LAKE VICTORIA FISHERIES RESEARCH PROJECT

PHASE II

Socio-economic implications of the fish export trade on the fishers and fisheries of Lake Victoria in Uganda

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Preface

The work presented in this LVFRP Technical document is the publication of Paul Namisi's Masters, completed and passed by the National University of Ireland, Cork, in July 2000. Certain modifications have occurred to the document which do not detract from its original content and/or argument. These include the removal of some figures for the sake of clarity and brevity; and the formatting of the document to conform to the normal format of LVFRP project documents.

Although Mr. Namisis's work was not funded by the LVFRP, he was assisted by the LVFRP with relevant literature, and certain limited supervisory aspects, including guidance with his questionnaires and the development of his argument.

The publication of this Masters thesis is the first to be carried out by the LVFRP. This Masters will contribute substantially to the debate surrounding the present status and management of Lake Victoria.

Dr. Kim Geheb
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Jinja, July, 2001

DEDICATION

To my dear wife Sarah,

and my lovely daughters Sheila and Vanessa

for their patience

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P.W.N. FIRRI,
July 2001.

ABBREVIATIONS

EPAU	Export Policy Analysis Unit.
EPRC	Economic Policy Research Centre
EU	European Union
FAO	Food and Agriculture Organisation
FIRI	Fisheries Research Institute
FO	Fisheries Officer.
F.O.B.	Free on board.
GDP	Gross Domestic Product
GRT	Gross Registered Tonnes
Kshs	Kenya shillings
LVFRP	Lake Victoria Fisheries Research Project
LVEMP	Lake Victoria Environmental Management Project
LVFO	Lake Victoria Fisheries Organisation
LVFRP	Lake Victoria Fisheries Research Project
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries.
MFPED	Ministry of Finance, Planning and Economic Development
MSY	Maximum Sustainable Yield
MEY	Maximum Economic Yield
MScY	Maximum Social Yield
MT	Metric Tonnes
NGO's	Non-Government Organizations
SDD	Sustainable Development Dimensions
SEDAWOG	Socio-Economic Data Analysis Working Group
UFD	Fisheries Department- Uganda.
Ushs	Uganda shillings
WRI	World Resources Institute

ABSTRACT

The purpose of this study was to investigate the implications of the fish export trade on the fishers and the fisheries resource of Lake Victoria, Uganda with respect to sustainability. Eight fish processing factories and ninety fishers were qualitatively investigated. Socio-economic characteristics of fishers and the economic characteristics of fish factories formed a basis for the analysis. Results of the research indicate that there is a relationship between the growth in fish export trade, particularly the growth in industrial fish processing (for export) and declining fisheries resources of the lake. However, whether or not that impact is positive or negative, and to what extent there is an impact, is highly dependent upon the underlying socio-economic considerations of the fishers to the process. The fish-ban imposed by the European Union countries was particularly decried by fishers and factory owners as the main cause for the present poverty among the fishers. Fundamentally, several conflicting issues: ecological, physical and economic activities are a threat to the sustainability of the Lake Victoria fisheries, and for all that depend on and interact with the lake. There is urgent need to address the immediate issue of the growing riparian population and the global fish trade, to educate and train all the relevant actors in appropriate fisheries management techniques. Attitudes of fishers towards the fish factory developments are positive and this is a way forward for co-management for the sustainability of the fisheries resource.

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1 INTRODUCTION

1.1. INTRODUCTION

Lake Victoria, the second largest fresh water lake in the world, is shared by Kenya (6%), Uganda (45%) and Tanzania (49%) (Figure 1) (Welcomme, 1972). The lake covers an area of 68,800 km^2, the Ugandan portion being 29,580 km^2 (Okaronon, 1994; LVEMP, 1996). The lake is shallow, with a depth ranging from 4 to 15 metres at the fringes and from 30 to 60 metres in the open lake (Ogutu, 1988). The deepest part of the lake is estimated to be 84 metres (Vanden Bosche and Bernacsek, 1990).

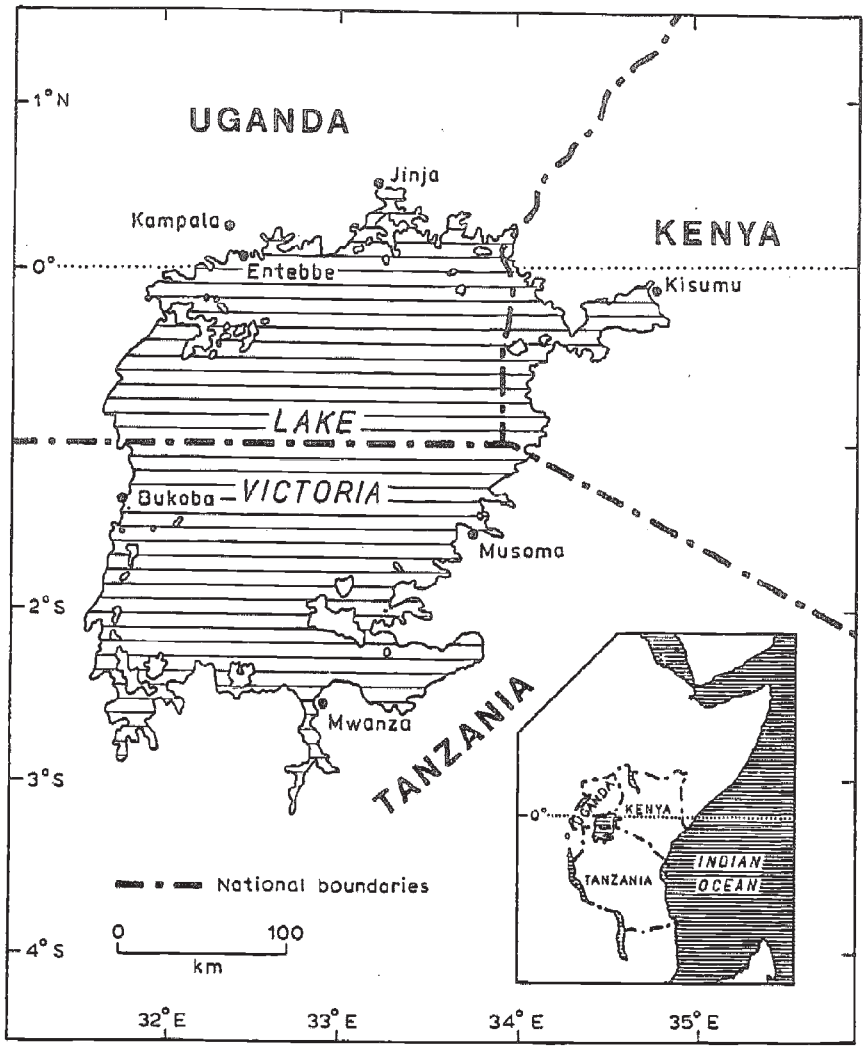

Figure 1: Map of Lake Victoria. Source: LVFRP

The Lake Victoria fishery constitutes the most important fishery in Uganda. Official estimates put fish production in Uganda in 1997 at approximately 219,300 tonnes (MFPED1, 1998/99) of which 106,800 tonnes were landed from Lake Victoria. Thus Lake Victoria alone accounts for ca. 50 percent of all fish production in Uganda of which 60 percent of total catch is *Lates niloticus* (Nile perch) (UFD, 1998).

Estimates of Maximum Sustainable Yield (MSY) for Nile perch are in the range of 300,000 tonnes for the whole lake (Pitcher and Bundy, 1995). During 1995, *Lates niloticus* contributed 61.8 percent of total catch while *O. niloticus* and *R. argentea* contributed 23.3 percent and 12.9 percent, respectively. Recently, however, conflicts over competing uses of fish production for domestic consumption and for export have become a significant issue in the Nile perch fishery in Lake Victoria. While conflict is present in all fishing communities, in the tropical-developing world where the reliance upon fishing as a food and income is critical, the consequences of conflict may be profound. Conflict is a serious impediment to economic and social development because it erodes the institutions needed to promote development. The global trade driven by market forces is intensifying and shifting to small-scale fishery. There are fears that this is leading to intense competition and declining catch rates for traditional and small-scale fishers, and less food for protein-deficient people in Uganda.

This study undertook a qualitative examination of the economic and social aspects of the performance by the fisheries sector in the wake of the growing conflicts. Particular emphasis was on the fish-export trade, and the trends and major issues pertaining to the fisheries sub-sector. Lastly, statistical analysis using a computer package, SPSS-version 8.0, was carried out to determine the socio-economic implications of the fish export-oriented industry on the fisher-folk communities and their impact on the health of Lake Victoria fisheries.

1.2. STATEMENT OF THE PROBLEM

The Fisheries industry development in Uganda primarily focuses on the exploitation, processing and marketing of Nile perch followed by Nile tilapia, *Oreochromis niloticus* and "Mukene", *Rastrineobola argentea* respectively.

The fish processing factories have increased from three in 1990 to 11 in 1999 and they depend entirely on Nile perch, which is harvested mainly from Lake Victoria, that is, 73,000 metric tonnes annually. These factories have created additional demand for the fish, acting as an attraction for new entrants into the fisheries. The increased demand has resulted in increased fish catches, exerting pressure on fish stocks with the threat of over-fishing. Furthermore, the development of industrial fish processing has deprived many small-scale fishers and fisher-folk communities who entirely depend on fish for their protein requirement and livelihood. Yet, the Nile perch trade boom on Lake Victoria was seen as offering opportunity for fishers to increase their incomes, modernize the fishery and improve fishers' living conditions (Reynolds and Greboval, 1988). Fishers in Uganda, however, still live under poor conditions and the progression to modernisation has not been realised. Most fishing areas still lack basic physical infrastructure and social amenities. It is evident that fish prices have gone up (average price of Nile perch on Lake Victoria rose from Ushs 300 (ca. US $ 0.3) per kg in 1990 to Ushs 1,500 (ca. US $ 1.2) in 1997: UFD, various years). Thus, Nile perch fishers now earn four times more per kilogram of fish landed than ten years ago. There is, however, little evidence of redistribution of this income into the wider community to achieve reductions in poverty, higher protein consumption and improved living standards. Instead, subsistence fishing and the use of illegal fishing techniques are on the increase and threaten the sustainability of Lake Victoria fisheries.

Against this background, this study undertook to evaluate the socio-economic characteristics of fishers and major buyers (industrial fish processors) engaged in fishing activities and to ascertain the degree of power/marginality they hold in the community. This was further to enhance the comprehension of the impacts of Nile perch export trade on the livelihood of the fishing communities and the fisheries sustainability for policy formulation. Therefore, to determine the level of impact and examine the conflict between fish production for export and for domestic consumption the following questions were formulated for guidance.

1.2.1. RESEARCH QUESTIONS

1. Is the decline in fish catches on Lake Victoria significantly a phenomenon of increased activity of the international fish trade and increased effort?

2. Has the expansion and increased value of the Lake Victoria Nile perch fishery enhanced the practice of illegal gear and destructive fishing?
3. Has the development of the fish export industry resulted in changes in employment, investments and incomes for the fisher communities?
4. Is the increasing activity of the international fish trade posing a significant threat to the local food security and livelihoods?
5. Do fishers see factory fish processors as actual and potentially important partners in the sustainable development of Lake Victoria fisheries?

1.3. STATEMENT OF PURPOSE

1.3.1. CONTRIBUTION OF THE FISHERIES SECTOR TO GDP AND EMPLOYMENT

Hitherto, the success of fish export development in Uganda has been measured in terms of foreign exchange earnings from export. Only little consideration is given to other socio-economic values and needs that concern the very people who form the basis of fish production. The trickle-down of benefits to the poor sections of the rural community have hardly been achieved.

Notwithstanding, the fisheries sub-sector plays an important role in Uganda's economy. Fisheries accounts for about 9 per cent of the total Gross Domestic Product (GDP) of the agricultural GDP valued at Ushs 110 billion. It earns livelihoods for as much as 10 percent of the total population, most of them being small-scale fishers. The sub-sector also contributes to foreign exchange earnings, balance of payments, employment, national food security, and to the living standards of the fisher-folk communities (UFD, 1996). For example, the contribution to GDP rose from Ushs 46.0 billion in 1990 to 58.1 billion in 1997, valued at constant 1991 prices (MFPED1, 1998). GDP is an important economic indicator for measuring the level and extent of total economic output. It reflects changes in total production of goods and services. As a single composite indicator of economic growth, it is a most powerful summary indicator of the economic state of development in its many aspects. It does not, however, directly measure sustainable development though it is a very important measure for the economic and developmental aspects of sustainable development, including people's consumption patterns and the use of renewable resources. It does not again account for the social and environmental costs of production; it therefore is not a good measure of the level of overall welfare. The need to investigate the sector's performance in terms of overall welfare of the main actors, the fishers, and the fisheries resource is timely.

1.3.2. CONTRIBUTION TO EXPORT EARNINGS

Fish export earnings showed a steady increase too, making the sub-sector Uganda's second highest foreign exchange earner after coffee in 1996, when it fetched US $ 45 million (MFPED2, 1998). Export earnings and imports are a good indicator of openness of the country's economy to international trade. In general, international trade promotes better utilisation of resources domestically and globally. The relationship between trade and sustainable development is specifically recognized in Agenda 21 (United Nations, 1992). International trade enables countries to specialize in what they do best and acquire the things they have difficulty in producing. By so doing, resources are more efficiently used on a global as well as a domestic basis and these efficiencies are passed on in the form of lower prices and higher economic growth. Thus, if an economy is more open to international trade, it can benefit more from the given resources. Dynamically, the economy can also benefit from innovative technologies available throughout the world. However, since prices of internationally traded goods and services do not fully reflect environmental costs and benefits, international trade may not always promote better utilisation of environmental resources. Moreover, while fish export trade captures the degree to which an economy is integrated with the international economy, it does not show environmental effects (depletion, destruction) associated with particular abuse.

As it happens, and despite contributions from the fisheries sector, not much positive impact upon the living conditions of small-scale fishers in Uganda has been achieved. These are the people who occupy a position near the bottom of the income scale, yet form the primary source of the big earnings from fish by

government. Livelihoods are meagre for a variety of socio-economic and environmental reasons that policy makers are only now beginning to recognise. Notable among other reasons is the fish export drive on an almost 'open access' resource, which is resulting in over-fishing of the Lake Victoria fisheries and dwindling fish stocks, poor catch, and a perpetual cycle of poverty among fishers. The growth in global demand for fish resulting from population growth and increased income in developed economies is exerting pressure on a finite size of fishery resources to yield ever-increasing quantities. Terms of trade on the international market have been moving in favour of fish exporters, offering developing countries greater opportunities to earn foreign exchange (Megapesca, 1997). This income can enable them to pursue development and improve their welfare but equally, exporting fish can rob needy people, including children of a traditionally low-cost but nutritious food thus threatening the livelihoods of small-scale fishing communities. Export trade can equally put disastrous stress on the environment from which the resources are generated.

Besides, more than half of all international trade involves exchanges of the same goods, which suggests there is little or no comparative advantage involved yet trade should be useful where gains from comparative advantage are real. To be fair and economically efficient, trade must be carried out within a clear framework of rules that internalise total costs (production, social and environmental costs, including the full costs of transport); and manage balanced trade relations. Free (unregulated) trade leads to competition between localities in need of jobs to reduce costs of local production by suppressing wages and allowing maximum externalisation of environmental, social, and even production costs. This is both inefficient and highly damaging to the environment and to social standards. It is against this background, that this study investigated the implications of the fish export trade on the fisherfolk communities and the sustainability of the fisheries of Lake Victoria.

1.3.3. SOCIO-ECONOMIC IMPORTANCE OF THE FISHERIES INDUSTRY

Fishing, fish processing and fish trading have provided the basis for food security, employment income and cultural traditions in coastal and inland communities for centuries (FAO, 1995a). Fish are an important element of the human food supply, and fishing is an important factor in global employment. Current harvest trends and fishery conditions put both of these at risk. Fish account for roughly one fifth of all animal protein in the human diet, and around 1 billion people rely on fish as their primary protein source. Indeed, production of fish products is far greater than global production of poultry, beef, or pork. However, new projections suggest that the contribution of fish to the global food supply is likely to decrease in the next two decades as demand for fish increases and production flags (Gleick, 1993). Currently, some 80 million tonnes of fish are available each year for direct human consumption. FAO expects demand to increase to 110 to 120 million tonnes in 2010 as world population grows (FAO, 1997).

According to Rothschild (1996) not all fish are eaten fresh: much of what is taken from the waters is frozen into large blocks for further processing or later use. Furthermore, over the years fish have been preserved by pickling, drying, smoking, and salting. Today much of the world catch (ca. 40 %) is not directly used as human food. It is converted in what is a major global industry, into fish meal and fish oil, chiefly for feeding livestock and as a food source for aquaculture (the 'farming' of fish under controlled conditions). For example, the export of fishmeal to China has risen steeply in recent years to satisfy the demands of a very large and growing aquaculture industry. The world demand for fish and fish products by the developed economies is ever growing. This has far-reaching implications on the overall balance of trade and domestic consumption requirements for small-scale fishers from less developed economies, with the emerging pattern of fish export trade.

Fish is an important traditional food item in most Sub-Saharan African countries, providing about 20 percent of total protein intake (FAO, 1996). It is highly nutritious as well as a valuable supplement in diets lacking essential vitamins and minerals for poor communities in Africa. Fish is marketed fresh, smoked, dried, salted or frozen, and is distributed primarily through informal channels. With the exception of limited quantities of Nile perch exported from Lake Victoria, the overall inland production is consumed in the Region, providing nearly half of local supply (some 3.3 million tonnes) (ibid). Because African consumers

prefer fresh fish it attracts a better price. It is generally marketed only near production centres although traders will distribute fresh fish to most urban centres accessible by road. The most important traditional fish preservation technique in Africa is smoke drying. Depending on the market, the fish is dried to different moisture levels. A hard-dried product takes up to three days of hot smoking but may keep for several months, allowing for long distance trading. There is active intra-regional trade in traditional smoked/dried fish (ibid).

In Uganda, fish is the preferred source of animal protein with 70 per cent of the production consumed domestically. Fish represents about 60 per cent of the animal protein intake. The per capita consumption of fish on average is 12.5 kg per year, although an average figure of 38 kg is characteristic of fisher-folk communities within the radius of 35 km from the lake (SEDAWOG, 1999). Compared to the current per caput consumption for sub-Saharan Region of 6.8 kg/person/year this is relatively higher, and almost equal to the world's figure of 13.6 kg (FAO, 1996). Fish is now Uganda's most important non-traditional export with annual volume of about 55,000 tonnes and estimated earnings of US $ 60-80 million. More than 700,000 people depend directly or indirectly on the fish industry in Uganda. These include: fishermen, fishmongers, fish processors, fish exporters, wholesalers and retailers, and the local administration in the districts, which collects taxes on landing sites and markets (East African Newspaper, 1999).

The fisheries sector is an important source of employment and income for over 120 million people worldwide (FAO, 1996). Fisheries exports have increased in importance in many developing countries. For example, in Uganda, industrial fish processing exporters have entered the market recently, being attracted by the growing international market of Europe, the Middle East, the Far East, USA and other developed economies. Their activities include buying fish and fish production either directly or through sub-contracting with fishing enterprises; fish handling, storage and transport of fish; fish clearing and filleting and for freezing or curing in the factory; fish marketing, including market procurement in the countries of destination.

1.3.4. MISMANAGEMENT AND UNSUSTAINABLE FISHING PRACTICES: A POTENTIAL THREAT TO THE FISHERIES RESOURCES.

Reynolds and Greboval (1988) indicated that due to the Nile perch fishery more people were eating more fish in more places than was ever the case under the previous fishery regime. Recent studies by Odongkara and Okaronon (1997) however, suggest the contrary. Moreover, government statistics indicate the falling regional exports (FAO, 1996). The increasingly destructive practices in the fishing industry are affecting the sustainability of the fisheries resources.
Weber (1992) examines the ecological, social and economic crisis in world fisheries in his thesis on: "sweeping changes in ocean fisheries management needed to feed world's growing population and save fishing communities". The author argues that mismanagement has caused recent drops in the world marine fish catch, yet experts say total catch could increase by 20 million tons (25%) to meet growing world needs. The author further describes a half-century of unsustainable fishing practices, reliance on exploitative technologies, and self-defeating government policies. Weber states,

> *"This is a global problem that has already caused armed confrontations between fishing nations, gunfire between fishers, and hunger in the developing world. If current mismanagement continues, we can expect a future in which millions of fishers are out of work. A future in which major fish consumers—especially in the developing world—lose access to their main source of protein. A future in which traditional fishing cultures from Nova Scotia to Malaysia disappear (Weber, 1992:16)."*

After decades of rapid growth the marine catch has stagnated or fallen in all but two of the world's fifteen major fisheries. Worldwide the marine catch is down five percent since 1989. For the first time since World War II, the fish catch has failed to stay ahead of population increase. The current world crisis in marine fisheries is a clear-cut global example of the consequences of violating a principle of sustainability: if we harvest more than nature can replenish the resource is diminished.

The resource we are overdrawing is a big one. Marine fish and shellfish provide nearly 6 percent of the world's protein intake, and 16 percent of the animal protein intake. For some 200 million people around the world, especially in coastal and island regions, fishing and fish-related industries are the primary means of support.

In the final analysis, Weber describes steps that could allow fisheries to continue to meet food needs in developing countries for the next 20 to 30 years as well as maintain cultural diversity and the stability of coastal communities that depend on fishing. Central tenets are rehabilitation of depleted fisheries, environmental protection, and community-based management.
To this point, it suffices to say that the problems pertaining to the sustainability of Lake Victoria are not far removed from those that have affected and crippled the world fisheries. The foregoing argument serves to provide a basis for the comprehension of the fundamental issues among the fishers and the global trade for Nile perch on Lake Victoria, Uganda. This would provide useful information for policy intervention while there is time to intervene. Therefore, this study was timely in that it looked at the socio-economic benefits and problems pertaining to the Nile perch fishery in the Lake Victoria region of Uganda, among other issues of relevance.

1.3.5. THE NEED TO SUPPORT SMALL-SCALE POOR FISHERS

The FAO World Food Summit in November 1996 (NGO's and Peoples' Organizations) put special emphasis on the need for policies to promote and protect the rights of small-scale and subsistence fishing communities as a strategy for addressing food and livelihood security for the poor (SD Dimensions, 1998).

In addition, it is now certain that fishing policy can no longer be made without regard for its social impacts. Greater recognition and support of small-scale fisheries and fishing communities is imperative. Costanza *et al* (1991) has had this to say:

> *"Humans have a special place in the system because they are responsible for understanding their own role in the larger system and managing it for sustainability. A necessary condition for sustainability is that processes and functions of natural capital are supported, rather than disrupted by feedbacks from society. Many resource use problems that currently exist can be traced in part to some of the same elements that we assign to cultural capital, e.g., differences in religion, ethics, cultural diversity, and social institutions".*

There is need to integrate human resource flows within ecosystems in a synergistic fashion. Combining knowledge of cultural self-regulatory patterns, such as those discussed on common property resources with improved understanding of self-organizing principles in ecosystems could lead us towards sustainable solutions.

Peter Weber of the World-Watch Institute makes a strong argument for public policies in support of small-scale and traditional fishers (Weber, 1992). Of the world's 15 to 21 million fishers, over 90 per cent are small-scale fishers, who use traditional equipment or operate small, relatively modern boats. This sector of the world's fishing industry has about the same capacity to bring in fish as the one per cent (200,000 to 300,000) of fishers who work in large-scale industrial operations. Weber points out that small-scale fishers who are the mainstay of local communities offer a number of clear advantages. To catch a given amount of fish, small-scale fishers and women tend to employ more people, produce less waste, require less capital and support a diversity of fisher-folk communities. On the other hand, if governments continue to favour large-scale industrial-style fishing, millions of small-scale fishers and their communities are at risk and fish catches will increasingly serve only the affluent.

In Uganda, the rapidly progressing fishing technology and differential access to investment funds as well as promotional or even laissez-faire fisheries policies have led to a dualistic form of coexistence of industrial fish processors side by side with small-scale fishers. Little attention is focused onto the developments in terms of welfare of fishers by government, more or less deliberately with the assumption that the small-scale

fishers are a transitory feature of fisheries development. Instead, more attention has been focused on fish export trade development with hope that the linkages and employment opportunities opened up by fisheries development and the general economic growth would trickle down and revive stagnating fisher-folk communities. In spite of this, the fundamental problem of small-scale fishers in Uganda is still their persisting absolute and relative poverty despite progress in fisheries development and economic growth in recent years. Thus, there is a need to put small-scale fisheries in the right perspective and examine the available policy options for improving their socio-economic condition and maximising their overall contribution to national economic and social development. Such efforts however, would require a thorough understanding of the factors responsible for the currently depressed situation and the existing potential for further development. Moreover, improving the standard of living of small-scale fishers is but one of the objectives in fisheries policy. Other often-competing objectives are employment creation, increase in fish supplies for domestic consumption and exports, and maximisation of the economic surplus generated by the fishery. Thus, given the overwhelming reports about the persistence of destructive fishing practices among fishers and deteriorating socio-economic conditions of the fisher-folk communities, this study sought to evaluate the underlying factors and seek out ways for sustainable management of the Lake Victoria fisheries.

1.3.6. THE CONCEPT OF SUSTAINABLE DEVELOPMENT- THE CASE OF WORLD FISHERIES

Sustainable development has been defined as:

> *"The management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development conserves land, water, plant and animal resources; is environmentally non-degrading, technically appropriate, economically viable, and, socially acceptable" (FAO, 1996).*

Goodland and Daly (1996) have also defined sustainable development as "development, without growth in through-put of matter and energy beyond regenerative or absorptive capacities". Notwithstanding these definitions, the world fish catch statistics according to FAO (1995b) shows that more than four decades of increasing fishing pressure have left many major fish stocks depleted or in decline. Despite the increasing attention of policy makers and industry representatives, progress toward better management of fish harvests has been slow, and the government policies and market forces behind the trend toward global over-fishing remain largely in place.

Over-fishing was recognized as an international problem as far back as the early 1900s. Prior to the 1950s however, the problem was confined to relatively few regions such as the North Atlantic, the North Pacific, and the Mediterranean Sea. With the expansion of global fishing activities in the 1950s, the exploitation of global fish stocks has followed a predictable pattern, progressing across the oceans as each region in turn reaches its maximum productivity and then begins to decline. The oceans were long considered a common resource open to anyone who could use them. Fishers from all around the world continuously increased their take until the common resource became depleted. Table 1 illustrates the depth of the problem.

Table 1 shows the world commercially exploited fish stocks that have been fished to the level of collapse. There are further cases that attest to the deplorable state of stocks that have been either fully fished, depleted, or are currently in recovery in various fishing sectors of the Atlantic and Pacific Oceans as of 1992. They range from a high of 100 percent depletion in the Northwest sector of the Pacific Ocean (the Asian coast) to a 29 percent depletion rate of the fish stock in the Eastern Central Atlantic Ocean (Abramovitz, 1996). This same 'boom-bust' cycle of exploitation has typified the exploitation of fisheries resources elsewhere in the world and others of the world's renewable resources.

Species	Peak Year	Peak Catch	1992 Catch	Decline in Million Tons	
Pacific herring	1964	0.7	0.2	0.5	-71%
Atlantic herring	1966	4.1	1.5	2.6	-63%
Atlantic cod	1968	3.9	1.2	2.7	-69%
Southern African pilchard	1968	1.7	0.1	1.6	-94%
Haddock	1969	1.0	0.2	0.8	-80%
Peruvian anchovy*	1970	13.1	5.5	7.6	-58%
Polar cod	1971	0.35	0.02	0.33	-94%
Cape hake	1972	1.1	0.2	0.9	-82%
Silver hake	1973	0.43	0.05	0.38	-88%
Greater yellow croaker	1974	0.20	0.04	0.16	-80%
Atlantic redfish	1976	0.7	0.3	0.4	-57%
Cape horse mackerel	1977	0.7	0.4	0.3	-43%
Chub mackerel	1978	3.4	0.9	2.5	-74%
Blue whiting	1980	1.1	0.5	0.6	-55%
South American pilchard	1985	6.5	3.1	3.4	-52%
Alaska pollock	1986	6.8	0.5	1.8	-26%
North Pacific hake	1987	0.30	0.06	0.24	-80%
Japanese pilchard	1988	5.4	2.5	2.9	-54%
TOTALS		51.48	21.77	29.71	-58%

Table 1: Collapse of the world's fisheries: Fishery Declines of More than 100,000 Tonnes from Peak Year to 1992. Source: Food and Agricultural Organization (FAO) of the United Nations. The State of World Fisheries and Aquaculture 1996. FAO, Rome, 1997. p. 36. * The catch of the Peruvian anchovy hit a low of 94,000 tons in 1994, less than one percent of the 1970 level, before climbing up to the 1992 level.

1.3.6.1. Over-fishing: an overview of the problem

The "Tragedy of the Commons" is the most common analytical model used to describe the world fisheries problems. The term refers to an influential 'Tragedy of the Commons' by Garrett Hardin (1968) in the journal, Science. Briefly, the Tragedy of the Commons tells the story of a group of cow-herders working on a common pasture. The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality? At this point, the inherent logic of the commons remorselessly generates tragedy. As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks. "What is the utility to me of adding one more animal to my herd?" This utility has one negative and one positive component.

The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly + 1. The negative component is a function of the additional overgrazing created by one more animal. Since however, all the herdsmen shared the effects of overgrazing the negative utility for any particular decision-making herdsman is only a

fraction of -1. Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit in a world that is limited. Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all. The point is that because of open access, no one is able to exclude or prohibit individuals from increasing their use of the resource, which they do because they think it is individually profitable, even though their actions result in negative effects (externalities) for other users.

Indubitably, the 'Tragedy of the Commons' model does not completely explain the range of problems facing the world's fisheries. Over-fishing has been one of the major, if not, the primary impetus to the global fisheries problem. There are however, other causes of fishery depletion. These include environmental degradation of coastal land and its subsequent pollution of coastal waterways, and/or improper government or institutional responses to the fisheries problems. The most critical case in this discussion is that the 'Tragedy of the Commons' model represents an adequate foundation for the comprehension of the world's fishery problems. How the situation became so grave is what is described in this section. That is, through the evolution of the current "Tragedy of the Commons" fisheries problems faced by the world today and the human activities that exacerbate them. One is an open seas tragedy, the other is a coastal waters tragedy, and then we lastly look at the "Lake Victoria tragedy".

1.3.6.2. The open seas tragedy

The concept of fisheries management on a large scale has been lacking throughout history. This lack of management is commonly attributed to two complementary sources. That is, an abundance of fish in the seemingly endless oceans and open access to the high seas guaranteed by a convergence of opinion around the *Grotian notion*. The notion stipulated that the oceans were a common property for use by all to the exclusion of none. Thus, for close to 400 years the world's fisheries were open pickings to any one with the appropriate vessels and fishing gear. The traditional fishing states (those with industrial capacity) started building fishing vessels that could and did fish around the world. By the middle of the twentieth century the fishing excesses started taking their toll. Whale stocks were depleted to the point that many species were on the verge of extinction. Various states started noticing problems with the fishing stocks off their coastal waters.

Based on these troubling trends in the world's fisheries, the global community started responding at the end of World War II. The International Convention for the Regulation of Whaling (1946) was negotiated and signed. A global conference on over-fishing was held in London in 1947, and in 1947 Chile and Peru were the first states to claim a 200-mile jurisdiction over their coastal waters. This latter idea was tossed around for the next two decades. By the middle of the 1970s and concurrent with the negotiations of the *Third UN Conference on the Law of the Sea*, most coastal states had asserted similar jurisdiction. The practice was eventually codified in the final draft of the Law of the Sea (1982), and changed the long-standing open seas regime into a bifurcated coastal seas private property, and open seas common property regime.

With the advent of the 200-miles, Exclusive Economic Zone (EEZ), many fishing fleets were compelled to change their fishing strategies and move to the high seas, thus creating more stress on those fisheries. Changes in fishing technology such as the creation of synthetic nets and electronic or sonar fish detection equipment made the task economically viable but contributed mightily to the continuation of the open seas tragedy. Drift-net fishing, a practice where long nets are placed around the high seas especially in the South Pacific in order to scoop up all the marine life in their wake, leave the areas they harvest barren. Reporting on the seriousness of the drift nets, Norse Elliot had this to say,

> *"Industrial fleets in the North Pacific have employed massive drift nets to capture squid and tuna, using up to 3.5 million kilometers of synthetic netting per annum- enough to circle the globe 88 times!*

Not surprisingly, some 40 percent of the catch netted in these "wall of death" drift-nets is reportedly discarded as by-catch, including up to 200 non-target species" (Norse, 1993:93).

1.3.6.3. The coastal seas tragedy

Despite the move to a private property regime, the coastal seas around the world continued experiencing problems associated with the 'Tragedy of the Commons' model. They did so because states that now had control of their coastal water resources neglected to implement effective fisheries management policies. The FAO estimated that by 1992 only three states (Australia, New Zealand, and Namibia) had organized effective controls over their domestic fishers. So domestic fishers picked up where the foreign fishers left off. They continued unsustainable fishing practices.

Even in instances where governments have intervened, their policies for fisheries have all the time, for some reason failed. A good example is the Canadian government's failed attempt to manage the Northern Cod fisheries off the coast of Newfoundland. Hutchings and Myers (1994: 2126-2146) show how reliance on the 'Tragedy of the Commons' model led to overly simplified accounts of both problem and solutions. Ultimately, in the rush to manage the cod crisis, the scientific community over-estimated the Cod population and subsequently allowed catch quotas too high for sustainability (McCay and Finlayson, 1995).

Furthermore, there are instances where government policies were in place but were ignored or evaded by the local fishing communities. The case of the small-scale shrimp fishery in two Mexican communities is such an example described by Donald (1996). During the 1990's the Mexican government attempted to regulate the shrimp industry and along the way tried to cut out the traditional village shrimpers. Their response to the change in policy was to continue their shrimping activities albeit illegally, even in the off-season, thus contributing to the fisheries problems in the area.

Depletion of the coastal fisheries along the coasts of economically developing states is furthered by population pressures and economic stagnation that lead more and more people to small-scale subsistence fishing along the coast. On a global scale, precious little had been done to thwart the potential catastrophe until recently.

1.3.6.4. The Lake Victoria tragedy.

Undoubtedly, the same concept of fishing for world fisheries of marine origin generally relates to inland fisheries like the Lake Victoria fisheries. Recent events in the lake region perfectly link to the 'Tragedy of the Commons' model concept of depletion of resources. Lake Victoria fisheries are already in crisis. Decades of unsustainable fishing practices characterized by the 'Tragedy of the Commons' model have resulted into fisheries depletion. The social and economic consequences are enormous. Loss of jobs for fishers is the likely outcome, as for example the case was in eastern Canada and the United States.

Lake Victoria fisheries have recently been plagued with an array of conflicts of ecological, economic, and social origin, which threaten its sustainability. For example, the globalisation of its fisheries and the pressure from domestic demand on a limited resource coupled with over-fishing is leading to economic ruin for the fisher-folk communities. The governmental restrictions on gear, catch, and seasons are normally criticised as laissez faire, and fishers are overexploiting the once-productive resource their livelihoods depend on. Freshwater fisheries in sub-Saharan Africa are almost entirely small-scale fisheries. There has been a net increase in inland fish production during the last decade from 1.2 million tonnes in 1980 to 1.66 million tonnes in 1994. The main producers are Uganda, Kenya, Tanzania, Zaire and Nigeria, which contribute 70 per cent of total harvests. Lake Victoria alone produces a quarter of total African Inland production (FAO, 1996).

Lake Victoria however, is faced with such types of threats as mentioned in the foregoing pages making it highly fragile and requiring careful management through appropriate policies and regulations. Particularly, Lake Victoria has been going through major ecological and man-made changes, which have seen the

fisheries reduce from a diversity of species to currently, three dominating species namely the Nile perch, Tilapia and *Rastrineobola argentea*, locally known as *mukene* (Odongkara and Okaronon, 1997)

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With over-fishing and increased economic activities threatening the depletion of the fish stock in Lake Victoria, there is increasing need than ever before for attention to be focused onto the underlying forces behind the threat. The combination of rising fish prices due to increasing world demand and scarcity due to over-fishing can make fish unaffordable to increasing numbers of poor people. The underlying threats to the fisheries are always biological and/or environmental, economical, and social. There is strong evidence that Nile perch that forms the main fishery (over 70 %) is being over-fished. The average size of landed fish has declined from over 50 kg in 1980, to less than 10 kg in 1996 (Mugabe *et al*, 1999). Catch rates are also reported to be in decline. For example in Uganda, between 1993 and 1998 the commercial fish catch fell by over 20 per cent (Table 5). The major problem is that there is still no systematic approach to the management of the fishery. There is a critical lack of information about the fishery (e.g. numbers of boats, fishing gear, landings and utilization of the catch), which would be the first step in establishing a management system. A crash in the fishery would undoubtedly have severe consequences for the estimated one million people that depend on Nile perch fishery for their livelihood in Uganda.

1.3.6.5. Summary

The foregoing discussion plainly highlights the seriousness of the fish stocks depletion among the world's major fisheries. The once abundant North Atlantic cod may be commercially extinct. Canada has closed its cod fishery to allow the fish to repopulate and practically putting 30,000 people out of work. Western Atlantic blue fin tuna are down to only 10 percent of their former abundance. Now each blue fin commands $270 per kilogram in Japan - a bounty that only adds to the desire to hunt it down. Oysters in the Chesapeake Bay are 4 percent of former levels. Has Lake Victoria's Nile perch fishery fallen into the same trap, or, is it drifting towards the same trend of affairs?

Sustainable development is about achieving the sustained economic growth needed to meet human needs, improve living standards, and provide the financial resources that make environmental protection possible. However, little of the growth of the past twenty years has improved the quality of human life. Most of the benefits have gone to the very wealthy; any remainder of the benefits has been offset by the costs of resource depletion, social stress, and environmental health and other problems caused by growth. Redefining sustainable development, clearly it should be about creating:

1. Sustainable economics that equitably meet human needs without extracting resource inputs or expelling wastes in excess of the environment's regenerative capacity, and;
2. Sustainable human institutions that assure both security and opportunity for social, intellectual, and spiritual growth.

With conflicts of domestic consumption and global trade characterizing the Nile perch fishery in Lake Victoria, the question of resource sustainability is more serious than ever before. Lessons learnt from community-run fisheries provide a good basis for examining the Nile perch fishery. It is a fact that a number of fishing communities have avoided self-destructive overexploitation for decades with minimal, if any, governmental regulation (Donald, 1996).

The diverse literature drawn from the world's heavily exploited fisheries experiences and lessons learnt from community-run fisheries elsewhere in the world was to help in the comprehension and the assessment of the fisheries sustainability issues on Lake Victoria, and to provide a framework for sustainable management and development of the fishery resource through this study.

1.4. OBJECTIVES

The main objective of this thesis is to evaluate the socio-economic implications of the fish processing and export industry on the sustainability of Lake Victoria fisheries in Uganda by:

1. Analysing the socio-economic characteristics of fishers that influence the sustainable management of Lake Victoria fisheries.
2. Examining the effect of the economic characteristics of the industrial fish processors such as quantities of fish processed, fish supply arrangements, price of fish and marketability on: the fisheries activities, food security, employment opportunities, investments by the fishers and living conditions of fisher-folk communities.
3. Assessing the attitudes of fishers and the industrial fish processors towards the sustainable management of Lake Victoria fisheries.
4. Discussing the implications of the findings for policy and additional research necessary to improve the contribution of fish export trade to the welfare of fisher-folk communities and for the sustainable management of Lake Victoria fisheries.

1.5. THE IMPORTANCE OF THIS STUDY

There is generally inadequate information on socio-economics of fisher-folk communities in Uganda. The last comprehensive socio-economic survey on fishing communities by Uganda Fisheries Department (UFD) was done in 1990 based on the frame survey results of that time (Kirema-Mukasa and Reynolds, 1991) and was basically descriptive. Moreover, the time lag is too long for current decisions given that many changes have taken place since in the Lake Victoria fisheries (like the Nile perch export trade boom and establishment of fish processing factories).

Research on the general socio-economics of the Lake Victoria fisher-folk communities and their fisheries has recently been enhanced through the Lake Victoria Environmental Management Project (LVEMP) by the Fisheries Research Programmes at FIRI, in Jinja. Their recent socio-economic studies mainly have concentrated on characterizing the fisheries of the Lake Victoria region and their fisher-folk communities (SEDAWOG, 1999). This study will go far to determine the implications of these socio-economic characteristics of the fish processing industry and fishers on the general health of the Lake Victoria fisheries. The information thereof will be generally utilised by LVEMP, Lake Victoria Fisheries Organization (LVFO) and Lake Victoria Fisheries Research Project (LVFRP) in the management programmes, among others.

It is the policy of the Uganda Government to modernise agriculture, raise the quality and consequently increase the quantity of agricultural produce. Research on production and distribution from various sectors is part of the strategy to reduce poverty among the population. Apart from the crop sector, the country has potential to do this from the fisheries sector. This research will generate socio-demographic information (to government and industrial fish processors) on fishing communities, indicating processes leading to modernisation of the fisheries sector and the implications on Lake Victoria fisheries. In addition, it will provide research-based suggestions for alleviating current fisheries management problems, development and conservation difficulties on Lake Victoria.

Fish exports from Uganda have increased to a level where the commodity currently ranks between second and third to coffee in the country's foreign exchange earnings. A large part of this export volume is due to Nile perch exports to the European countries as well as exports of other fish species to neighbouring countries. It is yet to be established however, to what extent internal needs are balanced against export diversification. This research will link policy makers and implementers with researchers on issues of fisheries socio-economic characteristics for local management, development and conservation. The study will further provide an understanding of the socio-economic dynamics within the Lake Victoria basin. The industrial fish processors will find this work a good piece of reference useful in their future operations.

2 LITERATURE REVIEW

2.1. INTRODUCTION

There are numerous studies on the technical and biological aspects of the Ugandan Lake Victoria fisheries. In general very few studies, however, have investigated the socio-economics and management of the fisheries industry and even fewer, attempt to integrate the economic and biological aspects of the fishery and determine the prevailing allocation of resources. Increased population and economic activities in the countries of the Lake Victoria region is resulting in the gradual spread of over-fishing. This is manifested in generally observed production loss, diminishing revenues (as the share of most valuable species decreases), the use of redundant inputs, and decreasing profitability (Greboval, 1989).

This chapter is concerned with introducing the reader to the literature, which is available on the issues of fisheries resource management, development and conservation. The following areas have been specially treated: The historical background of Nile perch fishery, economic characteristics of fish export trade and socio-economic characteristics of small scale fishers; economic processes of fish export trade; socio-economic impact of fish export trade on fisher-folk communities and the fisheries.

2.2. THE HISTORICAL BACKGROUND OF LAKE VICTORIA'S NILE PERCH FISHERY

2.2.1. AN OVERVIEW OF THE NILE PERCH ECOLOGY

The Nile perch *Lates niloticus* ('*mputa*') was reportedly transplanted from Lake Albert into Lake Kyoga and Victoria in the late 1950s and early 1960 respectively (Hamblyn, 1960). The major aim was to increase fish production of these Lakes into a larger table fish (Acere, 1985). The question of whether or not to introduce this large, predatory fish sparked considerable controversy (Anderson, 1961; Fryer, 1960; Jackson, 1971; Ogutu-Ohwayo, 1985; Ribbink, 1987; Van Sommeren, 1963). By the end of the 1970s, following the enormous and sudden expansion of this stock, an artisanal fishery for Nile perch had rapidly developed.

Currently, the Nile perch stock is the dominant commercial species and the most important export fish commodity from Uganda (Ogutu-Ohwayo, 1998). Total yield in the Ugandan region of the Lake Victoria increased from 17,000 tonnes in 1981 to 132,000 tonnes by 1989. This increase was naturally attributed to the increase in contribution of Nile perch from 14,000 tonnes in 1983 to 101,000 tonnes in 1989.

So far, considerable changes have taken place in fishery yield, and in life history characteristics of the Nile perch itself ever since the predation got established in the lakes Victoria and Kyoga. Before establishment of the Nile perch, up to 14 fish species occurred in the commercial catches. After its establishment, the number of exploited fish species decreased to three, Nile perch, Nile tilapia and one native species, *Rastrineobola argentea* ('*mukene*') as a result of the predatory behaviour of Nile perch (Fryer, 1986). *Haplochromines* prey, were particularly very vulnerable to Nile perch in the new rich habitats at that time. After *haplochromines* were depleted, the average weight of the fish decreased and they are now lighter than even in their original habitat (Ogari, 1985; Payne, 1987; Ogutu-Ohwayo 1998).

According to Ogutu-Ohwayo (1985), male Nile perch mature at 50-55 cm total length and females at 90-100 cm. The species has a very high reproductive potential. Females produce 3 to 18 million eggs depending on size. There are more males than females in Lake Victoria than was the case when food was abundant. Although the reproductive potential of Nile perch does not seem threatened by changes in prey supply due to the very large numbers of eggs produced, the male biased sex ratio may have some effects on the stocks. (Additional information on the biology and fisheries of the Nile perch is in Appendix E of this thesis). The foregoing discussion demonstrates that Nile perch may not sustain the very high yields realised soon after its establishment in Lake Victoria if the very high fishing

pressure on the species continues. The ever-increasing human population has attributed the high fishing pressure to the very high demand for fish and the fish export drive from fish processing plants (Abila and Jansen, 1997). This has raised questions of whether Lake Victoria is sufficiently bountiful to meet the needs as per demand, and how the Nile perch fishery can be best managed, allocated and conserved.

2.2.2. THE NILE PERCH FISHERY EXPLOITATION

Characteristically, most small-scale fisheries are overly exploited as a result of a build up of effort and the introduction of new technology in open-access fisheries according to Smith (1979). The author argues that there is a potential threat of over-exploitation, especially in a situation where you have a build-up of fishing effort in combination with environmental changes. In Lake Victoria, increased effort has resulted from the use of more effective modern fishing gears and the incentive to fish provided by the further development of commercial marketing networks. For example, nylon gillnets are now the dominant gear having replaced traditional gears over the last 30 years.

Studies indicate that the rapid proliferation of the Nile perch industry started in Kenyan part of Lake Victoria about 15-20 years after Nile perch was first introduced in the lake; then Uganda and Tanzania followed. In Uganda, as well as in Tanzania, less than 1,000 tonnes of Nile perch was landed in 1981. In 1986, according to government statistics, 41,000 metric tonnes of Nile perch were caught in Uganda (UFD, 1990). In 1989, the total production of Nile perch in the three countries was 325,000 tonnes (Greboval and Mannini, 1992). The production of this fish in the three countries in 1993 was close to 363,000 tonnes, with 27 percent landed in Uganda (Goulding, 1997).

The large increase in demand for Nile perch as the market expanded outside the region and abroad triggered a swift response by fishing practices, labour, and investment. By 1985, most fishers had rapidly switched from traditional target species to Nile perch and Nile tilapia (Okaronon *et al*, 1985). While Nile perch was caught mostly by tilapia gear in 1981, larger mesh sizes aimed specifically at Nile perch were becoming predominant by 1983. More investors from other sectors of the economy were being pulled in. The fishing effort in the Uganda sector of the lake increased from 3,200 canoes in 1972 to 4,500 in 1988 and 8,000 by 1990 (Okaronon, 1994). About 10,000 canoes were estimated to be operating on the lake in 1998 (Kamanyi *et al*, 1998). This increase in effort among other causes is thought to be responsible for the present decline in fishery yield by most workers.

Employment on the whole lake, including ancillary activities rose from 158,000 people before the Nile perch fishery to 422,000 people by 1992 and was believed to have increased to about 700,000 by 1999 (East African Newspaper, 1999). Earnings per fisher also increased by $ 473.00 per year adjusted for inflation (Reynolds *et al.* 1992). This whole process occurred overwhelmingly as a result of the spontaneous working out of different types of 'market forces', and with only minimal state involvement.

The investment policies in Uganda have stimulated the establishment of fish processing factories with various positive and negative consequences (Odongkara and Okaronon, 1997). In response, important questions have been raised locally about the outcomes and the sustainability of this chain of development. In particular, debates are about its relation to local diet and food security, about the relative distribution of returns between the main groups of actors and about its physical sustainability. The first reports of declining unit catches in the Ugandan section of the lake date from 1994 (Okaronon, 1994).

2.2.3. THE CASE OF THE TANZANIA NILE PERCH FISHERY

Gibbon presents a typical situation of the processes underlying the developments of the Nile perch fishery with particular emphasis on the marketing systems and the sustainability of the Lake Victoria fishery resource. As Gibbon (1997) stated:

> *"The obvious difference between fish and most other foodstuffs is that fish are a non-renewable resource: the story of the industrialisation of the fishing industry is therefore simultaneously the story*

of the systematic depletion of international fish stocks. This predisposition and the industry responses to it lay at the heart of understanding the concepts underlying the current industrialisation of the fishing industry".

Relating to the same situation of boom-bust fisheries that have characterized most of the world commercial fisheries, the author warns that the Nile perch fishery of Lake Victoria is in danger of collapse if intervention does not come in time. Gibbon spells out that although the fishery was already expanding rapidly previous to 1990-91, a new conjuncture was unveiled by the quantitative and qualitative transformation in capital flows after this date. That by 1996 the factories had invested about US $ 10 million in plant, supply and back-up systems. There had also been significant investment by many "artisanal" vessel-owners themselves, independently of the gear and engines supplied to them by the factories. The sharply rising investment levels were accompanied by a steep increase in the number of full-time equivalent fishers and auxiliaries (except "artisanal" processors). Thus, there was about 50 per cent increase in the Nile perch catch over the period 1992-96 and a more than corresponding increase in total real income to the artisanal sector as a whole. Much of this income had been ploughed back into the industry.

When relating to the conditions of its sustainability, both in terms of output, cost structure and demand, it is reasonable to consider this development as part of a boom-bust cycle. On the output side, however, the absence of serious biomass studies makes conclusive pronouncements impossible. Notwithstanding, the deployment of a larger and larger fishing fleet using intensified production methods and the practice of fishing on a 365-day year basis, together with consistent reports of falling unit productivity, suggests that generalized over-fishing may soon occur if it has not already begun. Localized over-fishing is already indisputable and the number of factories in Kenya is already falling. The major intricacies concern the nature of stocks outside the current range of the artisanal fleet and the nature of the additional investment needed to capture them. Large stocks may well exist, but given the artisanal fleet's basic restriction of working from land-based camps even investment in much larger outboard motors would not give dramatically greater access to them.

This raises the more general issue of the cost structure of the artisanal fishery on which no detailed study was undertaken. Yet those vessel owners who also had invested most heavily in engines were already complaining of lack of profitability even before the factories began their first serious and sustained campaign to drop prices in April 1996.

Indications from the fish traders (vessel owners) show that the economic rent is seriously falling with the build up of capacity and effort. This is already pointing to the consequences of the type of cost-structure, which will emerge as the fishery is forced into deeper waters. The addition of more engines will mean greater fuel consumption, and catches that will continue to fall (although at a slower rate than if the fishery remained inshore). The only possible compensating factor for the vessel owners in this context would be raising prices but it has no guarantee.

Even if the local demand situation around Mwanza stimulates the latter through the opening of additional plants, there is an absolute external limit on how high such prices may rise. This objective limit is set by the fact that there is no great room for improvement in Nile perch's international price. The stocks of fishes for which Nile perch is substituting are not likely to recover and the northern hemisphere demand for white fish is likely to increase, making Nile perch the only one remaining of a number of possible alternatives to cod. Moreover, the northern-hemisphere importers' interest in species like Nile perch is based solely on their ability to offset the tendency of the cod price to inexorably rise.

The 1980s "Southern Hake" boom in Chile is instructive in this connection. As prices to fishers spiralled in response to the construction of 30 local processing plants, and against a background of rapidly depleting catches and a steadily rising cost structure, efforts by exporters to push up international prices led to the main northern hemisphere importers substituting Namibian for Chilean Hake. Within a few years, 25 of the plants closed (Schurman, 1996). Current high levels of demand for Nile Perch could just as easily collapse should this same "scissors crisis" be repeated. Such a demand-side crisis could be postponed or averted to

the extent that strong counteracting pressures are present to contain it. These might include a strong state regulatory regime or self-imposed regulation by the processing factories to ensure that prices are reasonable and stable. In none of the different countries around the lake is there evidence of either.

2.3. CASES OF COMMUNITY-MANAGED FISHERIES

2.3.1. VALENCA, BRAZIL

The estuary fishery near Valenca, Brazil illustrates a vivid case of how external influence, in this case government intervention can disrupt otherwise previously stable community run fisheries. Thus, fishing communities can solve problems yet the solution can break down when governments ignore the forces that led to success. As John Cordell (1972) notes, the mixed-species fishery began nearly a century ago. At first, Valenca fishers fought over access to prime fishing spots. In addition, violence would often erupt when one type of gear became entangled with another as when mobile nets ran into stationary nets. Over time, local fishers came up with two harvesting arrangements to resolve these problems. To prevent one gear type from hampering another, they divided the estuary into different fishing zones with only one gear allowed in each zone. They assigned fishing spots by drawing lots to determine the order in which each fisher could use a particular spot.

After decades during which this arrangement operated successfully, the Brazilian government decided to "modernize" the Valenca fishery. The government made new nylon nets available to anyone who qualified for a bank loan arranged by the government. But local fishers did not qualify for the loan and did not have enough capital to purchase the nets on their own. A few wealthy individuals around Valenca did qualify for the loans and purchased the nylon nets. They hired men who had never fished the estuary before to fish using the nylon nets. The local fishers' management system crumbled as old and new fishers fought over fishing spots. Eventually the fishery was over-harvested and ultimately abandoned.

2.3.2. IVORY COAST-LAGOON FISHERIES

Panayatou (1982:48) relates an example of a contrast between an open-access fishery and a fishery with traditional fishing rights in two lagoons in Ivory Coast. In Lagoon Ebrie near Abidjan, traditional customary rights of fishers operating fixed gears broke down following the introduction of mobile gears such as purse seines, by outsiders (mainly town investors). The Ebrie fishery became overcapitalized and heavily over-exploited in both the biological and economic sense as was evidenced by the small size of fish caught and the relatively low incomes of fishers. The traditional fishers were reported to be abandoning the fishery for better employment opportunities in the town while people with lower opportunity costs from neighbouring countries (Mali and Upper Volta) were entering the fishery to earn a subsistence, thus perpetuating a situation of surplus fishing labour. In contrast, the rather isolated fishery of Lagoon Tagba, over one hundred kilometres from Abidjan remained under control by chiefs (fishing team leaders) who had knowledge of the biological features of the resource and were enforcing traditional regulations on mesh size and on fishing in spawning areas. Though several tribes operated on the lagoon, the limited migration of catfish (the main species exploited) permitted each community to manage its own portion of the lagoon.

In the late 1960s when fishers from neighbouring countries attempted to introduce purse seine fishing to the lagoon, a severe conflict arose between them and the local fishers. The foreigners were defeated. Thus, their territorial rights were jealously guarded, and the local fishers were reported to enjoy relatively high incomes and no surplus labour was to be found. The size of fish caught increased tremendously too.

2.4. WHAT CO-MANAGEMENT CAN OFFER

The most convincing body of evidence for human self-organizational ability may be found in the literature of common property resources (Berkes, 1986; Ostrom, 1990). The common property literature focuses on *institutions* rather than co-evolution or traditional ecological knowledge, but all three are no doubt interrelated toward the solution of the vexing common property dilemma. Considering that conventional

wisdom predicts the demise of any resource held in common (Hardin, 1968) a surprising number of cases exist in which users have been able to use shared resources such as grazing lands, forests, fish, wildlife and water sustainably. A number of long-enduring, self-organized and self-governed common property institutions have been analysed by Ostrom (1990). Examples include communal land tenure in high mountain meadows and forests in Torbel, Switzerland; common land management in Hirano and area villages in Japan; and the Huerta irrigation system in the Valencia area and elsewhere in Spain. From these and other cases, Ostrom (1990) has derived a set of conditions that lead to success (sustainability) in commons management, as opposed to the 'tragedy of the commons'.

Perhaps the main lesson from the common property literature is that given a resource management problem, a group of people often organize themselves to deal with it in a manner similar to the formation of a 'bucket brigade' to put out a fire in a rural neighbourhood. The evolution of rules and self-regulatory mechanisms within the group has adaptive significance for sustainability and survival. These common property institutions are found with all resource types, many of them non-traditional, covering a wide range of regions and cultures throughout the world. Specific institutions can arise in less than ten years and may endure over centuries (but evolve constantly). In these institutions, one of the critical variables is the number of functional units. Many simple common property systems involve on the order of one hundred users. More complex systems function with thousands if organized hierarchically as in some irrigation systems (Ostrom, 1990). Conceptually, it is not surprising that we find such self-organizing capabilities in human systems similar to those in ecosystems, because human systems are subsystems of ecosystems. But in practical terms, the adaptation of common property institutions for the solution of regional and international resource management problems can be challenging indeed.

2.5. ECONOMIC CHARACTERISTICS AND PROCESSES OF THE FISH EXPORT INDUSTRY

2.5.1 THE GROWING GLOBAL FISH DEMAND VERSUS DECLINING FISH PRODUCTION.

This section generally addresses the question of how the Nile perch production and marketing systems in Uganda and their international extensions relate to the economic and social characteristics of fishers, the spontaneously emerging marketing chains and private enterprises in the generally deregulated but still predominantly marginalized economies. Loftas (1996) reports that the global market share for fish has grown and the value and diversity of their products have increased, substantiating that the changing flow of trade is largely driven by demand in richer countries, which account for a substantial proportion of fish imports. The terms of trade have also been moving in favour of exporters, offering developing countries greater opportunities to earn foreign exchange.

The boom-bust cycle of the Nile perch fishery and its impacts on Lake Victoria fisher-folk communities has been a subject for a number of recent studies. For example, Reynolds and Greboval (1988) in their publication describe the events that have characterised the Nile perch fishery. They conclude that the rapid growth of the Nile perch fishery was favoured by a huge demand for Nile perch, which soon expanded beyond the three countries sharing the lake and to a market for the perch that developed quickly in the industrialised countries. In order to satisfy this market, processing factories were established along the shoreline of Lake Victoria in Kenya. These plants exported the Nile perch fillets to Europe, Middle East, Japan and USA in the early and mid-1980 and proved to be so profitable that more factories soon were set up in all the three countries. Jansen (1996) and Goulding (1997) on the other hand, have argued that the demand for Nile perch as evidenced by growing marketing chains is leading to a decline in the resource and threatening the food security of the people who depend on it. They particularly point out that there has been a rapid build-up of fish processing capacity around Lake Victoria as the international demand for Nile perch seems unlimited, and that most of the fish factories have the capacity to process more Nile perch than they are able to obtain. This has forced processors to start adjusting from the previously accepted minimum weight of 2 to 3 kg of Nile perch to lower weights, at times under 1 kg as a result of increased competition for wet fish by the plants. Almost all Nile perch of good quality above 2 kg is taken by factories for processing leaving juvenile Nile perch or rejects due to poor quality for the local markets. Jansen and Abila

(1997) further noted that even the frames (skeletons) of Nile perch, which previously were sold, processed and consumed in the local markets are now largely being processed into fish meal in Kenya. Due to lack of Nile perch, in recent years the processing factories have also started to fillet tilapia and to market this fish in the industrialized countries. The owners of the factories naturally hope that the demand for tilapia will take off in the same manner as it did for Nile perch. Moreover, *mukene* has also been subject to regional and international commercialisation. Special factories have been established to convert the sardine into fish meal for use in the broiler and animal fodder industry.

Thus all the three important fish species of Lake Victoria, which together make up 98 percent of the catch have become integrated into the global market. This will generally lead to increased exports that may cause further instability in the lake's fisheries and the entire ecosystem. The argument from the foregoing is that while increased participation in commercial markets can generate valuable foreign exchange for the country, global trade driven by market forces can also lead to intense competition and declining catch rates for traditional and small-scale fishers, and less food for protein-deficient poor communities. The combination of rising fish prices due to increasing world demand and scarcity due to over-fishing is making fish unaffordable to increasing numbers of poor people. Most of these research findings are based on studies on the Kenyan part of Lake Victoria and they may be a strong indicator to the trend of events on the Ugandan side of Lake Victoria, for which reason this study was undertaken.

2.5.2. MARKETS AND THE IMPACT OF GOVERNMENTS INTERVENTION

According to Weber (1992) the cost of fish in local marketplaces worldwide has risen dramatically. Low-income consumers are losing access to affordable fish as supplies tighten and affluent markets attract a larger and larger portion of the world fish supply. For example in Kerala, India's number one fishing state, prices for shrimp jumped from $50 a ton to $1,300 a ton between 1961 and 1981 because of the rise of commercial fishing. As a result, per person consumption of shrimp and other fishing products fell from 19 kilograms per person to 9 (ibid).

According to conventional economic theory, markets allocate resources most efficiently when there is the least government interference. Consumers express their preferences through their purchasing decisions, with the consequence that in the aggregate the market reflects the value preferences of the society as to how scarce resources are best allocated. When governments intervene they distort the price signals and the allocating efficiency is reduced. In performing most resource allocation functions markets tend to be more efficient than governments. Therefore, it is desirable to privatise such functions wherever possible while providing incentives to private investors to create jobs and increase foreign exchange earnings.
However, by its nature, the market reflects only the preferences for private goods of those who have money. Without the intervention of government and a vigilant civil society a free (unregulated) market takes no account of optimal scale or of the needs of those without money. Neglects essential needs for public goods, externalises a significant portion of real production costs, and tends toward monopoly control of allocation decisions by the market's winners (Filhol, 1995). When conventional wisdom calls for incentives for private investors, it is in fact calling for subsidies that commonly take the form of agreeing to let firms increase their private gain by transferring a larger portion of their production costs to the public. To achieve social justice and environmental sustainability, government must intervene to set a framework that assures full costs are internalised, competition is maintained, benefits are justly distributed, and necessary public goods are provided. A vigilant and vigorous civil society is required to assure the accountability of both government and market to the public interest and to provide leadership in advancing social innovation processes (Daly and Cobb, 1994).

2.5.3. FISH MARKETING SYSTEM: FISH SUPPLY ARRANGEMENTS AND PURCHASES

Fish being a perishable commodity, has to be disposed of steadily and efficiently to ensure that it reaches the consumer in acceptable condition. A considerable distance spatial as well as operational separates the producer from the consumer for whose use the fish is harvested. Thus, co-ordinated functions of the commercial units that intervene between the producer and the consumer are of crucial importance. The

marketing system operates through a set of intermediaries performing useful commercial functions in a chain formation all the way from the producer to the final consumer. For example, Abila and Jansen (1997) have described the supply arrangements of wet fish by Kenya firms as comprising three approaches. These include i) bought directly from fishers on different beaches; ii) supplied by contracted (company) agents and independent agents or middlemen; iii) acquired through the company's own harvest or from sister firms in Uganda and Tanzania. The most common arrangement is that where fish is acquired through two types of agents: i) Company agents - contracted by company to supply it with wet fish. Such agents may not provide any other firm with fish. ii) Independent agents - sell fish to the factory without any binding agreement. They may also sell fish to other factories. Some conflicts regarding the unfairness of this system were noted among the fish companies and the fishers, with the latter being seriously exploited.

In his report on the Nile perch and the marketing systems in Tanzania, Gibbon (1997) established the unfairness of the capitalistic Nile perch trade that has pushed the typical fishers to the fringes of absolute poverty. Gibbon argues that industrial capitalists operating predominantly and according to impersonal rules and principles dominate local markets for fresh fish. The small-scale market by contrast is dominated by a class of basically lowborn general traders, some with relatively large potential concentrations of capital on a continuous basis in the fish trade. This process has wrought a major change in the supply chain for small-scale processed fish, and a subsequent restructuring of the nature and range of its raw materials and end products.

Likewise, Asowe-Okwe (1989) expressed that the interaction between capital, the state and the fisher-people of Lake Kyoga and Victoria, led to the commoditisation of the industry, which resulted in the formation of four classes in canoe fisheries. That is, fishing capitalists; middle fisher-people with fishing equipment; poor fisher-people who own the simple fishing equipment they use and share the use of the craft (canoe); and fisher-labourers who work for wages under an employer-employee relationship in the two lakes. Consequently, the socio-economic structure of the fisher-folk communities has been greatly disrupted with the fisher-people now engaged in production specifically to realize exchange value (profits). In addition, the organisation of production is individualized in which case the typical fishers are the victims of poverty.

From the Kenyan region of Lake Victoria, Owino (1997) talks of arrangements, which are sometimes made between individual agents/factories and fishers. The agent either employs the fishers or provides them with fishing equipment on credit and in return, the fishers supply fish to the agent, and in the process pay back his/her loan. This strong patron-client relationship is geared towards serving the interests of the factories and agents. By establishing tight control of the fishers who in many cases are forced to supply them with fish, many fish agents have undermined the role of the fishers' co-operatives. They have become constraints for community participation in the marketing of fish.

Thus, while agents are necessary, they tend to inflate marketing costs leading to low buying price from fishers and price increases for consumers and fish quality also suffers because of the long marketing chain associated with them. The implication for fishers is that they get very little benefit from their production than if they were selling direct to the consumers. The common practice among producers, especially the commercial fishing boat operators is to concentrate on the production side of the fishing industry and relegate the marketing to representatives or agents. This creates another participating group in the distribution channel - the brokers. The most common marketing practices in the fish trade are auction sale, contract sale, and first-come-first-served basis (Panayatou, 1982). In Uganda, information on marketing mechanisms is scanty and most documented information is from Tanzania and Kenya, which relates to the same fishery of Lake Victoria.

Referring to the unfair fish trade, Owino (1997), reports that fishers have generally become discontented with the fish agents who supply fish to fish processing factories. The agents are accused of being unfair in manipulating buying prices set by fish factories, which in most cases are lower than the agreed prices. This is said to worsen when there is only one agent buying fish at the beach in which case the agent pretend to be disinterested. By displaying this attitude, the middlemen render the fishers helpless and then set their own price (Geheb personal comm.). The fishers are forced to pay at that price to avoid the unnecessary loss,

since fish is highly perishable. The agents will always make sure that fishers have no direct contact with the factory owners and by so doing fixes the fishers at the lower income end.

In relation to the foregoing argument, Panayotou (1982) describes a situation among one of the constraints of small-scale fishers whereby conflicts with large-scale (i.e. industrial fishery) tend to cripple the small-scale fishers. Large-scale fishers bid-up the prices of fishing inputs and/or depress fish prices through their fish market control. This effect raises the welfare of the producers of fishing inputs and the factories while small-scale fishers become increasingly unable to compete.

Under normal conditions, this is an unfair and irresponsible system by which the more efficient (low-cost) producers displace the marginal (high-cost) producers. Based on these study findings, this study intended to put into proper perspective the fish trade relationship between fishers and fish factories of the Ugandan side of Lake Victoria and to consider sustainable ways of managing the resource.

2.5.4. PRICE OF FISH, DEMAND AND PRICING MECHANISM

Generally, demand and prices are marginally influenced by local circumstances and depend more on the conditions imposed by international markets (FAO, 1996). Greboval (1989) identified several factors that are important for understanding the local market performance for Lake Victoria fish. Per capita local consumption of fish is relatively homogenous around the lake. There is a high price elasticity of demand when Nile perch production is mainly for local consumption. At significantly higher levels of production, however, Nile perch price tends to rise and be more stable because of the geographic expansion of the market. On the lake as a whole US dollar prices fell between 1975 and 1985 and then began to rise again because of long distance and export demand (Reynolds *et al*, 1992). Furthermore, Abila and Jansen (1997) observed that in 1997, probably due to the EU ban on fish (discussed further in section 5.2.2), the price of Nile perch on Lake Victoria beaches of Uganda dropped sharply from over 1,500 (US $ 1.5) to Ushs 350 per kg. The traders began to sell Nile perch in several inland markets and the price quickly rose to Ushs 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.

Studies undertaken by Gibbon (1997) and Asowe-Okwe (1989) in which they characterize the forms of production and exchange in the small-scale fisheries, best summarizes the events on Lake Victoria fisheries and their implications. For example, Gibbon writes that price competition between the factories tended to occur in fits and starts, triggered by the new entry of a particular plant or a plant's temporary shortage of throughput. The resulting price development was characterized by a series of sharp rises followed by plateaus of various durations. These plateaus were associated with new entrants establishing a base of tied fishers (and/or the development of in-house factory fleets). To this extent, competition over price tended to become partly displaced by competition to transfer working capital to groups of vessel-owners as means of production. In the process, individual factories gained an element of direct control over the production process itself. In such a situation the fishers remain at the mercy of factory owners and this can be an important determinant for persistent poverty levels among the fishers in Uganda. This kind of price manipulation is typical even on the global market where there is dependence on one type of fishery too, in which case the results can be catastrophic for the whole fishery industry. Take a case of the 1980s "Southern hake" boom in Chile. As prices to fishers spiralled in response to construction of 30 local processing plants, and against a background of rapidly depleting catches and a steadily rising cost structure, efforts by exporters to push up international prices led to the main northern hemisphere importers substituting Namibian for Chilean Hake. Within a few years, 25 of the plants closed (Schurman, 1996). Current high levels of demand for Nile perch could just as easily collapse without great prudence on the side of the government and resource managers.

2.6. SOCIO-ECONOMIC IMPACTS OF THE FISH EXPORT TRADE

2.6.1. SOCIO-DEMOGRAPHIC FACTORS

Socio-demographic factors, such as education, may influence the speed at which the fishers take up innovations and the successful application of the new technology, which increases the fish production. Huffman (1985) characterizes education as a training processing ability necessary for decision-making in a changing economic and physical environment. Presumably, literacy plays a role towards the practice of responsible fishing since it provides skills and knowledge.

According to a survey by Fearne (1990) about the influence of socio-demographic factors (education and age) on farmers' decisions, the younger and more educated farmers appeared more willing to seek external advice than the older and less educated farmers. These factors are likely to influence the fishers' decision towards fish production in a similar way.

2.6.2 THE INCOME AND LIVING STANDARDS

The Food Insecurity and Vulnerability Information and Mapping System (FIVIMS) process identifies vulnerable groups as those who are: victims of conflict, migrant workers and families, marginal population in urban areas, people belonging to at-risk social groups, some or all members of income households within vulnerable livelihood systems and dependent people living alone or low-income households with large size. Among those grouped under the low income households within vulnerable livelihood system are: subsistence or small-scale farmers, fishers, female headed farming households, landless peasants, agricultural labourers, nomadic pastoralists, sedentary herders, small-scale agricultural producers and market gardeners and day contact labourers (FAO, 1999).

Fisherfolk communities of Uganda are generally around or below the regional income average as indicated by various household surveys and reported earnings in fish related activities. For example the L. Victoria survey (Kirema-Mukasa and Reynolds, 1991) showed that about 84 percent had less than Ushs 50,000 per month with 31 percent below Ushs 10,000 per month.

It is noteworthy that in 1991 a higher proportion of fishers (76%) had incomes of less than 10,000/- as compared to only 52 percent among processor/traders. The proportion among labourers (helpers) would be higher since it is the poorest group and representing a transitional category between the unemployed and the productively employed.

These low incomes were associated with significant remittances to the villages of origin from the fisher-folk migrants. It was also reported that lack of enough income was the most important barrier (100%) to increased standards of living as compared to social services (25%), ill health (40%), transport (13%), food security (12%), and dependants (8%). During the recent rapid appraisal it was revealed that inadequate incomes and ill health still constitute the major social problems of these communities (UFD, 1998).

The overall standards of living were generally poorer than the national averages as indicated by the L. Victoria survey, L. Kyoga Survey (1988) and the Consultants rapid rural appraisals (Kirema-Mukasa and Reynolds, 1991, UFD, 1996). There were hardly any improvements in peoples' dwellings around L. Victoria from the 1991 situation, which was largely dominated by mud/thatched buildings and temporary structures (88% in 1991). The cooking facilities were mostly open fires (77%) or charcoal stoves (22%); water sources mostly lakes or streams (93%); and sanitation characterised by lack of pit latrines (56%) or open pit latrines (22%); ownership of radios at 35 percent and of mattresses at 52 percent.

Gibbon (1997) reported that labourers in the fisheries sector in Tanzania who were not fishing crew members hardly fared better in terms of conditions of employment (casual piece work was a rule even in the factories) and were frequently far worse in terms of income. Although there are no documented reports of

over exploitation of crew labourers in Uganda currently, this observation in Tanzania may suggest that the same practice is possible in Uganda and this research is timely.

Nyagambi (1991) looked at the trends of prevailing situations in artisanal fish processing, utilisation and marketing in Kenya. He discussed socio-economic conditions of artisanal fish processors and traders on selected landing beaches both for marine and inland waters and concluded that in spite of many attempts to overcome social, economic and technological barriers for the development of artisanal fisheries, most fishers, fish processors and traders still live at subsistence levels.

2.6.3. THE FISHING INDUSTRY AS A MAJOR SOURCE OF EMPLOYMENT

The importance of an industry to the society can be measured in the number of people employed or dependent on its existence. There are reports that people in harvesting, processing and distribution sub-sectors of the Nile perch fisheries benefited greatly from the Nile perch fisheries regime in early 1980s. It has been estimated that during the 1980s 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 nicknamed the Nile perch "the saviour" (Reynolds and Greboval, 1988).

The period saw more women engaged in the processing and marketing of fish both on Lake Victoria beaches and in markets in several towns in Kenya (Yongo, 1994; Abila, 1994). In response to the increased landings of Nile perch, more fishers were recruited into the fishery. By the mid-1990s thousands of young men had found employment as fishermen, and while the main beneficiaries were obviously the owners of processing plants, some local vessel-owners were accumulating on a previously undreamed economies of scale. The number in the Kenyan part of Lake Victoria increased from about 11,000 fishers in 1971 to 22,000 in 1989 (Gibbon 1997).

Fishing adds only about 1 per cent to the global economy, but on a regional basis it can contribute enormously to human survival. Fishing typically does not require land ownership, and because it remains in general, open to all, it is often the employer of last resort in the developing world, an occupation when there are no other options.

Worldwide about 200 million people depend on fishing for their livelihoods. In northern Chile 40 percent of the population lives off the ocean. In Newfoundland most employment came from fishing or servicing that industry until the collapse of the cod fisheries in the early 1990s left tens of thousands of people out of work (WRI, 1996). That notwithstanding, it has been noted that for each US $ 1 million of investment, industrial-scale-fishing operations require only one to five people, whereas small-scale fisheries would employ between 60 and 3,000 (Weber, 1992). Needless-to-say, industrial fishing itself is therefore a major threat to Tens of millions of fishers working on a small scale and who for their subsistence depend on the fish being depleted.

O'Riordan (1996) has however, lamented that despite supporting the flourishing trade resulting from Nile perch boom, the Lake Victoria region seems to have gained insignificantly. He notes that very little of the massive foreign exchange and tax revenues earned from the exports is ploughed back for infrastructure and human development in the fisher-folk communities.

Weber (1992) notes that declining catches have already cost more than 100,000 jobs in the last few years among the world's 15 to 21 million fishers. A loss that could reach 9 out of 10 fishing jobs in the coming decades as countries struggle with the great gap between the capacity of the world's fleets and the limits of the oceans.

Therefore, to encourage sustainable fisheries production where employment of fishers and production are ensured, the need for proper management measures is important. In that case one will complement the other and will maintain socio-economic balance in the remote fisher-folk communities instead of creating socio-

economic conflict among fishers. Furthermore, effort is needed to understand the distributional characteristics of fish factories. For fisher-folk communities to progress in alleviating persistent poverty, the distributional properties of local economic activity need to be considered. With an understanding of these properties, local development policy can become a "lever" whereby targeted economic growth can mitigate distributional problems.

2.6.4. INVESTMENT OPPORTUNITIES FOR FISHERS

In Uganda, the fish processing and export sub-sector has grown fastest due to availability of foreign private investments and the good market prospects for Uganda's fresh water fish in overseas markets. Some industrial fish processors have also been able to promote contract producers through provision of ice facilities credit for inputs, and construction of fish handling facilities at selected landing sites. The majority of fishers, fish processors, and wholesale traders, including those who handle overseas exports, however, have not yet accessed adequate supplies of equipment (e.g. outboard engines, fishing gear) and credit facilities (Fisheries Master Plan, 1997).

The number of canoes doubled in the period between 1971 and 1989, resulting from the Nile perch boom (Ssali *et al*, 1992). In addition, there were substantial investments in fishing nets, and especially the gill nets with large mesh-sizes aimed at catching the larger Nile perches. The impact of these investments needs to be reviewed, especially now that slower progress in development has been recorded among the fisher-folk communities.

2.6.5. ATTITUDES OF FISHERMEN TOWARDS SUSTAINABLE DEVELOPMENT OF LAKE VICTORIA FISHERIES

Attitudes are evaluating statements, either favourable or unfavourable, concerning objects, people or events reflecting how one feels about something. Attitudes are identified as one of the critical components of human development vital to effective development projects (Dorsey, Hill and Woods, 1989). Attitudes can determine whether fishers work towards the long-term sustainability of the fisheries resource, or work to destroy it. Attitudes can also affect investment practices among the fisher-folk communities, as attitudes about new technologies and modernization can be affected by many factors. Some of the most likely are mainly socio-demographic such as age, education, employment, income and food security generally. Income factors and the inequalities among the fishers can influence attitudes towards development. For example, fishers in Kenya showed a negative attitude towards fish factories (Abila and Jansen, 1997) because fish processing factories are said to concern themselves with selling fish to the lucrative export market, without giving any consideration to the socio-economic effects of their profit motivated activities. Again here we see that the factor of food security overrides, when fishers indicate that domestic food security seems to be of no concern to the factories. This study explores the question on whether continued expansion of the industrial processing capacity is, among other effects, the one that further reduces availability of fish locally and pushes poor fishers to use illegal fishing practices, which ultimately deplete the fisheries resource.

2.7. BASIC CONCEPTS OF FISHERY MANAGEMENT: AN OVERVIEW

Fisheries management as defined by Panayatou (1982) is the pursuit of certain objectives through the direct or indirect control of effective fishing effort or some of its components. The indirect control of effort includes the case in which a management authority does not get involved in the control of the effort but simply creates the appropriate environment for its control by the fishers themselves (e.g. community property rights). The measures are meant to ensure increased productivity of the resource and/or maximizing the economic returns from the fishery.

Fishery development on the other hand is the expansion of effective effort through a set of assistance programmes again for the purpose of attaining certain objectives: for example, measures taken for the purpose of exploiting under-utilized resources and increasing fish supplies and fisher's incomes. Panayatou further elucidates that fishery development may be defined more broadly to include, in addition to the

expansion of fishing effort, improvement in post-harvest technology, marketing and transportation of fishery products, as well as the provision of infrastructure and other related facilities. For example, recently there has been assistance given by governments and aid agencies to prospective factory owners to promote fish export trade by upgrading their production facilities to meet the EU quality standards. Of importance in relation to this is that any form of fishery development that makes fishing more profitable will lead (indirectly) to an expansion of effort unless it is combined with fisheries management.

Due to its control role, fishery management is thought to be required once a fishery becomes "overexploited" while fishery development is thought to apply while a fishery is still "under-exploited". This though in most cases depends essentially on the objectives being pursued by the fishery. In actual situations, one need not wait for over-fishing to occur before management measures are taken. Over-fishing is better avoided by judicious management measures taken along with development. Similarly, the need for development is not confined to under-exploited fisheries.

As management of over-exploited fisheries sooner or later involves the regulation of fishing effort, development fishery-related or otherwise is needed to absorb the surplus labour and capital. In many developing countries, enforcement of management regulations is virtually impossible without development of sufficiently attractive employment alternatives elsewhere. Moreover, further "development" of an already "overexploited" fishery may not be as unnecessary as it sounds if the purpose is a temporary solution of otherwise intractable social problems.

These interrelations notwithstanding, the priority in overexploited fisheries is for management and in under-exploited fisheries for development. Thus, the general objective of fisheries management and development is the attainment of the "optimum" rates of exploitation of the fishery. How this optimum is defined, of course depends on the specific objectives of the policy-makers. If the policy objective is maximum fish production then the optimum rate of exploitation is defined by the maximum sustainable yield (MSY), that is, the maximum catch that can be obtained on a sustained basis.

If on the other hand, the policy objective is to maximize the economic benefit to the national economy from the fishery, the optimum rate of exploitation is defined by the maximum economic yield (MEY), that is, the maximum sustainable surplus of revenues over fishing costs. The fishery is said to be under-exploited in the economic sense and to require further development if the actual catch falls short of MEY due to insufficient effort. Analogously, the fishery is said to be overexploited in the economic sense and to call for management if the actual catch falls short of MEY due to excess fishing effort.

In cases where social considerations such as the improvement of the socio-economic conditions of small-scale fishers, the generation of employment opportunities and improvement of income distribution matter, the optimum rate of exploitation is defined by the third concept, the Maximum Social Yield (MScY). Maximum social yield as the objective of fisheries management takes full cognisance of the likely conflict between income and employment objectives (more employment may lead to over-fishing and a reduction of the aggregate fishing income). Employment objectives may be weighted more heavily than income objectives only when there are no other effective means of redistributing income to lower-income groups. Thus, Maximum Social Yield is the level of catch and corresponding effort that provides the best possible solution to social problems given the policy objectives and all possible alternatives. Thinking of MScY as a modified MEY meant to account for non-purely-efficiency aspects, such as poverty and distribution is rational. Introduction of social considerations may limit the speed with which management measures are introduced, or it may justify a more intensive rate of fishing than is justified on purely economic grounds. Thus, levels of effort below the one corresponding to MScY may be termed socio-economic under-exploitation, while levels of effort above it, socio-economic overexploitation. In situations like the case of small-scale fishers grappling against powerful market forces in the Nile perch fishery on Lake Victoria, and where socio-economic considerations rank alongside both biological and strictly economic concerns, the concept of MScY is relevant.

However, estimation of MScY cannot be made independently of MSY and MEY. As biological aspects enter the economic model, which more appropriately may be termed "bio-economic", so do both biological and economic parameters enter the determination of MScY, which may be more appropriately termed a "bio-socio-economic" model. Panayatou (1982) explains details of the basic biological, economic and social model aspects of the fishery management. Here we have only given a brief account of the underlying principle of fisheries management and fisheries development for sustainable development, to allow the reader to conceptually comprehend the sustainability problems of Nile perch fishery of Lake Victoria.

2.8. SUMMARY

Nile perch, introduced into Lake Victoria in the late 1950s developed rapidly, having been favoured by food abundance, its predatory and adaptive features, and became the main fishery of commercial importance driving the market since early 1980s to-date.

This rapid development of the Nile perch fishery was seen as a boom, attracting large investments as demand for fish expanded beyond national borders. A build up in fishing effort accompanied this change with fishers and boats more than doubling between 1988 and 1998. This over-exploitation, coupled with other natural causes has resulted into a bust in the once booming fishery. Catches are dwindling as processing factories' capacities and real output grows every year. This has raised fears about the overall sustainability of the lake's fisheries and all that depend upon it for livelihoods.

In the wake of the pertaining circumstances in the Lake Victoria Nile perch fishery, related cases from several collapsed fisheries and community managed fisheries elsewhere in the world can be sought to serve as a lesson to take instruction from for the sustainable management of the lake's fisheries. Working together as a team for sustainable management of the 'over-exploited' fisheries of Lake Victoria is one way by which government and the fisher communities can ensure the sustainability of the fisheries resources.

Overwhelming evidence suggests that the ever-growing global market for fish is the main driving force for excessive exploitation of the fisheries of the world. And, the same trend has already caught up with the inland fisheries of Lake Victoria where Nile perch is being exploited mainly for global market.

Generally trade liberalization, or free market trade is the most efficient way by which resources can be well distributed to benefit the poor. Governments' intervention and those who are more powerful, however, can corrupt the good role of markets. For example, fish trade liberalization on Lake Victoria Nile perch fishery has been accused for fostering capitalism, and the exploitation of the disadvantaged fishers. Gibbon particularly asserts that it is the situation between the powerful capitalistic factory owner/agents and the weak fishers, who are overly exploited.

The rapid emergence and growth of fish trade on Lake Victoria is also said to have led to commoditisation of the fish trade, and to the breakdown of traditional sustainable management structures, replacing them with those that enhance over-exploitation and unsustainability of the resources.

While fish export boom created employment for most fisher-folk communities and the rest of Ugandans, its rapid development has taken toll on the resource threatening the livelihoods of many resulting in job losses. Fishers are counted among the most disadvantaged poor of the world. Although up to date studies on the socio-economics of the fisher-folk communities of Lake Victoria are scanty, earlier studies indicated that fishers' living conditions were still very poor as of early 1990s.

Fishers being the main players in fish production, their attitudes can affect the overall sustainability of the lake's fisheries. There is evidence on serious marginalisation of fishers in the new market system for fish to factories by new players, the factories and their agents/brokers. These are more powerful and determined to exploit the weaker fishers who form the base of fish production. Such mistrust can lead to frustration and destruction of the resource through unconventional methods for survival's sake.

Serious considerations of the biological, social and economic aspects of the fisheries are very important in sustainable management. This, however, is rendered impractical in places like Uganda because of the sporadic tropical climatic conditions and the general scarcity of reliable data. Notwithstanding, the theoretical analysis of these factors can be very useful for balanced judgements involving fisheries management and development.

Therefore, the Lake Victoria fisheries show a boom-bust scenario with serious implications for the biological, economic and social aspects of the lake. For this reason, this study undertook a comprehensive analysis of the economic and social activities by the main players, the fishers and the factory owners to determine the implications for the fisheries sustainability.

3 METHODOLOGY

3.1. DESCRIPTION OF STUDY AREA AND SAMPLE SELECTION

3.1.1. STUDY AREA

The Ugandan section of Lake Victoria is divided into five fisheries regions according to the Uganda Fisheries Department (UFD): Sesse Islands, from which fresh and processed fish are brought to the mainland; Jinja, for the eastern lake; Entebbe, for the central lake; Masaka, for the western lake; and finally Tororo, a minor region which includes the small easternmost portion of the lake extending to the Kenya frontier (Figure 2).

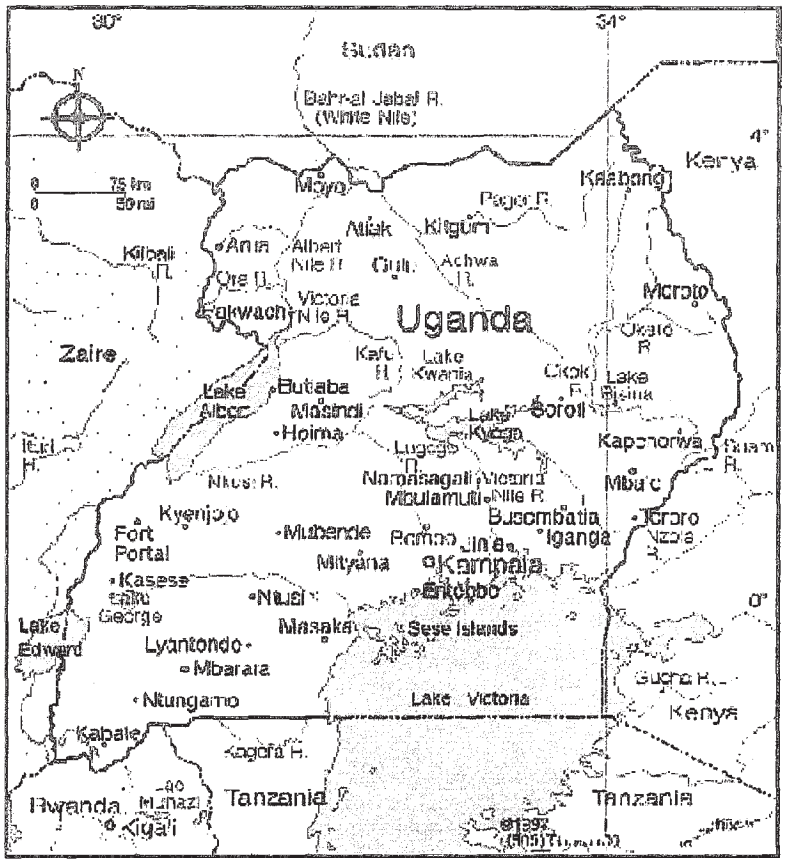


Figure 2: The Ugandan sector of Lake Victoria

The Study took place in the central region of the Uganda sector of Lake Victoria comprising Jinja and Entebbe fishing regions. Involved in the study were eight Uganda fish processing and export industries (Table 2) located in the central region, plus ten fish landing sites (Table 3), three from the Lake Victoria Islands in Mukono and Iganga districts; and 7 from the mainland shores of Lake Victoria. This area was deliberately selected because it has recently attracted a lot of industrial fish processing investments as a result of the Nile perch boom.

Site	Factory name	Location
3	Greenfields company Ltd.	Entebbe
4	Ngege Ltd.	Kampala/Port Bell
5	Uganda Fish Packers	Kampala/Nakawa
6	Hwan Sung Ltd.	Kampala/Ntinda
7	Uganda Marine Products	Kampala/Mpelerwe
8	Gomba Fishing Industries Ltd.	Jinja
8	Marine and Agro Export Processing Ltd.	Jinja
9	Masese Fisheries Ltd.	Jinja

Table 2: Interview sites for the survey of industrial processors

Region	District	County	Site name	Location/size
Jinja	Jinja	Butembe	Masese/Walukuba	Mainland/small
Jinja	Iganga	Bunya	Lwanika	Mainland/big,
Tororo	Iganga	Bunya	Lolui/Gorofa	Island/big
Tororo	Iganga	Bunya	Jdagusi/Kasambwe	Island/big
Entebbe	Mukono	Buikwe	Nsazi	Island/big
Jinja	Mukono	Buikwe	Kiyindi	Mainland/small
Entebbe	Mukono	Buikwe	Katosi	Mainland/small
Entebbe	Kampala	Ggaba	Ggaba	Mainland/big
Entebbe	Mpigi	Entebbe	Kigungu	Mainland/small
Entebbe	Mpigi	Kasenyi	Kasenyi	Mainland/big

Table 3: Data collection sites

3.1.2. RESEARCH DESIGN

This lake region is also the major fish producing area in Uganda and it has the potential for fish export enhancements (UFD, 1997). Demand for fisheries products is very high in this region due to the presence of major population centres around the lake. The proliferation of fish processing factories; a purchasing power generally higher than in the rest of the country; and a traditional preference for fish reinforced by the relative scarcity of meat (Reynolds and Greboval, 1988) make this area suitable for this study. This region represents a good geographical distribution of major fish-producing areas in the country and is the centre for all export-oriented fishing activities.

A survey of ninety commercial fishers and eight fish processing factories was conducted from September to November 1999 in two regions out of the five Lake Victoria regions of Uganda. Data on the socio-economic aspects of fish-export industry of the Lake Victoria fisheries in Uganda's Central region (Jinja, Iganga, Mukono, Kampala, Entebbe and Mpigi) was collected. The sampling units were the landing sites and the fish factories, with a fisher and factory manager as main respondent respectively.

Internal and external validity of the questionnaire was controlled by developing the questionnaire in conjunction with relevant researchers at Fisheries Research Institute (FIRI) and UNECIA-Ltd. at FIRI, Jinja as well as in the Department of Food Economics at the National University of Ireland Cork, in Ireland. A first outline of the socio-economic questionnaire was discussed with the staff of the above-mentioned institutions during a preparatory mission for the execution of the survey. Following these discussions the questionnaire was modified and field-tested in October 1999. After the field test a final version was designed. The pre-test was also very helpful in establishing rapport with the study area. Face to face interviews were then carried out by the researcher himself to save time and minimise response errors. The research assistant worked as a guide and interpreter.

3.1.3. SAMPLE SELECTION

3.1.3.1. Factories

Given the wide dispersion of factories a current list of operations was obtained from Uganda Fish Processors and Exporters Association in Kampala, which was used to select factories for the survey. There were 11 fish factories, but some fish factories were not in operation (some factories closed down totally due to EU-fish ban in 1997 and 1999, while others were closed for renovation) because they could not meet quality standards required by EU countries.

Purposive sampling was therefore used to select the eight fish processing factories of 1998/99 (Table 2): Masese, Gomba, Fish and Agro Products, Hwan Sung, Uganda Fish Packers, Ngege, Greenfields, Marine Fish foods, as a representative of all fish processing factories in Uganda.

3.1.3.2. Landing sites

The Sample Selection for the landing sites was based on a stratified approach that ensures full geographical representation of the Lakeshore and Islands. Two regions (Entebbe and Jinja) out of five fisheries regions of Lake Victoria (Entebbe, Jinja, Tororo, Masaka and Kalangala) were selected as a representative sample. These are the biggest areas with the largest percentage of fisheries activity and industrial processing. Given the time limit and resources available a sample of 90 fishers (boat owners) was purposively selected in proportion to the size of the landing sites associated with them. Based on gear and /or boat ownership the target group was identified. The sample was biased in favour of boat owners because they knew more about the details of fishing and fish sales than their crew.

In Entebbe region, six landing sites (Kigungu, Kasenyi, Katosi, Ggaba, Kiyindi and Nsazi) and in Jinja region, four landing sites (Masese port, Lwanika, Lolwe and Jdagusi) were randomly selected (Table 3). A list of all landing sites from Lake Victoria's Entebbe and Jinja fishing regions was obtained from the Fisheries Department, Entebbe. In order to avoid a possible bias towards either large or small beaches, the average beach size per stratum (number of active boats) was calculated (Table 4).

Stratum	Average number of active boats per beach
1. Entebbe region	24.4
2. Jinja region	33.8

Table 4: Average beach size per stratum (number of active boats).

Based on this average and the frame of the survey, the sub-sampling frame was drawn up classifying the beaches in an 'above average size' and an 'under average size' category. From the resulting list for each stratum, five small and five large beaches were randomly selected (Table 3). The sum of respondents to be interviewed in the small and the large beaches was proportional to the number of boats in these size classes in each stratum as enumerated during the survey. With these results a sub-sampling frame could be drawn up. The local authorities (fisheries personnel and L/Cs) were useful in helping to identify the fishers from crews. All fishers who were available were interviewed.

3.2. CONDITIONS FOR TESTING

A covering letter from the Department of Zoology and Animal Ecology at the National University of Ireland, Cork and another one from FIRI in Jinja, plus personal explanations by the researcher about the nature of the study ensured unbiased response from the subjects. Explanations were given to avoid misconception that the study was being done for the purpose of law enforcement or even revenue collection.

The importance of the study to the area was thoroughly explained and a promise was made to deliver the summary of the research findings. Local Councils, area fisheries personnel, and opinion leaders in the area were used for introductions so as to create confidence in the local people.

Interviews for fish processing factories were always conducted by appointment. Interviews for fishers were done in the mornings and late afternoons when fishers were readily available. In cases where the questions seemed hard to understand, the researcher interpreted the questions and recorded the answers after working backwards from their previous responses.

3.3. DATA TYPE

The following data were collected.

1. The relative quantity of fish landed by fishers
2. The supply arrangements and marketing of fish by fishers and factories
3. The fishing effort
4. The buying price of fish at landing sites
5. Opinions about lake Victoria fisheries management
6. Fish factory capacity relative to real fish processed over the years
7. Suggestions from factory managers for better management of Lake Victoria fisheries
8. Attitudes of fishers towards fish-processing factories
9. Socio-demographic characteristics of fishers
10. Experience and ownership of fish factories
11. Employment and investment of fishers.
12. Incomes (assets) and living standards of fishers
13. Data were also collected on fishers' opinions about the future of the fisheries, fishing practices and constraints faced.
14. Questionnaires are reproduced in Appendices A and B.

3.3.1. SECONDARY DATA SOURCES

The initial stages of this survey of Lake Victoria fisheries constituted searching and gathering secondary data that is related to the socio-economic implications of recent developments of the fisheries sector in the management of the fisheries globally, regionally, nationally and locally.
Information was obtained from:

1. Fisheries Research Institute (FIRI) libraries,
2. Makerere University Institute of Social Research library,
3. Ministry of Finance and Economic Planning (MFEP),
4. World Bank library in Kampala, FAO library at Wandegeya, Kampala,
5. Fisheries Department, Entebbe;
6. Fisheries Training Institute Library, Entebbe;
7. European Union-Lake Victoria Fisheries Research Project (EU-LVFRP) office at FIRI, Jinja,
8. Kawanda Agricultural Research Institute NARO library Kawanda, Kampala,
9. Department of Food Economics and UCC main library in Ireland,
10. University of Portsmouth-CEMARE, UK,

Information was obtained in the form of computer-based data through inter-net, books, journals, archives, Occasional papers, reports, pamphlets and direct correspondence.

The data collected constituted macro-level data pertaining to production levels, physical and institutional infrastructure etc. These data provided a backdrop to the study of socio-economic conditions of small-scale fishers and developments in the fisheries sub-sector.

3.4. LIMITATIONS IN DATA AND THE STUDY

3.4.1. DATA

The major shortcoming in the data collected for this study was sometimes the lack of accurate statistics. This survey was conducted at a time when the EU ban on fish exports was in place and the factory managers were reluctant to give out information. Respondents were often reluctant to disclose information concerning fish prices. Some factories were unwilling to allow the researcher in while others were suspicious of outsiders. Bad infrastructure as well as lack of time and money restricted the accessibility of statistics and primary data available in Uganda. This is however, something encountered by every researcher embarking upon a research project in a developing country.

3.4.2. THE STUDY

The demarcation of the study to focus the investigation on just Nile perch market participants and the fish processing factories has limited the analysis of the commercial fisheries sub-sector. Other market participants of interest for the study were local market traders of fish, fishers not targeting Nile perch, fish traders dealing in other fish processing (smoking).

3.5. PROCESSING AND DATA ANALYSIS

The data collected over a time period in the fieldwork was both quantitative and qualitative, coming from a mixture of primary and secondary sources, which therefore demanded different analyses and presentations. The information obtained was coded and entered in a database utilising the software package Dbase III plus files. The data were then converted into SPSS/PC+TM V.8.0 system files for processing and preliminary analysis. SPSS/PC+TM V.8.0 was used for this purpose. Graphs presented in this report were created with Harvard Graphics.

3.7 USEFUL INDICATORS

1. Fishing practices (legal or illegal).
2. Quantity of fish (metric tons) processed/purchased.
3. Attitudes of fishermen towards industrial fish exporters.
4. Fish supply arrangements.
5. Pricing mechanism and fish prices.
6. Investment opportunities for fishery incomes within landings.
7. Investment opportunities outside fishing industry.
8. Fish food security.
9. Incentives to fishers for sustainable management.

4 RESULTS AND ANALYSIS

4.1. INTRODUCTION

Owing to the qualitative nature of most of the survey, a lot of information was collected from different institutions involved with the Lake Victoria resources and research work on the lake from different workers. Mainly, this information entailed most of the deskwork part of the research and is presented in part one of the results chapter. The first section gives a comprehensive account on fish production, indicating developments in the fishery, trends in years and the analysis of the underlying management issues. Section two deals with the development of the Nile perch processing industry, the export market and analyses the implications for the fisheries sustainability. Finally, section three discusses the socio-economic characteristics of the fisher-folk communities of Uganda: with particular emphasis on the recent changes in the Lake Victoria fisheries.

4.2. ANALYSIS OF FISHERIES SUB-SECTOR PERFORMANCE AND TRENDS IN UGANDA

4.1.2. FISH PRODUCTION

Generally, there are no up-to-date data on the magnitude of the fish stocks on most of the lakes and other bodies of water. As Odongkara and Okaronon (1997) have noted:

> *"The existing data on fish catches is deficient in coverage and reliability. The bulk of fish landing sites on the major lakes are not manned for data collection while the minor lakes and rivers are not covered at all. The data does not take into account fish caught and smuggled before landing for records and fish that originates outside our sector of the shared lakes for example* mukene *from Tanzania."*

The only comprehensive stock assessment survey was in Lake Victoria in 1969/1971 during which time the multi-species fishery was dominated by the *haplochromine* ichthyiofauna (*nkejje*). Since then, a lot of changes have taken place in Lake Victoria and other water bodies with serious implications for the sustainability of the fisheries resources. For example, in Lake Victoria, the fishery has been reduced to three fish species, the Nile perch (*Lates niloticus*) or *mputa*, Nile tilapia (*Oriochromis niloticus*) or *ngege* and a Sardine-like fish, known locally as *mukene* (*Rastrineobola argentea*). The Nile perch is the dominant fishery. The relative abundance of fish stocks in Lake Victoria (also in other water bodies) has apparently declined from about 800 kg/hr trawling in 1969/71 to about 150 kg/hr during 1994 (Okaronon, 1994). Determining rate of renewal for the major fish species (Nile perch, Tilapia, *mukene*, etc.) of Lake Victoria is complicated by the fact that the underlying processes are influenced by the changing environmental conditions and human activities upon the fishery resource.

Notwithstanding this, there are some records in the form of annual reports from the Fisheries Department (UFD) on catches from various landing sites on Lake Victoria, which form a basis for stock estimation. These data together with more from other sources were synthesized into the following results (see Table 3). During the period of structural economic decline of 1970s and early 1980s, fish production remained one of the few steadily growing sub-sectors. There was an increase from 167,800 tonnes in 1981 to 213,300 tonnes in 1994 (averaging 4.0% p.a.) and eventually to 222,000 in 1996 (averaging 6% p.a.). This, however, represents a decline of 9% from the peak harvest of 254,900 tonnes of 1991.

The initial increase in landings was due to increased catches of the Nile perch following its establishment in Lake Victoria (Table 5 and Figure 3). Peak catch of 134,900 tonnes (49% of national total) was recorded in 1993 after which there was a remarkable drop to 103,000 tonnes (48% of national total) in 1994. This decline was attributed to the infestation by the water Hyacinth plant (*Eichornia crassipes*) and due to expensive fishery inputs (e.g. nets, boat engines, fuel), which are accessible to only a few fishers (Odongkara and Okaronon,

1997), and has since then not made any notable recovery. This meant that few fishers could go out to fish since the weed affected transport on the lake as well and fishing grounds. Earlier, catches from Lake Victoria made a great contribution to the national total fish production when in 1961 a total of 25,500 tonnes (43% of national total) was harvested. From then there was a decline, which reached the lowest level in 1966, with only 6,000 tonnes (7% contribution to national total) attributed to bad weather and less people involved in fishing. From 1967 catches improved drastically for Lake Victoria, 38,200 tonnes (38.5% national total) until after 1969. Thereafter, a steady decline was observed hitting its low in 1980 with only 10,000 tonnes (6% national total); and stagnated up to 1984. From 1984, there was again a drastic increase in recorded catches, 44,800 tonnes (22.5% national total). This trend was sustained until it peaked in 1989 when 132,400 tonnes (62% national total) were recorded. The explanations for the fluctuations prior to late 1980s is obscure but the most likely reasons relate to the weather conditions, political instability and generally less motivation in fishing. However, with most of the institutions paralysed by the political instability and corruption that reigned in Uganda from early 1970s to late 1980s, the data recorded at that time should be treated cautiously. The boom in 1989 was due to the growth of a new fishery, the Nile perch, which attracted market locally, regionally and internationally. This boom coincided with the reinstitution of political stability in the country and reconstruction of social life with more people entering the fishing business.

While fish production declined by 1.5% in 1996, from 222,000 tonnes in 1996 to 219,300 tonnes in 1997, the value of fish and fish products increased from Ushs 70.04 billion to Ushs 75.75 billion over the respective years. This decline among other factors was attributed to both the *El Nino* weather phenomenon, which limited the number of hours fisher-folks could put in the fishing activities, and the increased water levels reaching out into the surrounding grass that is not appropriate for fishers to lay their fishing nets. Then there was the water hyacinth, which is a menace to the fisheries sub-sector (Background to the budget 1998/1999:6-7). Currently fish catch rates are stagnant or declining despite increased fishing effort from about 3200 fishing canoes in 1972 to over 10,000 canoes presently for Lake Victoria (Table 5, Figure 3).

The fish processing capacity (fish purchases) and fish exports followed the same trend as fish harvesting (see Section 4.1.2). Purchases for processing increased to about 50,000 tonnes in 1995 before declining to about 30,000 tonnes in 1997. Given the continued export drive largely propelled by foreign investment in industrial fish processing and the relatively high prices in export markets, production is likely to grow steadily until it reaches the Maximum Sustainable Yield (MSY) currently estimated at between 300,000 and 400,000 tonnes p.a. (UFD, 1999).

However, while appreciating the developments in the fisheries sub-sector, there is also a need to examine how these have related to the whole sustainability of the fisheries resources and how fisheries management has been influenced. For this reason, a critical analysis of the socio-economic aspects of the fish processing factories and fisher-folk communities of Uganda's Lake Victoria with respect to their fisheries activities was undertaken in part two of chapter four.

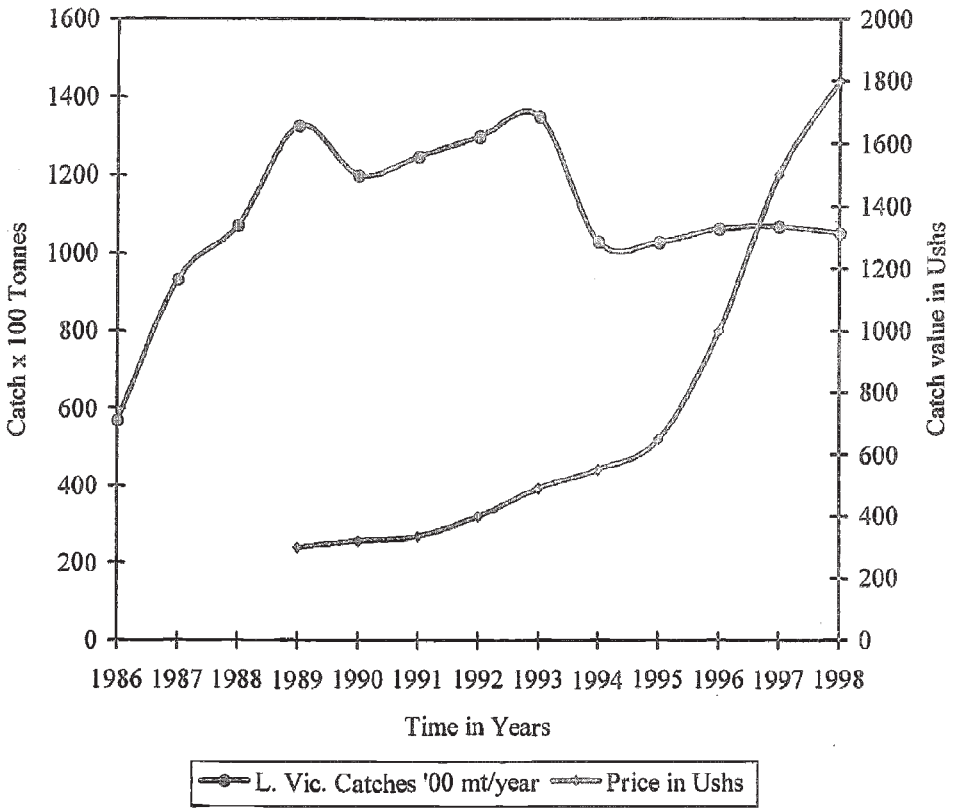
4.1.3 A CONCEPTUAL EXPLANATION FOR CATCH AND CATCH VALUE CHANGES

Figure 3 shows national fish catches in metric tonnes from Lake Victoria and the catch value in Uganda shillings from 1986 to 1998. As stated previously, there is a notable increase in catches from 1986 to 1989, when the trend began to fall and staggered over to 1993, when again the catches show a big decline in 1994. From then, catches more or less stagnated up to 1998, showing no appreciable increase. On the other hand, the catch value increased gradually from the low in 1989 to 1995 when the price almost skyrocketed and continued over this trend. To appreciate the trend of events in the Lake Victoria fishery the author related Figure 3 to the uncontrolled open access fishery growth and constructed Figure 4 to explain the trend of events at different stages in the fishery.

Period	Price* (Ushs)	L. Vic. Catches (000) Tonnes	National catches (000) Tonnes	% Contribution by L. Victoria
1961		25.50	59.40	43
1962		23.40	66.60	35
1963		24.40	71.90	34
1964		24.40	70.60	35
1965		24.40	71.50	34
1966		6.00	82.60	7
1967		38.20	99.10	38.5
1968		40.50	109.90	37
1969		46.10	127.10	36
1970		41.70	147.70	28
1971		38.10	162.30	23
1972		33.90	164.00	21
1973		32.50	169.50	19
1974		24.50	167.50	15
1975		16.90	173.20	10
1976		11.10	192.60	6
1977		15.70	219.50	7
1978		14.20	222.20	6
1979		12.00	179.90	7
1980		10.00	165.90	6
1981		17.00	167.80	10
1982		13.00	170.00	8
1983		17.00	172.10	10
1984		44.80	199.20	22.5
1985	?	54.60	171.10	32
1986	?	56.80	202.90	28
1987	?	93.20	167.80	56
1988	?	107.1	214.30	50
1989	300	132.4	213.60	62
1990	320	119.9	245.20	49
1991	335	124.7	254.90	49
1992	400	129.7	265.50	49
1993	490	134.9	276.00	49
1994	550	103.0	213.30	48
1995	650	103.0	213.20	48
1996	1000	106.4	222.00	48
1997	1500	106.8	219.50	49
1998	1800	105.2	218.70	48

Table 5: Time series data for estimated quantity of fish landed by Lake Victoria alone (1961 to 1998) against the national fish catches: '000 Tonnes. Source: Fisheries Department (UFD), 1999. * The prices were based on different quotations given by different fishers and in part from the Fisheries dept. The means of these prices were computed to give the figures that were used to construct Figure 3; and this is only a representation of the general conceived trend. Of special consideration about these figures, is that fish prices fluctuate so much and there were no systematic data on prices even at the Fisheries Dept.

Figure 3: A Conceptual Explanation- Catch (MT) and value of catch (Ushs) from Lake Victoria, 1986 to 1998.



The data from Table 5 was used to construct Figure 3 to show the trend in catch and catch value from 1989 to 1998. There is a definite trend of catches and catch value, with catch in '000 metric tonnes falling or stagnating while value in Uganda shillings shows a skyrocketing trend. This trend is further used to explain the characteristics of the open access fishery reminiscent of Lake Victoria fisheries in Figure 4.

Figure 4 is based on an extremely simplified bio-economic model that was developed by Gordon (1954) over 40 years ago to conceptualise the economic return on a fishery, which is exploited in an open, competitive manner. Revenue generated from the sale of fish captured is plotted against effort or cost expended to catch these fish. In Gordon's model (1954), a so-called "bio-economic equilibrium" will be reached in an unregulated fishery where total revenue generated from the fishery just balances cost. The fishery itself at this point would have been depleted below the point of sustainability and no one is making money from exploiting the fishery any more. Net profits would be maximised, however, if fishers would voluntarily reduce their fishing effort to EO (MEY = Maximum Economic Yield) where the fishery is maintained at some sustainable level.

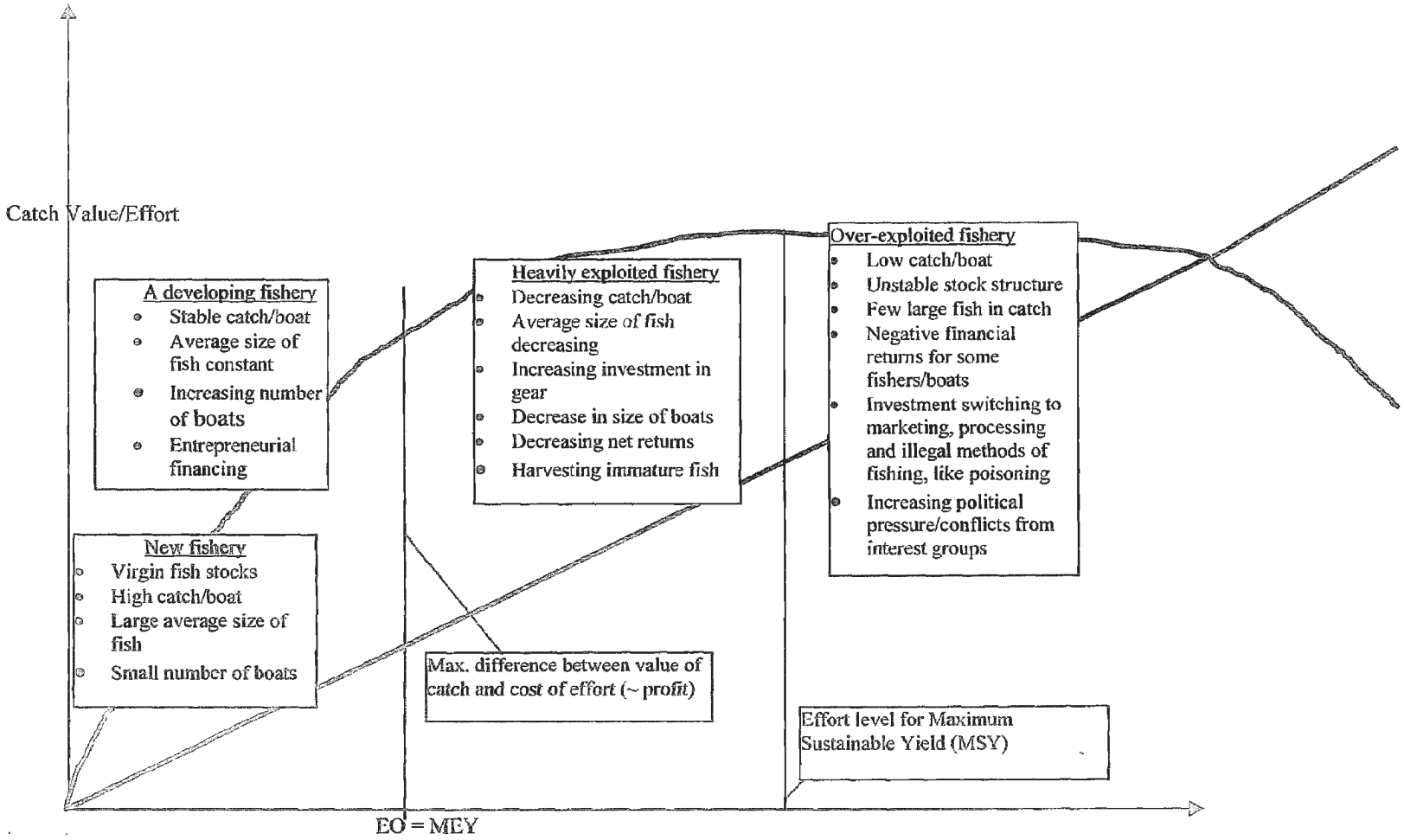


Figure 4: Growth of an uncontrolled open access fishery (Based on a basic bio-economic model (Gordon, 1954))

In the real world, of course, such constraint is rare and history is replete with examples of fisheries that have been driven to the brink of extinction. Gordon's over-simplified model reveals a fundamental problem in renewable resource exploitation, which is that if regulated, open access resources will become over-exploited, leading to the impoverishment of the resource.

Relating Figure 4 to Figure 3, it can be observed that Nile perch fishery from Lake Victoria is at the over-exploited stage of the fishery where catches are declining while price is ever increasing. As can be ascertained from Figure 4, open-access or common property fishery shows a variable progression from low exploitation to over-exploitation. For limited resource, the increasing effort and decreasing resource will eventually lead to dire consequences, which include unemployment (fishers leaving the fishery) because the fishery can no longer sustain them with extended fishery. The indicators of heavy exploitation and over-exploitation are shown in the boxes on the plot in Figure 4 and they are indeed typical of the changes in the Nile perch fishery in Lake Victoria.

4.1.4. CAPACITY AND CAPITALIZATION

Over-capacity, according to Lee Anderson (lgafish@UDEL.EDU) is "when capacity is greater than the average productivity of the stock when the stock is at the desired level". Again, taking Figure 4 for a fishery where there are or were no regulations profitability seems to play the major role in capacity and capitalization. As long as there are no regulations, the market grows. If the abundance of the catch does not decrease appreciably then more boats or more efficient boats will enter the fishery. Ultimately, this change will result in decreasing catches per boat, a decrease in average size of fish, increase in gear investment, decrease in size of boats, decrease in net returns and harvesting of immature fish.

Capacity and capitalization increases with each new unit until equilibrium is reached. At that point in time, the fishery could be defined as being at full capacity (amount of catching and holding ability) and fully capitalized (vessels and infrastructure). The moment the fish harvest declines due to natural or man made ecological circumstances (short and long term effects of *El Nino*, droughts, water diversion etc.), the fishery cannot be defined as having excess capacity and over-capitalized. Only when a regulation is enacted setting quotas lower than the amount caught at equilibrium or totally prohibiting harvest, then that fishery could be defined as having excess capacity and is over-capitalized. Over-capacity and over-capitalization happens automatically in the commercial fishing sector when a fully developed fishery is given a quota lower than the historical level of production.

4.3. SOCIO-ECONOMIC CHARACTERISTICS OF THE FISHING COMMUNITIES OF UGANDA

The last frame survey was carried out on Uganda waters in 1990 (Table 6). It was the most elaborate and comprehensive survey on this lake since 1971. Generally, there are no reliable statistics for calculating employment levels in the fisheries sector and making realistic trend forecasts. However, various research estimates put total employment between 350,000 and 500,000 (UFD, 1996). Recent figures have put the total employment at between 700,000 and one million (East African Newspaper, 1999). Government assessment, however, puts the figure at about 440,000 persons comprising full-time and part-time fishers at 140,000; fish processors/distributors at 150,000 and fisheries related activities at about 150,000. The sector is still dominated by males as indicated by Kirema-Mukasa and Reynolds (1991), and recently by SEDAWOG (1999). Regionally, fisher's spouses are not normally engaged in fisheries-related activities. Agriculture occupies most fisher's families and hence raises questions as to whether or not lakeshore communities can in fact be viewed strictly as fishing communities. The constraint to the women's self-employment and wage earnings include lack of transport for traders, capital and shop premises, and family commitments. This generally means that women are rendered economically unproductive leaving men only to provide the much-needed income for the families, which in most cases is inadequate. The number of fishers alone was estimated at 70,000 to 80,000 in 1988/89

(Reynolds *et al*, 1989), and currently they are estimated at 130,000 to 140,000 in 1997 excluding porters (ca. 30% increase).

Year	1997	1990
Total number of landings		715
Total Active canoes	35,000	8,674
Transport canoes		674
Fishing canoes		8,000
Dugout canoes		2,142
Powered canoes		1,200

Table 6: Number of canoes and landings in 1990 and 1997

The fishing enterprise typically consists of one boat owner, one to three fishers including or excluding the boat owner, one to 4 boats per boat owner, and a set of fishing gear. The single-boat owners are the majority (Reynolds and Kitakule, 1991) whereas the multiple boat owners usually have less than 5 boats. Only a few fishing enterprises own 5 or more boats usually of large size with employment averaging four (4) persons per boat (fishers + part-time helpers). Fishing companies or co-operative societies that are very few usually own more than 10 boats with some formal organisation. There are 65 fish co-operatives (1% of all co-operatives) of which 14 are rated by Uganda Co-operative Alliance (UCA) as active, 16 semi-active, and 26 dormant (Reynolds *et al*, 1989).

Many communities living around Lake Victoria are under intense pressure to meet escalating needs for animal protein. As requirement for fish protein is rising rapidly in relation to increasing human populations, Ribbink *et al* (1985) predicted that these fisherfolk communities are likely to be subjected to even greater fishing pressure in the future. These predictions have been substantiated by findings of SEDAWOG (1999).

The fishing activities are predominantly by small-scale fishers residing in numerous fishing villages, which are either permanent or temporary. These fishing villages were estimated at 1,250 in 1997 and vary considerably in population size, number of boats and volume of fish handled. The fishing boats used are of two types, the traditional dugout canoes, and the planked canoes, which dominate (over 90%) as shown in Table 6. All small-scale boats were estimated at 30,000 to 35,000 in 1997, having increased significantly since 1988/89 largely due to the rapid growth of industry, which has recently been stimulated by Nile perch exports. Two thirds of the fishers of Lake Victoria target Nile perch. The gill net fishery is the most commonly employed gear, utilised by 64% of fishers followed by 24% who use purse seines. Other fishers use hooks, long line, and some outlawed destructive methods, such as mosquito nets and drift nets (SEDAWOG, 1999).

If managed correctly, fish can provide a sustainable source of food and livelihood security. Estimates from the Fisheries department statistics indicate that Nile perch could sustainably yield about 300,000 tonnes of fish per year for the whole lake, that is, only if the ecological welfare of the fishery is ensured. Unfortunately, modern fisheries management has been likened to "controlled plunder" because governments are often ill equipped or lack the political will to define, monitor and enforce regulations. Any development venture tends to concentrate access to fishery resources in the hands of powerful interest groups, and often ignores or disadvantages small-scale and traditional fishers

The benefits from the Nile perch fishery activities would translate into employment opportunities, economic prosperity, new industry, improved regional infrastructure, enhanced educational opportunities, and increased tax revenues under proper governance. However, this kind of growth always results in stress placed on the environment, where features that first attracted people to the Lake can be lost or diminished if growth is not planned for or addressed during development.

4.4. RESULTS AND ANALYSIS FROM THE SURVEY FINDINGS

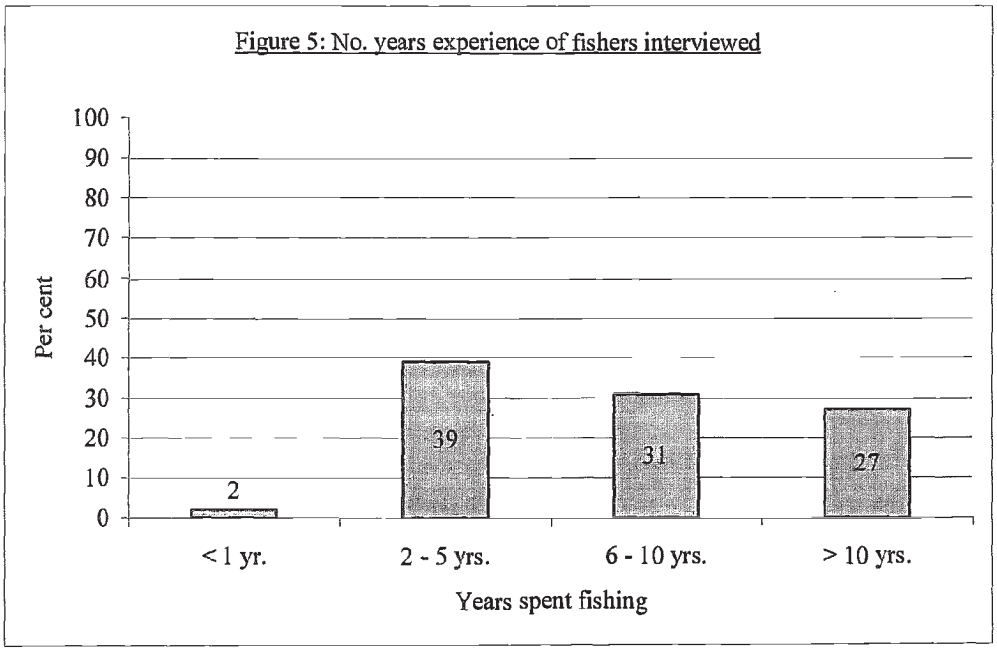
4.4.1. INTRODUCTION

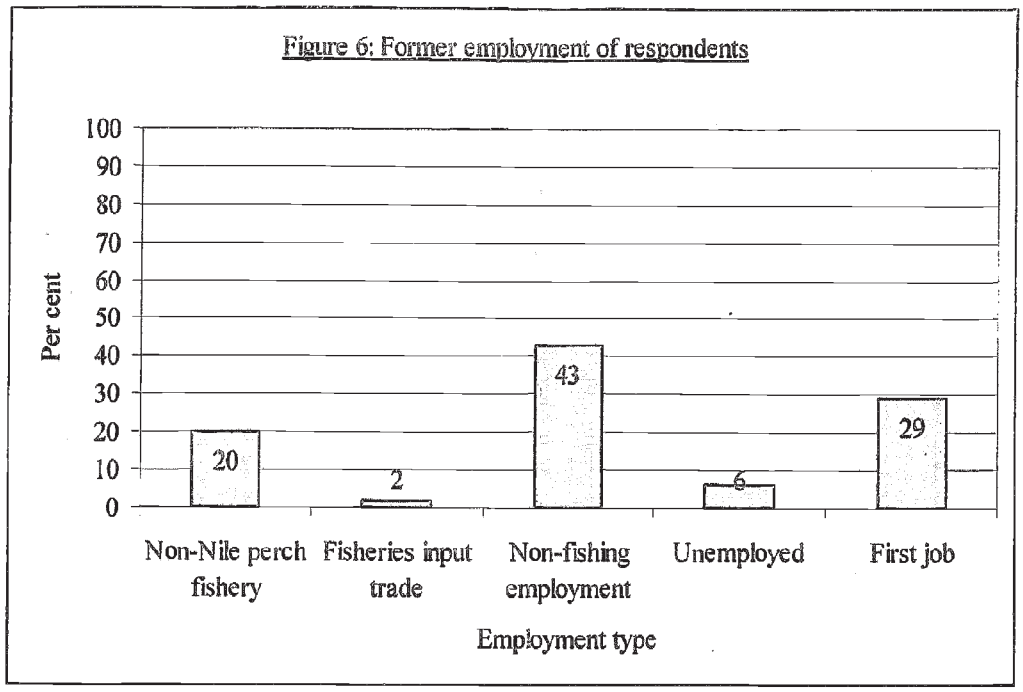
This part of chapter four presents results and an analysis of primary data, divided into sections that deal with the socio-economic status of Lake Victoria fisheries, the implications of the export trade on the fisheries resource and sustainability. Additional sections deal with results from the survey on the fishers' socio-economic characteristics within the fisheries management and development framework including the socio-demographic profile of the fishers. Finally, a profile of a typical fish factory in Uganda with respect to economic development and resource sustainability is presented.

4.4.2. SOCIO-DEMOGRAPHIC PROFILE OF THE FISHERS

Fishers of Lake Victoria are mostly males (96%) of ages between 20-40 years (86%), mainly married (84%), and many have had some formal education (57% in primary and 39% in secondary). The fishers interviewed were mostly independent boat owners (81%) with a few fish traders (8%), factory employers (7%) and others (crews). The fishers' fishing experience ranks from highest response to lowest thus, 2-5 years (39%), 6-10 years (31%), more than 10 years (27%) and less than one year (2%) respectively (Figure 5). This means that the fishers with fishing experience of 10 years or less are the majority with 73% response reflecting a big recent entry into the fishery. Most fishers (77%) are new entrants into fishing business. These were either having work outside fishing (42%) and left because of less profit in their business, or started with fishing as their first employment (29%), or entered the fishing business because they were unemployed and decided to try their luck in fishing (6%). Figure 6 shows the former employment of respondents. For most (43%), employment was derived from the sectors outside the fishery, followed by 29% for whom fishing was their first job and 20% who had been employed in the non-Nile perch fishery.

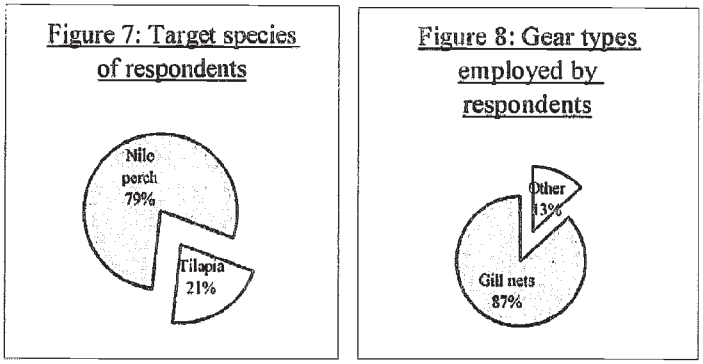
Figure 5: No. years experience of fishers interviewed





4.4.3. FISHERY TYPE

The findings (Figure 7) showed only two types of fish species targeted by fishers, Nile perch, *Lates niloticus* and Tilapia, *Oreochromis niloticus*. 79% of the fishers target Nile perch as their catch compared to only 21% that target Tilapia.



Source: Survey Questionnaire 1999

Six types of different fishing gears were recorded in this region, gill net, purse seine, long line, hooks, cast nets and mosquito nets (Figure 8). Of significance, however, is the gill net fishing gear with a recorded response of 87% and the rest 13% all together (others). The mesh size of the gill net used ranged from 4 inches to 7 inches as reported by most fishers.

4.4.4. TRENDS IN THE FISHERIES

Most fishers reported that catches had declined in recent years. This was attributed to the use of illegal gears and destructive fishing methods (39%), increased effort in form of boats and gear (36%), fish depletion in water or over-fishing (28%), natural phenomenon-bad weather, water hyacinth (31%), and due to the increased numbers of fishers (26%) and to the improved gear and fishing experience (9%) (Table 7).

Reasons for changes in fish catches	No. (N=88)	% response by fishers
Fish depletion in water/overfishing	25	28.40
Increased effort (gear and boats)	32	36.36
Increased number of fishers	23	26.14
Due to better gears and fishing experience	8	9.10
Due to natural phenomenon (weather, water hyacinth, etc.)	27	30.68
Use of illegal gear and destructive fishing methods	34	38.64

Table 7: Percentage response by fishers on reasons why there are changes in fish catches

A qualitative comparison was made of fishers' catches during entry into fishing and presently. This was presented graphically as shown in Figures 9 and 10. It was observed that the average catch per day of fish by fishers has shifted from the high common range of 15-100 kg/day and a mode of 100 kg/day to a low common range of 10-50 kg/day and a mode of only 10 kg/day catches.

Figure 9: Average catches per day on entry
Source: Survey Questionnaire, 1999

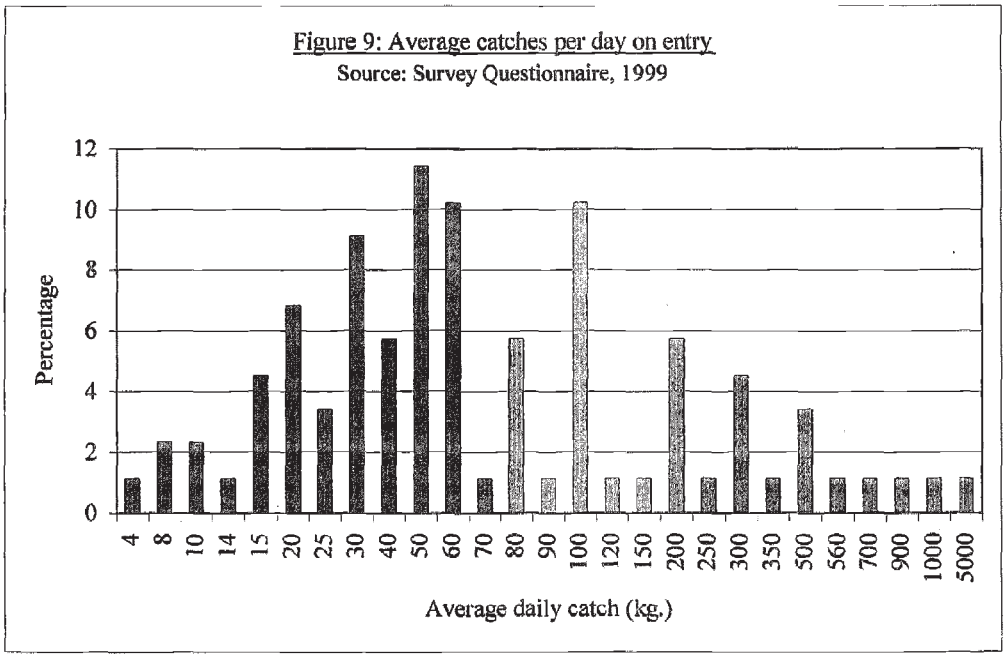
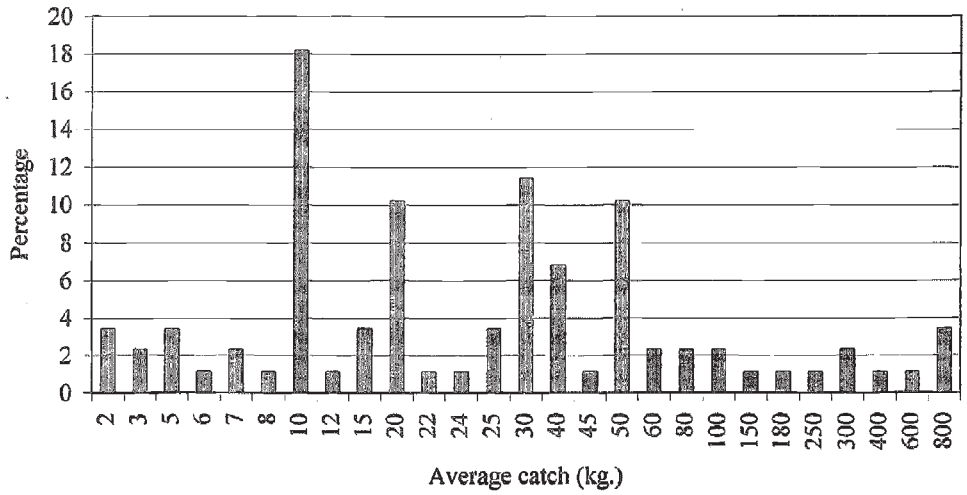


Figure 10: Average catches at present.
Source: Survey Questionnaire, 1999

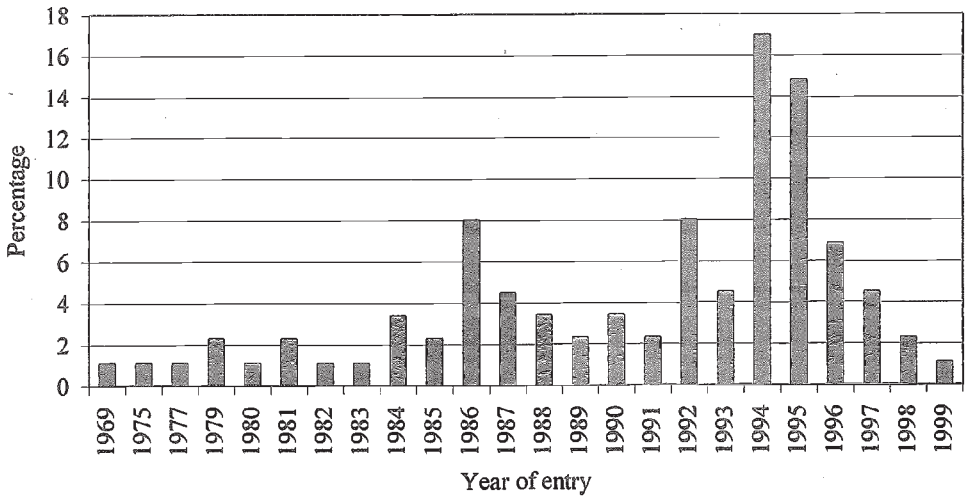


Furthermore, non-parametric tests were carried out on the catches per day during time of entry and currently (1999) for confirmatory purposes. Results indicated average catches per day currently as being less than that during year of entry into fishing (85% responses indicated so). The test statistics (Table 8) gave a high Z of 5.59 indicating a significant difference in the means for the two catches and confirming that there is a decline in catches currently. Consistent with the foregoing results, Figure 12 shows the year of entry for fishers with the majority of fishers having entered fishing between 1992 and 1996, and a small mode in 1986. This explains why there were low catches as expressed by most fishers.

	Ranks	N	Mean Rank	Sum Of Ranks
Average catch per day currently - Average catch per day during year of entry into fishing.	Negative Ranks	75[1]	44.01	3300.50
	Positive Ranks	13[2]	47.35	615.50
	Ties	0[3]		
	Total	88		

Table 8: Wilcoxon signed ranks test. Notes: [1]Average catch per day currently < Average catch per day during year of entry into fishing; [2]Average fish catch per day currently > Average fish catch per day during year of entry into fishing; [3]Average catch per day during year of entry into fishing = Average catch per day currently. Z score –5.590; Asymp. Sig. (2-tailed): .000

Figure 11: Year of entry into fishing
Source: Survey questionnaire, 1999.



4.4.5 DISPOSAL OF CATCHES (Table 9)

All the fishers interviewed sell their catch for cash and there was a well-developed network for wet fish, with fish being traded in large quantities to most urban markets in Uganda. The most prominent market for fish was found to be in Ggaba. Fishers sell their fish to independent supply agents, local market traders, local fish processors and directly to fish processing factories, and to consumers. From this survey, it was noted that most fishers sell their fish to local market traders (63%) and to independent agents (46%). Only 19% of the fishers interviewed supply their fish directly to fish factories; local fish processors (15%) have the least chance of receiving fish from the fishers. These results indicate the importance of the local market, although the processing factories in the end claim more if we add 46% and 19%, giving 65%.

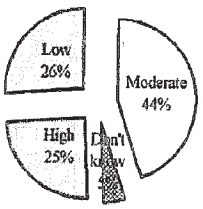
Fish supply arrangement- Fish sold to:	N = 89	% response of fishers
Independent agent	41	46.07
Local market trader	56	62.92
Local fish processor	13	14.61
Direct to factory	17	19.10
Directly to local consumers	2	2.25

Table 9: Fish supply arrangements (marketing mechanism) percentage response Source: Survey Questionnaire 1999

4.4.6. IMPACT OF SUPPLY ARRANGEMENT ON QUANTITY OF FISH SUPPLIED BY FISHERS

45% of the fishers were of the view that the quantities of fish supplied are moderate and commensurate with the demand (Figure 12). 25% said that the supply arrangement has ultimately resulted in less fish being supplied by fishers (probably due to increased effort/competition, over exploitation and decreasing catches). Another 25% thought that the quantities of fish supplied by fishers have increased as a result of the supply arrangement, whereas 5% did not know what has resulted from the arrangement.

Figure 12: The impact of supply arrangements on fish supplies

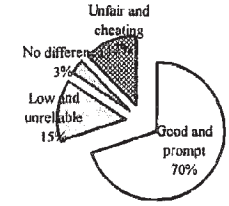


Source: Survey Questionnaire 1999

4.4.7. IMPACT OF SUPPLY ARRANGEMENT ON THE PRICE AND FISH SALES

Fishers were asked to comment on the impact of the supply arrangement on fish sales using the ratings: good and prompt, low sale and unreliable, unfair and cheating, and no difference (Figure 13). 70% of the respondents indicated that the supply arrangements in place have resulted in good and prompt sales. That is, fishers are able to dispose of their fish on cash by cash basis and sell-off all the catch promptly. This again highlights the importance of demand for fish in this region. The remaining 30%, however, were not in favour of the supply arrangements by factories, reasoning that it is unfair and characterised by cheating (12%); additionally, that it is unreliable because it has resulted in less fish being sold to factories by fishers (15%). These results, present a very important piece of evidence about the unfair fish trade in the region, highlighting the serious shortcomings of the impact of the Nile perch export trade on the Lake Victoria's fisher communities as mentioned by most researchers (Jansen, 1997, Odongkara and Okaronon, 1997, Gibbon, 1997).

Figure 13: The impact of supply arrangements on fish sales



Source: Survey questionnaire, 1999.

4.4.8. INVESTMENT INTO THE FISHERY ON ENTRY AND SUBSEQUENTLY

Fishing was found to be a major occupation and source of income for all the fishers interviewed. As shown (Table 10), investments on entry for most fishers mainly consisted of a boat and few nets to start with (43 or 69.35%); 19.35% used a hired boat. Only very few could afford a boat engine. In subsequent investments (Table 11), most fishers could afford an engine or additional boats, nets and other inputs for their fishing. 13% stated that they were unable to make any change.

Type of Investment	Frequency	%	Valid%	Cumulative%
No answers	7	7.8	7.8	7.8
Hired boat	12	13.3	13.3	21.1
Hired boat + Own boat	2	2.2	2.2	23.3
Hired boat + Few nets	5	5.6	5.6	28.9
Own boat	9	10.0	10.0	38.9
Own boat + Few nets	43	47.8	47.8	86.7
Own boat + Few nets + other inputs	2	2.2	2.2	88.9
Own boat + Few nets + Engine	5	5.6	5.6	94.4
Own boat + Engine	1	1.1	1.1	95.6
Few nets	3	3.3	3.3	98.9
Had engine boat	1	1.1	1.1	100.0
Total	90	100.0	100.0	

Table 10: Investment on entry into the fishery Source: Survey questionnaire 1999.

Investment type	Frequency	%	Valid%	Cumulative%
No answers	7	7.8	7.8	7.8
Bought a boat or more boat(s)	7	7.8	7.8	15.6
A boat + Engine	2	2.2	2.2	17.8
A boat + Engine + More nets	20	22.2	22.2	40.0
A boat + More nets	16	17.8	17.8	57.8
A boat + More nets + other inputs	2	2.2	2.2	60.0
A boat + Engine + More nets + other inputs	1	1.1	1.1	61.1
Bought an engine	3	3.3	3.3	64.4
Engine + More nets	8	8.9	8.9	73.3
Engine + More nets + other inputs	6	6.7	6.7	80.0
Engine + other inputs	1	1.1	1.1	81.1
Bought more nets	3	3.3	3.3	84.4
More nets + other inputs	1	1.1	1.1	85.6
More nets + other inputs	1	1.1	1.1	85.6
No change	13	14.4	14.4	100.0
No change	13	14.4	14.4	100.0
Total	90	100.0	100.0	
Total	90	100.0	100.0	

Table 11: Subsequent investment Source: Survey questionnaire 1999.

The results from this section qualitatively presents an indirect picture of the income levels among the fishers interviewed as inferred from the improvements in assets acquired and inputs for their fishing. Since determining the real incomes of fishers was not possible, a comparative analysis of the sources of income for their investments was useful in establishing the importance of fish for their socio-economic requirements. For example, fishers were asked to mention where they got money to enter the fishery and how they were able to maintain their business subsequently. On entry fishers had to seek money from agricultural sources and other business, from credit or inherited assets, labour for others to get money, combine fish sale and agriculture sources or fish sales and labouring for others, and fish sales alone. After establishing themselves in the business, most of the income (49) was from the fish sales alone compared to four from fish combined with agriculture sources and one from agriculture and other business. This again presents fish as a very important income provider for fishers.

The fishers further indicated that they had acquired several assets, ranging from established homes with land and plots to household items including property such as cars for transport besides boats, engines and other

inputs for fishing. Some fishers indicated that they have opened up some other businesses like shops, etc. (Table 12). 48 (60%) reported that fish sales was the source of their income for acquiring assets. Eight (16%) got money from agricultural sources and business and ca. 2 got money from credit facility. When fishers were asked why they decided to invest or to add more boats and gear, 46% indicated that more fish incomes had enabled them to upgrade, 24% invested because of income and competition or/and increased awareness. On the other hand, some fishers (8%) were unable to invest because of prohibitively expensive inputs (Table 13). Others gave the EU fish ban as a reason for lack of investment because they were not getting money enough to invest.

Type of assets	Frequency	%	Valid%	Cumulative%
No answer given	4	4.4	4.4	4.4
Land and house	19	21.1	21.1	25.6
Established house and transport	11	12.2	12.2	37.8
Established house, transport, family	5	5.6	5.6	43.3
Established house, transport, and business	6	6.7	6.7	50.0
Established house and family	11	12.2	12.2	62.2
Established house, family and business	5	5.6	5.6	67.8
Established house and business	12	13.3	13.3	81.1
Better transport: bicycle, car; House effects	4	4.4	4.4	85.6
Better transport and family	1	1.1	1.1	86.7
Married, educate children	1	1.1	1.1	87.8
Shop and other businesses	2	2.2	2.2	90.0
No tangible property	9	10.0	10.0	100.0
Total	90	100.0	100.0	

Table 12: Welfare of fishers in terms of assets acquired Source: Survey Questionnaire 1999

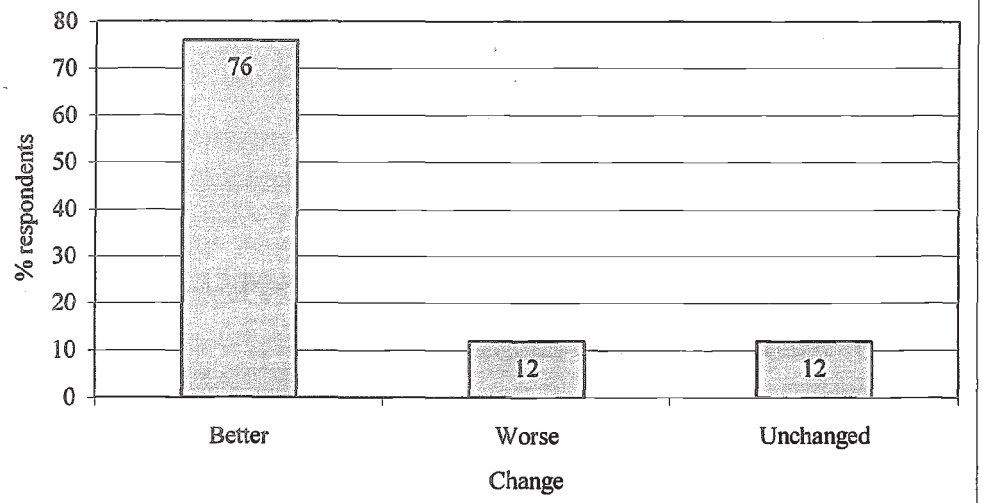
Reasons for Investing	Frequency	%	Valid%	Cumulative%
No answers	15	16.7	16.7	16.7
More fish income	41	45.6	45.6	62.2
More fish income + More competition	10	11.1	11.1	73.3
More fish Income + Awareness	9	10.0	10.0	83.3
More competition + Technology	2	2.2	2.2	85.6
More competition + Expensive inputs	2	2.2	2.2	87.8
More competition + Awareness	1	1.1	1.1	88.9
Unaffordable inputs	7	7.8	7.8	96.7
Increased awareness + experience	3	3.3	3.3	100.0
Total	90	100.0	100.0	

Table 13: Reasons for changes in investment in the fishery Source: Survey Questionnaire 1999

4.4.9. LIVING STANDARDS OF FISHERS

76% of fishers interviewed believed that living standards for fishers are better than five years ago (Figure 14). 12% of fishers reported that the living conditions have worsened and 12% felt that nothing much has changed. Those who said that living standards for fishers have greatly improved attributed this to increased incomes (47%) and increase in local investments (assets) (32%). Also, those who mentioned living conditions as worse or unchanged attributed this to decline in catches due to the water hyacinth (9%), EU fish ban (8%) and 5% did not know why (Table 14).

Figure 14: Changes to the living standards of fishers
Source: Survey questionnaire, 1999.



Reasons for Changes in Living Conditions of Fishers	Frequency	Valid%
Improvement in incomes	60	47.2
Increase in local investments (assets)	41	32.3
Decline in catches due to water hyacinth	11	8.7
Don't know	5	3.9
EU fish ban has paralysed incomes	10	7.9
Total response	127	100.0

Table 14: Reasons for changes in living standards Source: Survey Questionnaire 1999

4.4.10. FISHERS' PERCEPTIONS OF THE MAJOR CHANGES IN THE LAST FIVE YEARS

Fishers were asked to mention any major changes they have observed in the last five years since fish factories started operating and the results were as presented in Table 15.

Changes in the Fishery	Frequency	Valid%
Incomes of fisher communities have improved	60	39.5
The fish market has greatly improved	58	38.2
Fishing effort has shot up	13	8.6
Local processors have reduced	4	2.6
Increased use of illegal gear and destructive fishing	11	7.2
Reduction in use of destructive fishing and illegal gear	6	3.9
Total response	152	100.0

Table 15: Major changes in the last five years Source: Survey Questionnaire 1999

A majority of fishers reported that major changes had occurred in their community ever since the fish factories started operating. The most important change among the fishing communities mentioned by 40% of fishers was increased incomes as inferred from assets and better standards of living for most people. This was closely

followed by great improvement in the fish market (38%). Other changes mentioned included increased fishing effort (9%), increase in illegal fishing (7%), and for some, a reduction in illegal fishing (4%) and the disappearance of local fish processors. Fishers also indicated that they had observed a recent increase in the numbers of fishers in their local fisheries (see Table 8).

4.4.11 FISHERS' ATTITUDES TOWARDS FISH PROCESSING FACTORIES AND THE SUSTAINABILITY OF THE FISHERIES RESOURCES

Attitudes about the fisheries resources and the role of fish factories in the sustainable management were assessed on an attitude scale that was based on a fixed-format response framework. The attitude scale consisted essentially of nine statements depicting varying degrees of favourable and unfavourable attitude to the relationship between fishers and fish factories in the sustainable fisheries exploitation from "agree" to "not sure". In order to tap direction and intensity, these responses were broken down into three categories: "agree", "disagree", and "not sure" (Table. 16).

	Categories		
Statements	Agree	Disagree	Not sure
Fish factories have created employment for fishers	71	9	5
Fish factories provide credit to fishers	20	44	21
Fish factories provide good market for fishers	82	1	2
Fish factories have helped improve fishers' incomes	73	9	3
Fish factories provide fishers with education on fish handling	25	52	8
Fish factories deprive fishers of livelihood through their fish supply arrangements	35	34	16
Fish factories responsible for illegal and deteriorating fishing practices	21	58	6
Fish factories deprive locals of their domestic fish needs	19	62	4
Fish factories likely to deplete fish	28	49	8

Table. 16: Descriptive statistics depicting attitudes/ relationships of fishers towards fish factories. Source: Survey Questionnaire 1999

Of the nine statement categories in Table 16, the statements numbered 1, 3, 4 and 6 are indicators of favourable attitudes, and 2, 5, 7, 8 and 9 are indicators of unfavourable attitudes. Thus, fishers are mostly of the view that factories have created employment for them and other people of the community (71); provided a good fish market for fishers (82); and helped to enhance fishers' incomes (73).

However, a good number of fishers (35) also think that the supply arrangements created by fish factories have deprived them of livelihood. This is an issue that highlights the supposed conflict about the implications of export trade on the sustainability of the fishery resource and the people who depend upon it for livelihoods and food.

Furthermore, a majority of fishers responded that factories do not provide credit (44) or basic education on fish handling (52) to them. Most fishers, however, do think that fish factories are not responsible for illegal and deteriorating fishing practice (58) or for depriving fishers/locals of their domestic fish requirements. They argue that fish factories generally do not have direct influence on what goes on in the waters, so they cannot determine what fishers use for fishing. Most fishers talked to state that factories do not allow small size fish, or do not deal in tilapia, which is very susceptible to poisoning since it is mainly pelagic. The fishers also argue that most domestic fish for the locals is tilapia and other species, which the factories do not need for fish processing.

In regard to how they view the future of Lake Victoria fisheries, most fishers (49), disagree that fish factories will deplete the fisheries resource; however, some fishers are very cautious of the trend of activities rampant on the lake.

4.4.12 FISHERS' PERCEPTIONS OF THE SUSTAINABLE MANAGEMENT OF L. VICTORIA FISHERIES

Fishers were asked to give some suggestions towards the sustainable management of the fisheries and several responses were made, which were summarised into seven succinct viewpoints (Table 17). 66% of responses from fishers were of the view that illegal gear and destructive fishing be discouraged as a matter of urgency. 43% of the responses suggested that there should be some credit facility provision put in place to assist fishers in their financial difficulties. Fishers further suggested that government and concerned players should work to stabilise the fish market by lifting the fish ban imposed by the European Union and by encouraging more industrial fish processors to come and invest in Uganda (29%).

	Statistics	
Suggestions	N=86	% response from fishers
Discourage illegal fishing practices	57	66.28
Rectify fish market and encourage more investors	25	29.07
Provide fishers with credit	36	42.60
Encourage fisher community involvement in management policy	14	16.28
Provide education to fishers	25	29.07
Improve facilities at the landing sites	19	22.09
Call for more responsibility and accountability for government	15	17.44

Table 17: Suggestions by fishers (% response) on sustainable management of Lake Victoria fisheries.
Source: Survey Questionnaire 1999

This seems rather divergent from what most sceptics think about fish factories, as noted from literature cited earlier in chapter two of this thesis. There should be more help according to fishers in the provision of relevant training for fishers (29%), improvement of landing sites facilities (22%); responsibility and accountability on the part of government (17%) and involvement of fishers in management-development policy (16%). These were some of the suggestions that fishers felt were of utter importance if the fishery resource was to be managed sustainably.

Of interest was that fishers' perceptions on sustainable management were quite positive and encouraging. Fishers believe that fisheries management is a legitimate activity, which they perceive as a means honestly designed to ensure that there is enough fish in future.

They see legitimate management as being in the hands of the government, and that it is the legitimate role of fisheries officers' to honestly enforce the management.

Fishers, however, deplore the inefficiencies of the fisheries officers whom they say are corrupt in their appointments and operations.

While management is seen as an honest attempt to conserve the fishery, individual officers are not seen as necessarily a part of that effort. There is also a real feeling among the fishers that the government as a whole, while they are very dependent on it for leadership and development, has neglected the fishers and their communities. (Some fishers are of the view that they should be represented in parliament so that their problems can be addressed like other disadvantaged groups (the disabled and women) in Uganda have done).

4.4.13 FISHERS' PERCEPTIONS OF THE MAJOR FISHING PROBLEMS

In order to highlight the most disabling problems fishers face in their day-to-day fishing operations, fishers were asked to mention the problems they view as serious in their operation; a summary was presented in Table 18. The most serious problem mentioned by 52% respondents was the prohibitively expensive inputs used in fishing operations. In fact, expensive inputs may be partly responsible for the increasing use of illegal gear. Most fishers (39%) mentioned lack of security in water as the next disabling problem. This was particularly reflected in their complaint that gear theft and piracy is rampant on the lake. In addition, fishers (31%) reported that fish traders are unfaithful and exploitative as they cheat them in price.

	Statistics	
Major Problems faced by fishers	N=82	% response by fishers
On-water safety and poor sanitation	5	6.10
Inputs are very expensive	43	52.44
Government revenues are unrealistic	15	18.30
Lack of security in water	32	39.00
Unfaithful buyers (low price)	25	30.50
Less fish and bad weather	7	9.00
Unfriendly/uncooperative govt officials	6	7.32

Table 18: Major problems encountered by fishers in the fishery as percentage response. Source: Survey Questionnaire 1999

Other notable problems included unrealistic and unfair government revenue collection (18%), declining catches and bad weather (9%), unfriendly/uncooperative fisheries officers (7%), and lack of proper sanitation and safety on water, which results in many deaths (6%). Even though the EU fish ban was in place at the time of this survey, fishers did not highlight this as one of the disabling problems. This observation underpins the importance of the fish export trade and highlights the importance of the local demand.

4.5. INDUSTRIAL FISH PROCESSING FACTORIES

4.5.1. INTRODUCTION

There are 11 fish processing factories currently in operation in the Ugandan region of Lake Victoria. Much concern has been expressed over the rapid growth of the industrial fish processing from three factories in 1990 to 11 factories currently in 1999. There abound mixed feelings about this rapid growth, with some proponents expressing fears that the demand for fish by these factories may be constraining the fishery resource, while others are optimistic about the factories. To determine the implications of the industrial fish processing on the fishery resource, interviews were conducted with the factory owners/managers of 8 out of 11 factories in late 1999 and results of the survey are presented in this section.

4.5.2. UGANDA'S INDUSTRIAL FISH FACTORIES' PROFILE

The fish factories are owned on partnership (75%) or sole (25%) basis by different nationalities, which include Ugandans (38%), Kenyans, Koreans, Saudi Arabians, Indians and Dutch (Table 19). Most factory owners (56%) indicated that they have extensive professional experience in the fish processing business; only a few have only some relevant training (11%) in the business. On the other hand, 33% had no previous experience in the fishing industry prior to the establishment of the processing factory business.

	Frequency	Valid%
Ugandan	3	37.5
Kenyan	1	12.5
Korean	1	12.5
Saudi Arabian	1	12.5
Indian	1	12.5
Dutch	1	12.5
Total	8	100.0

Table 19: Nationality of owners Source: Survey Questionnaire 1999

Some factories (38%) have sister companies dealing in fish processing outside Uganda (Table 20). All the fish factories surveyed were dealing in Nile perch, which they say is on demand in the overseas export market (46%). The factory owners disclosed that Nile perch commands a good price; and that the product is available in good supply (46%), making it convenient for exploitation.

	Frequency	Valid%
Yes	3	37.5
No	5	62.5
Total	8	100.0

Table 20: Sister companies in other countries. Source: Survey Questionnaire 1999

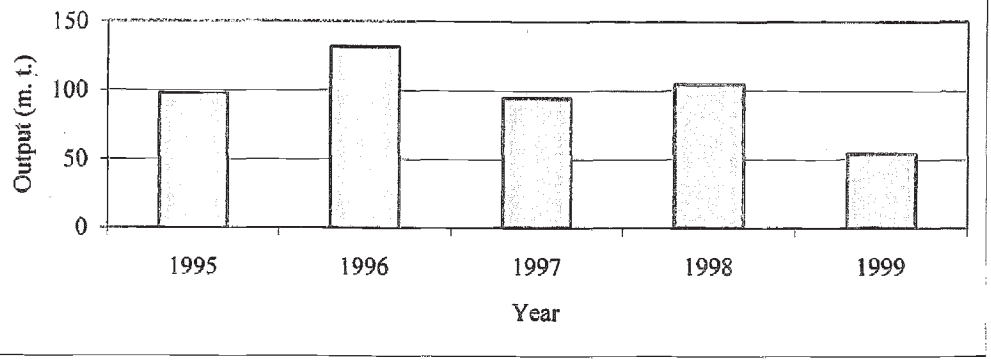
4.5.3. FACTORY CAPACITY AND REAL FACTORY OUTPUT

Generally, there has been growth in capacity and in real output for the factories over the recent years. Some factories (A, E and G), however, had remained at the same level both in capacities and daily output, while others, such as C, D and F registered a big growth both in capacities and daily output. Fish factory B showed a decline in real output at constant capacity while factory H had reduced its capacity at constant output. On the general outlook, however, there is a decline in the volumes of fish processed since 1995 to 1999 (Table 21 and Figure 15).

Output	N	Range	Min.	Max.	Sum	Mean	Std. Deviation	Variance
Tonnage per week for 1995	4	60.00	60.00	120.00	393.00	98.2500	26.3106	692.250
Tonnage per week for 1996	5	255.00	60.00	315.00	660.00	132.000	103.8388	10782.50
Tonnage per week for 1997	4	41.00	79.00	120.00	379.00	94.7500	19.4143	376.917
Tonnage per week for 1998	7	150.00	25.00	175.00	732.00	104.571	56.5062	3192.952
Tonnage per week for 1999	6	135.00	15.00	150.00	329.00	54.8333	51.0114	2602.167

Table 21: Descriptive statistics for fish processed per week from 1995 to 1999 by different fish processing factories. Source: fish factory processor questionnaire 1999

Figure 15: Mean fish output per week from fish processing factories, 1995 - 1999
Source: Mean from Table 21



4.5.4. REASONS FOR CHANGES IN CAPACITY

Factory owners gave several reasons for changes in capacity and real output since 1995 (Table 22). The need to meet the demand from the international export market (18%) and to provide for the increase in quantities of fish to be processed (18%), were among the prominent reasons given. In addition, the increasing competition from the rapidly growing industry (18%) was also mentioned.

Reasons stated	Frequency	Valid%
Improved management	1	9.1
EU fish ban	1	9.1
Increased competitiveness	2	18.2
Improvement in the export market	2	18.2
High level investment	1	9.1
Increased demand for processing	2	18.2
Improved technology	1	9.1
No serious change	1	9.1
Total	11	100.0

Table 22: Main reasons for changes in capacity and real output

On the other hand, the factory owners noted that it was due to the pressure from the EU fish-ban (9%), and the requirement to satisfy the high level of quality standards for processing plants that they had to upgrade in technology, investment and management.

4.5.5. SPECIFICATIONS FOR NILE PERCH PROCESSED BY FISH FACTORIES.

Contrary to what is generally expressed about the small size of Nile perch processed by fish factories, results from this survey (Figures 16 and 17) showed that the size of Nile perch processed has been increasing on average. Initially, factories used to process Nile perch of sizes ranging from 2-5 kg (62%), more than 3 kg (25%) and less than 2 kg (13%). At the time of this survey, the number of factories processing fish of more than 3 kg had gone up to 40% and those processing fish of 2-5 kg had gone down to 50%. Only 10% were still processing fish of less than 2 kg. The factory owners indicated that the sizes of fish processed were mainly determined by the specifications of the export market (50%) and the legal obligations (40%), which are such that there should be no exploitation of small size fish. In addition, the nature/type of product (i.e. frozen fish) (10%) also determines the size of processing (see Figure 18).

Figure 16: Weight ranges of Nile perch purchased

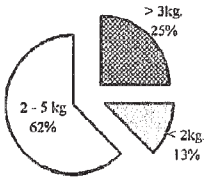


Figure 17: Current size ranges of Nile perch purchased

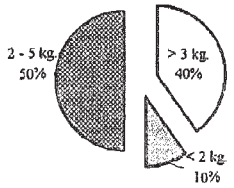
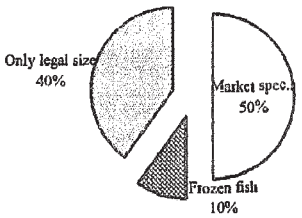


Figure 18: Reason for changing size bought



4.5.6. PRICE MECHANISM FOR NILE PERCH

75% of the respondents reported that factory owners normally set prices. The remaining 25% argued that several actors are involved in the price determination including factory owners, fishers, agents, etc. and the outcome of the price is generally a mutual agreement between the players (Figure 19). It was noted that some fishers (50%) feel bitter when factories impose their price on them; however, the same percentage response (50%) indicated that there is satisfaction from fishers with the supply arrangements (see Figure 20). Compared to other fish species (e.g. tilapia), Nile perch prices are relatively higher according to some factory owners (38%). The same number, however, have no idea of the comparative prices since they have no interest in other species. A small number of factory owners (12%) say that it is relatively lower or the same as others (12%) (Figure 21).

Figure 19: Who determines Nile perch purchase prices?

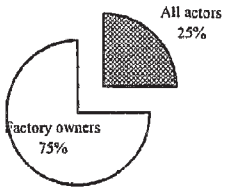


Figure 20: Fishers' reactions to prices

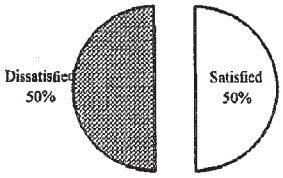
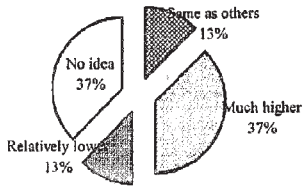
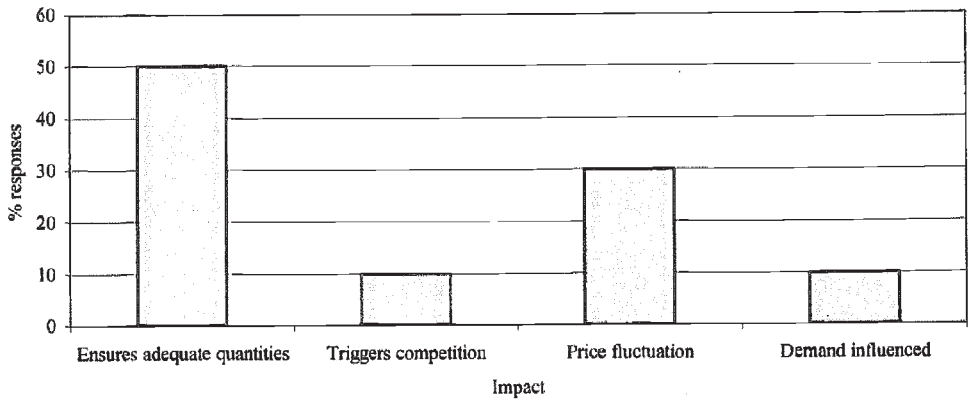


Figure 21: Nile perch prices compared to other species



Nile perch prices influences considerably the quantities supplied to factories, affects price stability and induces competition. 50% factory owners indicated that good prices ensure adequate supplies for their factories (Figure 22).

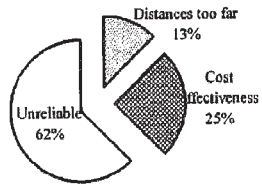
Figure 22: Impacts of prices offered for Nile perch



4.5.7. FISH SUPPLY ARRANGEMENTS

80% of the processing factories surveyed procure their fish through agents/middlemen. 20% buy their fish directly from fishers. Factories that use agents against fishers, reason that fishers are unreliable (63%), ineffective (25%) and uneconomically far away from the factories (12%) (Figure 23).

Figure 23: Why supply arrangements may exclude fishers



4.5.8. REGULAR SUPPLIES

To ensure that adequate and regular supplies are availed, factories offer competitive prices (29%) and prompt payment (38%). The fish factories also "tie" suppliers to themselves by offering loans and outboard engines. Some factories even offer free "scrap" (skeletal-left-over from filleted Nile perch) of Nile perch to their agents (Table 23).

	Frequency	Valid%
Offer better price	4	28.6
"Tie" suppliers by offering loans and inputs	2	14.3
Offer free 'scrap' from Nile perch	1	7.1
Ensure prompt payment	5	35.7
Provide collecting boats and out board engines	2	14.3
Total	14	100.0

Table 23: How factories ensure a regular supply

4.5.9. AGREEMENT TYPES WITH SUPPLIERS

The fish factories make some agreements with their agents for mutual understanding (Table 24). These include provision of handling facilities and collecting boats (55%), and provision of basic inputs like ice, as long as the agents agree to supply only to them (27%).

	Frequency	Valid%
Provide basic inputs as long as they supply only to them	3	27.3
Provide soft loans for their capital investment	1	9.1
Provide handling facilities and collecting boats	6	54.5
Mutual agreement as an association	1	9.1
Total	11	100.0

Table 24: Agreement types with suppliers

Other agreement types include provision of soft loans and mutual understanding between the agents. Most factory owners are very happy with the arrangement because it guarantees adequate supplies of fish (56%), and problems associated with procurement directly from fishers are by-passed (Table 25).

	Frequency	Valid%
Adequate supply ensured	5	55.6
There are less procurement problems	2	22.2
No serious impact at all	2	22.2
Total	9	100.0

Table 25: Impact of supply arrangement on quantity of fish supplied

It was further reported by plant owners that as a result of proper supply arrangements, the fish supplies have become more regular (80%) and the demand and specifications are adequately met (20%) (Table 26).

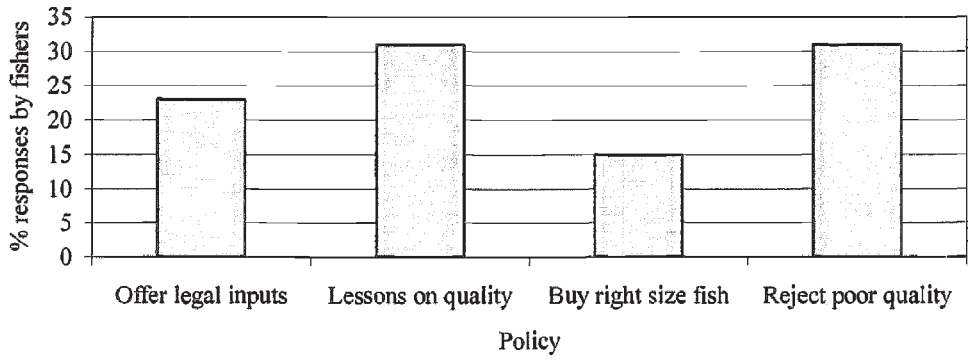
	Frequency	Valid%
Specific and required quantities are supplied	1	20.0
The supplies of fish are regular	4	80.0
Total	5	100.0

Table 26: Reasons given for the impact of supply arrangement

4.5.10. THE ROLE OF FISH FACTORIES IN SUSTAINABLE MANAGEMENT OF THE FISHERY RESOURCE

75% of the factory owners recorded that they operate within the legal framework of the Lake Victoria fisheries management. According to factory owners, implementation of management measures is generally effected directly or indirectly through lessons on fish quality and handling provided to suppliers and fishers (31%). Also through rejecting any small size fish (15%) or poor quality fish (31%) and by offering legally acceptable inputs to fishers (23%) (Figure 24).

Figure 24: How factories implement management policy
Soiurce: Survey questionnaire, 1999

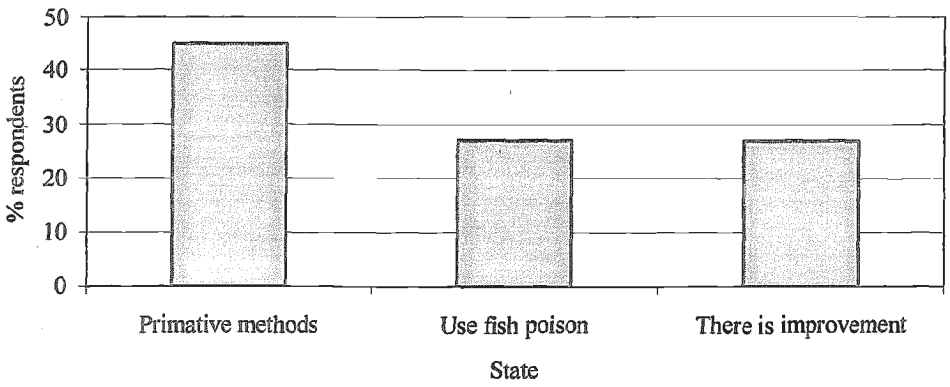


4.5.11. PERCEPTIONS ON THE FISHERY STATE

Most fish factory owners (46%) were of the view that destructive fishing is rampant (primitive/illegal gears are still in use by fishers). Moreover, some factory owners (27%) indicated that fish poisoning was still being practised by the fishers, calling for some serious attention (Figure 25). On the other hand, some factory owners (27%) reported that there had been some improvement in fishing practices by fishers.

When the factory owners were asked whether they have provisions in place to provide fishers with incentives to fish sustainably, the factories were evasive, giving the reason that fishers are unreliable and that there is no money to give to fishers. Some fish factory owners asserted that the issue of incentives is a government responsibility and they have nothing to do with it. They complained that a lot of taxes in revenues, etc. are given to government by fish factories and it is up to the government to safeguard its fishery resource.

Figure 25: State of fishers' fishing practises



4.5.12. FACTORY CONTRIBUTION TOWARDS DEVELOPMENT

All fish factory owners registered that they have greatly contributed to the development of the fisheries industry in Uganda (see Table 27).

	Frequency	Valid%
We provide foreign exchange for the country	5	27.8
Provided employment to the people of Uganda	5	27.8
Provide subsidized inputs to fishers	1	5.6
Provide credit to fish agents/suppliers	2	11.1
Promoted investment and modernization	3	16.7
Provide training in better handling and quality control	1	5.6
We have contributed to the improvement of fish market	1	5.6
Total		100.00

Table 27: How have factories helped in development Source: Fish factory processor questionnaire 1999

Their contribution to foreign exchange to the country and employment to the people of Uganda are the most important according to them (56%). Among others, promotion of investment and modernisation, and provision of credit to fish agents were recorded.

4.5.13. HOW FACTORIES CAN HELP IN THE MANAGEMENT

Most factory owners when asked whether they can help in the management of the fishery responded in the affirmative (88%), even indicating ways through which they would help in the sustainable development as compiled in Table 28. The most highlighted means were, to provide reliable data on production statistics, factory controls of size of fish bought and providing technical assistance on fish handling.

	Frequency	Valid%
Directly providing technical assistance on fish handling	3	17.6
Advising policy makers on technical aspects	2	11.8
Provide reliable data on production statistics	4	23.5
Controls by sizes of fish received at the factory	3	17.6
Construct better facilities at beaches	1	5.9
Provide credit to fishers	2	11.8
Participate in the co-management of the resource	2	11.8
Total	17	100.0

Table 28: How factories can help in the management Source: Fish factory processor questionnaire 1999

The factory owners, however, noted that they have limitations that can make their contribution to sustainable development /management difficult (see Table 29).

	Frequency	Valid%
Poor legislation leading to resource destruction	4	23.5
EU fish ban paralyses their market and business	5	29.4
The quota system limits the quantity they wish to produce	1	5.9
There is low cooperation with fishers and other actors	2	11.8
There is poor research concerning the resource of lake Victoria	1	5.9
Government corruption makes it difficult for us	2	11.8
There is no proper mechanisms for price control	1	5.9
The resource is an open access with no limitations for use	1	5.9
Total	17	100.0

Table 29: Limitations for factory management of the fisheries Source: Fish factory processor questionnaire 1999

EU fish ban, which has paralysed their market and business, was the most decried limitation, followed by poor legislation and enforcement of fisheries laws, which according to them has resulted in destructive fishing. Other limitations mentioned are lack of co-operation with fishers and actors, and the rampant corruption by government officials, which erodes away the moral incentive to practice sustainable management.

4.5.14. HOW TO HELP FISHERS FOR SUSTAINABLE MANAGEMENT

Factory owners were asked to make suggestions on how to help fishers accomplish sustainable management of the fishery resource (see Table 30). Provision of basic education on fishery resource management and basic requirements for community welfare were some of the prominent suggestions followed by provision of credit to fishers and the need to revisit the laws for better sustainability of the resource. Others included subsidised inputs for fishers and co-management.

	Frequency	Valid%
Provide basic education on fish resource management	5	31.3
Encourage fishers' organizations	1	6.3
Provide basic requirements for the community	5	31.3
Provide basic requirements for the community	5	31.3
Provide subsidized inputs	1	6.3
Provide subsidized inputs	1	6.3
Make proper laws for the sustainability of the resource	2	12.5
Make proper laws for the sustainability of the resource	2	12.5
Provide capital for fishers	2	12.5
Provide capital for fishers	2	12.5
Total	16	100.0

Table 30: How fishers can be helped for better management Source: Fish factory processor questionnaire 1999

4.5.15 FUTURE PERCEPTIONS OF THE NILE PERCH FISHERY

Fish factory owners showed mixed viewpoints about the future of Nile perch fishery. Some factory owners think that the future is bright (36%) while others feel there is need for precaution since catches are already on the decline (36%) (see Table 31). 18% however, asserted that the resource is in no danger and that there should be quick action to improve the export market.

	Frequency	Valid%
No serious danger for the resource	2	18.2
The future is bright	4	36.4
Improve the export market	1	9.1
There is a decline already in catches of Nile perch	4	36.4
Total	11	100.0

Table 31: The future of the Nile perch fisheries Source: Fish factory processor questionnaire 1999

4.6. SUMMARY

1. Earlier changes in fish production on Lake Victoria in Uganda were sporadic and unstable, mainly influenced by the political instability and social breakdown rather than the biological state of the fishery.
2. The reinstitution of social and political stability coincided with the Nile perch fishery boom in the late 1980s and early 1990s resulting in mixed implications. Perhaps the most profound implications were the rapid growth in fishing effort and entry into fishing business attracted by the lucrative business of Nile perch and quick economic gains. The changes that followed the boom in Nile perch fishery were surmounted by counter implications resulting in the stress placed on a finite resource. Catches increased appreciably at first but then stagnated since 1996 up to now raising many questions about the sustainability of the Nile perch fishery.
3. The Uganda government largely blames current low fish catches on the infestation by the water hyacinth, the *El Nino* weather, the EU fish-ban, and the increased number of fishers and their destructive fishing methods. However, it is also acknowledged that the rapid expansion of industrial fish processing has had serious impact on the fish catches.
4. Moreover, trends of recorded catches and prices of fish based on a bio-economic model show that there is a convincing likelihood of overexploitation of the fisheries resources of Lake Victoria.
5. The current findings confirm that there have been considerable changes (social, economic and biological) in the lake, which resulted from the rapid growth of the Nile perch fishery since 1990. The high demand for Nile perch and the subsequent trade liberalization and increased industrial fish processing and investments triggered these changes. Stimulated by the economic incentive and a well-organized market the Nile perch trade therefore developed rapidly. The increase in fish demand, however, means that more fish are removed un-proportionately from a limited fishery resource thus threatening the sustainability of the whole lake's fishery.
6. Notwithstanding, Nile perch still drives the export market and the industrial processing plants are keen to exploit it as long as it will last. This is seen from the ever-growing capacity since the 1990s and the increasing demand for fish globally.
7. The fishery has been capitalized with new players who are economically powerful marginalizing the weaker fishers. This has led to some fishers resorting to use of unsustainable methods (such as illegal gear and fish poisoning) for getting fish in order to survive.
8. Despite the serious problems of sustainability, the fishers feel they have benefited from the Nile perch boom and they hail the export fish trade for the improvement in the fish market. They are aware of the increasing effort and the declining catches but they blame the latter on the use of illegal fishing gear

(these are cheaper and affordable than legal gear), many fishers and weather changes.

9. Perhaps the most encouraging information is that the main players- the fishers and fish factory owners understand the seriousness of the problem and are willing to work for the sustainability of the lake's resources if they can get assistance. This is a way forward for co-management.