4
2.1.3 <i>Fishers</i>	7
2.1.4 <i>Socio-Economic Information</i>	8
2.1.5 <i>Age structure of entrants to the industry</i>	8
2.2 MARINE FISHERIES	9
2.2.1 <i>Production and Value of Kenya Marine Fisheries</i>	10
2.2.2 <i>Other crustaceans: Crab, Lobster and Octopus</i>	10
3.0 PROCESSING	10
3.1 FISH PROCESSING CHAIN	11
3.3 THE EXPORT MARKETS	12
3.4 TRENDS OF KENYA'S FISH EXPORTS.....	13
3.5 EXPANSION OF FISH-MEAL PRODUCTION IN KENYA	14
4.0 TRANSPORTATION.....	16
5.0 FINAL CONSUMPTION	16
6.0 REGULATIONS	17
6.1 LEGAL AND REGULATORY FRAMEWORK	17
6.2 BEACHES ALONG LAKE VICTORIA SHORELINE AND KENYA COAST	18
6.3 COMMUNITY MANAGEMENT OF FISHERY RESOURCES.....	18
6.3 OTHER INSTITUTIONS.....	18
7.0 MARKET STRUCTURE	19
7.1 MARKET CONDITIONS	19
7.2 DOMESTIC MARKET.....	19
7.3 EXPORT MARKET.....	20
7.4 MARKETING OF CRUSTACEAN (CRABS, LOBSTERS AND OCTOPUS).....	21
8.0 DATA AVAILABILITY.....	22
9.0 SPECIES SELECTION FOR VCA.....	22
REFERENCE	23

LIST OF TABLES

TABLE 1:	NUMBER OF CULTURE SYSTEMS AND AREA IN SQUARE METRES 2009.....	2
TABLE 2:	TOTAL FRESHWATER AND MARINE FISH LANDINGS AND VALUE IN KENYA (2007 – 2009).....	5
TABLE 3:	INDUSTRIAL FISH PROCESSORS IN KENYA, THEIR INSTALLED AND UTILIZED CAPACITIES.....	11
TABLE 4:	COST AND INCOME ESTIMATES FOR A NILE PERCH FACTORY (2008).....	12
TABLE 5:	VALUE OF FISH AT FISH LANDING.....	12
TABLE 6:	INDUSTRIAL PROCESSORS USING OMENA AS RAW MATERIAL, THEIR AGE, INSTALLED CAPACITY AND PRODUCT TYPES MANUFACTURED (2008) AND PRODUCTS AND VALUE FROM INDUSTRIAL PROCESSING USING OMENA AS RAW MATERIAL BASED ON 20 KG PACKAGES.....	14
TABLE 7:	NILE PERCH CONTRIBUTION IN THE FISH FOOD SUPPLY FROM 1996 TO 2009.....	16
TABLE 8:	AVERAGE EX-VESSEL PRICE IN KES PER KG OF PRAWN, OCTOPUS, LOBSTER AND FISH (2007).....	21

LIST OF FIGURES

FIGURE 1:	AQUACULTURE PRODUCTION BY SPECIES IN 2009.....	3
FIGURE 2:	DISTRIBUTION OF FISHERS BY DISTRICTS 2010 (SOURCE: KENYA FRAME SURVEY 2010)	7
FIGURE 3:	EDUCATION LEVEL OF FISHERMEN (SOURCE: FISHERIES SYNTHESIS REPORT)	8
FIGURE 4:	THE IMPORTANCE OF FAMILY BOAT-OWNING TO NEW ENTRANTS TO THE INDUSTRY	9
FIGURE 5:	EXPORT VALUE PER KG OF NILE PERCH AND LOBSTERS FROM 1996 TO 2009 (FOB).....	13
FIGURE 6:	EXPORTS OF NILE PERCH BY DESTINATIONS- 2009	20
FIGURE 7:	EXPORTS OF NILE PERCH BY PRODUCT TYPE 2009	21

LIST OF ABBREVIATIONS AND ACRONYMS

AFIPEK	Association of Fish Processors & Exporters of Kenya
AFP	Artisanal Fish Processors
BMU	Beach Management Units
CAS	Catch Assessment Surveys
CBS	Central Bureau of Statistics
CORDIO	Coral Reef Degradation in the Western Indian Ocean
DWFN	Distant Water Fishing Nations
EEZ	Exclusive Economic Zone
EEZ	Exclusive Economic Zone
ESP	Economic Stimulus Program
EU	European Union
FSB	Fisheries Statistical Bulletin
HACCP	Hazard Analysis Critical Control Point
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
KEBS	Kenya Bureau of Standards
KESCOM	Kenya Society for Conservation of Marine Mammals
KMFRI	Kenya Marine and Fisheries Research Institute
LVEMP	Lake Victoria Environmental Management Project
LVFO	Lake Victoria Fisheries Organization
MCS	Monitoring, Control and Surveillance
UAE	United Arab Emirates
UNCLOS	United Nations Convention on the Law of the Seas
USA	United States of America
VCA	Value Chain Analysis
WWF	World Wildlife Fund

ACKNOWLEDGEMENT

My sincere thanks go to Mr. Peter Nzungi of the Department of Fisheries, Statistics Section who provided the annual catch data, to Ms. Beth Wagude from AFIPEK who availed the Fish Export Data, to KMFRI-Kisumu, specifically to Dr. Richard Abila who facilitated and provided fish market data from Lake Victoria, Dr. William Ojwang, Mr. Okech and Mr. Raphael Okeyo who extracted the information from the EFMS Database. My sincere thanks also go to the FAO-NORAD Fish Value Chain Project for giving me this opportunity to contribute towards the Kenya case study. I would also like to thank many other individuals who are not mentioned by name but assisted greatly in providing some of the information, data and background information appearing in this report.

EXECUTIVE SUMMARY

This is a country report that provides a fisheries sub-sector review and fishing activities, processing, trade and export as a basis for selecting suitable species for Value Chain Analysis at national level for Kenya. The report provides a background on the development and status of both capture fisheries and aquaculture that have both grown from subsistence level in the 1930s to 1950s to some viable commercial ventures, the regulatory frameworks that have existed in the sub-sector and the development by both government and the private sector in the industry. The report highlights various institutions and organizations that have taken a leading role in fisheries activities in Kenya such as WWF, LVEMP, LVFO, CORDIO, KESCOM among others. Deliberate efforts to stimulate the growth of aquaculture are highlighted in the report.

The report further presents and provides insight into the types of fisheries data available in Kenya, official custodians, format and availability to the public. In this respect, secondary data, survey data, published data and primary datasets have been identified for purposes of case studies in Fish Value Chain in Kenya in both freshwater and marine environments. From these various datasets, information on fish production in Lake Victoria and other inland water bodies has been highlighted. The report further analyses the existing fish production technologies in Kenya, the characteristics of the fishers and some socio-economic issues that are relevant to Fish Value Chain Analysis. Similarly, information on fish production in the marine environment has also been covered, including the EEZ and existing potential.

The processing sector development has been traced from the early artisanal methods in the 1950s to ultra-modern fish processing plants and conversion of fish based raw materials into animal feeds. The report relates the industrial and semi-industrial processing to the processes, stages and entrepreneurial establishments in the inputs, harvesting, processing and marketing activities for both domestic and export markets; trends in fish production and utilization points to conversion from basic artisanal to commercial fisheries in both marine and freshwater systems in the 1960s. Though the fish transport system is poorly developed, the industrial based processing outfit has a well organized transport system with provision of both refrigerated trucks and provision of ice.

A number of regulatory frameworks govern fisheries activities in Kenya mainly under the Fisheries Act Cap 378 but there are other legal notices and instruments that are applicable to the sub-sector such as the Subsidiary Regulations, Beach Management Regulations, Fish Quality Regulations and Fisheries Management Plans (recently). The sub-sector is also undergoing several reforms in line with national, regional and international demand to create Competent Authority in various aspects of National Fisheries.

Whereas Kenya Fish targets both international and domestic market, a large proportion of fish production is locally consumed. The challenges encountered in the fishery include inadequate information and data on various aspects of the fishery and non-centralized fisheries databases that make decision-making process tedious and lengthy. Based on the available information, the report proposes the study of the following species *Lates niloticus* (Nile Perch), *Rastrineobola argentea* (Dagaa), *Oreochromis niloticus* (Nile tilapia) and *Panilurus sp.* (Lobsars).

1.0 VALUE CHAIN ANALYSIS

1.1 Capture Fisheries

The fishery sector in Kenya consists of a complexity of interwoven activities and value chains: fresh and processed fish, industrial and artisanal processing, domestic and export markets, food and feed products. Traditionally, Lake Victoria has the largest fishery, it produced 143,908 metric tonnes of fish in 2006 (Fisheries Statistical Bulletin (FSB), 2007). However, the production declined to 111,369 metric tonnes and 108,934 metric tonnes in 2008 and 2009 respectively, and has the largest number (44,263) of fishermen operating small crafts and artisanal gears (FSB, 2007). The Coastal and Marine waters produced 6,959 metric tonnes while Lake Turkana produced 4,559 metric tonnes (FSB, 2007). Other major fisheries are; Lakes Naivasha, Baringo, Jipe, Chala and the River Tana. Lake Victoria has a multi-species fishery comprising endemic and introduced species. The endemic species include tilapiines and haplochromines, cichlids and more than 20 genera of non-cichlid fish, including Mormyrus, catfish, cyprinids and lungfish. The introduced species, especially Nile Perch and Nile tilapia, were responsible for the increase in total annual fish catches in the 1980s and 1990s. However, in the recent past, there has been a steady decrease in fish diversity and production due to increase in fishing effort as a result of commercialization of fishing in the last two decades.

The Kenyan coastline is 640 kilometres long and forms part of the western border of the Indian Ocean. It consists of 12 nautical miles of territorial waters and an Exclusive Economic Zone (EEZ) extending to 200 nautical miles with a total area of 142,400 square kilometres. The Kenyan marine waters support a wide variety of fish species which include fin fishes, both pelagic (king fish, barracuda, mullets, queen fish, etc.) and demersal (rabbit fish, snapper, rock cod, scavenger, etc.) as well as crustaceans (prawns, lobsters, crabs, etc) and molluscs (squids and octopus). In the marine fisheries, there are about 6, 500 artisanal fishermen operating 1,800 simple fishing crafts with limited access to offshore and the deep sea fisheries and therefore often land very little catch. These artisanal fishermen land about 7,000 tonnes of fish annually, which is about 4% of the total national fish production. The offshore fisheries zone is mainly exploited by Distant Water Fishing Nations (DWFN) targeting the tunas including skipjack, yellow fin and bigeye tuna.

The capture fisheries activities are managed by the Department of Fisheries under the Ministry of Fisheries Development. The management system currently in place takes into consideration: Monitoring, Control and Surveillance (MCS), Fisheries Development, Appraisal, Improvement and Data Collection among other activities.

The official fisheries data collection, processing and analysis are the mandate of Fisheries Department and the final summaries are submitted to the Central Bureau of Statistics (CBS) for the compilation of Statistical Bulletin. Kenya Marine and Fisheries Research Institute (KMFRI) also collect fisheries data but specifically for research purposes. There are a number of organizations that also collect specific fisheries data under numerous projects such as World Wildlife Fund (WWF), Coral Reef Degradation in the Western Indian Ocean (CORDIO), Kenya Society for Conservation of Marine Mammals (KESCOM),

Lake Victoria Environmental Management Project (LVEMP), Lake Victoria Fisheries Organization (LVFO).

1.1 Aquaculture

During the year 2009, the country had 6,328 (individuals or groups) fish farmers compared to 4,742 in 2008. They were farming on 9,116 earthen ponds covering an estimated area of 2,753,696 metres square compared to 7,530 ponds covering an area of 2,277,895 metres square in 2008. There were also 331 dams with an area of 5,473,346 metres square and 161 tanks/races with an area of 23,085 (see Table 1). This translates to 825 hectares of surface area used in 2009 in aquaculture fish production as opposed 728 hectares in 2008. The farmers were found in all the provinces apart from Nairobi and North Eastern.

This increase in area of farmed fish can be attributed to the Economic Stimulus Program (ESP) which was funded by the Government in 2009/2010 Financial Year. Under the ESP some 140 constituencies constructed 200 fish ponds each. A total of 1,586 new fish ponds measuring 475,800 square metres had been constructed throughout the country by end of December 2009 under the ESP. The increase in area of farmed fish can also be explained by the fact that most of the farmers who have been practicing subsistence farming have abandoned the activity while new farmers practicing commercial aquaculture have emerged owning bigger ponds resulting in higher yields.

Table 1: Number of culture systems and area in square metres 2009

Province	No. of Farmers	Ponds		Dams		Tanks		TOTAL	
		No.	Area	No.	Area	No.	Area	No.	Area
Central	1,339	1,609	506,605	167	1,933,809	83	18,744	1,859	2,459,158
Coast	184	434	58,698	-	-	9	180	434	58,698
Eastern	538	752	423,628	20	113,018	3	118	775	536,764
Nyanza	1,360	2,070	453,423	15	41,220	1	27	2,086	494,670
Rift Valley	1,242	1,531	761,856	129	3,385,298	65	4,015	1,725	4,151,169
Western	1,665	2,720	549,486	-	-	-	-	2,720	549,486
TOTAL	6,328	9,116	2,753,696	331	5,473,346	161	23,085	9,608	8,250,127

During the year under review, a total of 4,895 tonnes of various farmed fish species valued at KES 1,041,420,000 to the fish farmers were harvested. Tilapia contributed the bulk of the harvested fish with 3,424 tonnes (69.9%) of the total fish harvest, followed by Clarias 1,047 tonnes, Common carp 373 tonnes and trout 51 tonnes (Fig. 1). There were other farmed species such as Black bass, Koi carp and Gold fish but their overall contribution was minimal.

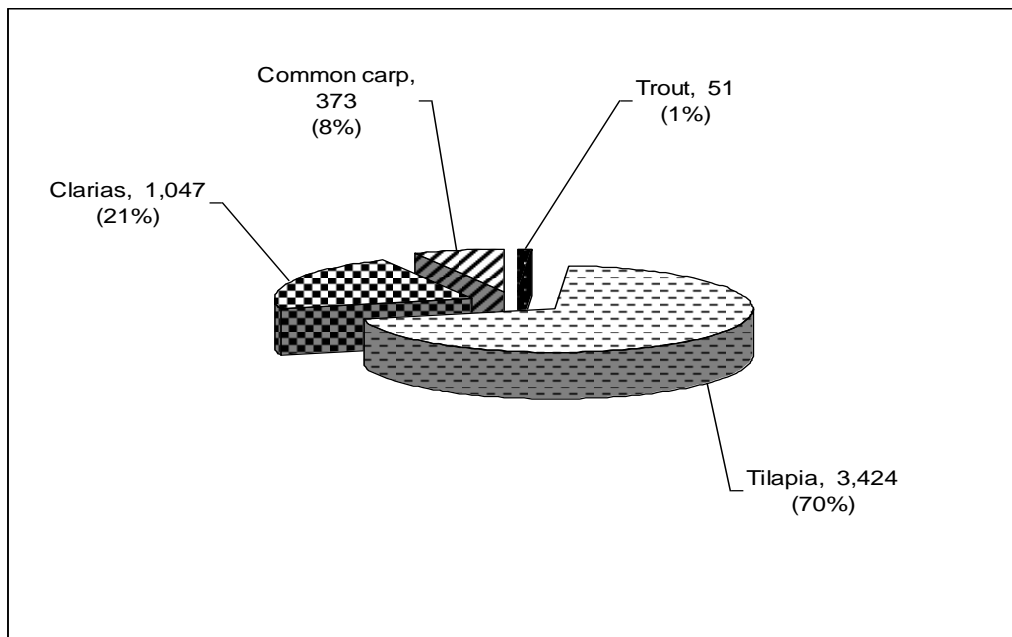


Figure 1: Aquaculture production by species in 2009

Aquaculture development has received a lot of support in terms of publicity since 2002. A lot of campaign and outreach to promote aquaculture has been carried out by the government agents and other stakeholders especially among the rural and semi-urban communities. With the declining stocks in the capture fisheries the government adopted a strategy to expedite commercial aquaculture growth, through a collaborative and participatory approach, involving both the public and private sectors through Public-Private Sector Partnerships. The private sector has also taken up aquaculture activities more serious than before and already one foreign company is doing very well in large scale commercial fish farming and several local companies are currently practicing enterprise based aquaculture.

Most fish farmers in the country have formed themselves into producer groups or association making it easy for advisory service delivery and economy of scale in the acquisition of farm inputs. During the year 2009, Sagana Aquaculture Centre produced 448,359 fingerlings (of Tilapia, Catfish, Goldfish and Swordfish) worth KES 1,669,914 while Kiganjo Trout Hatchery produced 53,993 fingerlings worth KES 863,904. Among the recent government efforts to promote aquaculture include formation of Ministry of Livestock and Fisheries Development in 2002 and later formation of a fully fledged Ministry of Fisheries Development in 2008 where aquaculture received major attention which it had always deserved in the past but in vain.

All these efforts have produced varying quality and quantities of fisheries data. The sets of fisheries data available for value chain studies can therefore be obtained from the following sources:

Secondary data

These datasets obtained from historical sources and include

- i) Annual fish landings and value from Catch Assessment Surveys (CAS)
- ii) Fish export quantity and value from export declaration documents
- iii) Effort data based on fishing licenses and boat registration

Published or unpublished literature

Most of the published data can be obtained from the Statistical Bulletins but these are greatly summarised for the purpose of economic planning at national level. There are few scientific publications on fisheries data in Kenya.

Surveys

Two types of fisheries survey data are generally available in Kenya:

- i) Frame Survey carried out every two year from 2000 that enumerates the landing sites, fishers, beach facilities and fishing gears
- ii) Bottom Trawl Surveys for Lake Victoria and Malindi-Ungwana Bay in the Kenya coast for demersal stocks and prawns respectively. These are however not regular and depends on projects

Focus groups

These are isolated case studies and do not usually cover a whole fishery spectrum. Many of these studies have been centred on HIV/AIDs and few socio-economic issues.

Rapid appraisal

These are also isolated studies and many of them are over 10 years old. For example, a rapid appraisal was done for the Lobster Fishery in Lamu by Fieldings (2000).

2.0 PRODUCTION FROM CAPTURE FISHERY

2.1 Lake Victoria Basin

2.1.1 Production of fish in the Lake Victoria Basin

Fish production in Lake Victoria is artisanal, employing mainly gill nets, baited long lines, traps and seine nets. There are currently no mechanised fishing activities in the Kenya part of Lake Victoria. Fish production from Lake Victoria grew exponentially until 1990 when signs of decline were realized for the first time. The exponential growth in production in the 1970s and 1980 was attributed to the Nile perch (*Lates niloticus*) explosion. In recent years, the total annual production of fish from Lake Victoria fluctuates between 130,000 and 140,000 metric tonnes annually (Table 2).

2.1.2 Production Technologies

Time-specific records of fishing activities in Lake Victoria are available from about 100 years. A British military captain conducted the first survey on Lake Victoria between 1898 and 1909 and produced detailed charts of the lake (Graham, 1929). In 1905 flax gillnets imported from Ireland were introduced in the lake, which had a great impact on fishing (Dobbs, 1927). Before 1915, less than 500 such nets were imported annually to Lake Victoria, but this increased rapidly to over 20,000 in 1921 (Graham, 1929).

Table 2: Total freshwater and marine fish landings and value in Kenya (2007 – 2009)

FRSH WATER	2007		2008		2009	
	M. tons	000 Kshs	M. tons	000 Kshs	M. tons	000 Kshs
Alestes	386	12774	145	2,893	53	1,056
Bagrus	150	6064	58.5	2,251	306	16,759
Barbus	505	25073	418	8,386	524	10,497
Black bass	4	487	2	229	2	185
Clarias	2,092	162832	2,269	270,702	2,736	311,010
Rastreonobola	49,472	1269451	46,966	1,650,286	49,326	2,219,624
Labeo	1,023	30120	1,900	39,097	1,900	40,442
Haplochromis	5,690	241001	5,423	314,514	822	51,621
Lates niloticus	47,067	4630128	45,026	6,017,748	43,650	6,705,665
Momyrus	29	1312	-	6	*	8
Protopterus	3,146	199796	3,077	259,032	930	54,406
Schilbe	438	21754	-	-	-	-
Synodontis	768	29324	20	409	16	309
Tilapia niloticus	13,090	1113110	12,732	1,751,812	17,274	2,501,777
Tilapia others	3,498	188295	5,092	179,028	5,041	204,810
Trout	47	16262	49	26,950	51	28,050
Carp	855	46518	947	59,115	1,238	74,877
Eels	1	23	*	28	1	51
Citharinus	44	1760	13	263	103	2,058
Hydrocynus	39	1560	18	361	229	4,578
Distichodus niloticus	119	4760	765	15,315	1,022	20,443
Unspecified	425	26912	1,751	119,223	450	26,067
TOTAL	128,888	8,029,316	126,672	10,717,649	125,674	12,274,292
MARINE FISH						
Demersal	3,508	218,888	4,092	274,088	3,836	287,916
Pelagic	2,046	147,588	2,572	193,379	2,401	201,538
Sharks/Rays	165.165	13,209	183	16,655	232	22,384
Sardines	202.025	10,677	151	10,570	130	8,390
Unspecified	433	31,684	553	46,262	425	36,318
TOTAL	6,354	422,045	7,551	540,954	7,024	556,546
CRUSTACEA						
Spiny Lobster	93.79	51,966	112	58,830	84	55,321
Prawns	306.766	55,146	243	50,608	153	34,877
Crabs	137.253	19,354	148	18,067	117	19,863
Others	80.67135	18,970	75	19,125	53	16,509
TOTAL	618	145,437	578	146630	407	126,570
MOLLUSCS						
Oysters	10.682	238	33	2,903	23	501
Squids	17.143	7,701	162	11,854	140	13,504
Octopus	221.61	14,770	291	22,415	256	20,056
Beche-de-mers	180.074	15,016	33	5,595	11	3,860
Others	64.42635	5,659	78	6,415	65	5,688
TOTAL	493.93535	43383.4119	597	49182	495	43,609
TOTAL MARINE	7,467	610,865	8,726	736,766	7,926	726,725
GRAND TOTAL	136,355	8,640,181	135,398	11,454,415	133,600	13,001,017

Source: Fisheries Annual Statistical Bulletin 2009
Data for 2000 – 2009 in "Catch Data 2000-2009_JOM_Rev1)

At that time boats fished at only about a mile from the shoreline, each catching an average of 25 fish per 100 yards of fishing net. Dobbs (1927) estimated that there were at that time between 4,000 and

6,000 local fishermen, and about 2,000 canoes made of rough boards and grass fibre, in the Central and Southern Kavirondo - the two districts bordering the lakeshore in Kenya.

In the mid-1950s the nylon gill net, which was stronger and easier to apply, was introduced, and it quickly replaced the flax type (Geheb, 1997). The use of modern fishing hooks (in long line and hand line fishing) started at the end of the second world war, when Kenyan soldiers returning from combat abroad brought hooks along with them (Mbuga *et al.*, 2000). Beach seines made of nylon twine came into use in the lake in the late 1940s. However, they could only be used during the 'open fishing season' (Geheb, 1997). Beach seines were initially meant to target tilapia, but later they were applied to catch Nile perch (*Lates niloticus*) as well as river-based fish species. As Nile perch became abundant and its average size increased, it became necessary to have a stronger beach seine that could hold it, hence, the net were modified to include a strong bag at the cod end. In the 1990s, the number of beach seines and the intensity of their fishing operations increased tremendously (Yongo, 2000).

The 'mosquito net' was introduced in the lake in the 1950s to catch *Rastrineobola argentea*, an endemic species locally called 'Omena'. In the late 1960s pressure lamps for attraction were introduced to be used with this net (Okedi, 1981; Witte and van Densen, 1995), a technology that was widely used in Lake Tanganyika for the Clupeids. The use of seine nets and light attraction by pressure lamps spread to many parts of the lake, making it one of the dominant fishing gears today.

Other important changes took place in the technology of propelling fishing boats. Initially this started with the use of paddles to propel simple fishing crafts. Perhaps due to their simplicity and affordability, paddle-propelled crafts are still the most common means of transport in Lake Victoria fishery. A survey carried out in 2000 revealed that 6,369 crafts still used paddles in the Kenyan part of Lake Victoria (Asila, 2001).

Fishing dhows using sails for propulsion were introduced in the mid-1920s and were mainly for travelling further to set nets in deep waters. In 1927 there were between 50 -100 such dhows in Nyanza Gulf of Lake Victoria, which had been introduced by Asian fish traders living in strategic trading centres around the lake. Today sails are still an important propulsion method for fishing boats in Lake Victoria. In 2000 there were 3,031 sail-propelled fishing crafts in the Kenyan part of the lake (Asila, 2001).

There has also been a steady increase in motorized transport. Trawlers have been the most important in this category, with quite a long history in Lake Victoria. The first trawler in the lake was a small one used by Graham (1929) for experimental work. In the late 1940s to early 1950s, the Lake Victoria Fisheries Service (LVFS), which then was the authority responsible for regulating the fishery, conducted trawling for research purposes (Gee and Gilbert, 1967). Other exploratory trawl surveys covering the entire lake were conducted between 1969 and 1971 (Kudhongania and Cordone, 1974). Commercial trawlers were introduced to the Kenyan waters of Lake Victoria in the late 1960s to harvest fish for a small processing plant in Kisumu. In the early 1970s, a private company with four trawlers also tried to carry out commercial fishing for a fishmeal factory to be established in Kenya (Jansen, 1977). However, both these attempts in commercial trawling failed since their target was the abundant but low value *Haplochromis* species (locally called 'fulu'). Trawlers could not catch sufficient quantities of the more valued tilapia ('ngege') species mainly because of its occurrence under rocky and shallower parts of the lake – and its

low stock density. Trawling became a dominant fishing method until the early 1990s when it was banned by the Kenya Government due to its destructive nature to the environment.

2.1.3 Fishers

Fairly consistent data on the number of fishers is available from 2000 to 2011 when a regional biannual frame survey was initiated in Kenya, Uganda and Tanzania. The number of fishers was 41,912 in 2010 as compared to 42,257 in 2008, 44,263 in 2006, 37,348 in 2004, 54,163 in 2002 and 38,431 in 2000. These figures indicate a minor decrease by less than 1% in the 2011 as opposed to a decrease of 4.4% from 2006 to 2008 and to a decline of 31% from 2000 to 2004 and an increase of 41% from 2000 to 2004. The density of fishers was 10.25 fishers per km² of Kenya waters of Lake Victoria in 2008 as compared to 10.7 in 2006, 9.1 in 2004, 13.1 in 2002 and 9.3 fishers in 2000. During the Frame Survey of 2002 the total number of people who were hauling the beach seines were enumerated as fishers while in 2004, 2006, 2008 and 2010 Frame Surveys, only the people who took part in the setting of the beach seines were enumerated as fishers hence the big reduction in the number of fishers between 2002 and these subsequent surveys.

The fishers were distributed within the eight riparian districts of Lake Victoria (Kenyan) waters as follows: In 2010 Frame survey, Suba District had the highest number of fishers at 15,131 (37%) followed by Bondo at 12,024 (29%), Migori, with 5,172 (12%), Busia with 3,196 (8%), Rachuonyo with 2,643 (6%), Kisumu with 2,682 (6%). Nyando had the least number of fishers at 467 followed by Homa Bay at 597 fishers (see Figure 2). The overall mean number of fishers per landing site was 127 as compared to 138 in 2008, 140 in 2006, 123 in 2004, 177 in 2002 and 129 in the year 2000. Migori had the highest mean number of fishers per landing site at 167 followed by Suba at 141, Bondo at 140, Busia 139, Homa Bay 100, Kisumu 81, and Rachuonyo 70. Nyando had the least concentration of fisher at 67 fishers per landing site in 2010.

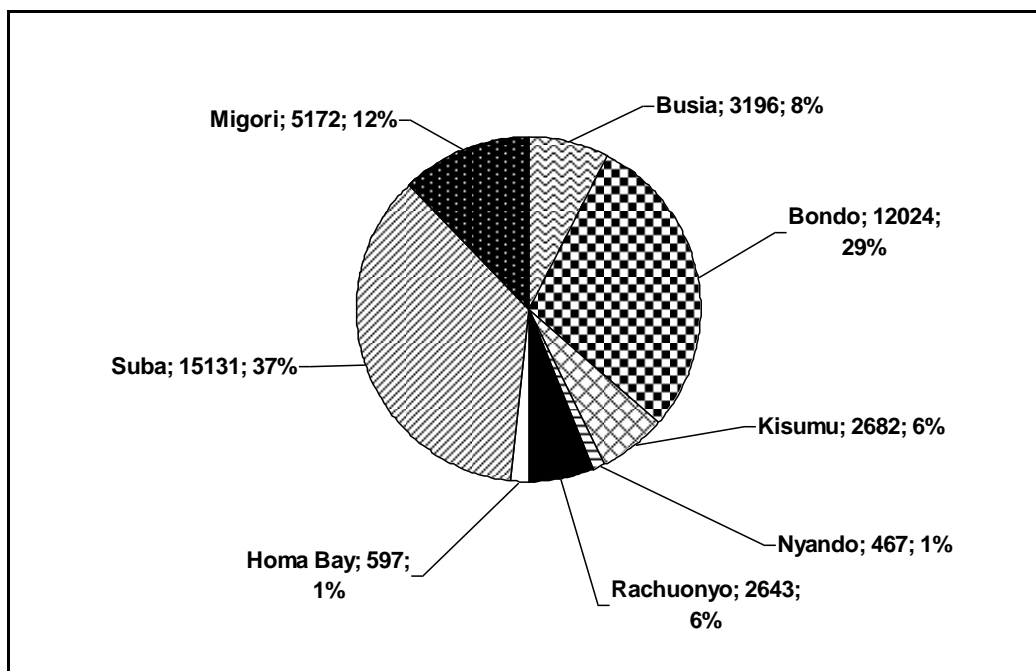


Figure 2: Distribution of fishers by districts 2010 (Source: Kenya Frame Survey 2010)

2.1.4 Socio-Economic Information

Given the general socio-economic characteristics of the fisheries, it is likely that no clear annual trends could be determined prior to the Nile perch boom. This situation would have probably continued if the overall fisheries situation had not been dramatically transformed by the rapid expansion of the Nile perch stocks after 1979-1989. The socio-economic characteristics of these fisheries were not known in any details as only a few investigations had ever been undertaken (Greboval 1989).

Specific socio-economic data and information on fishers is available from various isolated studies. However, socio-economic data is collected at national level by the Central Bureau of Statistics and is summarised by administrative boundaries. This approach makes it difficult to single out the socio-economic data for fishers, since every administrative unit has a mixture of socio-economic groupings that include small scale farmers, large scale farmers, livestock farmers, fishers etc. Some of the socio-economic information has been collected from secondary data. Figure 3 indicates that nearly three-quarters of fishermen have primary level education and one quarter secondary level education. Hardly any fishermen have no education at all (Manyala, 2005).

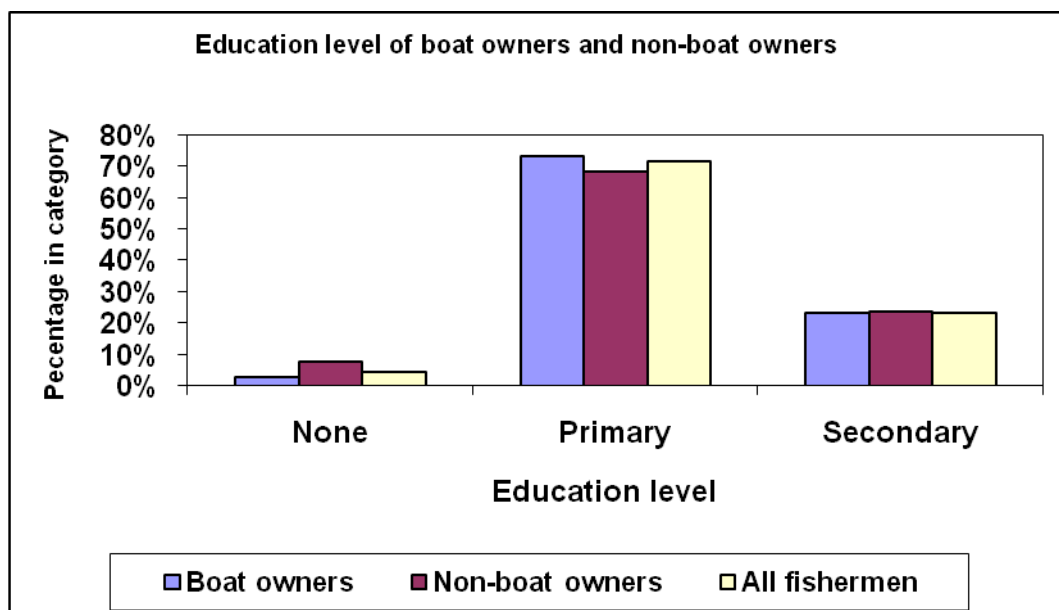


Figure 3: Education level of fishermen (Source: Fisheries Synthesis Report)

2.1.5 Age structure of entrants to the industry

Figure 4 indicates that about half of all fishermen first started fishing before the age of 20. Thereafter, the numbers fall rapidly with age as shown in the figure. It seems, therefore, that fishing on Lake Victoria is very much a profession, which attracts young people. Most new entrants start out fishing in their father's boat, so young people whose fathers are boat owners are likely to leave school at an earlier stage to start fishing. Young people abandoning school to start fishing is a social issue within the fisheries in Lake Victoria, which is causing concern to local communities and is becoming a big social problem.

There is some suggestion that proportionately fewer fishermen aged less than 20 years and more than 30 years of age, enter the fishery as boat owners. Boat owning predominates in those entrants between 20 and 29 years of age. Younger fishers who have just joined the fisheries may not have the necessary capital with which to buy their own boats, but may acquire this only after saving some money unless the fishing boat is inherited from the parents.

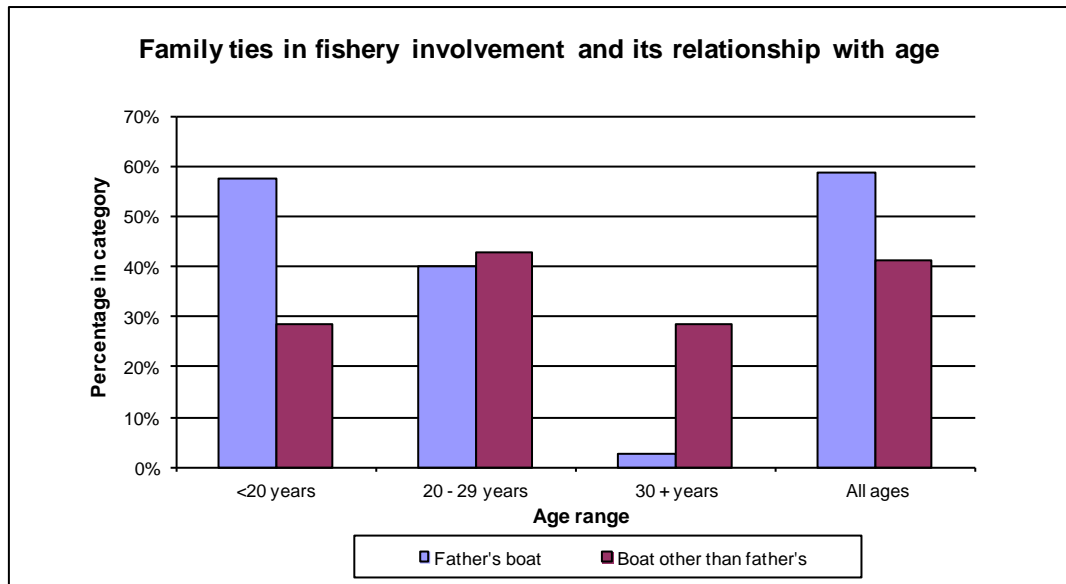


Figure 4: The importance of family boat-owning to new entrants to the industry

Nearly 60% of all fishermen started fishing in a boat owned by their fathers, rather than starting out in a boat belonging to someone else or buying a boat of their own. This indicates the importance of having a tradition of fishing in the family in either influencing offspring to take up fishing in the first place or in providing them with the means to do so more easily (or more probably both). There is some indication that the existence of a family owned boat is of more importance in fishermen of less than 20 years of age starting fishing, than it is for older fishermen, fishing activity requires some form of training and this seems to be the norm here.

2.2 Marine Fisheries

The coastal and marine fisheries cover marine waters and the intermediate brackish waters as well as coastal fresh water bodies. The Coast stretches for 640 Km from Somalia border in the north to Tanzania border in the south. The territorial waters cover 12 nautical miles where the artisanal fishermen do operate from, while the Exclusive Economic Zone (EEZ) covers 200 nautical miles from the Coast line. The marine fishery is estimated to have a potential of between 150,000 - 300,000 metric per year. At the moment the EEZ fishery is still being exploited by Distance Water Fishing Nations (DWFNs) with little knowledge on the amount of fish being caught due to lack of Monitoring, Control and Surveillance (MCS) system.

Kenya has recently applied to the United Nations for extension of her EEZ from 200 nm to 350 nm under the United Nations Convention on the Law of the Seas (UNCLOS III). This will not only enhance the ability of Kenya to enhance fish production from the marine waters but will facilitate the

operationalisation of several new policies on fisheries and ocean utilization such as the National Oceans Policy, the National Oceans and Fisheries Policy, the National Aquaculture Policy and Vision 2030 that all aims at increased production from natural resources, employment, income generation and investment among other key pillars.

2.2.1 Production and Value of Kenya Marine Fisheries

During 2009, a total of 7,926 tonnes of assorted fish species valued at KES 726,725,000 to the fishers were landed. This production reflected a decline of 9% from 2008 production of 8,725 tonnes. These were landed from 141 landing sites distributed all along the whole stretch of the Kenyan Coastline.

Fish production from the marine artisanal fishery has remained fairly stagnated between 5,000 and 8,000 tonnes over the years only showing marginal fluctuations. In 2009, demersal fish species dominated the marine artisanal landings, contributing 49% by weight while pelagic contributed 30%, sharks and rays made up 10% and crustacean contributed 5%.

2.2.2 Other crustaceans: Crab, Lobster and Octopus

Crab, lobsters and octopus fetch high prices locally and in export markets and are increasingly targeted. The improved market access for these high value crustaceans and octopus has attracted the interest of sea food companies, local businessmen and migrant fishers.

Crab fishing is a small-scale artisanal activity principally serving tourist hotels and foreigners residing in Mombasa, Malindi, Kilifi and Watamu. It is mostly concentrated in Ngomeni-Marereni area, where fishers target the swimming crab and sell to middlemen. In 2008, crabs were sold at KES 300 per Kg during low tourist season, which rose to KES 500 per Kg during the high tourist season.

Lobster fishing has attracted local businessmen who engage skilled diving fishers to catch lobsters for them. Many lobster fishers are migrants from Pemba Island in Tanzania, while some come from the Kenyan coast. Lobster fishing mostly takes place during the North East Monsoon, from October to March. Lobster dealers have moderately invested in the business, including dedicated fish shops in Malindi with deep freezers to preserve lobsters and improved sanitary conditions (tiled pavements and flowing water) to maintain high quality standards. In 2008, the ex-vessel price of lobsters per Kg was KES 600 in Malindi and KES 500 - 600 in Kipini, while dealers in turn sold them at KES 800 – 1,400 and KES 750 – 900 in the two areas respectively. The mean catch per lobster fisher per day in 2008 was estimated at 3.3 kg, although this ranged widely between 0.1 Kg and 20 Kg. Therefore lobster fishers earned an average of about KES 2,000 per day.

3.0 PROCESSING

There are 17 industrial fish processing companies in Kenya all of which are export oriented and can be classified as either land based establishments or water-based freezer vessels. These companies mainly produce frozen and chilled fish for export to European and other non-European markets. These companies deal in different fish species including Nile Perch, prawns, lobsters, octopus, cuttlefish and squids. The 17 industrial fish processors in Kenya have an installed capacity of 437 Tonnes per day of

which only 162.7 tonnes per day is utilised. The companies have varying installed and utilised capacities (see Table 3).

3.1 Fish Processing Chain

The introduction of the Nile perch, while ecologically catastrophic, has been of short-term benefit to large fishing companies around Lake Victoria. The long-term benefit is at stake as over-fishing reduces its population. In 2004 there were 14 fish processing and exporting companies around the lake. But due to diminishing fish resources, only 6 factories are operational to date. The factories operating by 2009 were: the East African Sea Foods Limited, Prinsal Enterprises Ltd., Fish Processing (2000) Ltd., Peche Foods Ltd., W.E Tilley Ltd., and Capital Fish Ltd. Some of the factories relocated to Uganda where there is more fish catches.

The fish industry has a chain of stakeholders which include the artisanal fishermen, agents and sub-agents, and processors. The fish market has a structure that categorizes traders focusing on the internal market and others dealing with the international market. The later market requires high fish handling standards of Nile perch fillets, prawns, octopus, cuttlefish and lobsters that are exported to various countries. The estimated processing cost for a single factory was the highest for the raw products (see Table 4).

Table 3: Industrial fish processors in Kenya, their installed and utilized capacities

Name of the company	Location	Fish species processed	Installed Capacity Per Day/Metric tonnes	Utilized Capacity Per Day
*W.E Tilley (M) Ltd	Nairobi Kisumu	Nile Perch	60	24
*East African Seafoods Ltd	Kisumu Mombasa	Nile Perch	40	18
*AfroMeat Ltd (Closed)	Kisumu	Nile Perch	30	Closed
*Prinsal Enterprises	Migori	Nile Perch	30	20
*Peche Foods	Kisumu	Nile Perch	15	Closed
*Capital Fish (K) Ltd	Homabay	Nile Perch	50	16
*Fish Processors (2000) Ltd	Kisumu	Perch	25	6
*Samaki (2000) Ltd	Nairobi	Nile Perch	25	6
*Wananchi Marine Products Ltd	Mombasa	Tuna	100	50
*TransAfrica Fisheries Ltd	Mombasa	Octopus	29	18
		Lobsters		
		Cuttlefish		
		Squids		
*Sea Harvest Kenya Limited	Mombasa	Octopus	5	2.5
		Lobsters		
		Cuttlefish		
		Squids		
*Banner Distribution Ltd	Malindi	Lobsters	10	1.2
*Crustacean Processors	Mombasa	Lobsters	0.5	0.16
**M.V Alpha Manyara	Mombasa	Prawns	2	0.2
**M.V Alpha Serengeti	Mombasa	Prawns	2	0.2
**M.V Alpha Amboseli	Mombasa	Prawns	2	0.2
**M.V. Venture II	Mombasa	Prawns	2	0.2

Source: Department of fisheries Ministry of Livestock & Fisheries Development, 2009 Survey
Land Based Fish Processing Establishments * Water Based Freezer Vessels **

Table 4: Cost and income estimates for a Nile perch factory (2008)

Item	Estimated income (million US\$)	Estimated costs (million US\$)
Fish fillet export	6.4 (94.1%)	
Sale of by-products (maws, frames etc)	0.4 (5.9%)	
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)

Source: Department of fisheries Ministry of Livestock & Fisheries Development, 2009 Survey

The average value of fish landed from Lake Victoria in 2006-2009 was KES 130.00 per kg for Nile perch, KES 35.00 for dagaa, KES 107.00 for tilapia and KES 200.00 for Lobsters (see Table 5). Lobsters have a higher value than each of the freshwater species. All these species are artisanal in nature and Lates is the only species that undergoes real industrial processing whereas Lobsters are semi-processed or just packaged for export and the other two (dagaa and tilapia) targets mostly local markets and regional markets to a lesser extent.

Table 5: Value of fish at fish landing

Fish and Fish products	Mean annual quantities landed, 2000-2007 (tonnes)	Mean annual landing price, 2000-2007 (KES/ Kg)	Mean annual value of landed fish, 1990-2007 (KES/tonne)
Lobstars	703	200.04	140,631
Dagaa	145,764	35.26	5,139,361
Lates	133,412	129.29	17,248,839
Tilapia	33,594	107.73	3,619,061

Source: Compiled from Fisheries Department Records (No recent data compiled)

3.3 The export markets

The number of export markets has expanded over the years. In 2002-2003, Kenya exported fish to around 26 countries. 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 European Union (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 countries represented, on average, 26% of the value of fish exports.

iii) **The Middle East:** This is dominated by Israel as a single and 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 the value of total fish exports.

iv) **Others:** These include the United States of America (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.

During 2003, a total of 11,114 metric tonnes of fish and fish products were exported from Kenya. The export earned the country KES 3,715,607,000.00 in foreign exchange as compared to 18,506 metric tonnes in 2009 and earning Kenya KES 4,170,358 in foreign exchange. Fish and fish products exported were mainly Nile perch fillets, fish maws, Octopus, sharks Sword fish, Crabs and fish skins. Nile perch fillets exports accounted for 87.4% of the total quantity and 84.73% of the total earnings. Fish maws contributed 5.6% in quantity and 11.3% in value while Octopus contributed 4.8% in quantity and 3.2% in value. This year's Nile perch fillets export decreased by 2 1.8% from the previous years' export of 12,425 tonnes By country destination, Israel had the lion's share of Nile perch exports at 4,420 tonnes or 45% of the total Nile perch exports. The export price per unit has also increased considerably for Nile perch and lobster over the years (see Figure 5).

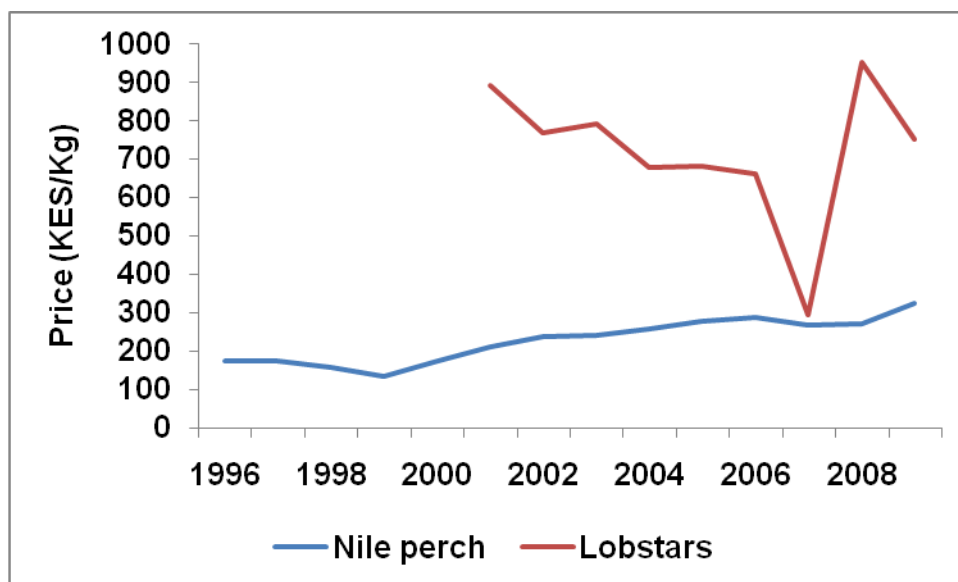


Figure 5: Export value per Kg of Nile perch and Lobsters from 1996 to 2009 (FOB)

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 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 and Israel became the most prominent single importer of Kenya's fish. However, it should be noted that 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.

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 during the EU fish bans.

3.5 Expansion of fish-meal production in Kenya

According to KMFRI's catch records Dagaa constituted about 77, 000 metric tonnes, or 44% of fresh fish landed on the Kenyan sector of the lake in 1995 (Abila and Jansen 1997). In each of the first eight years, it has constituted between 37- 45% of the catch (Othina and Osewe-Odera, 1996). Previously Dagaa has been mainly used as food for humans and has often been referred to as the "poor man's food". The animal feeds industry stated using Dagaa as the main source of crude protein in the industry in the early 1990s.

The industry in Kenya has continued to expand, stimulated by the need to export to the neighboring countries. Even as the amount of Nile perch frames going for fish meal increased, the industry soon turned to 'dagaa' (see Table 6), which proved to be an even richer source of crude protein for animal feeds (Manyala and Gitonga, 2008). In 1995, the fishmeal industry in Kenya was using about 69% of 'dagaa' that was landed on the Kenyan part of Lake Victoria (Abila and Jansen, 1997). For example, in 1999 another fishmeal factory with an additional capacity of 40 tonnes per day was constructed near Kisumu. The advantage of using 'dagaa' in fishmeal vis-à-vis for human consumption has, though, generated much controversy.

Table 6: Industrial processors using Omena as raw material, their age, installed capacity and product types manufactured (2008) and products and value from industrial processing using Omena as raw material based on 20 Kg packages

Name	Place	Age	Capacity	Unit Time	Product Type
Ranalo Millers	Nakuru	7 Years	250	Kg/day	Animal feeds
Wonder Feeds Ltd.	Nakuru	8 Years	1500	Kg/day	Animal feeds
Pembe Millers Ltd.	Nairobi		15,000	Kg/day	Animal feeds
Hemco Feeds	Nairobi	8 Years	300	Kg/day	Animal feeds
Kenya Dry Products Ltd.	Mombasa		32,000	Kg/Month	Pet food (Export)
Promasidor	Mbita/Nairobi	4 Years	60,000	Kg/Month	Human/Pet food
Lake Feeds	Kisumu	6 Years	1,500	Kg/day	Animal feeds
Poultry Feeds					
Name	Layer	Grower	Chick	Broiler Starter	Broiler Finisher
Ranalo Millers	350	300	360	400	380
Wonder Feeds Ltd.	340	290	390	430	400

Pembe Millers Ltd.	330	300	375	425	395
Hemco Feeds	290	270	330	380	-
Kenya Dry Products Ltd.					
Promasidor					

Name	Cattle Feeds			Pig Feeds	
	Dairy Meal	Brand_1	Brand_2	Finisher	Sow/Weaner
Ranalo Millers	250			250	380
Wonder Feeds Ltd.	320	260	210	280	310
Pembe Millers Ltd.					
Hemco Feeds	220	250	215	240	280
Kenya Dry Products Ltd.					
Promasidor					

Name	Human/Pets	
	Human	Pet Feeds
Ranalo Millers		
Wonder Feeds Ltd.		
Pembe Millers Ltd.		
Hemco Feeds		
Kenya Dry Products Ltd.		50,000.00
Promasidor	4,000.00	

Source: Manyala & Gitonga, 2008

For example, Harris (1992) questioned whether fishmeal was sufficiently profitable to justify the use of 'dagaa' in that industry, instead of for human consumption. Bokea and Ikiara (2000) argued that the use of 'dagaa' for fishmeal was a direct protein loss to the poor communities around the lake for whom 'dagaa' was a major source of protein. Similarly, Abila and Jansen (1997) argued that 'dagaa' should remain for human consumption as this offered more jobs, especially for women in the distribution sector and, obviously, a greater supply of protein to lakeside communities.

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 picked up. In 1976 – 1980, Kenya imported fishmeal worth about US\$ 1.5 Million annually, but this figure had reduced by nearly 50% in 1993 – 1997. Local fishmeal production has, therefore, saved the country a large amount of foreign exchange, but it has led to less protein available for consumption especially to the poor people in the country. Pressure on Kenya's fisheries is expected to increase towards meeting the fishmeal demand, since the local demand for fishmeal in Kenya is not yet satisfied. There is an increasing capacity of fish processing factories to meet export demand, and the expansion in fishmeal processing capacity, both industries depending on Lake Victoria's Nile perch. The fishmeal industry started using 'dagaa', the second most important fish species in Kenya. It was also a time of increasing competition for fish among the different users of Nile perch, chiefly; fish traders, artisanal processors, industrial processors and fish consumers (Bokea and Ikiara, 2000).

4.0 TRANSPORTATION

Transportation of fresh fish at production is done by the fishers themselves and using fishing crafts. At landings, fresh fish for industrial processing is packed and transported in refrigerated trucks to the processing plants. The trucks are usually owned by the industrial processors. Most of the export fish is transported by air in containers designed for fish transport. Not all processed fish end up in the export market but a small proportion is usually marketed locally, in the supermarket chains.

Fresh fish for domestic market is transported mostly in private small commercial vehicle or by public transport for small scale traders. The fish is usually packed in ice placed in polythene sheets and placed in traditional baskets before transportation. Fish packed in this manner usually ends up in Nairobi and Mombasa through overnight public transport systems.

For lobsters, the fish is kept alive until the dealers transport them either for export purposes or local consumption. This is usually by road to Malindi, Kilifi, Mombasa and some end up in Nairobi.

Processed fish such as sundried Nile perch, tilapia and Dagaa and deep fried Nile perch meant for domestic market are transported by road to the various urban markets. The transport may be private or public and this depends on the quantities to be transported.

5.0 FINAL CONSUMPTION

For Nile perch exports, the quantity exported from 1996 to 2009 was in the range of 18,000 to 42,000 tonnes, leaving behind 70% to 89% for local consumption. Lobster export ranged from a low of 8 tonnes to a high of 165 tonnes during the same period and leaving behind about 3.5% to 90% of the catch for domestic consumption (see Table 7). Lobster exports started in 2001 and there were no official exports prior to this period. This means that even though more fish was being exported during this period, a larger proportion was being made available for local consumption.

The Dagaa trade is more informal and the amounts exported up to 2008 have been minimal. For Lobsters, no detailed analysis has been carried out on the proportions exported and that for local consumption. The Nile tilapia is basically for local consumption and it does not appear in the export schedules and export declaration data.

Table 7: Nile perch contribution in the fish food supply from 1996 to 2009

Year	Total Catch	Total Export	Catch		Export		Percentage Available	
			Lates	Lobsters	Lates	Lobsters	Lates	Lobsters
1996	339,547	18,839	96,471	177	16,477	0	82.92	100.00
1997	307,487	17,024	73,004	136	14,719	0	79.84	100.00
1998	329,667	17,816	76,663	33	11,698	0	84.74	100.00
1999	407,790	18,145	114,808	54	12,518	0	89.10	100.00
2000	388,853	20,510	109,068	52	15,826	0	85.49	100.00
2001	305,814	23,825	78,534	76	17,947	38	77.15	50.00
2002	234,370	42,210	58,432	119	16,456	72	71.84	39.50
2003	216,402	22,563	54,689	171	16,546	165	69.75	3.51

2004	241,565	28,240	59,497	162	15,728	108	73.57	33.33
2005	270,718	33,147	51,400	97	13,769	33	73.21	65.98
2006	252,590	36,368	48,979	202	11,846	8	75.81	96.04
2007	234,462	31,376	46,558	307	13,101	29	71.86	90.55
2008	222,738	29,575	44,232	243	12,422	47	71.92	80.66
2009	236,758	18,506	42,622	153	9,712	23	77.21	84.97

6.0 REGULATIONS

The sector is regulated and controlled by the Fisheries Department, which falls under the Ministry of Fisheries Development. Following are some regulation related issues:

6.1 Legal and regulatory framework

The government policy for the fisheries sub-sector has been to maximize production by proper utilisation of resources. The policy encourages fish filleting for export, rationalisation of tariff structures on inputs of fish processing machinery and support of programmes that provide boats and gear (engines and nets) to fishermen. The government has named agro processing, which includes fish processing, as a priority area for investment promotion as outlined in the recently held International Investment Conference in Nairobi – Kenya in March 2004.

The Fisheries Department is the national institution mandated to manage the fisheries sector and operates under the Ministry of Livestock & Fisheries Development. Basic fisheries legislation is set out in six parts and 26 sections of the Fisheries Act 1989 (Act No. 5 of 1989; revised 1991). The Act applies to both marine and inland fisheries, and broadly empowers the Director of Fisheries, with the approval of the Minister, to issue regulations to promote the development of fisheries and aquaculture and to ensure the proper management of specific fisheries, including the possibility of declaring closed seasons and/or areas, access limitations, and restrictions on fishing methods, gear, and the characteristics of fish that may be caught.

The Act further establishes bases for:

- i) Registration of fishing vessels (obligation of registration of fishing vessels and definitions of governing conditions).
- ii) Licensing (Fisher folk, Traders)
 - Section 8 of the Fisheries Act (Cap 378 of 1991) provides that no person other than persons fishing for their own consumption shall catch or assist in catching fish in Kenya fishery waters otherwise than in accordance with the terms and conditions of a valid license issued to him under the above Act.
 - The Fisheries (General) Regulations 15 (1) provides that no person shall trade in fish or fish products unless he is in lawful possession of a fish traders license issued under this regulation and is operating on conformity with the terms and conditions of the license.
 - Obligation to be in possession of a valid license to fish Kenya waters.
 - Local fishing vessel requirements.
 - Foreign fishing vessel requirements.
 - Other licenses (requirements for any other fisheries activity including sport fishing).
- iii) Offences and enforcement (defines specific offences and penalties):
 - Prohibited methods of fishing.

- Trade and commerce of fish illegally caught.
 - Obstruction of officers
 - Powers of officers.
 - Procedure of forfeiture
- iv) General provisions (miscellaneous):
- Prohibition on fishing for marine mammals in Kenyan waters.
 - Specification of Minister's powers to make regulations (e.g. to organise and regulate marketing and distribution of fish; establishment of credit schemes, etc.).
- v) Kenya Fishing Bans (Omena)
- The ban on fishing and trading omena (*Rastrineobola argentea*) was implemented in 2001 in order to conserve vulnerable stocks during the peak breeding period and reduce the overall effort on this fishery. The ban was published in the Kenya Gazette Notice No.7565-The Fisheries Act (Cap 378) – Imposition of Management Measures- gave notice that fishing *Rastrineobola argentea* (Omena) in Kenya waters of Lake Victoria during the period from 1st April to 31st July each year is prohibited and the respective periods wherever specified, shall be closed seasons or areas for purposes of this notice.

6.2 Beaches along Lake Victoria shoreline and Kenya Coast

The Lake Victoria basin has approximately 307 gazetted fish landing beaches in Kenya while the marine coastline has 141 fish landing sites. A beach is a place along the lakeshore where boats anchor or land to discharge fish catches. There are fish landing beaches that are not recognized by the Government but could be well known to the communities for social activities. Gazetement of a beach follows a procedure where inspection for the minimum requirements of social amenities is carried out. Those that qualify to be gazetted are listed in the official government newsletter “The Kenya Gazette” and become recognized places for landing fish and subject to all requirements as contained in the legal provisions. Those beaches that do not meet the minimum requirements may remain social beaches but the government operations will not recognize them and any infrastructure developments cannot take place in such fish landing sites.

6.3 Community Management of Fishery Resources

The Government of Kenya has recently emphasised on fisheries co-management and strengthened the previously inefficient Beach Committees into Beach Management Units (BMUs) through the Gazette Notice on Beach Management Unit Regulations in 2000. The BMUs are responsible for vetting fishermen, monitoring, security, marketing and development of the landing sites in partnership with the government and other development partners in the sector.

6.3 Other Institutions

The Kenya Bureau of Standards (KEBS), which sets and supervises standards for manufactured goods, also has defined standards for fish processing for both domestic and export markets. To improve the quality of Kenyan fish, all fish factories have instituted stringent quality control procedures like the Hazard Analysis Critical Control Point (HACCP). New institutions have also emerged to implement the additional regulations required for exporting fish. The fish industry is now governed

directly by at least six sets of standards operated through several Kenyan agencies and EU, the latter having the most significant regulations on the fisheries sector.

The regulations are based on HACCP principle, and define the practices governing fish production, handling, packaging, and transporting of fishery products destined for EU. It also imposes strict standards regarding construction of buildings, equipment, purification tanks, storage tanks intended for holding fish prior to export, on-premises laboratories, strict record keeping, and accurate labelling are other requirements. EU conditions also require that processors and exporters organise an industry association to ensure self monitoring on matters of fish quality. These standards are enforced through competent authority (Ministry of Fisheries Development - Department of Fisheries) approved by the EU.

Other institutions in the sector include the Kenya Marine & Fisheries Research Institute (KMFRI) which is a government body formed through an amendment of the National Science and Technology Act of 1979. KMFRI's mandate is to carry out research on aquatic and fisheries resources in the country and to provide information on the resources therein. The Institute is also currently under the Ministry of Fisheries Development. The industry also has a representative body called Association of Fish Processors & Exporters of Kenya (AFIPEK) that articulates issues concerning the industry and self policing.

7.0 MARKET STRUCTURE

7.1 Market conditions

The largest species of fish processed and exported is the Nile Perch. Other commercially important species in the domestic market are the small sardine fish and tilapia. The Nile Perch is not a native species in Lake Victoria. It was introduced by the colonial government in 1954, but did not become important until the mid 1980s, when the Nile Perch became popular in the export market. The catching and processing of Nile Perch in Kenya has grown from a local activity into a major export industry.

7.2 Domestic market

The domestic Market commands about 70% of the total fish market. It is however not well defined or organized and involves buying fish at the beach by small scale traders and selling to various open-air markets and fish shops. The fish are sold either dried, fresh or processed for later consumption. The Artisanal Fish Processors (AFPs) prepare dried and smoked fish. Nairobi forms one of the main destinations for fish from Lake Victoria, Naivasha, Coast (marine) and even Tana River Dams. The main markets in Nairobi are Gikomba and City Markets. In the year 2000, the total fish traded in Nairobi was 12,253 metric tonnes, valued at KES 121million. Other local markets include Central and Eastern Provinces, who buy fish from fish farmers in the Tana River Dams. Some parts of Rift Valley Province also receive fish from Lake Turkana, Naivasha and even Lake Victoria. The markets in other districts are fairly small.

7.3 Export market

The Nile Perch accounts for 84% of the total fish exports followed by the tuna accounting for 13% while the other species account for 3%. The export volumes of Nile Perch show a gradual increase in volumes though this was interrupted by the fishing ban imposed in 1998/1999 by the European Union on fish from Lake Victoria. Kenya's main markets for the Nile Perch are the European Union, Far East and Israel. Before the exports ban, the EU (Netherlands, Belgium, Germany, Portugal, Italy, France and Spain) accounted for about 62% of all fish exported from Kenya. New markets emerged during the ban, among them Israel, the Far East, North America, the Middle East, and other African countries. Israel became the most prominent single importer of Kenya's fish i.e. the position it has retained to date. The EU is still, however, the preferred market for fishery exports from Kenya because of its relative proximity and accessibility, which allows for greater profit margins. Thus, meeting safety standards in the EU is important for the industry's future.

During 2009, a total of 18,114 metric tons of fish and fish products were exported. The exports earned KES 4,170,607,358 in foreign exchange. Fish and fishery products exported were mainly Nile perch fillets, fish maws, Octopus, sharks Sword fish, Crabs and fish skins. Nile perch fillet exports accounted for 87.4% of the total quantity and 84.73% of the total earnings. Fish maws contributed 5.6% in quantity and 11.3% in value while Octopus contributed 4.8% in quantity and 3.2% in value. This year's Nile perch fillets export decreased by 21.8% from the previous years' export of 12,425 metric tons. By country destination, Israel had the lion's share of Nile perch exports at 4,420 metric tons or 45% of the total Nile perch exports. Israel was followed by Netherlands with 1,786 metric tons (18%), Portugal with 585 metric tons (6%), UAE with 441 metric tons (5%) and Australia with 410 metric tons (4%) (See Fig. 6). By product type the exports of frozen Nile perch fillet contributed the highest percentage which is 66% (6,358 metric tons) followed by fresh fillets 29 % (2,852 metric tons), frozen headless and gutted Nile perch 5% (498 metric tons) ,and fresh headless and gutted Nile perch 0.03% (3 metric tons) refer to figure 7.

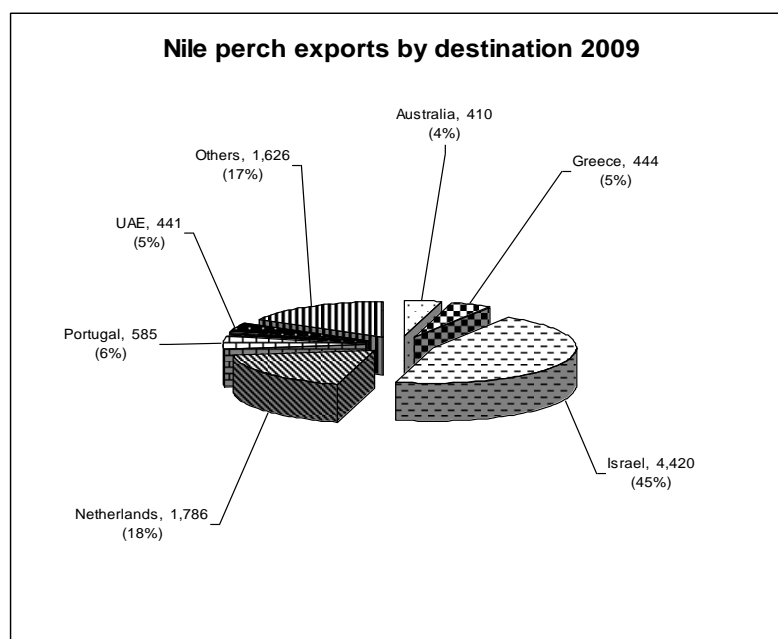


Figure 6: Exports of Nile Perch By destinations- 2009

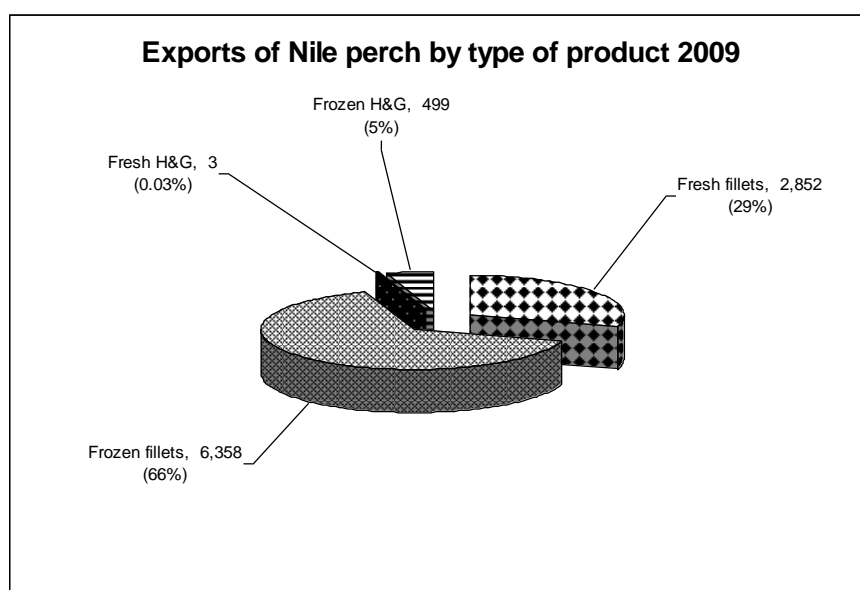


Figure 7: Exports of Nile perch by product type 2009

Apart from the above mentioned exports, 7,392 metric tons of Tuna loins were processed and trans-shipped through the port of Mombasa. This quantity was a decrease of 50.9% from the previous year's trans-shipment of 15,069 metric tons. The decline can be attributed to the piracy problems which were experienced though out the year under review.

7.4 Marketing of Crustacean (Crabs, Lobsters and Octopus)

Octopus is highly valued species and it attracts many migrant skilled fishers especially from Pemba Island who are engaged by dealers. Octopus fishing takes place mostly during the North East Monsoon, especially from October to March. The dealers pay fishers KES 50 for each Kg of Octopus. The local dealers have shops close to landing sites purposely for buying and preserving octopus, which they resell to one company called Sea Harvest, which specializes in export of octopus. Dealers around Malindi buy octopus at KES 70-80 during high supply and at KES 120 per kg during low supply (Table 8). They in turn sell to hotels at KES 130-150 per Kg during low supply season and KES 120-250 per Kg during high season (Ochiewo *et al*, 2008).

Table 8: Average ex-vessel price in KES per Kg of prawn, octopus, Lobster and fish (2007)

	Malindi	Ngomeni	Kipini	Average
Jumbo prawns	780	-	600	600
Cocktail prawns	365	-	160	
Octopus	70	-	50	
Lobster	600	-	550	450
Fish grade 1	98	90	73	80
Fish grade 2	78	70	37	60

Source: Ochiewo *et al*, 2008

8.0 DATA AVAILABILITY

There is no central fisheries database in Kenya and most of the data is either in the custody of individual officers or are already highly summarised in statistical bulletin. This situation poses a serious challenge in acquiring the complete datasets for complete value chain analysis.

For this case study, the following datasets have been obtained and compiled:

- i) Lake Victoria Fish Landing data on an annual basis by species and ex vessel value from 1970 – 2007
- ii) Fish prices and quantities of three main species (Nile perch, tilapia and Omena (Dagaa) from 140 sites (landing beaches and markets) on a daily basis only for 2010.
- iii) Fish export quantities and value by species on annual basis 1996 - 2009
- iv) Monthly landing of lobsters and value from three landing sites in Lamu District from 2001 - July, 2009
- v) Isolated data on prices per Kg over varying times and places for Nile perch, tilapia, dagaa, and lobsters
- vi) Operation costs of fishermen, fish processors, fish traders for Omena through a couple of marketing surveys between **2008** and **2010**.
- vii) Additional information to be include:
 - i) Transportation/processing and retail costs for lobsters
 - ii) Foreign exchange rates from 2000 to date
 - iii) Artisanal traders and fish shop costs

9.0 SPECIES SELECTION FOR VCA

Based on this review, the following species are selected for Value Chain Analysis (VCA):

1. *Lates niloticus*: where the fishery is mainly artisanal but on a commercial basis, the collection and transportation is organized through agents and part of the catch is industrially processed while a large proportion is for domestic market.
2. *Oreochromis niloticus*: where the fishery is also artisanal, a small proportion is industrially processed but currently does not target export market. The target consumers are the affluent or upper class consumers through supermarket chains, high class hotels and tourism sector.
3. *Rastrineobola argentea*: which is artisanal and its utilization is split between animal feed industry and human consumption and does not target export market at the moment. A few attempts to establish export markets have been recorded with low success.
4. Lobster fishery: that is also artisanal fishery with a very well organized marketing system, agents, processors and exporters.

REFERENCE

- The Republic Of Kenya (2007). Applied Research Program For The Lake Victoria Basin, Lake Victoria Environmental Management Project II. Ministry Of Environment And Natural Resources. Proposed Projects For LVEMP II - Vol II. (Final Report, March 2007)
- Republic Of Kenya (2007). Natural Resources Interventions And Investments For The Lake Natural Resources Interventions And Investments For The Lake. Victoria Basin Ministry of Environment And Natural Resources, Lake Victoria Environmental Management Project II Preparation. Final Report, March 2007.
- Greboval, D. (1989). Managing the New Fisheries of Lake Victoria: major Socio-Economic Issues. UNDP/FAO Regional Project for Inland Fisheries Planning, development and Management in Eastern/Central/ Southern Africa. RAF/87/009-TD/04/89 (En). 25 pp
- Greboval, D. and P. Mannini (1992). The Fisheries of Lake Victoria: Review of Basic Data. UNDP/FAO Regional Project for Inland Fisheries Planning, development and Management in Eastern/Central/ Southern Africa. RAF/87/009-TD/16/92 (En). 44 pp
- Abila, R. (2000). The Development of Lake Victoria Fishery: A Boon or Bane for Food Security. IUCN Report No. 7. 28 pp.
- Bokea, C. and M. Ikiara (2000). The Macro economy of the Export Fishing Industry in Lake Victoria, Kenya. IUCN Report No. 7. 32 pp.
- GoK (2005) Draft Beach Management Unit Regulation. The Fisheries Act Cap. 378 of Kenya.
- GoK (2005). The Implementation of Fisheries Management Plan for Lake Victoria. National Beach Management Unit Guidelines. 33 pp.
- LVEMP (2001). Draft Report of the Regional Task Force for the Harmonization of Fisheries legislation. Third Edition. LVEMP.
- LVEMP (2005). Status Report on Frame Surveys 2000, 2002 and 2004. Combined Reports for Kenya, Tanzania and Uganda.
- Manyala, J. O. and J. E. Ojuok (1993). Survival of the Lake Victoria *Rastrineobola argentea* (Pellegrin 1904) in a rapidly changing environment: Biotic and Abiotic interactions. Great Lakes of the World Conference
- Mbuga, J.S. (1991). Harvesting: Socio-economic aspects of the tilapia Nile perch and pelagic fisheries (*Rastrineobola*). FAO/UNDP RAF/87/099-WP/07/91 (En). Pp. 27-57; 1991; (Proceedings of the Symposium on Socioeconomic Aspects of Lake Victoria Fisheries. Volume 2 (Unedited Papers 8-12)).
- Abila, R. (2000). The Development of Lake Victoria Fishery: A Boon or Bane for Food Security. IUCN Report No. 7. 28 pp.
- Odonkara, K., M. Kyangwa, J. Wegoye, A. Nyapendi and R. Jawoko (2003). Globalization and Fish Utilization and Marketing Study. Off-Beach Fish Marketing and Livelihood in Uganda. FIRRI, 22 pp.
- Manyala, J. O. and N. Gitonga (2008). Omena Marketing Study in the Major Urban Centres in Kenya. GTZ-PSDA Commissioned Study
- Manyala J. O (2005). Evaluation of the Dagaa (*Rastrineobola Argentea*) Fishery of Lake Victoria. Implementation of a Fisheries Management Plan (Ifmp) Project for Lake Victoria Edf Project No: 8 ACP/ROR/029