FROM LOCAL TO GLOBAL MARKETS

The Fish Exporting and Fishmeal Industries of Lake Victoria — Structure, Strategies and Socio-economic Impacts in Kenya

Richard 0. Abila[1] and Eirik G. Jansen[2]

Lake Victoria is the second biggest lake in the world. With its 69,000 km2, the lake has me same size as Ireland. The lake is shared between three countries; Tanzania (which possesses 49%, Uganda (45%) and Kenya (6%) of the lake.

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[1] Research Officer 1
Kenya Marine & Fisheries Research Institute
Kisumu Research Centre
P.O. Box 1881 KISUMU, Kenya

[2] Technical Advisor
lUCN-The World Conservation Union
Socio-economics of the Nile Perch Fishery on Lake Victoria
P.O. Box 68200
NAIROBI, Kenya

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SUMMARY

The fisheries of Lake Victoria has undergone a dramatic transformation during the last 15 years. From being a locally based fishery with little intervention and capital investment from outside, the present fishery is dominated by national and international capital penetrating the industry. It is the explosion in the growth of Nile perch, and the strong demand which has developed for this fish in the global markets, which have transformed the fisheries of Lake Victoria.

This paper presents the results of a survey carried out between December 1996 and June 1997 about the fish export and fishmeal industries in the Kenyan part of Lake Victoria. The ownership pattern of the export industry is described as well as the strategies the fish processing factories pursue to obtain as much fish as possible. A major part of the paper discusses some of the socio-economic impacts of the present industry. It particularly focuses on the effect the export of fish and the development of a fishmeal industry in Kenya has on food security and employment for the local population.

There are 12 Nile perch processing factories operating in the Kenyan part of Lake Victoria. Most of them are owned by non-indigenous Kenyans. The industry is well integrated horizontally and vertically, which extends to other factories in Tanzania and Uganda. Much of the investments in the industry has been financed by funds from both international and local financial institutions. The factories have established relationships with fishermen, either directly or via agents, by supplying gear or credit. This makes fishermen dependent on factories or their agents, effectively reducing their choices in the market.

The factories in Kenya process about 200 tons of Nile perch per day, which is only 50% of the existing capacity. The excess capacity is mainly due to the difficulty factories face in getting adequate fish supplies, although some of them also have constraints related to marketing, fish quality and under-financing. Besides fillet, the plants also produce frames (skeletons), fish maws (bladder), fish oil and skins for various markets. Fillet and maws are exported to several countries overseas. There is though a ready potential market locally for much of the exported Nile perch.

Most of the fish frames produced by factories, about 60%, now goes for fishmeal. Similarly about two-thirds of the catch of a small sardine-like fish, dagaa, goes for fishmeal. The demand for both products in the local market for human consumption is high and unsatisfied. Therefore Nile perch frames and dagaa going for fishmeal is directly in conflict with food security requirements for local people. The per capita fish consumption in Kenya is about 3Kg per year. If none of the fish in the country was exported or used for fishmeal, this figure could be 6Kg, which is still very low by all international standards. Because of the strong demand for fishmeal, the price of fish frames and dagaa has risen beyond what most consumers can afford.

The industries also draw away fish and fish products from the traditional processing sectors, thus causing unemployment, which outweigh the new employment opportunities created in the modern sectors. At least a net of 10,000 jobs, mainly involving women, have been lost in the traditional fish processing and marketing sectors as a result of the fish exporting and fishmeal industries. Finally, industrialization of the Lake Victoria fisheries has negative impacts on the conservation of fisheries resources.

The current trends in the fish industry therefore do not promote the important objectives set up for Kenya's fisheries policy, especially on food security and employment. These are being undermined by the present way in which the fish resources are being utilized and exploited.

INTRODUCTION

During the last 15 years the fishery of Lake Victoria has been completely transformed. From being a locally based fishery with little intervention and capital investment from outside, the present fishery is dominated by national and international capital penetrating the industry. This change is very much a result of the strong demand which has developed in the global markets for the Nile perch (Lates niloticus) of Lake Victoria.

This paper will discuss the transformation which has taken place, particularly focusing on the fish processing and exporting industry in the Kenyan part of Lake Victoria. The paper presents some information on this industry's structure, strategies and its socio-economic impacts. Some preliminary investigations have also been carried out in the Ugandan part of Lake Victoria which reveal many similarities to Kenya's situation with regard to the structure of the industry and the socio-economic impacts.

It is the explosion in the growth of Nile perch fishery which has caused the transformation of the fisheries of Lake Victoria. In order to understand the recent developments of the Lake Victoria fisheries, it is therefore useful to distinguish between the "old" pre-Nile perch fisheries regime which lasted up to about 1979 and the "new" fisheries regime which developed during the 1980s (Greboval, 1989). In the next section we will present information about the Lake Victoria fisheries as it existed during the 1960s and 1970s before the Nile perch boom. This is followed by a discussion of the changes which occurred during the 1980s when an export market developed for the Nile perch.

We then present a detailed description of the structure and strategies of Kenya's fish processing and exporting industry, based on a survey that we carried out between December 1996 and June 1997. This is followed by a brief look at the Government of Kenya's major policy objectives for development of the fisheries. We then evaluate to what extent the present trends support this policy. We discuss, in particular, the effects the export of fish have for the food security and employment situations for local people. Most of the local people are poor and they have depended on the fisheries for generations, as a source of food, employment and income. We also explore the possible negative effects the exports of fish have on sustainable exploitation of fisheries resources. Finally we indicate some measures through which the major Government objectives for the fisheries can be better achieved.

The Pre-Nile Perch Fisheries Regime (1960-1979)

The total catch from Lake Victoria during the 1960s and 1970s was quite stable. About 100,000 tons of fish was caught annually in the three countries. Until the mid-1970s the fisheries of Lake Victoria was exploited solely by small-scale fishermen. It was then estimated that some50,000 fishermen operated from about 12,000 fishing vessels (Butcher and Colaris, 1973). The fishermen had a varying degree of involvement in the fisheries. Some fished only on a part-time or seasonal basis while others were full-time fishermen. Nearly 80% of the fishermen derived their primary income from fishing. With the decline in opportunities for urban employment, many of the population from around the Lake region, who previously migrated to large cities in the country, turned to fishing, with the result that earnings per fishermen declined (Francis and Hodinott, 1993).

In the pre-Nile perch regime there were clear barriers to investment in equipment in the production sector. Very few owners of canoes possessed more than one canoe or owned more gill-nets than they were able to control themselves. The ownership pattern was thus very decentralized and the income from the lake evenly distributed among the fishermen (Jansen, 1973 and 1977). There was very little investment in fishing technological improvement. The canoes were sailed and manually operated in the same way as they had been for decades. Although outboard engines had been available for the previous 30 years, only a few canoes were fitted with them, and almost all these were used for transport purposes only.

During this period, the processing and trading sectors of the traditional fisheries was almost totally dominated by small scale operators, most of them women, who were based in the local communities around the lake. The part of the fish which was not sold fresh, was processed by being smoked or sun-dried on the beach and carried to local inland markets by the traders. There were few wholesalers in the fish trade, and the traders never acquired control over the fishermen as they have managed to do in so many other traditional fisheries through the establishment of credit relationships. Most fishermen sold their fish to a limited number of women fishmongers with whom they had developed long-standing relationships. Most of the animal protein which the local population ate came from fish of the lake (Jansen, 1973 and 1977).

Before 1980 the fisheries to a large extent existed independent of outside interference. The Governments of the riparian states though collected statistics on the fishery and formulated different regulations. These regulations were rarely enforced. Although in principle there has been an open access to fish in the lake, the local fishing communities around the lake have all through this century, developed rules which regulate the fisheries. These rules stipulate who may fish, in what season, in what area, what types of fishing gear are acceptable and what type or size of fish which can be caught. Institutions have been developed in the local communities to enforce these regulations. The rules and nature of enforcement "institutions" vary from one area to another and they have also changed over time. In some places these rules are detailed, explicitly expressed and well-known in the community. In other areas the rules may be more vague, cover less issues related to the fishing effort and may not be generally recognized in the community. This system of local management has been threatened with the introduction of commercial fishing (Ogutu, 1994; Geheb, 1996; Jansen, 1996)).

Characteristics of the Nile Perch Regime (1980-1997)

The rapid proliferation of Nile perch started in the Kenyan part of the lake about 15-20years after the fish was introduced in the lake. In 1978 about 1,000 tons of Nile perch were caught, in 1981 nearly 23,000 tons and in 1985 the production had increased to 50,000 tons. Figure 2 shows that Nile perch landings rose to a peak of 123,000 in 1991, and has since been on a generally declining trend.

An even faster increase took place in Uganda and Tanzania. In each of these countries less than 1,000 tons of Nile perch were landed in 1981. In 1986 approximately 41,000 tons of Nile perch was caught in Uganda and about twice that amount in Tanzania. The total production of this fish in the three countries in 1993 was close to 363,000 tons, with 29% landed in Kenya, 27% in Uganda and the rest in Tanzania (Greboval and Mannini; Goulding, 1997).

The total catch of all fish species of Lake Victoria increased from about 100,000 tons in 1979 to about 500,000 tons in 1989. Since 1989 the annual production has remained at a level four to five times higher than what was achieved during the late 1960s and 1970s. In the last 6-7 years, the production of fish from Lake Victoria has represented about 25% of the annual total catch from Africa's inland fisheries (FAO, 1995).

Along with the rapid increase in the stock of Nile perch, the composition of the fish biomass in the lake changed dramatically. Nile perch, being a predator, feeds on most of the species of fish in the lake. From being a multi-species fisheries, the fisheries of Lake Victoria is today basically a "three species fisheries". Nile perch is the dominant species, but about a third of the lake's catch consists of dagaa (Rastrineobola argentea) while various species of tilapia, mainly Oreochromis niloticus, constitute about 10%. These three species alone have during the last years made up about 98% of the total catch in the lake. In the Kenyan part of the Lake, it rnay today even be more correct to talk about a "two-species" fisheries. In 1995 about 91.5% of the catch consisted of the combination of Nile perch composing 47.2% and dagaa constituting 44.3% (Othina and Osewe-Odera, 1996).

In response to the increased landings of Nile Perch during this time, more fishermen were recruited into the fishery. The number increased from about 11,000 fishermen in 1971 to 22,000

in 1989 and 24,000 in 1992 on the Kenyan part of Lake Victoria. In 1995 there were 30,000 fishermen. The number of canoes also significantly increased in the same period. There were about 8,000 canoes of different types in this area in 1995. Besides, there was substantial investments in fishing nets, and especially the gill nets with larger mesh-sizes aimed at catching the bigger Nile Perch (Reynolds et al, 1992; Hoekstra et al, 1990; Ogutu, 1994; Kenya Government I, 1995).

Initially the local market could not absorb all the Nile perch landed. In particular, it was difficult to sell the perch in the local markets in Kenya in the early 1980s. Many of the consumers living in the fishing communities near the lake resented the "oily and fatty" fish. However, it only took a few years before the perch became a- popular table fish also in Kenya as new forms of fish processing developed (Yongo, 1994; Abila, 1995). Preliminary results of a consumption survey we carried out in 1997 and our previous investigations in 1996 show that Nile perch has become even more popular and spread to new markets all over East Africa.

Unlike in Kenya, the Nile perch was better known in the other countries sharing the lake, as Lakes Kyoga and Albert in Uganda and Lake Tanganyika in Tanzania had supported flourishing perch fisheries in the past. During the mid-1980s, in a period of only 3-4 years of the Nile perch boom, the market in East Africa was able to absorb a supply of almost three times higher than any time previously, without much effect on prices. This shows the popularity of the Nile perch and the existence of a huge demand for a medium priced table fish in the three countries. There is no doubt that many new fish consumers gained tremendously from the changes which affected the rich Lake Victoria fisheries during the 1980s, with huge amounts of fish having been made available at more affordable prices in many parts of the three countries (Greboval and Mannini, 1992).

People in the harvesting, processing and distribution sub-sectors of the fisheries also benefited greatly from the new fisheries regime. It has been estimated that during the 1980s, an additional 180,000 jobs were created in the primary and secondary fields of the fisheries. Many people who had been unemployed or under-employed were able to obtain incomes at levels they had never experienced before. No wonder that many fisher-folk nick named the Nile perch "the saviour" (Reynolds and Greboval, 1988).

In the early and mid-1980s the fisheries continued to be almost exclusively operated by small scale rural fisher-folk with little fundamental changes in technologies, techniques and practices compared to the former fisheries regime. The period saw more women engaged in the processing and marketing of fish both on the Lake Victoria beaches and in markets in several towns in Kenya, as in the other countries (Yongo, 1994; Abila, 1994).

Linked to the rapid growth of the Nile perch, another "revolutionary" change took place in the Lake Victoria fisheries. This change is related to the huge demand for Nile perch which soon expanded beyond the three countries sharing the lake. A market for the perch developed quickly in the industrialized countries. In order to satisfy this market, processing factories were established along the shoreline of Lake Victoria. The first plants in Kenya were set up in the early and mid-1980s to process Nile perch and export its fillets to markets overseas. They proved to be so profitable that more factories soon were set up in all the three countries.

Today there are about 35 factories spread around the lake. Many of the factories have been financed by international development banks and received support from government development aid agencies of the industrialized countries. Most of the factories have the technical capacity to process Nile perch which far exceeds the amount of fish they are able to obtain (Asowa-Okwa, 1996; Jansen, 1996; Goulding, 1997).

The filleting factories around Lake Victoria are therefore competing to secure sufficient raw fish. Many factories have already been closed permanently or temporarily due to lack of Nile perch. In addition, in the early part of 1997, most of the factories closed down as a result of a ban on fish exports to the European Union

(EU) for quality related reasons. Some understanding has since been reached and many of the factories are now able to export fish, although with stringent quality requirements. However, arrangements are being made to establish a long-term quality monitoring and assurance system for East African fish going to the EU.

Previously the factories only processed Nile perch of minimum weight 2-3Kg. Due to increased competition for wet fish, the plants now accept lower weights, at times even under 1Kg. Almost all Nile perch of good quality above 2Kg goes to factories for processing. The only Nile perch available in the local markets are the juveniles or that rejected by factories due to poor quality. Even the frames (skeletons) of Nile perch, which previously were sold, processed and consumed in the local markets are now largely being processed into fishmeal in Nairobi.

In the past few years, some processing factories have also started to fillet tilapia, in addition to Nile perch, and to market this fish in the industrialized countries. There is sufficient demand for tilapia in the international market. The only constraint is that very little amount of tilapia is landed at the moment. The export of tilapia could easily pick up if more of it is landed.

Also the small sardine fish, dagaa, has been subject to regional and international commercialization. Special factories have been established to convert the sardine into fishmeal for use in the animal feeds industry. Thus all the three important fish species of Lake Victoria, which together make up 98% of the catch, have become integrated into the global market (Jansen, 1996).

Methods for Collection of Information -

The information presented below was gathered in a survey we conducted from December 1996 to June 1997 This involved 12 Nile perch processing factories operating in Kenya, namely: Afro Meat, Capital, East African Sea Foods, Kendag (Midas), Lake Victoria Fish, Modern Fishing Industries and Peche Foods. Also included were Prinsal Enterprises, Samaki Industries (in Kisumu and Nairobi), Star Fisheries and Tropical International Foods. We visited these factories and, in each case, formally interviewed one or more of the Managers using a questionnaire. However, for purposes of anonymity, the factories are labeled with letters A - M in the paper.

We also conducted interviews at four factories producing fishmeal or animal feeds. They are Kenya Fishmeal, Milling Corporation of Kenya, Unga Feeds and United Feeds. These are labeled N - R in the text. Similarly a number of processors and traders on the by-products of Nile perch were interviewed in Kisumu, Homa-bay and Migori. The survey was also carried out in selected Lake Victoria beaches where consumers, processors and traders of different fish species were interviewed informally. In several instances, we held discussions with officers of the Kenya Fisheries Department, and their views have been considered when making our conclusions.

In order to have a point of comparison, we also conducted limited interviews in Uganda with representatives of fish processors and exporters, fishermen and senior fisheries researchers and administrators. We have also referred to relevant studies in other parts of Lake Victoria. Finally some preliminary conclusions have been drawn from a fish consumption survey we carried out in June-July, 1997 in rural and urban areas in the Lake Victoria basin of Kenya.

THE STRUCTURE OF KENYA'S FISH PRROCESSING INDUSTRY

According to the information received, there are 15 registered Nile perch processing factories in Kenya distributed in four Kenyan towns, shown in Table 1. At the beginning of our survey nine of these factories were operational. Three new ones started operating during the study. Towards the end of the survey, one of the major factories faced financial crisis and was expected to wind up operations later in 1997, while waiting for a new buyer. Its statistics have though been included in this report. All the factories primarily process Nile perch but three of them have diversified and fillet a small amount of tilapia in addition to Nile perch.

Ownership and Integration

Kenya's fish processing factories are dominantly owned by members of the Asian community, some of whom are Kenyan citizens. Of the 12 operating factories, eight are owned by people of Asian origin as sole owners or in partnership with people of other nationalities, especially Israelis. Three of the firms are fully owned by Kenyan Africans while one is fully owned by Israeli nationals.

Table 1: Distribution of Nile Perch Processing Factories in Kenya

Town	No. of registered factories	No. of factories actually operating
Kisumu	9	9
Nairobi	4	1
Migori	1	1
Homa-bay	1	1
TOTAL	**15**	**12**

Source: Survey results

The top management posts are in most cases occupied by members of the same community as the principal owners. Many of the Asian-owned factories are run as family business, with members of the family employed in some of the management posts. One of the factories owned by Asians, however, had an unusual combination of an Asian, Israeli and Russian occupying important posts in the firm. Another Asian-owned plant employed a Swiss national as plant manager while a third one had an Israeli in the top management post. The employed managers generally have good experience or skills in fish processing and marketing. Therefore they provide the factory with the technical expertise required in fish processing and also enable the firm to gain easy access to markets in the manager's country of origin. Other factories normally receive experts sent by fish importing companies abroad to ensure quality standards are met in the factory. These experts may be attached to the factory for a shorter period of time, as a condition for selling fish to specific buyers overseas. Factory C though has established a marketing department manned by members of the family, who mostly reside in London.

Through buying or constructing new factories, mergers or simple business arrangements, some established firms have been able to gain greater power in the industry and enhance vertical and horizontal integration. Originally most fish processing plants were located in Nairobi and Mombasa. In order to cut on transport costs, the companies have opened up plants in Kisumu, Homa-bay and Migori, all close to Lake Victoria, which now do the bulk of fish processing. This arrangement reduces the cost of transporting whole fish. The other advantage of this is that wet fish reaches the factory in good quality due to the reduced transport time. Further, with the opening of Eldoret Airport in Western Kenya, the companies will easily ship out the fish by air. Horizontal integration may also achieve greater economies of scale if the same marketing arrangement serves all companies in the same group.

Other factories have built or acquired partner firms in Musoma and Mwanza in Tanzania and Jinja and Entebbe in Uganda. There are several advantages of this. Factory D imports fish from sister companies in Entebbe or Musoma if it cannot get enough fish in Kenya or if the price is too high. Factory B does pre-processing for its Nairobi partner which has better facilities for further processing, storage and packaging. Factory H will supply J with skin-on fillet, even though the former has sufficient facilities to produce high quality final fillet itself. This is because J has good contacts in export market, which H has not developed.

Table 2 shows the extent to which fish processing factories have grouped together either under joint ownership or through working partnership. Most of the plants in the industry are together with at least one other firm under such grouping. Factories B and L are owned by the same entrepreneur(s), who also has another factory in Uganda. Companies H and J have business arrangement, where the former supplies the latter with semi-processed fish. However the two factories are owned by different people. Factories D and M have the same owner. Their group also owns one factory each in Tanzania and Uganda. Factory E is a member of the largest fish processing group in the region, together with two factories in Tanzania, and one in Uganda.

Some of the companies have diversified their business to include commercial activities outside the fishery. The owner of one of the factories also owns a meat processing plant in Mombasa. The same fish processor owns, jointly with Japanese nationals, a company manufacturing fishing nets in Kisumu. The owner(s) of another factory has also invested in a bakery and hotel business in Kisumu. A third factory owner also has a butchery chain in Nairobi.

The fish processing factories have been constructed, or acquired, and equipped using funds obtained from different sources. The managers of eight factories stated that their factories were financed by resources obtained locally, either from local financial institutions or that generated from their previous commercial activities. Some of the processing factories have also obtained loans from international financial institutions such as the African Development Bank (ADB), the International Finance Corporation (IFC) and the Aga Khan Foundation.

Table 2: Fish Processing Company Groupings

Factory	No. of partner factories in Uganda and Tanzania
A,F	0 each
H and J group	0
C, G, K	1 each
B and L group	1
D and M group	2
E	3

Source: Survey results

Others have got loans from donor agencies such as NORAD. One of the large fish processing groups with four factories in East Africa has invested a total of US$ 47 million in constructing and equipping the plants. This has been realized using loans obtained from ADB, IFC, NORAD, local financial institutions and the owners' other business.

Fish Supply Arrangements

In order to procure adequate fish supplies, some processing factories have invested in motorized boat transport and specialized insulated vehicles for transporting the landed fish to the factories. Others provide fishermen with nets and credit. Five of the factories provide fishermen or agents with boats, nets and outboard engines for harvesting or transporting fish.

Another two factories only give boats and nets but not engines. Six factories also have some kind of credit relations with fishermen directly or through their cooperative societies.

Except for factory A, all others have specialized insulated vehicles and participate in transporting wet fish from the beaches to their factories. Company A has left fishing and transport activities to local groups so that they also benefit from the export trade. Its fish is delivered to the factory by 120 bicycles, 6 ordinary vehicles and 2 boats, all owned by local people. However this factory, like all the others, has specialized trucks which transport chilled (fresh) fillets to Nairobi and frozen fillets to Mombasa for export. Table 3 shows the facilities provided by various factories so that they get enough fish.

There are several ways through which factories get their fish supplies. These may be classified into three broad strategies. First, some factories buy fish directly from fishermen or their cooperatives on the landing beaches. The second method is where factories get fish supplies from contracted (company) or independent agents. The third case includes firms which participate in fish harvesting, by employing and equipping fishermen, and those that depend on fish supplies from partner factories in Tanzania or Uganda. In Figure 1, the factories are classified according to the three major modes of procuring fish supplies. The

Figure shows that five factories use a combination of all three strategies to ensure fish supplies. Another five plants employ two of the methods, while only two factories depend on a single means of getting fish.

The most common method in which fish supply is secured, is through agents. All 12 factories use agents, either singly or in combination with other strategies, to procure fish supplies. There are two types of agents:

Company agents: These are contracted by the company to supply it with wet fish. Such agents may not provide any other firm with fish.

Independent agents: These sell fish to the factory without any binding agreement. They may also sell fish to any other factory.

Agents have an important role to play in the fish marketing channel. They collect fish from several dispersed landing beaches and bring it to central points from where factory trucks take it. Some agents develop credit relations with fishermen by supplying nets and other fishing gear on loan. One independent agent operating at Uhanya beach in Kenya has built a modern fish banda supplied with running water, where fish is landed, cleaned and loaded into waiting trucks. The agent has at least 30 boats for harvesting and collecting fish in remote parts of the lake and on the neighbouring islands. This agent, alone, handles, on average, 15-20 tons of Nile perch per day, which he supplies to five factories.

Table 3: Fish Procurement Facilities by Factories

Facility	Factory proving
Outboard engines	B,C,E*,G,L
Boats	B,C,D*,E*,G,L,M
Nets	B,C,D*,E*,G,L,M
Credit	B,C,E,F,G,L

* - Facility provided only in Tanzania and Uganda
Source: Survey results

Agents normally earn about KSh 5 per Kg of fish delivered, which is approximately 10% of the landing price, as commission. This pays mainly for the costs of transport, ice, labor and the agent's own remuneration. Since agents handle large quantities of fish, on average 3-5 tons each per day, they can become very rich and powerful. In addition they easily get loan advances from the companies to which they supply fish. Company E often lends money to its agents, who have been very prompt in repaying such loans. Some agents though are not trustworthy. Factory L lost a large sum of money to an agent who disappeared after being advanced a loan.

Factories F, J and L have no company agents and so get fish from independent agents. All other factories use both kinds of agents. The number of agents per company varies widely. Company F buys fish only from two independent agents while factory K has 13 agents in Kenya. Most of the factories prefer to maintain the same suppliers in order to ensure continued supply of high quality fish. Factory K has retained the same agents in the last two years for this reason.

Before an agent is contracted, a factory manager would carefully scrutinise his character and past business record. To be successful, an agent should be a resident in his area of operation. He should be influential and develop good contacts within the local community and also build trust with fishermen. Company M engages very influential people, usually local leaders or people who are highly respected by the community, as its agents.

A common complaint encountered when interviewing fishermen was that they are exploited by the agents. Through various mechanisms, such as credit and supply of gear, the fishermen become dependent on agents. Although there are continual and elaborate attempts to escape from this relationship of dependence, many fishermen are paid well below the going market rate for their fish. Often the agents will cooperate and postpone their purchase of fish until the fishermen get desperate and agree to sell at lower prices. Most of the time agents also hide vital market information, such as the prevailing price paid by factories and the quantities of fish required by factories at a given instance, from fishermen.

Usually the factories place formal purchasing orders with agents which define the quantities of fish to supply at a given time. There is, however, no formal contract between fishermen and agents. The agents are therefore protected from breach of contract while fishermen have no chance of legal address in case of disputes.

The second most common mode for the factories of obtaining fish is from local fishermen, directly, or through their cooperatives. As earlier mentioned, most of the companies provide fishermen with nets, boats, engines or with credit to purchase the fishing gear. In 1996, factories G and B supplied at least 200 and 300 fishermen respectively with such facilities. The fishermen receiving the facilities are contracted by the company concerned to supply it with fish. Their earnings from delivered fish is deducted to recover the loan. Such fishermen are not supposed to sell fish to any other company. However, company E has been cheated by fishermen through this arrangement and had to suspend buying fish from two beaches where it lost money. Company G also lends to fishermen but, unlike E, has not had problems with repayment. The fishermen repay at the rate of KSh 1 per Kg of fish delivered.

A third method of obtaining fish is through the firms directly getting involved in fish harvesting. Some of the companies own boats, nets and engines on which they hire fishermen to operate. We gathered that it is practiced more in Uganda and Tanzania than in Kenyan waters. Kenyan firms therefore depend on their sister companies in those countries to organize the fishing and supply them with wet fish. This is enhanced by the relatively close distance between Kisumu and some of the other lakeside towns where factories are located such as Jinja, Entebbe and Musoma. Factory M has 22 fibre-glass boats with built-in insulated compartments and equipped with outboard engines. These boats are operated by fishermen and agents in Tanzanian waters who take the fish to a partner factory of M in Musoma. This factory later sends half of the fish to M as skin-on fillet.

Commercial trawling, though banned in all parts of Lake Victoria, is still practiced illegally in all three countries. One factory owns five 12-metre fishing trawlers in Kenya, capable of catching 4-5 tons each daily, but which, according to the manager, are not used now due to the ban. Our investigations revealed that there are at least 5 trawlers fishing in Kenya, which can land 10-15 tons of fish daily. Details concerning ownership of the trawlers was not determined. But there is possibility that they are owned by people who are not directly involved in the ownership or management of the processing factories.

Processing Levels

The fish factories vary widely in sizes, with processing capacity ranging between 10 to 75 tons of whole Nile perch per day. This capacity, distributed as in Figure 3, is based mainly on the space available for freezing fish in each factory. The fish factories in Kenya can process up to 380 tons of whole fish per day. But on average the factories process about 200 tons per day, indicating that only close to 50% of this capacity is actually utilized. From Figure 4 it may be deduced that the total quantity of Nile perch processed is not evenly shared between the factories. The top three factories process and export over half of the total amount. Factories C and K process the highest quantities at 40 tonnes each per day, while the factory processing the least, H, handles only three tons daily. Figure 5 displays the daily average quantities of fish processed by each of the factories compared to the existing capacity for each plant. The total unused capacity, displayed in Figure 6, is about 180 tons per day.

There are several reasons for under-utilization of capacity. For most companies, the main constraint limiting maximum production is due to the difficulty in obtaining enough fish to process. Irrespective of all strategies put in place by various factories to procure fish supplies, many of them still cannot get sufficient quantities most time of the year.

The second limitation is related to fish quality for the export market. This is especially important for the fresh (chilled) fillets, which require greater attention in handling and packaging. Due to constraints in availability of skilled labour and processing facilities, factories can only handle well a limited volume of fish at a given time. A factory taking in much higher

quantities than it is used to, risks contamination or drop in quality standards. Some managers indicated that this may have been one of the reasons for the drop in fish quality (and contamination with salmonella species) in early 1997, which led to the ban on Nile perch exports from East Africa to the EU.

Some factories also find difficulty in getting access to particular markets overseas. This problem is common especially to new factories which have not established contacts with reliable fish wholesalers or retailers abroad. As earlier mentioned, factories attempt to solve this problem by employing nationals of the countries they want to sell fish to, who may have contacts in those countries already. Others allow the importing company to send an expert to work with the Kenyan firm for a short period of time to establish acceptable quality standards and link the factory with the market.

The fourth cause of excess capacity is that some factories, especially in the initial stages, cannot raise enough funds to buy all the fish they are able to process. Fishermen insist on being paid cash on delivery of fish. Therefore whenever fish prices are too high, such factories may not be able to buy all the fish they want.

The figures mentioned above are average estimates made by the managers of the particular factories during the interviews. The managers noted that the capacity utilization would fluctuate widely during the year, depending on seasonal catches of fish. In periods with little fish, some of the factories closed down completely for weeks or even months.

Nile Perch Products and Markets

The main product of Nile perch is its fillet. Ideally fillet should comprise of 30-35% of the body weight of a medium size Nile perch. Some of the factories produce fillet within this range and are able to sell it in the more competitive markets, especially in Europe, U.S.A. and Australia. Most factories though have adopted more efficient techniques of filleting, which removes 35-50% of the perch flesh as fillet. Such fillet is sold mainly in Israel, Japan and other parts of Europe. Broadly, fillets are exported either in chilled (fresh) or frozen state. Depending on the target market, the fillet may be presented in different forms, for example, as skin-less, skin-on or as blocks, and in various size grades (Werimo, 1994; Goulding, 1997).

The by-products of fish processing are the swim bladders (maws), frames (skeletons), fats and oil, skins and trimmings. All these products have actual and potential uses in different industries. Nile perch maws are sun-dried and easily exported to the Far East, in particular China and Japan, where it is prepared into a rich soup, considered to have medicinal values. It may also be used in the beer making industry as is in glass for filtering beer. The frame has previously been used for human consumption, although more of it now goes into making fishmeal. The Nile perch belly flaps and fats can be rendered to produce high quality fish oil for domestic uses. The skin may be tanned into good quality leather, or used to manufacture glue. It also has potential use as a storable edible fish product. However, industrial utilization of the skins is still the least developed among the various products of Nile perch. After all flesh is trimmed out, a large quantity of skins is still discarded or used as fuel material by artisanal fish processors (Abila, 1994; Odhiambo, 1994; Ogunja, 1994).

Table 4 shows that Kenya's Nile perch fillet is exported to many countries in different continents. Many of the exporting firms have established marketing departments which directly deal with wholesalers or retailers in export markets. Company A, however, has found it difficult to gain direct access into the export market and still sells fillets through middlemen or brokers. This arrangement has problems since the brokers, who are non-Kenyans based in Nairobi or overseas, often do unethical trade practices such as buying unlabeled fish from different companies and selling it in bulk, making it difficult to identify a factory in case it sells low quality fillet.

In 1996, different companies bought wet Nile perch on various Lake Victoria beaches in Kenya at prices ranging from KSh 50-60 per Kg. Company F, which bought fish at KSh 57 per Kg in November 1996, estimated that all the costs from the time fish is landed to the time it reaches the factory gate, amount to about KSh 5

per Kg. This includes various levies charged on the beach, handling and transport costs to the factory. The cost of shipping out frozen fish from Kenya to the EU market is approximately US$ 0.2-0.5 per Kg. Factory E estimated that the total costs of exporting 1kg of frozen perch fillet is US$ 1.8-2.2. This includes the cost of purchasing, transport, handling, processing and marketing. Considering the volumes of fish exported by different companies, the free on board (f.o.b) prices for Nile perch leaving Kenya, shown in Table 5, indicate that the export trade is very lucrative. Furthermore, the retail price for chilled Nile perch fillets in some of the EU markets exceeded US$ 9 per Kg in 1996 (Goulding, 1997).

However, despite supporting this flourishing international trade, the Lake Victoria region seems to have gained insignificantly. Very little of the massive foreign exchange and tax revenues earned from the exports is ploughed back for infrastructural and human development in the fishing communities. Most fishing areas still lack basic physical infrastructure and social amenities (O'Riordan, 1996).

Even though Nile perch fishermen now earn more per kilogram of fish landed than ten years ago, there is little evidence of re-distribution of this income in the wider community to achieve reduction in poverty, better protein consumption and improved living standards. A recent Government of Kenya official report shows that Kisumu, which is the largest town on Lake Victoria, and where 80% of the Nile perch factories in Kenya are located, has the highest percentage of the population suffering food deficiency and absolute poverty, among all urban areas in the country (Kenya Government, 1997).

Other rural districts bordering Kenya's Lake Victoria also have high prevalence of food poverty, with close to 50% of their population unable to get the minimum calorific intake requirement of 22.50 calories per adult equivalent per day, as recommended by the World Health Organization. The total monthly expenditures for such households on food and non-food items is in the range of US$ 13-18. The findings of this report supports earlier surveys by UNICEF and other organizations which have shown high incidence of protein deficiencies, especially in children, in the lake communities (Chalken, 1988; Kenya Government, 1997).

The Government report ranks two provinces sharing Lake Victoria - Nyanza and Western - among the last four in terms of both informal and formal employment situation in Kenya. It also demonstrates that there is more potential in creating employment in the informal than the formal sector. Increased modernization of the fishing industry has the effect of concentrating a few visible jobs in the factories, while opportunities of creating employment in the artisanal fish processing and distribution are lost.

Table 4: Nile Perch Products Exported by Factories in Kenya (1996 - 97)

Factory	Fish processed	Product for export (in order of importance)	Export market for fillet
A	Nile perch Tilapia	Frozen N. perch fillets Chilled N. perch fillets Frozen Tilapia fillets Fish maws	Germany
B	Nile perch Tilapia	Frozen N. perch fillets Chilled N. perch fillets Frozen Tilapia fillets Fish maws	Israel, EU countries
C	Nile perch	Frozen N. perch fillets Chilled N. perch fillets Fish maws	Greece, Holland, other EU countries, Israel, Japan, U.S.A.
D	Nile perch Tilapia	Frozen N. perch fillets Fish maws	EU countries, Israel, Japan, U.S.A.
E	Nile Perch	Frozen N. perch fillets Fish maws	Spain, Italy, other EU countries, Australia, Hong Kong and Israel
F	Nile perch	Frozen N. perch fillets Fish maws	Italy, other EU countries, Japan
G	Nile perch	Frozen N. perch fillets Fish maws	EU countries, Israel, U.S.A.
H	Nile perch	Frozen N. perch fillets Fish maws	Exported through Factory J
J	Nile perch	Frozen N. perch fillets Fish maws	Germany, other EU countries
K	Nile perch	Frozen N. perch fillets Chilled N. perch fillets Fish maws	Israel, other EU countries
L	Nile perch	Chilled N. perch fillets Frozen N. perch fillets Fish maws	Australia, Greece, Netherlands, Israel
M	Nile perch	Chilled N. perch fillets Frozen N. perch fillets Fish maws	EU countries, Israel, Australia

Source: Survey Results

Table 5: Markets and Prices for Nile Perch Products (1996 - 97)

Product	Destination	Prices
Frozen N. perch fillet Chilled N. perch fillet	Germany, Netherlands, Spain, Greece, Italy, other EU countries, Japan, U.S.A., Australia	Frozen fillet: 2.5 - 4.0 f.o.b. Mombasa Chilled fillet: 3.5 - 5.0 f.o.b. Nairobi (in US$ per Kg)
Frozen Tilapia fillets	Germany, Netherlands	Ex-factory price: 120 - 200 (in KSh per Kg)
Fish maws	China, Japan, Hong Kong	Ex-factory price: Wet weight: 180 - 250 Dried weight: 700 - 1,000 (in KSh per Kg)
Nile perch frames	To local market for human consumption For fishmeal	Ex-factory price: 5 Ex-factory price: 3 - 4 (in KSh per Kg)
Fats and oil		Ex-factory price: 20 - 30 (in KSh per Kg)

Source: Survey Results

GOVERNMENT POLICY OBJECTIVES FOR THE FISHERIES

The Government of Kenya has developed a policy with very clear objectives for its fishery (Kenya Government, 1995). These are:

- Increase per capita fish consumption through production of low cost high protein food (fish)
- Generate employment opportunities in the country through fishing, fish processing and trade
- Enhance the living conditions of the fishermen and their families by maximizing economic benefits to them. This is achieved through provision of cold storage, fish handling and processing facilities.
- Maximize export and foreign exchange capacity.

This paper will limit itself to discuss to what extent the present fish export and fishmeal industries contribute to achieve the two first objectives of the Government's policy.

SOCIO-ECONOMIC IMPACTS OF INDUSTRIAL FISH PROCESSING

Nile Perch Exports and Impact on Food Availability

The catch statistics recorded by the Kenya Marine and Fisheries Research Institute (KMFRI), Figure 2, indicate that about 82,000 tons of Nile perch was landed in Kenya in 1995. Of this, approximately 47,000 tons was used by fish processing industries to produce nearly 15,000 tons of fillet for export and 21,000 tons of frames (Abila, 1996). This means at least 35,000 tons of whole fish, as well as any products of Nile perch such as frame, is left behind in the local market. However, preliminary observations on landing beaches indicate that a much lower quantity of Nile perch, composed mainly of immature fish and that rejected by factories for being in poor state of quality, remains behind for local consumption. A rough assessment on some of the beaches in Kenya indicated that, depending on the season and location of the beach, 10-35% of the Nile perch landed could be juvenile fish. According to our own survey results, the average processing levels by Nile perch factories in Kenya was, as previously mentioned, 200 tons per day in 1996. Assuming that factories operate for 310 days annually, then the quantity of Nile perch processed was about 62,000 tons, to produce over 21,000 tons of fillets and 28,000 tons of frames. The Nile perch catch statistics for 1996 were not yet available. But if we take the projected figures of about 80,000 tons, then less than 20,000 tons of Nile perch, most of it juveniles and spoilt fish, remains behind. However some fish is also imported from Uganda and Tanzania both through legal and illegal channels.

With so much unutilized production capacity, the factories make great efforts to obtain all Nile perch weighing more than 1.5-2Kgs. One factory manager admitted that their factory now takes in even fish below 1Kg, and that this is done by other factories as well. Evidence from fish landings clearly show that the factories are successful in this regard and hardly any Nile perch in good quality weighing above 2Kgs is left for the local market.

A notable exception was found at Dunga fish landing beach, 6Km from Kisumu. Here some fishmongers fillet about 20-30Kg of mature Nile perch daily, which they sell to local hotels and well-to-do consumers able to pay about KSh 150 per Kg for fillet, or KSh 50-55 per Kg for whole fish, the same price as paid by factories. Except for Dunga, and maybe a few other beaches close to urban centres, very little mature Nile perch of acceptable quality is left behind. "The Nile perch just passes us by" was a standard remark encountered when interviewing fishmongers and consumers along the fish landing sites. Most consumers interviewed stated they would prefer to eat Nile perch of size 2-5Kg. When the consumers cannot get mature Nile perch, they opt for the juvenile perch. On some fish landing sites, juvenile Nile perch weighing below 1.5Kg fetches as much as KSh 35 per Kg.

The local situation is made even worse in that there are no proper facilities in place to preserve and distribute the little Nile perch rejected by the processing firms. Much of it undergoes some form of artisanal processing such as smoking or frying in oil. However, the additional effort in processing is not well compensated for in terms of increased consumer demand and price. Hence the Nile perch available in many local markets may not be in a state which is acceptable to many fish consumers. Despite this, the taste and preference for Nile perch has positively changed with time. Where as many Kenyans derided Nile perch in the early 1980s, very few continue to reject it. The demand for the fish, especially if in good quality, is high. It is quite clear that Nile perch has become an acceptable form of food for many consumers who were not fish eaters in the past.

Preliminary results of a consumption survey we conducted in June and July 1997 of 250 households in three districts bordering Lake Victoria, namely; Kisumu, Migori and Suba, reveal that 30% of these households consume Nile perch. The sample had respondents representing all income classes, and were picked from both rural and urban communities in this region. About 25% of the sample, composed mainly of those households with higher incomes or those directly involved in fishing activities, indicated that they eat more

Nile perch than five years ago. Another 30% ate the same quantities, or had very slight reduction in their consumption of the fish. However, the larger group, constituting 45%, stated that they now consume much less quantities of Nile perch than five years ago. The respondents gave several reasons for eating less Nile perch, including the increase in fish prices, relative reduction in real household incomes and the unavailability of Nile perch locally. There is also evidence that the reduction in consumption of Nile perch has been greater among poor rural households than the urban based consumers during the specified period.

Thus, there is potential demand for Nile perch locally, which is still unsatisfied. Recently, the price of Nile perch on Lake Victoria beaches of Kenya dropped sharply from over KSh 50 per Kg in November 1996 to about KSh 25 per Kg in February 1997, probably due to the effects of the EU ban on imports. However the traders easily found new outlets for Nile perch locally and prices gradually rose up to KSh 35 per Kg by May 1997. Our investigations revealed that similar trends were observed in Uganda during the same period, where prices drastically dropped from USh 1,500 (US$ 1.5) to USh 350 per Kg. The traders began to sell Nile perch in several inland markets and the price quickly rose to USh 900 within two weeks. This indicates that the local market can absorb much more Nile perch, although at lower prices, should the export market collapse.

The growing demand for Nile perch has also been noted in several urban centres far from the Lake region, where the fish was initially unpopular. In particular, a significant quantity of Nile perch fillet is now sold in hotels and supermarkets in Nairobi. Some perch also goes to similar institutions in Nakuru, Mombasa and even to towns in Central Province, where previously, fish was not consumed. Four cases described below give an indication of the existing network for distributing fillets locally.

The owners of factory H, previously based in Nairobi, have been involved in distributing fillet in Kenya for the last 5-6 years. The company bought fillet from other fish processing factories, re-packed it and sold as wholesalers in the local market. In the latter years, the firm has encountered problems securing fillet supplies from processing plants in Kenya, which view it as a potential rival in the trade. The company then started importing fillet from two Mwanza based processing firms and continued distributing in the country. In 1996 it bought fillet at US$ 1.5 f.o.b. Mwanza. Compared to the f.o.b. prices for Kenyan fillet discussed on Table 5, the price of the Mwanza fillets suggest that they may be grades not meeting the export quality requirement. After paying transport costs, customs duties and other costs, the ex-store wholesale price in Nairobi was KSh 120 per Kg. The same fillet retailed at KSh 150-160 per Kg in hotels or supermarkets which they supply in different towns in Kenya. The company has managed to sell 15 tons of fillet in the domestic market every week.

A few fish retailing companies have also started selling Nile perch fillets in shops serving especially the high income consumers in Nairobi. In one of these shops located in Westlands region of Nairobi, a fillet of Nile perch sells at KSh 300 while, in comparison, that of tilapia goes for KSh 270 per Kg.

One processing factory also has a retail shop in Nairobi where it sells Nile perch fillets and a little unprocessed tilapia. The demand for the products is high and the factory is able to sell 800Kg of fillet daily, approximately 2-3% of its output. In the City Market, located in the central part of Nairobi and which serves middle to high class consumers, whole (unprocessed) Nile perch sells at KSh 75-90 per Kg. The above examples show that Nile perch sold in these urban markets is highly priced and serves mainly the upper income market. The low and medium income earners in towns, like their counterparts around the Lake region, cannot afford Nile perch.

Thus, the drive to sell fish overseas has resulted in very little of it being available locally. The little that remains is mainly rejects because of small size or poor quality state. And because the export trade exerts strong influence on landing prices, the resulting retail prices of Nile perch and its fillets are too high for most consumers.

The main interest of the fish processing industry is to sell to the lucrative export market. Most firms give no consideration to the socio-economic effects of their profit motivated activities. In particular, the domestic food security seems to be of no concern to the factories. We believe that the continued expansion of the industrial processing capacity will, among other effects, further reduce availability of fish by exporting what could have been consumed locally.

Competition for Nile Perch Frames and the Effect on Food Security

In the earlier years of Nile perch processing, the remains of Nile perch after removing fillet, commonly known as frame (or Mgongo Wazi), was considered a waste, and factories incurred expenses to dispose of it. In less than a decade this product has become an important part of the diet of many people especially in Western Kenya.

Initially considered a "poor man's food" which many people would not consider eating, the frame has increased in price so much that consumers often cannot afford to purchase it (Jansen, 1996).

By the late 1980s, almost all Nile perch frames produced by factories was consumed by local people or discarded. The animal feeds manufacturing industry then depended either on imported fishmeal, fishmeal made from dagaa or crushed animal bones from the Kenya Meat Commission (KMC) slaughterhouses. However the fishmeal industry soon started to use Nile perch frames in processing fishmeal. Their demand for frames has increased so much that they now compete directly with the local market processing it for human food.

Currently there are two factories, both based in Nairobi, which convert Nile perch frames into fishmeal. The larger factory, N, was established in 1990 and makes fishmeal entirely using Nile perch frames. Factory N uses an average 40 tons of frames per day to produce about 10 tons of fishmeal. The second factory processes 15 tons of fish frame to produce 4 tons of fishmeal daily. Annually the two factories therefore process approximately 17,000 tons of frames which yield 4,000 tons of fishmeal, representing about 17% of fishmeal used in Kenya. The quantity of frames going for fishmeal is equivalent to 21% of the weight of Nile perch landed in 1995.

The Nile perch processing factories have to decide which market they will sell frames to. Two sets of factories, each with six members, have emerged in regard to the destination of frames. The first group has factories which sell 51-100% of the Nile perch frames they produce to fishmeal factories. In this group, E and B sell all of their frames to fishmeal factories, while the rest supply this same market with 51-80% of their frames. Members of this group tend to be factories producing large quantities of frames.

The second group has factories which sell 51-100% of their frame output to the local market for human consumption. In this group factories A, F and H sell all their frames to the local market. The remaining three factories in the group sell 51-70% of their frames to the local market. Most factories in this group produce relatively little quantities of frames each.

If we take that each of these groups will sell, on average, 75% of frames produced to the first choice market and 25% to the alternative market then, as in Table 6, we estimate that 55 tons per day, or 60%, of frames produced in Kenya goes for fishmeal. The remaining 39 tons is left to be processed in the local market for human consumption.

There is evidence of price discrimination in the selling of frames to the two markets. Table 5 shows that the local processors, who have to collect frames from the factory, pay KSh 5 per Kg on average; Various factories though sell the product at KSh 3-4 per Kg to fish meal firms, and the factories, in most cases, incur the cost of transporting the frame to the fishmeal plants in Nairobi. Such discrimination in pricing against local processors can only persist if the demand for frame is very high in the local market. It is an indication that the local demand is not satisfied.

Table 6: Destination of Nile Perch Frames Produced by Factories in Kenya (1996)

Companies	Approximately Daily Frames Output (tons)	Proportion to Fishmeal Industry (tons)	Proportion to Local Market for Human Consumption (tons)
Group 1: B,D,E G,K,M	63	47	16
Group 2: A,C,F H,J,L	31	8	23
Total	**94**	**55**	**39**

Source: Survey Results

One surprising aspect is that Nile perch factories continue to sell frames to fishmeal factories, even when they can easily sell it to the immediate local market at higher prices. Several reasons may explain this. First, it is apparent that the fishmeal factories must put much effort to ensure that they are supplied with adequate quantities of frames on a continuous basis. One way to achieve this is by establishing long-term contracts with processing factories for the supply of frames.

Some Nile perch factory managers we interviewed also stated that the supply of frames fluctuate substantially during the year. In the rainy seasons the supply of wet fish, and consequently, the production of frames, is high. Because of distribution constraints, the local market cannot absorb all the frames produced at such times, hence factories resort to the fishmeal market. Nile perch processing factories, especially those producing large quantities of frames, therefore prefer to maintain good relations with fishmeal factories all the time, by selling them a portion of their frames throughout the year. One manager explained that local traders can only buy small amounts of frames each, leaving the rest to accumulate in the factory and cause a foul smell. Another manager stated that it is a nuisance in selling the frames to many small scale fishmongers who always want to bargain.

Other Nile perch factories prefer to sell frames to fishmeal plants since they buy large quantities at once, thus keeping the processing plant clean and hygienic. This is one of the requirements of the EU regulations for the fish processing industry. The EU Directive on Hygiene (91/493/EEC) deals with handling and processing of fish from the point of capture to its eventual arrival on the market. It is quite specific about how processing waste should be handled and disposed of (O'Riordan, 1997). With the visit of the EU inspectors in May and June 1997 to the processing factories in all of the three countries around the lake, there is no doubt that many of the factories in the future will sell all their frames to the fishmeal plants.

As we mentioned previously, most fish processing factories have adopted new filleting techniques which remove up to 50% of flesh off the skeleton. According to the artisanal frames processors, these frames are "too naked". Consumers of such frames hardly get any edible flesh on the skeletons. It should be pointed out that even for a fairly filleted Nile perch, the edible flesh left on the skeleton is only 10-20% of the frame's weight. The rest is mainly bones which are discarded by the eater. Increased filleting efficiency at the factory further reduces this little edible flesh on the skeletons.

Despite these practices, the demand for frames by local consumer, who are among the poorest in the community, has continued to rise. New artisanal "factories", at which frames are fried in deep oil, have emerged in Kisumu, Migori and Homa-bay, the same areas where processing factories are located. The fried frames have got ready market in several parts of Kenya, especially in Western Kenya. Frames traders we interviewed mentioned Kakamega, Busia, Kitale, Bungoma, Oyugis, Kisii, Awendo, Rongo, Kisumu, Migori and Homa-bay as some of the prominent markets for the product. Other traders obtaining frames from Kisumu have been able to sell it in farther inland markets such as Nakuru, Nairobi, Kiambu and even Taita-Taveta, which is more than 500 Km away.

Table 7: Quantity of Dagaa used by Milling Companies (1996)

Milling Company	Quantity of Dagaa Utilised (tons per year wet weight)	Animal Feeds Output (tons per year)	%
Q	30,000	150,000	56
P	10,000	50,000	19
Others	13,000	65,000	25
Total	**53,000**	**265,000**	

Source: Survey Results

The recent changes in the processing and marketing of Nile perch frames therefore have two important negative implications to the local food security situation. First, increased use of frames in the fishmeal industry means that most of it is now not available for direct human consumption. Secondly, even the available frames from most of the factories now has much less flesh on it. Its value as food is thus greatly reduced. If the fishmeal industry did not utilize fish frames, then an additional 17,000 tons of Nile perch, in form of frames, which currently goes for fishmeal, could be made available for human consumption.

Dagaa for Fish Meal and its Implications for per capita Fish Consumption

According to KMFRI's catch records, dagaa constituted about 77,000 tons, or 44% of the fish landed on the Kenyan part of Lake Victoria in 1995. In each of the past eight years it has composed between 37-45% of the catch (Othina and Osewe-Odera, 1996). Previously dagaa has mainly been used for human consumption. It has been considered a "poor man's food" and has been a source of protein, especially to many low and medium income fish consumers in the country. However a significant proportion of this fish now goes into making fishmeal.

The animal feeds industry in Kenya started using dagaa as the main source of crude protein in feeds in the early 1990s. Currently there are six major animal feeds manufacturing companies in Kenya which mostly depend on dagaa. Table 7 shows that the two largest companies, Q and P, control nearly 75% of the total animal feeds production.

The dagaa is supplied to the feeds factories either in whole (uncrushed) form or in milled (powder) state. The distribution channel supplying dagaa to this industry has several middlemen who buy the fish from various landing beaches. They in turn transport dagaa to small milling factories located in Nakuru, Nairobi, Kisumu, Ahero and Migori. After milling, the dagaa fishmeal is supplied to the animal feeds companies by the millers. Company P however receives only whole dagaa directly from middlemen, which it then dries and grinds into fishmeal at the factory premises.

Dagaa contains 55-60% crude protein and hence is a suitable source of protein in the feeds. In comparison, Table 8 shows that imported fishmeal can yield 70-80% crude protein, and is thus a richer source of protein. However the price of imported fishmeal is double that of dagaa. Manufacturers of animal feeds therefore find more economic advantages in using dagaa than imported fishmeal.

The demand for animal feeds in Kenya is still much higher than the supply. Hence feeds manufactured in Kenya is all used within the country. Many times during the year, when dagaa supply is low, some of the feeds manufacturers only use fishmeal in formulating chicken feeds, since chicken lack some essential amino acids which they get from supplementary protein sources. At such times, feeds for pigs, cattle and pets are made without fishmeal. This indicates that there is a large and unsatisfied demand for fishmeal in the country. This demand is even increasing as the national agricultural policy now puts greater emphasis on intensive production systems which requires more usage of supplementary feeds.

On some beaches there are two kinds of dagaa for the two markets. The market for human consumption takes the cleaner and higher quality fish, which sells at approximately twice the price of that going for fishmeal. The dividing line differentiating the product forms for the two markets is, however, not clear. Much of the dagaa considered unfit for human consumption could easily go for that purpose if additional effort was put in washing and cleaning it of incidental physical impurities. The fishmeal industry, by readily buying dagaa in a

dirty state, discourage traders from undertaking such cleaning operations, which would make fish acceptable for human consumption.

The interest shown by the fishmeal industry for dagaa has important implications for the food security situation in the country. With most of the Nile perch going for export, dagaa has remained the "staple fish" to many households around Lake Victoria. For a long time, its price was low and many local people could afford to buy it. However Figure 7 shows that the price of dried dagaa going for human consumption rose considerably from less than KSh 20 in 1490 to about KSh 60 per Kg in 1995. This has been attributed to increased pressure due to fishmeal factories buying this fish. The price has since fluctuated at KSh 40-60 per Kg, depending on the season.

Table 8: Types of Fishmeal Used in Kenya (1996)

Type	Quantity (tons per year dried weight)	% Crude protein	Cost of Feeds Company (KSh per Kg
Lake Victoria Dagaa	16,000	55 - 60	25 - 35
Lake Victoria Nile perch (Frames)	4,000	50 - 55	25 - 35
Fishmeal from Peru, Chile, Europe	3,000	70 - 80	65 - 75
Total	**23,000**		

Source: Survey Results

The continued use of dagaa for fishmeal will make it more scarce and cause further price increases. Since most of its consumers are local people with low incomes, they are likely to be vulnerable to any competition, however slight, with fishmeal factories. An important aspect concerning the fishmeal industry's interest for dagaa is related to the huge differences in seasonal availability and price. The fishmeal plants usually buy much of the dagaa in the wet season when the price is low. During our visit to one of the factories manufacturing animal feeds, the manager showed to us a stock of about 640 tons of dagaa, which would be adequate supply for the factory's needs in the next 2-3 months. In spite of this, the manager stated that he would accept more of the fish if delivered, since it would be harder and more expensive to buy it in the drier season.

Besides the domestic fishmeal industry, there have been attempts to export dagaa. In the early 1990s dried dagaa from Kenya was briefly exported to Hong Kong and Korea (Ogunja, 1991). Two years ago there was further pressure to export this fish to South Africa's fishmeal industry. However the initial consignment was rejected by the importer for not meeting the required quality conditions.

Despite the use of dagaa in fishmeal industry leading to increases in its price, it has continued to have a strong demand in many communities around Lake Victoria. Our fish consumption survey in the three Lake Victoria Basin districts mentioned earlier, revealed that dagaa is consumed by 89% of the 250 randomly selected households. The proportion of consumers is though much higher among rural households. Over 95% of 85 respondents in Suba District, which is largely rural, indicated that they consume dagaa. However 79% of these households are already finding it more difficult now to get or afford dagaa than five years ago. As more dagaa goes for fishmeal, it has become scarce in many areas, and its price has progressively risen, preventing many consumers from getting sufficient access to it.

From the consumers' point of view, dagaa has a distinct advantage. Being a sardine-like fish, people can easily buy small quantities of it without any difficulty. Many relatively poor consumers only buy dagaa for Ksh 10-20 at a time and still the fish contributes an important source of animal protein in their diet. Where as the use of fish frames for fishmeal may, to some extent, be explained in that it is a by-product of fish processing which is consumed only as a last resort, the use of dagaa for animal

feeds cannot be sufficiently excused. Its high protein content and flesh composition is an advantage to the consumers, especially to children threatened with malnutrition.

The fishmeal industry in Kenya uses about 53,000 tons of wet dagaa annually. This is equivalent to about 70% of all dagaa landed in the country in 1995. In that year therefore, only 24,000 tons of the landed dagaa could have been left for the local people to consume. However a significant but unknown quantity of dagaa milled in Kenya actually comes from Tanzania and Uganda. This helps to relax the pressure on the dagaa available in the country.

Based on the statistics discussed in various sections above, we estimate that the per capita fish consumption in Kenya was 3.76 and 3.13 in 1995 and 1996 respectively. In calculating this parameter, all fish caught from various sources in Kenya are taken into account. This includes the catches of Lake Victoria, which has represented over 90% of the total catch during the last ten years, as well as that landed from other inland lakes, marine sources and aquaculture. The per capita consumption level is affected by the fish landings, exports and imports, quantity of fish used for fishmeal and Kenya's population levels. It should though be explained that per capita consumption is simply an average measure showing what is available to the whole nation. It does not tell the levels or distribution of consumption to various groups or individuals.

The amount of dagaa going for fishmeal is thus one important factor determining the level of per capita fish consumption in the country. Since huge demand exists in both markets of dagaa for fishmeal and human consumption, it is difficult to predict what quantities of this fish will be allocated to either market in future, and the impact it will have on per capita fish consumption. One way of looking at it is by assessing the per capita fish consumption trends if we assume different percentages of dagaa landed had gone for fishmeal in the last decade, all other factors held constant.

Figure 8 displays various trends of per capita fish consumption assuming that 50%,70% or 100% of dagaa landed went for fishmeal. Additionally we take it, as we estimated earlier, that 21% of the equivalent weight of Nile perch landed went for fishmeal, in form of frames. Per capita consumption lines derived from the three assumed percentages of dagaa going for fishmeal display the same patterns. In each case there is a general increase from 1985-87 and then a fluctuating pattern in the next four years. This is followed by a small rise from 1992-95. From the graph, it is noticed that even at lower levels of dagaa going for fishmeal, it was difficult to reach 9.3Kg per capita consumption, which has been suggested as a suitable target for Kenya (Okemwa and Getabu, 1996). Increased use of dagaa for fishmeal will further reduce per capita fish consumption, which is still too far below the targeted level.

If the animal feeds industry did not use fish products, then 70,000 tons of fish, consisting of 53,000 tons of dagaa and 17,000 tons of fish frames, which currently goes for fishmeal, could be channelled to human consumption. This would raise the per capita fish consumption in 1996 by about 2.5Kg, or 80%.

In addition, if the exported Nile perch was all retained for local consumption, the per capita consumption in that year would have increased by another 0.75Kg. Thus if all the fish landed in Kenya went for local human consumption, the per capita consumption could have exceeded 6Kg in 1996. By eliminating fish going for export and fishmeal, the per capita consumption could be doubled. A per capita consumption of 6Kg would still be very low by all international standards.

General Fish Price Trends and its Effect on Access to Food

The beach price of dried dagaa and wet Nile perch remained constant at less than 5 Ksh per Kg before 1983 for the former and 1987 for the latter. Figure 7 shows that the prices rose gently between 1983 and 1990 for dagaa and from 1987 to 1991 for Nile perch. These trends generally conformed to the pattern of changes in the consumer price index (inflationary changes) in Kenya. There was a sharp rise in the rate of inflation from 1991 to 1993 followed by a huge drop to 1995. In response to the rise in inflationary rate, there was a sharp increase in prices of both Nile perch and dagaa from 1991.

However these prices have not dropped, even though inflation has declined. This suggests that other factors beside the inflationary changes, contributed to the price increases. In particular it indicates that there has been increased demand for fish in the early 1990s. The most probable reason for this is the demand for the two fish species for industrial uses for export and fishmeal.

As fish prices rise without compensatory increase in consumer purchasing power, many local people are denied access to fish.

The Export and Fishmeal Industries and Consequence to Job Security

We have noted that in recent years there has been increase in numbers of fish processing factories while existing ones continue to expand their processing capacity. This has caused intense competition for wet fish as companies try to increase their volumes to the seemingly unlimited export market. The firms have put in place several mechanisms in order to be able to acquire sufficient quantities of wet fish regularly. As already noted, some companies have purchased boats, including trawlers, nets and engines and have hired fishermen to operate, them. In addition, almost all companies have invested in transporting fish from the various landing beaches to the processing plant.

The consequence of these strategies is that local people, who in the past depended on the fisheries, have lost employment as processing companies become more involved in various sectors of the fishery. New fish harvesting and transport facilities, especially motorized boats and trawlers, use much less labour per Kg of fish handled.

The Nile perch going for export is brought directly into the insulated trucks on the beach without local transporters and traditional fishmongers intervening as they would have done if the fish was sold through the local market. Observations and interviews at the fish landing beaches confirmed that many local small scale fishmongers, most of them women, have given up their traditional jobs as fishmongers, simply because there is declining amounts of fish to trade on.

Given that there would be a ready market locally for most of the fish taken to the factories, for each ton of whole fish taken from the local to global market, not only the availability of fish and food security is threatened for the local population, but also job security. The lost jobs in the traditional sector is not compensated for by the employment created in the export industry.

The fish processing factories each employ between 100 and 200 people directly, mostly to perform filleting and packaging activities. The 12 fish factories in Kenya have therefore directly created at most 2,400 jobs. About 75% of these employees are on casual or temporary employment terms, with no job security and no long-term benefits. Often the workers are laid off for several days without pay whenever the factory cannot get sufficient supply of fish.

These conditions of employment are quite similar to that in the informal sectors of the fisheries. Since all fish factories are in urban centres, they create mostly urban-based jobs, away from the fishing community. Many of the people employed have not been engaged in any fishery activity in the past.

As noted earlier, the average daily processing of Nile perch in Kenya is about 200 tons. Therefore, each factory employee at least handles about 80-90 Kg of fish. In contrast an ordinary fishmonger, according to our estimates, handles 10-20 Kg of fish per day. It would seem therefore that for each job created in the industrial fish processing sector, there could have been 4-9 jobs in the traditional sector. Based on the above figures therefore, we estimate that about 15,000 jobs in the traditional fish processing and marketing sector have been lost as a result of the modem industry.

Even if we consider the 2,400 jobs directly created by factories, and giving a wide margin of error, there would still be a net loss of at least 10,000 jobs in the local communities of the lake. Although some assumptions have been made, there is no doubt that for each ton of Nile perch transferred to the export market and fishmeal industry, many jobs are being lost in the fishing communities around Lake Victoria.

The artisanal sector processing Nile perch frames is another area where local people are threatened with unemployment. As earlier mentioned, several informal processing "factories" were established in the early 1990s in Kisumu, Nairobi, Homa-bay and Migori, where Nile perch frames from nearby factories was fried and distributed to markets for human consumption. In 1994 Kisumu town alone had about 600 people, 75% of them women, engaged in processing and distributing the frames of Nile perch to many parts of the country (Abila, 1994).

In Homa-bay there were 500 such artisanal processors in 1993. These fried 20-40 tons of fish frames daily, which was obtained from the two processing plants in the town at the time. About 400 people processed and sold frames in Nairobi and a similar number was employed for the same purpose in Migori.

The artisanal Nile perch frames processing and distribution sector therefore directly employed close to 2,000 people in Kenya in early 1990s. Besides, these processors and traders formed smaller groups through which additional economic and social benefits accrued and trickled down to other sections of the community. These included internal financial and capital generation and group welfare activities.

However the fishmeal industry has now moved in to take away the frames, the same raw materials which local processors depend on. As earlier estimated, about 60% of frames now go for fishmeal. The remaining quantity is too little for the requirement of local processors. As such, several processors and traders who were previously employed in this sector have already been displaced, and even more are being threatened.

We gathered that as many as 50-60% of the people employed in frames processing and trade 4-5 years ago in the four towns have now lost employment because they have no frames to fry or sell. Even the processors still lucky to obtain some frames, are under-employed most of the time.

Our own observations in Kisumu, Migori and Homa-bay showed that about half of the stalls formerly used for processing frames are currently idle. We also noticed that processors often spent many hours outside the factory gates in order to secure some supply of frames, and they protested when the frames were loaded into lorries to be taken to the Nairobi fishmeal factories.

In Homa-bay, there is only one processing factory now and it sells the greater portion of its frames to a fishmeal factory in Nairobi. The remaining frames, which the traders approximated as or 2-4 tons per day, is inadequate for the artisanal processors. Hence the processors have formed two groups which receive frames from the factory on alternate days, each group working only three days a week.

Even though artisanal frames processors willing and able to pay for frames at significantly higher prices than fishmeal factories, the latter through various mechanisms, still takes more of the frames. With the demand for fishmeal still largely unmet, the remaining artisanal frames processors are at real risk of losing employment.

THE IMPACT OF THE FISH EXPORT AND FISHMEAL INDUSTRIES ON THE CONSERVATION OF FISH RESOURCES

This last section briefly discusses the impact the export and fishmeal industries have on sustainable exploitation of the fisheries resources of Lake Victoria. The demand for Nile perch in the export market has posed the greatest challenge to the conservation of the fisheries of the lake in the last decade. The fishmeal industry, particularly targeting dagaa, now raises the possibility for even a greater threat to a sustainable exploitation and to the conservation of biodiversity. A part from being an important fishery itself, dagaa forms part of the food chain for Nile perch.

The great demand of fish for export and fishmeal, as well as that for human consumption, have caused new fishermen to join the fishery. With them have come more technically efficient fishing techniques and technologies capable of catching larger quantities of fish at reduced fishing efforts. These include non-selective small-meshed nets which have the effect of catching a large by-catch of juveniles or non-targeted species. In order to satisfy the export demand, trawling for Nile perch has continued, albeit illegally. Besides the by-catch and juvenile fish caught in a trawling expedition, trawlers destroy the fish breeding habitats. They also interfere with the stability of the water column and the general aquatic environment. Similar effects are caused by beach seining, which has gone on uninterrupted in several areas of Lake Victoria. Beach seine fishermen aim especially at catching small and medium sized tilapia and Nile perch for the local market. This is justified in that the processing factories and fishmeal industry now take most of the fish caught in other parts of the lake.

The development of the Nile perch fishery, and the emerging fishmeal industry, have therefore greatly increased fishing pressure, leading to overfishing in two ways. First, the use of small mesh sizes raises the chance of catching immature fish before they can grow, develop into adults and spawn. It is estimated that the average age of the Nile perch currently caught is 2-3 years, which barely gives them time to reproduce before being caught. Secondly, the use of certain destructive and non-selective fishing methods, such as trawling and beach seining, removes large quantities of fish species, or their food, indiscriminately thus interfering with food chain linkages. This disrupts the aquatic environment, making it less capable of supporting fish life (O'Riordan, 1996).

The greatest evidence of overfishing in Lake Victoria is the declining trends in catch levels. Figure 2 shows that Nile perch catches have been on general downward trend since 1991. A second indication of overfishing is the common use of smaller mesh size nets. It is reported that the average mesh size used in the lake has reduced from 12 inches in 1981 to 6 inches in 1996. Along with the reduced mesh size, the average size of fish caught has come down from 50-100Kg in 1981 to 5-10Kg in 1996. Factories which previously processed Nile perch of minimum weight 2-3Kg now fillet even those below 1-2Kg. In addition, boat catch rates have reduced from a daily average of 400-500Kg in 1981 to about 100-150Kg in 1996 (O'Riordan, 1996; Othina and Osewe-Odera, 1996).

As most mature Nile perch goes for export and dagaa for fishmeal, there is increased efforts to catch juvenile fish for the local market. As noted previously, the juvenile catch in some beaches constitute close to 10-35% of the overall landing. The allocation of more Nile perch frames to fishmeal rather than the local processing sector for human consumption has also encouraged the artisanal processors to fry and sell juvenile fish. We observed in Homa-bay that artisanal processors who previously fried Nile perch frames have now turned to frying Nile perch juveniles since frames have become scarce.

The lack of mature Nile perch remaining behind for local consumption has therefore contributed to much of the fishing with illegal gear. Thus the monopoly the filleting factories have established for buying mature Nile perch has led to increased efforts to catch juvenile Nile perch. Indirectly the factories in this way contribute to an unsustainable exploitation of the fish resource.

The issue of over-exploitation of fisheries resources is already causing some concern to the fish processing industries. With such heavy capital and financial investments, the industrialists would not like the resources to deplete soon. Managers of various factories suggested four broad ways of improving conservation efforts for Lake Victoria fisheries: First there is need to develop a better regulation and enforcement framework for the lake. The regulations should address and control sizes of fish targeted, mesh size, breeding areas, beach seining, trawling, pollution and aquatic weeds. The second means should be for the government to enact administrative controls on the expansion of the processing industry, as well as that of fishmeal. In particular the government should prevent the licensing and establishment of new factories since the industry is already over-established. A related issue is for the government to consider and, if possible, allocate export quotas to each factory. The quantity of dagaa going for fishmeal should also be closely monitored and controlled.

Thirdly there should be greater self-policing by the factories themselves. In particular, factories must avoid processing immature Nile perch of below 2kg. Lastly some managers suggested the formation of an association of fish processors and exporters to spearhead conservation efforts and internal regulation of the industry. In Uganda such an association already exists and it contributes to conservation efforts, among other issues. One common complaint is that the fish processors and exporters in Kenya have been only interested in exporting the maximum possible quantity of fish, while paying little regard to the status of the resources. With its immense power, the industry could significantly contribute to the management and conservation of the fisheries resources.

CONCLUSIONS:

1. There is a ready local market for much of the Nile perch currently going for export. Increased exports of the fish therefore poses eat to local food security.

2. The local human demand for fish frames is high and still unsatisfied. Hence there is clearly a conflict between the use of fish frames for fishmeal instead of direct human consumption.

3. The demand for dagaa among local people is high and largely unmet. There is much potential in selling it in many new markets. Its use in fishmeal industry therefore threatens local food security.

4. The export industry and the fishmeal factories, particularly using fish frames, continue to draw away fish and fish products from artisanal processing sectors, thus causing unemployment, which is not adequately compensated for by jobs created in the formal sector.

5. The current levels or expansion of industrial utilization of fisheries has negative impacts on conservation of the resources.

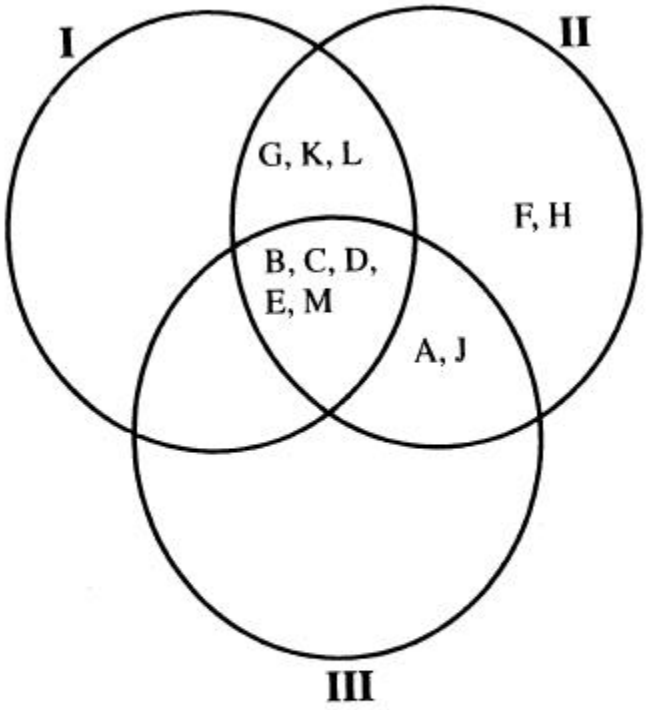
6. The current trends in the fish industry do not promote the important objectives set up for the development of the fisheries, in particular food security and employment.

RECOMMENDATIONS:

1. The fisheries policy should be re-focussed to put greater emphasis on food security. It should avoid conflicting objectives such as goals to maximize foreign exchange and ensure food security as well, since there is limited supplies of fish in the country.

2. The use of fish frames and dagaa in fishmeal should be controlled both through deliberate policy and administrative action. The human market must take priority over fishmeal whenever there is direct conflict. In addition the frames going to the market for human consumption passes through the traditional processing systems, thus generating new opportunities for artisanal employment.

3. There is clearly a need for controlling the expansion of the fish processing and exporting industry. This is important for food security as well as sustainable exploitation of the fisheries. Such controls may involve stopping the licensing or establishment of new factories. The Government may also institute policy of allocating export quotas to existing factories.



I : Obtain fish directly from fishermen or cooperatives

II : Obtain fish from agents/middlemen

III : Company directly involved in fish harvesting or obtain fish from sister companies

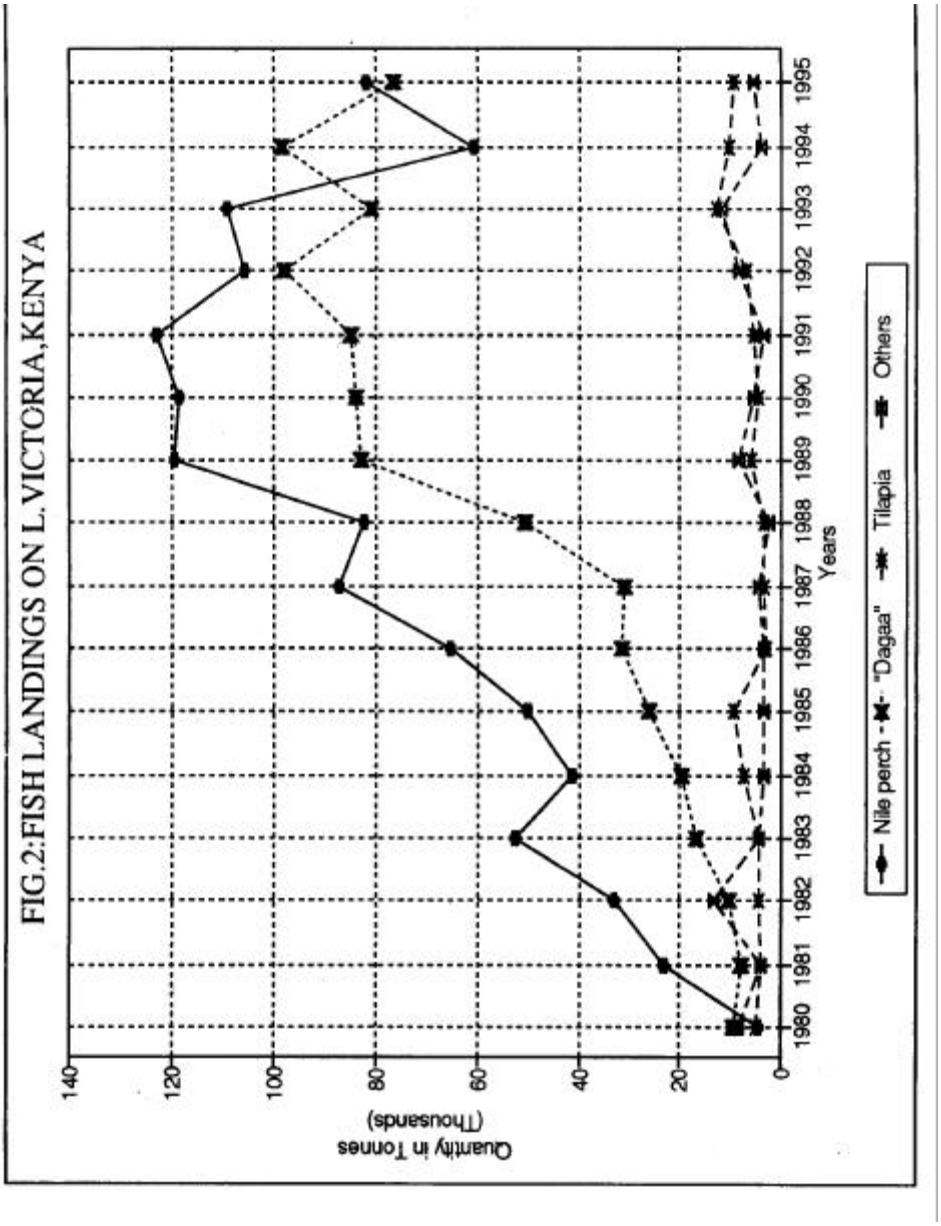


FIG.2:FISH LANDINGS ON L.VICTORIA,KENYA
Quantity in Tonnes
(Thousands)
140
120
100
80
60
40
20
0
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995
Years
Nile perch
"Dagaa"
Tilapia
Others

FIG.3: DISTRIBUTION BY CAPACITY OF NILE PERCH PROCESSING PLANTS IN KENYA (1996)

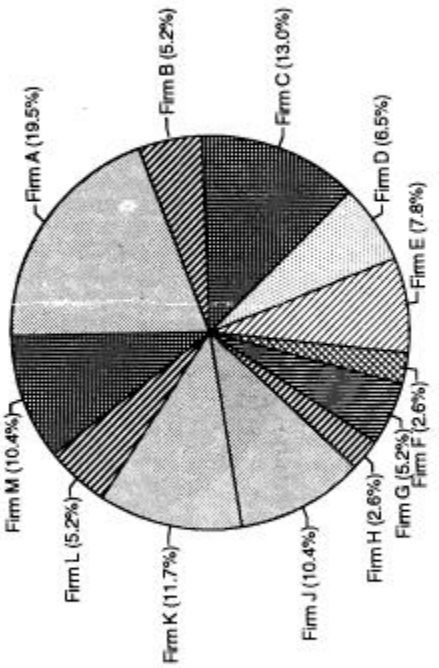
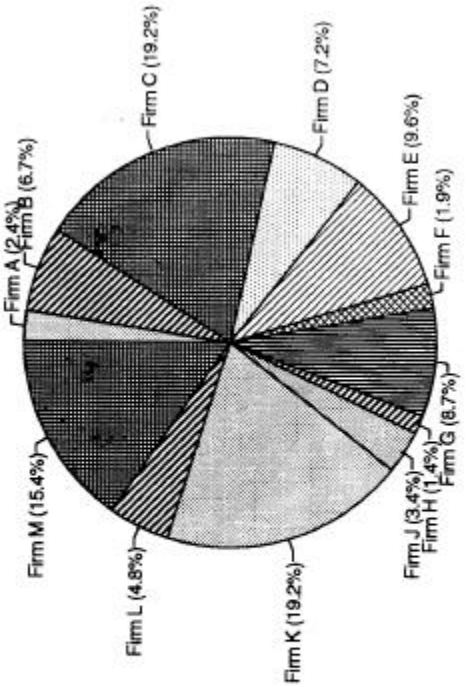


FIG.4: DISTRIBUTION OF FACTORIES BY QUANTITIES OF N. PERCH PROCESSED (1996)



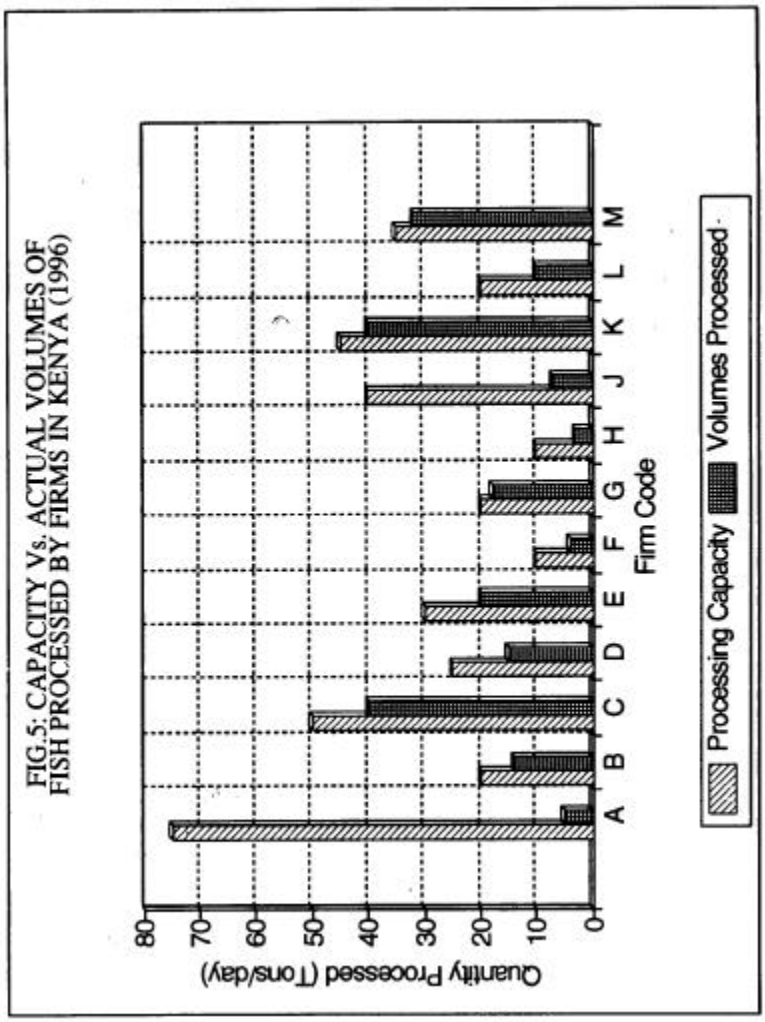


FIG.5: CAPACITY Vs. ACTUAL VOLUMES OF FISH PROCESSED BY FIRMS IN KENYA (1996)
Quantity Processed (Tons/day)
0
10
20
30
40
50
60
70
80
A
B
C
D
E
F
G
H
J
K
L
M
Firm Code
Processing Capacity
Volumes Processed

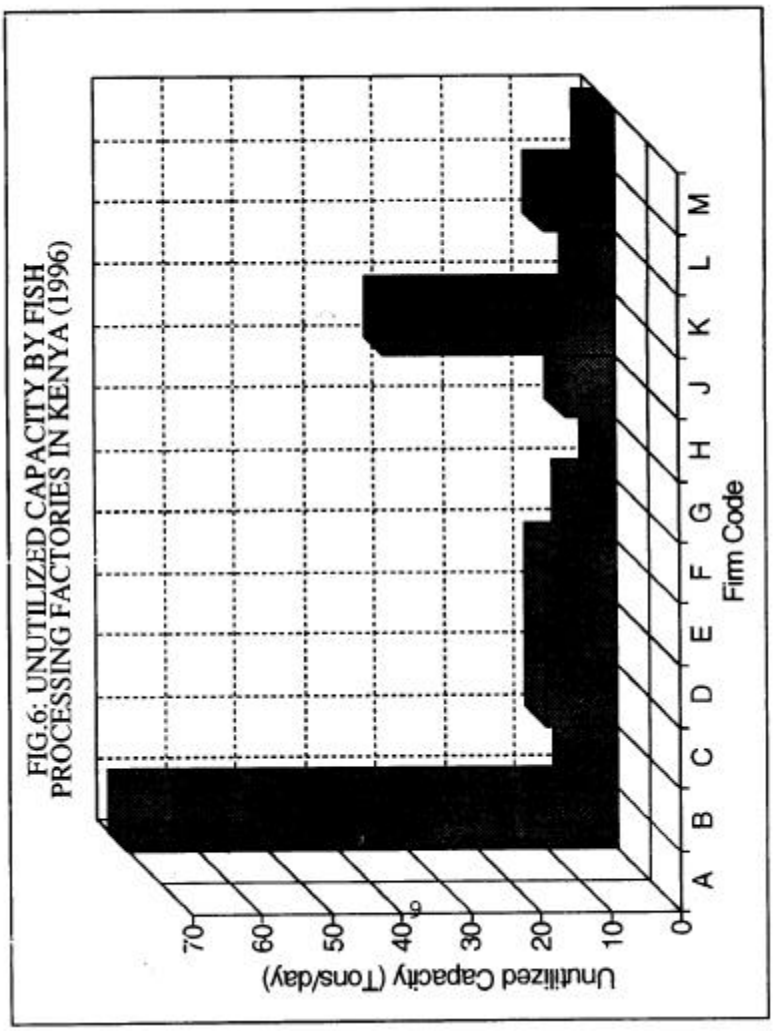


FIG.6: UNUTILIZED CAPACITY BY FISH PROCESSING FACTORIES IN KENYA (1996)
Unutilized Capacity (Tons/day)
0
10
20
30
40
50
60
70
A
B
C
D
E
F
G
H
J
K
L
M
Firm Code

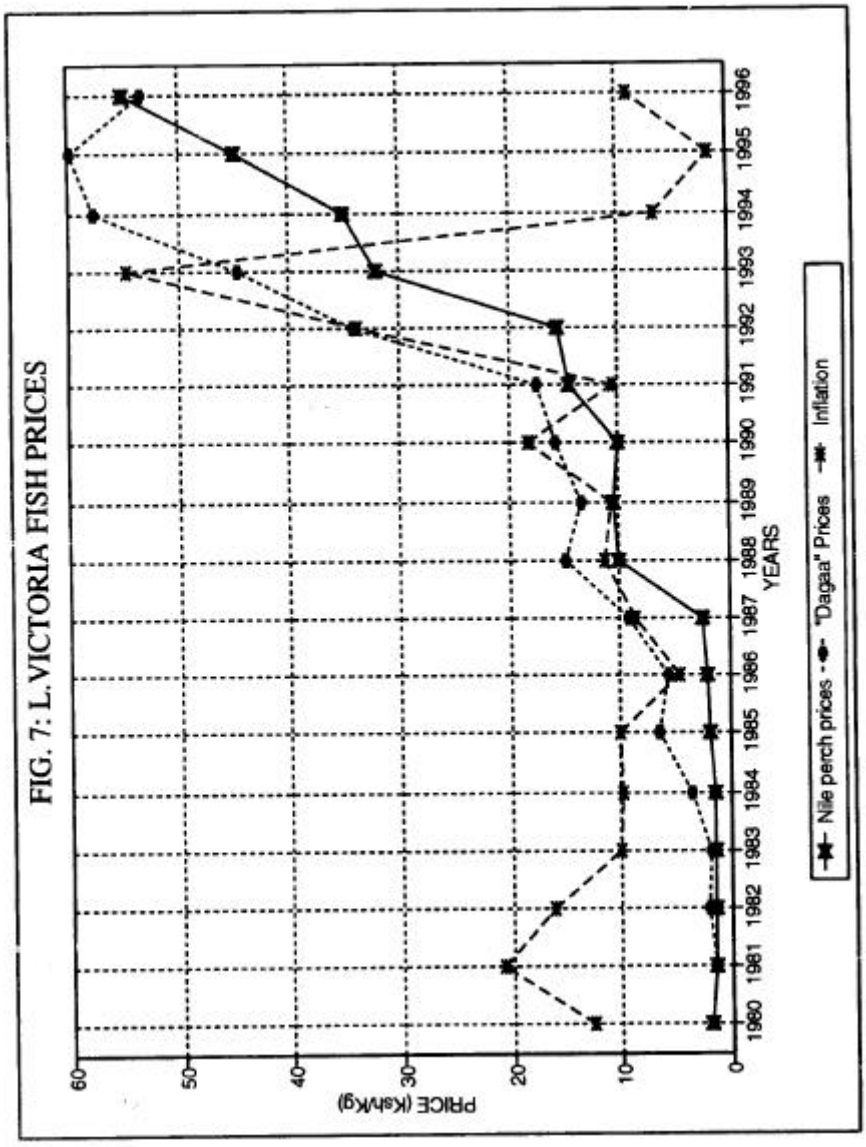


FIG. 7: L.VICTORIA FISH PRICES
PRICE (ksh/Kg)
0
10
20
30
40
50
60
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
YEARS
Nile perch prices
"Dagaa" Prices
Inflation

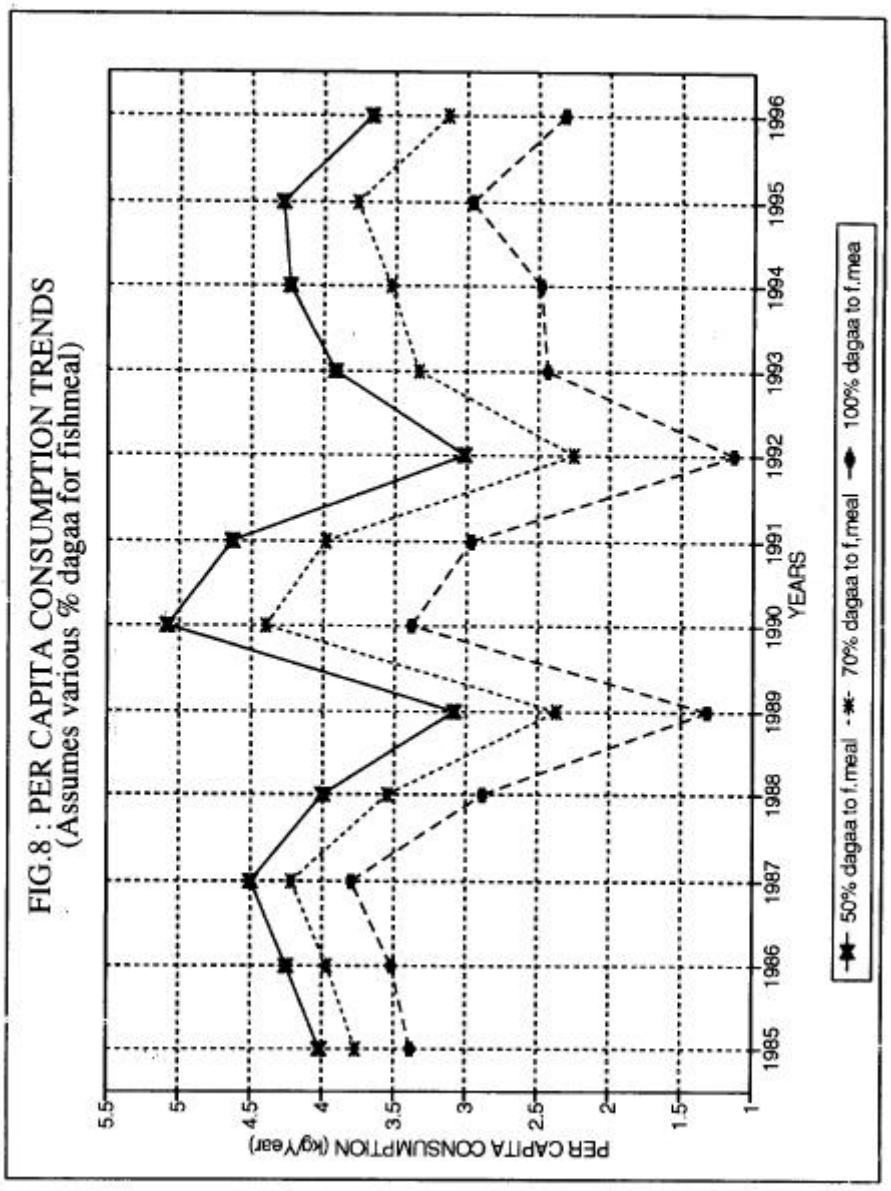


FIG.8 : PER CAPITA CONSUMPTION TRENDS
(Assumes various % dagaa for fishmeal)
PER CAPITA CONSUMPTION (kg/Year)
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
YEARS
50% dagaa to f.meal
70% dagaa to f.meal
100% dagaa to f.mea

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