C. MAIN REPORT

SUB-CONTRACTED SURVEY
SOCIO-ECONOMICS IN FISHERIES COMMUNITIES

JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF NATURAL RESOURCES AND TOURISM
FISHERIES DIVISION
UNITED REPUBLIC OF TANZANIA

THE MASTER PLAN STUDY ON FISHERIES DEVELOPMENT

IN

THE UNITED REPUBLIC OF TANZANIA

Socio-economic Survey of Fishing Communities in Tanzania Mainland

Prepared by
The Economic Research Bureau
University of Dar es Salaam
Tel: 255-22-2410134
Fax: 255-22-2410212
Email: erb@udsm.ac.tz

July, 2001

STUDY TEAM

Participating Consultants

Dr Kassim Athumani Kulindwa, study team leader – ERB (UDSM)
Dr Joseph Louis Mark Shitundu-ERB (UDSM)
Dr Natu El-Maamry Mwamba-ERB (UDSM)
Prof. Issa Kaboko Musoke-Sociology Department (UDSM)
Mr William Nehemiah Mkanta – Department of statistics (UDSM)

Participating Research Assistants

Mr Ebenezeri Samwel- B.A. Economics, Demography
Mr Mateso Bigirimana –B.A Economics
Ms Mereciana Chrisostom Taratibu – B.A. Statistics
Mr John William – Assistant ERB (UDSM)
Mr Charles Kadonya – M.A. Sociology

TABLE OF CONTENTS

1.0 Study Background

The master fisheries development master plan project was launched in January 2001. This project is executed and funded by the Japan International Co-operation Agency(JICA).

The outputs from the project are expected to culminate into the fisheries sector development master plan, which will provide guidance to the government and donors for fisheries policy implementation for the whole Tanzania mainland. The project is also expected to emphasise immediate priorities and necessary actions for accelerating growth of the sector and improvement of fishers' lives in the coming decade. A social economic study of the fishing communities is thus proposed among other studies.

2.0 Statement of the Problem

Fisheries activities in Tanzania have been going on for time immemorial. In the previous years fisheries resources were abundant due to less pressure put on them. Today demand pressure on fisheries resources from local and foreign consumers necessitates careful planning of fisheries resources utilisation and management. Without planning and application of appropriate management approaches of our fisheries resources there is a danger of loosing the resource through crashing and dying out of our fisheries. As an input to this planning process, information is vital. Information emanating from the major player in this industry is important if we need to plan effectively and have a successful outcome. Fisherfolk, processors, traders and consumers make up this set of stakeholder groups. Hence, the survey of the fisheries communities aimed at providing this type of information for effective planning.

3.0 Rationale for the Study

This study has its importance in the supply of vital information and understanding of the underlying causes of why the fisheries sector is what it is. The fisheries sector of Tanzania is now gaining major international recognition thanks to the Nile Perch in Lake Victoria. Together with this recognition is the opportunity for the sector to increasingly contribute to the national economy. In the early years, fishing in the Lake Victoria and Nyasa and other water bodies was done in the traditional subsistence level with a little extra for the local markets. Fishing in Lake Tanganyika and Coastal areas of the Indian Ocean has also been at the subsistence level but with a commercial bias for Sardines in Lake Tanganyika and commercial fisheries by foreign and local vessels in the Indian Ocean waters. With the emergence of the commercial fisheries in the Lake Victoria, the importance of fisheries has been enhanced not only for providing nutritional benefits but also employment creation, government revenue generation and foreign exchange generation. According to the statistics provided in table 1 below, the contribution of the fisheries sector to the national economy is significant and increasing since 1995.Real fisheries value has consistently increased between 1991 and 1999. At the same time fisheries sector value in terms of USD has consistently increased since 1993. Despite these obviously positive indicators of the fisheries sector trend, questions abound about whom really benefits from the vast wealth of the fisheries resources of the country?

A study was thus deemed necessary to provide for information and facts of the industry. This information is essential ingredient towards understanding of the real situation on the ground and therefore what should be done in order to redress the imbalances existing in the fisheries industry. Using this information in the fisheries master plan should help to promote the sustainable development of the industry.

Table 1: Selected Relationships Showing the Importance of Fisheries in the National Economy

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total GDP	989594	1275917	1607763	2125324	2794266	3452558	4281600	5125311	5986085
Total Fishing	29920	35120	41802	56038	65803	82166	103199	129245	157698
NCPI	43.32	54.15	67.2	90.87	115.77	140.07	162.62	183.45	191.5
Fish/Total GDP	3.02	2.75	2.60	2.64	2.35	2.38	2.41	2.52	2.63
Tshs/USD	219.16	297.71	405.27	509.63	574.76	579.98	612.12	666.75	800
Real Fisheries Value(Fish/NCPI)	690.67	648.57	622.05	616.68	568.39	586.61	634.60	704.52	823.49
Fisheries value (/USD)	136.52	117.97	103.15	109.96	114.49	141.67	168.59	193.84	197.12
Fisheries Contribution to GDP	3.02	2.75	2.6	2.64	2.35	2.38	2.41	2.52	2.63
Real GDP	22843.813	23562.64	23925.04	23388.62	24136.35	24648.80	26328.8648	27938.4628	31258.93
National Budget (Total recurrent and development)			337895	410533	453393	500116	711673	866951	1007786
MNRT Budget (Total recurrent and development)			7898	7898	7898	7898	7898	7898.5805	16053.85
Division of Fisheries Budget			251	251	251	251	251	251.9322	1620.819

4.0 Objective of the Study and Terms of Reference

The objectives of this study are imbedded in the terms of reference (TOR) provided by the client. The TOR required a social economic survey to be conducted in order to provide both quantitative and qualitative analysis on the sector situation and fishers life for the Fisheries Development Master Plan. Specifically, the objectives of the TOR were:

(i)   to collect household and market data within the fishing communities and different fisheries groups with the intention of establishing fisheries policy for development issues.

(ii)   to analyse of the local and foreign fish processors potential as markets for the fisher folks

(iii)   to determine the fishing industry characteristics from different localities:
- level of technology
- type of fishing practice
- problems and constraints faced

(iv)   to prepare a report that will comprise an analysis of findings and recommendation for the following issues:
- poverty situation and level at the fishers household accessibility to finance meaning the overall situation on savings and credit schemes/ facilities
- fishers opinion for fisheries development and government support
- characteristics of fish consumers
- fish demand forecasting for the consumption market
- (Quality, price, species, processing, type etc.)

5.0 Methodology

The study is utilising various approaches to carry out this study. The following approaches have been use for this study.

Review of Literature and Key Documents
The consultants have reviewed existing key publications and reports, which are related to fisheries development in Tanzania. This exercise has helped to understand the past and present socio-economic situations in the fishing areas.

Data Sources
This study will utilise both primary and secondary data. The published official documents has been used to collect secondary data and information. The primary data has been collected mainly through surveys and formal informal interviews with key stakeholders in the selected areas of the study. The researchers will also gather information through observations.

Choice of the Study Areas
The study areas to be covered were chosen after considering several issues including the geographical representation, accessibility and active fishing community. The areas chosen in this regard are presented in the table 2.

Table 2: Selected Surveyed Areas

Region	District	Village	Village inventory	Fisheries household	Marketing	Consumption
Lake Victoria						
Mwanza	1. Ukerewe	Rugezi/ Mulusenyi	X	X		
	2. Sengerema	Nyakalilo, Nkome	X	X		
	3. Mwanza	Kirumba market			X	
		Mwanza town				X
Mara	4. Tarime	Sota	X	X		
	5. Musoma	Bwai	X	X		X
Kagera	6. Muleba	Katunguru/kinagi	X	X		
	7.Biharamulo	Mganza/Nyabugera	X	X	X	
	8. Bukoba	Nyamkazi	X	X		
Lake Tanganyika						
Kigoma	9.Kigoma	Bangwe/ Kibirizi Katonga	X	X		
		Kigoma town			X	X
Rukwa	10.Sumbawanga	Kipili	X	X		
Lake Nyasa						
Mbeya	11.Kyela	Kyela	X	X	X	
	12.Mbeya	Mbeya				X
Marine Coastal Areas						
Tanga	13.Muheza	Kigombe	X	X	X	
	14.Tanga	Tanga town			X	X
Coast	15.Bagamoyo	Bagamoyo	X	X		
Dar es Salaam	16.Kinondoni	Kunduchi beach	X	X		
		Town				X
	17.Ilala	Banda beach			X	
Lindi	18. Lindi	Mchinga bay	X	X		
		Lindi town			X	
Mtwara	19. Mtwara	Msimbati	X	X		
		Mtwara town			X	X

Thus, the study has covered 15 sites around the four major water bodies in Tanzania, namely, Lake Victoria, Lake Tanganyika, Lake Nyasa and Marine Coastal areas as shown in the table for household surveys. Marketing survey was done in nine (9) urban centres. Consumer survey has been conducted in seven (7) urban centres.

Sampling methodology
The study has carried out one village inventory (profile) survey from each village. This has involved:
(i)   Stratification across the village according to occupation to get a representative number of various groups but with a focus on fisherfolk including youth and women. In this case the study has undertaken fisher household survey with a sample of about 70 to 78 respondents of fisher/household from each village. With regard to fish marketing about 30-63 fish traders from each village or market site have been sampled. Further, between 86 to 103 consumers (household, hotels, schools, hospitals, etc.) have been sampled for the fish consumption survey.
(ii)   Within these groups, we also categorised the household respondents into rich and poor so that they are all represented proportionately.

Data Collection Techniques
At least six major instruments for data collection for this study have been used and these are:

(a)   *Structured Questionnaires*
These have been used in trying to generate information and data, which are used for both qualitative and quantitative analysis. The questionnaire used by the FINNIDA/FAO study on Lake Tanganyika has been used as a basis for this study's household questionnaire.

(b)   *Checklist of Leading Questions*
This instrument had questions, which guided researchers in conducting dialogue with a range of stakeholders in the fish sector.

(c)   *Focus Group Discussions*
These discussions have been organised for special groups amongst the -fisherfolk such as women and youth.

(d)   *Use of Informants*
This instrument has been used so as to capture specific changes and historical information as can be narrated by elders and leaders in the area of study.

(e)   *Observations*
Observations during the fieldwork has mainly assisted to probe on issues beyond those, which are covered in the structured questionnaire and interview checklist.

(f)   *Documentation*
This has involved collecting information and data from existing reports and documents on fisheries. The key documents and reports which have been reviewed and others in the process of being reviewed include:
(i)   Socio-economic surveys carried out by:
  •   Lake Victoria Fisheries Research Project – has taken stock of fishers.
  •   Lake Tanganyika Fisheries Research Project
  •   Integrated Fisheries Development in Rural Fishing, Village, Kagera Region.
(ii)   Household Budget Survey, 1991/92
(iii) Sample frame survey for Lake Victoria, 2000.
(iv)   Fisheries Division, annual reports
(v)   Other studies by FAO, EU, Finnish Embassy, UNDP, IUCN, UNCDF, World Bank and USAID.
(vi)   The National Fisheries Policy, 1997
(vii) The National Environmental Policy, Vice President's Office, 1998.
(viii) PRSP and Vision (2025).
(ix)   Gibbon, (1997) of Saviours and Punks: The Political Economy of the Nile Perch Marketing Chain in Tanzania, CDR Working paper 97.3, June.

Types of Surveys
The following surveys have been undertaken by this study:

(a) *Household Survey*

This survey has involved all the reparian communities but with a focus on fisherfolk. The survey has facilitated the establishment of the socio-economic characteristics of the surveyed households. It has also assisted in the analysis of issues of credit facilities and environment. ·

(b) *Market survey*

This survey has been carried out so as to establish the marketing chain and analyse who is doing what in this chain.

(c) *Consumer Survey*

This survey is also important since it is expected that the fisherfolk will expand their production given existence of demand increase for fish. Thus in addition to establishment of the existence of demand for fish, the survey has facilitated the establishment of the fish consumption habits which influence the size of the market for fish.

6.0 Scope and Limitations of the study

This study has covered all the major lakes of the country namely Lake Victoria, Lake Tanganyika, Lake Nyasa and also the Indian Ocean coast. The other water bodies including Lake Eyasi, Rukwa and also dams like those of Mtera and Nyumba ya Mungu have not been covered. Only a select few landing sites and villages have been surveyed. We hope the surveyed areas will represent the other areas not visited. Co-operation in all the areas the researchers went was generally good with the exception of some areas where villagers showed reluctance to co-operate due to bad previous experience with a group from an NGO who promised loans but were never to be seen again!

7.0 Analysis of Findings

7.1 Sample characteristics and Analysis
7.1.1 Sample Size

From the study areas of the four major water body regions of Lake Victoria, Lake Nyasa, Lake Tanganyika and the Coastal areas along the Indian Ocean, the study was able to conduct interviews with 1,118 households.

Villages along these areas were the primary units of data collection; heads of households responded to the interviews. A total of 15 villages were involved in the exercise; and the sample size from each is shown below from a distribution based on the above mentioned water body regions.

Table 3: Distribution of Respondents by villages and fishing areas

	Region	District	Village	Number of Households
Lake Victoria	Mara	Musoma	Bwai	75
		Tarime	Sota	75
	Kagera	Muleba	Kinagi	75
		Bukoba (U)	Nyamukazi	73
		Biharamulo	Nyabugera	75
	Mwanza	Ukerewe	Mulusenyi	72
		Sengerema	Lugata	71
Coastal	Dar es Salaam	Kinondoni	Kunduchi	74
	Tanga	Muheza	Kigombe	75
	Mtwara	Mtwara (R)	Msimbati	76
	Lindi	Lindi (R)	Mchinga	75
Lake Tanganyika	Kigoma	Kigoma (U)	Kibirizi / Katonga	75
Lake Nyasa	Rukwa	Nkasi	Kapili	78
	Mbeya	Kyela	Kajunjumele / Igombe	74
Total				1,118

Despite some missing responses from some of the households on some of the issues covered in the study, all the 1,118 households sampled have been used in the subsequent analysis of the collected information.

Basically, the study covered fisher-households in the study areas. This means much of the findings and their implications will be for typical fisher communities.

7.1.2 Age-Sex Composition

Being the basic demographics, age and sex distributions of the respondents were studied. Fisher communities are not different from other communities in the African-rural or African general setting with respect to the gender of the head of household. It was found from the study that 93% of the households were male-headed. Most of these respondents were aged between 26 and 45 years of age where they make a proportion of over 60%. However, some variations were observed in the age -sex composition of the respondents when controlled for the water body region.

It was revealed that Lake Victoria region, unlike other regions, has a good proportion of female-headed households who, in the range of 19 to 45 years constitute 12% of all the heads of households.

These could be an indication of the diversity of fish-related activities in this region that might allow direct involvement of women in the decision-making process. All other regions have shown a general tendency of having very few female-headed households.

These characteristics of the respondents, as shown in summary in Table 4 will be crucial in determining other variables of the study.

Table 4: Percent Distribution of the respondents by age, sex and study area

Sex	Water-Body Region				Total
	L. Victoria	Coastal	L. Tanganyika	L. Nyasa	
	n = 515	n = 375	n = 75	n = 151	n = 1118
Male	89.1	97.9	96.0	91.4	92.8
Female	10.9	2.1	4.0	8.6	7.2
Total	100.0	100.0	100.0	100.0	100.0

Age (years)					
	L. Victoria	Coastal	L. Tanganyika	L. Nyasa	Total
	n = 516	n = 375	n = 75	n = 151	n = 1118
Up to 18	0.8	2.4	0.0		1.2
19 - 25 yrs	16.3	21.3	16.0	15.8	17.9
26 - 35 yrs	40.1	34.4	37.3	42.8	38.4
36 - 45 yrs	25.0	20.3	32.0	21.7	23.4
46 - 55 yrs	11.2	10.1	12.0	11.8	11.0
56 - 65 yrs	3.7	6.9	2.7	6.6	5.1
Over 65 yrs	2.9	4.5	0.0	1.3	3.0
Total	100.0	100.0	100.0	100.0	100.0

7.1.3 Marital Status

This aspect of the sample showed the pattern that's followed by an average household in a given community. That's most of the respondents are married, making about 80% of the sample. Variations in this characteristic of the sample are mainly shown by the age of those who are married and the number of wives for the married men in the four study areas.

The data shows that polygamy is exercised in all regions; however, the extent shown by the Lake Victoria and Coastal regions is relatively higher than in the other regions. In these regions there are respondents who have up to six wives. This is an indication of the intensity of fish activities that might be taking place in the regions. Thus, by having many wives and eventually many children, one could have security in terms of the manpower that would be needed to cater for the day to day needs of the household. This need is further indicated by the distribution of respondents by their longevity in the fishing business. For these regions, respondents are many in each class representing their longevity (in years) in the business. This shows for these regions fishing is the traditional occupation of its residents and is passed through generations.

7.1.4 Education attainment

Before dwelling upon the types and extent of fishing activities that are carried out by the respondents, the study looks into the aspect of education attainment as it has direct influence on such activities and other socio-economic variables in the study. Respondents were required to state the highest level of education that they have so far attained.

The data shows that on the average the largest proportion of the respondents (62%) has completed primary school. (this pattern is generally shown regionally). This implies that a good proportion of fishers have the ability to read and write and thus can make use of written materials which may influence their behaviour and attitudes towards some matters related to their daily activities.

However, on going through regional variations, we note that there are some alarming results. Coastal region, for instance, has got the largest proportion of those who did not had formal

C-9

education. Their average, 23%, is twice the whole study average (11%); furthermore they represent 70% of all respondents who didn't acquire formal education in the study. Table 5 below summarises this information.

Table 5: Distribution of Respondents by highest Level of Education attained

Level of Education	Water Body Region			
	L. Victoria	Coast	L. Tanganyika	L. Nyasa
None	25 (4.8%)	87 (23%)	7 (9.3%)	4 (2.6%)
Lower Primary Std. I - IV	73 (14.1%)	79 (21.1%)	12 (16.0%)	30 (19.9%)
Higher Primary Std. V - VII/VIII	366 (70.9%)	182 (48.7%)	49 (65.3%)	99 (65.6%)
Secondary Form I-IV	39 (7.6%)	14 (3.7%)	4 (5.3%)	17 (11.3%)
Higher Secondary To degree level	9 (1.8%)	2 (0.6%)	2 (2.6%)	1 (0.7%)
Functional Literacy	4 (0.8%)	10 (2.7%)	1 (1.3%)	0 (0%)
Total	516 (100%)	374 (100%)	75 (100%)	151 (100%)

In addition, rate of school-dropouts, indicated by he number of respondents who studied up to standard IV is highest (21%) from the Coastal region. This is after leaving out respondents aged over 56 years 18% who might have been in the educational system that had a complete curriculum after standard IV. This observation has been typical of the coastal areas in Tanzania where the government and its organs have been trying to change some traditions in the areas that hinder educational development.

All regions have shown negligible proportions of respondents with higher education. For the whole study, respondents with education higher than lower secondary (Form I - IV) are less than 2%. This trend is observed in the regional distributions as well.

7.1.5. Migration and Occupation

Fishers are well known for their habit of shifting from on place to another in search of better working places in terms of type and quality of their catch. This behaviour is well known to have some relationship with socio-economic activities of the places where the fishers do reside at any point in time.

To measure the extent of migration, this study required respondents to state they were born at localities were the interviews were conducted or not.

From the whole study it was found that about 43% of the fisher folks were involved in shifting from one place to another. The shifts were observed to be minimum before independence (2%) and maximum in the period 1995 to 2000 (51%).

Table 6: The distribution respondents by areas they migrated from

Shifting from	Frequency	Percent
Within District	98	23.7
Different district within region	104	25.1
Neighbouring region	157	37.9
Distant region	52	12.6
Neighbouring country	2	0.5
Distant country	1	0.2
Total	414	100

The highest proportion of the migration rate (38%) was observed to be the one involving movement of fisher folks between neighbouring regions (i.e. neighbouring regions with one or both having a major water body). The second ranked type of migration for the fisher folks is that involving movements within a region where people move from one district to another. This type of migration involved 25% of the sampled fisher folks.

At water body regional level, the study found out that there were a lot of shifts of fisher folks from other parts of the country to the Lake Victoria and Coastal regions. There shifts were at the peak in the period between 1995, and 2000 representing 60% and 37% of all fisher folks who moved to the Lake Victoria and coastal regions respectively.

There shifts could be attributed to a number of factors including (i) normal shifts of fishers in search of more productive areas, (ii) signs of fish stock depletion in some areas and (iii) outcome of policy changes in the country that make people shift from one work to another, consequently causing migration.

Particularly for the Lake Victoria region, fish processing industries in Mwanza and Musoma have caused influx of fishers to its vicinity due to the market assurance that is provided by the processors.

Another class of migrants not mentioned from the above discussion is that of young fishing hands coming from neighbouring countries. Most of these are boys who have not completed formal education in their countries of origin. They form a large group of fishers who live in fishing camps around the shores of Lake Victoria and other major water bodies of Tanzania. They are normally "owned" by big fishers who are agents of fish processing companies. There are signs of growing tension between this class of migrants and the locals when it comes to the distribution of fishing grounds in the lake.

Despite having respondents as fishers, the study wanted to establish type and extend of fish related activities that they were engaged in. It was found out that 74% of the respondents were involved in fishing on a full time basis. This trend was observed in all water-body regions with the exception of Lake Nyasa region, where only 41% of the respondents were full-time fishers.

Distribution of respondents by their status as fishers is shown in Table 7 From the table we not that the majority of fishers are those who own boats and physically get into the water bodies for fishing. They represent 44% of the fishers.

Table 7: Distribution of Respondents by status of Fishing

Status	Frequency	Percent
Fishing aid	309	32.2
Boat owner and fisher	420	43.7
Boat owner don't fish	102	10.6
Renter of gear	109	11.3
Renting/Borrowing	21	2.2

Fishers who don't own boats represent the lowest proportion of 2% . These are normally casual fishers or those new into business and are in the process of acquiring their own gear.

Regionally, the same pattern is shown with the exception of Lake Tanganyika region, where most of fishers (61%, n = 70) are fishing hands.

The study found out that the main activity occupying the respondents besides fishing is farming for both food and cash crops. All regions have shown to have over 45% respondents who are farmers. Lake Nyasa Region has the highest proportion (65%) of such respondents.

7.1.6 Earnings

Due to complexities of estimating income for people in different communities this study tried to use different approaches in doing so in order to get a clear picture of the means of extent of income generating activities that are undertaken by the respondents.

The study looked at earnings from fishing activities, income from other activities, minimum and maximum monthly income as well as earnings in poor and good months of fishing activities.

Monthly expenditure and value of household possessions, aspects closely related to income, were also studied in order to supplement the gained knowledge on the income of fisher households.

Average monthly income from fishing was observed to be Tshs.45,000, with most of the fishers (26%) having monthly income of between Tshs.31,000 and 60,000 per month. This study result was found to be consistent with all regions; i.e. all 4 regions under study have shown to have the average income from fishing activities as Tshs.45,000. However, we observe some differences when we look at income from supplementary activities.

Table 8 below shows distribution of respondents by income from other sources.

Table 8: Distribution of Respondents by Income from Supplementary Sources

Income (Tshs.)	Region			
	L. Victoria	Coastal Belt	L. Tanganyika	L. Nyasa
Less Than 10,000	116 (40.7%)	51 (30.0%)	4 (8.7%)	16 (12.7%)
11,000 - 20,000	50 (17.5%)	22 (12.9%)	13 (28.3%)	40 (31.7%)
21,000 - 30,000	49 (17.2%)	25 (14.7%)	9 (19.6%)	29 (23.0%)
31,000 - 60,000	37 (13.0%)	57 (33.5%)	10 (21.7%)	19 (15.1%)
61,000 - 100,000	17(6.0%)	11 (6.5%)	6 (13.0%)	14 (11.1%)
101,000 - 150,000	4 (1.4%)	1 (0.6%)	1 (2.2%)	1 (0.8%)
151,000 - 200,000	2 (0.7%)	1 (0.6%)	1 (2.2%)	4 (3.2%)
Over 200,000	10 (3.6%)	2 (1.2%)	2 (4.4%)	3 (2.4%)
TOTAL	285 (100%)	170 (100%)	46 (100%)	126 (100%)

The distribution above portrays the extent of dependence on fish-related activities by region of respondent.

We note that residents along Lake Victoria are heavily dependent on fishing for their income; the data shows that the average income per month from other activities is less than Tshs. 10,000/= the least compared to other regions. The coastal region tends to give a picture of a wider diversity in other activities apart from fishing. In this region the average income from other activities is almost the same as the income from fishing, i.e. Tshs.45, 000 per month. Lake Nyasa and Lake Tanganyika regions have shown some moderate income from other activities, lying in between the other two with an average of Tshs.15, 000 per month.

Other aspects of income/earnings tend to show similar pattern, that is the Lake Victoria region has fishers who depend on fishing activities for their income much more than any other economic activity. This finding calls for a more detailed analysis of the fishers using other proxies of income in order to determine why this is so.

7.1.7 Technology/Fishing gear used

After observing the extent of dependence on fish-related activities for the well being of the respondents, the study now gets into the analysis of the gear used. It will be of interest to know the type of gear and degree of usage for the region. This will enable us to understand whether or not regions with highest economic dependence on fishing have the most advanced technology in fishing.

Firstly, the study wanted to know the type of boats that are used by the fishers in the study areas. it was found out that about 1% of the respondents were casual fishers who don't need to use boats for their fishing activities as they just get into shallow waters of their fishing areas.

The largest proportion, however, was that of fishers with no engine-driven boats, they are 85% of all the fishers interviewed. This huge proportion indicates the types of fishers that reside in the study areas; they are small-time fishers who can not really engage themselves in fishing without risking their lives by going into deep waters for good catches. This follows the results of other studies in these areas where it has been shown that there are indications of depletion of fish stocks; and when this is coupled with the weather changes, it makes the fish get into deep waters that can only be reached using motor-driven boats for adequate catch.

This finding along calls for an immediate attention to the whole question of well being of individual fishers. This follows from the fact that other parties that depend on fish, for instance processing industries, would benefit from the "combined" poor catches of individual fishers and thus would never bother them with what happens to an individual fisher, in terms of his well being. The circle can only be broken if appropriate measures are taken to make fishers a unit that works for itself determining all its needs by itself and having the power to negotiate with all other parties that fall in the chain of fish industry.

7.2 Production and Processing of Fish

7.2.1 Preamble

To understand how any business enterprise function, we begin by analysing a firm's production function. This is determined by the relationship between the maximum amount of output that can be produced and the inputs required to make that output for a given state of technology (Samuelson and Nordhaus, 1992: 107). In the fishing industry this is related to catch and effort. Where catch will represent the production output and effort will represent aspects of technology (soft and hard), that in turn will determine the amount of manpower. Likewise, the processing of fish is carried out in different ways for preservation in order to facilitate longer shelf life and therefore transportation to far off markets without spoiling the quality of fish. This is done in different ways, which are discussed below. The findings of this survey point to both production and processing employing rudimentary and low level technology. Huge potentials for improvement exists, given various conditions are met. Such conditions include improving the way fishing is done in both Lakes and in the Indian Ocean especially through employing improved fishing gear and marketing arrangements.

7.2.1 Fishing Practice

Fishing practice differs from place to place and particularly practice in the coastal areas as compared to Lake fishing. There are differences and similarities though. The similarities include the small-scale nature of fishing activity, the following of the same conditions of darkness or moonlight days for fishing decisions. Hence, the dark days will produce more catch than the moonlit days both in the Lakes and in the ocean. The differences include the seasonal migration in the coastal areas influenced by the northerly and southerly winds. These normally take fishers migrating to and from Mozambique side during northerly and southerly winds respectively. Mozambicans do move to the Tanzanian side during the southerly winds (May-July) up to Kilwa to fish, while Tanzanian move to Mozambican side during northerly winds for the same reason. While they are there they do also sell their fish to the nearest markets. This does not happen in the Lake water bodies. The migration there is mainly prompted by decline of fish catches in fishing grounds.

In both areas, Lakes and Ocean, illegal fishing gears are used due to three main reasons. First, is the decline of fish catches and the need to get more fish. Secondly, Lack of better fishing equipment and thirdly greed. However, dynamite fishing is found in the ocean fisheries, while the use of poison is most common in lakes.

7.2.2 Fishing Technology

Different technology prevails in the fishing industry and these have an influence on the amount of output produced. Technological change refers to a change in the underlying techniques of production, as when a new product or process is improved. In such situations, the same output is produced with less input, or more output is produced with same inputs.

The current fishing technology at local level in all the areas of study i.e. Lakes Victoria, Tanganyika and Nyasa and also the Indian Ocean Coast, is still the traditional technology whereby fishermen with their vessels or small canoes use fishing nets and hooks. Few fishermen have boats with outboard or inboard engines. A handful of "wealthy" fishermen and fish processors in Lake Victoria command many boats with outboard engines and many fishnets with a higher catch capacity, while the majority are still traditional owning one or without canoes/boats and one or a couple of fishnets! This as has been found out is one of the major obstacles to better catch and hence income.

The Fisheries Division frame survey for 2000 for Lake Victoria (Tanzania side) show clearly that number of landing sites have increased by about 33% from 451 in 1998, while number of fishermen has increased by 74% from 1998 figure of 32,403. The number of fishing vessels has also increased by 103% from the figure of 7,618 fishing vessels. Furthermore, fishing has become more mechanised and sophisticated by a huge increase in both in-board and outboard engines. Outboard engines have increased by 76% from the 1998 figure of 825 outboard engines only! Likewise for inboard engines the increase has been tremendously phenomenal by 1400% from the 1998 figure of 5 inboard engines. The range of fishing gear has also increased remarkably.

Table 9: Summary of Technology Used in Fisheries in Mainland Tanzania 1995

SN	Item/Gear In Use	Freshwater	Marine Waters	Total
1	Number of vessels	18696	3768	22464
2	Gill nets	185424	4120	189544
3	Shark nets	-	3357	3357
4	Beach seine	1343	350	1693
5	Scoop nets	1129	75	1204
6	Cast nets	6	49	55
7	Apollo nets	4	-	4
8	Lift nets	1403	-	1403
9	Ring nets	-	221	221
10	Sardines seine nets	2979	-	2979
11	Hooks/hand lines	1685193	7839	1693032
12	Longlines	-	1575	1575
13	Basket traps (madema)	5071	3390	8461
14	Fixed traps (uzio)	-	25	25
15	Spears	-	134	134
16	Hurry up	67	-	67
17	Outboard engines	798	272	1070
18	Inboard engines	15	34	49
19	Trawlers (industrial)	16	19	35

Source: Adapted from Fisheries Division Annual Statistics Report 1995

7.2.3 Output/Catch Trend
7.2.3.1 Availability and Quantity

In all the fishing grounds we visited fishers pointed to us that fish availability was declining as measured by their daily and seasonal catches. Various reasons have been put forward to explain this, but in most cases increased pressure on the resource in terms of fishing effort and illegal fishing practices have accounted for the most part this decline. Fishing effort for Lake Victoria for instance has increased tremendously as discussed above.

Table 10: Fish Production Trend in Mainland Tanzania

Year	Inland lakes	Marine
1993	294782	331467
1994	228007	268792
1995	207139	258212
1996	308600	356800
1997	306750	356960
1998	300000	348000
1999	260000	310000

Source: Economic survey 2000

7.2.3.2 Fish Prices Determination

Determinants of the level of prices for fish are various. In Lake Victoria for example, the existence of many buyers in some areas do put prices high while in others prices are low due to monopolistic practices by some of the bigger buyers especially buying agents from the big fish processing plants of Mwanza and Musoma. The type of fish also determines the price levels. So, due to the consumer preferences of certain type of fish we may find that some fish are highly prices than others. The extent of the market in many cases is the major determinant

of price levels. Where there is export opportunity for fish, the market is expanded and the demand therefore expands prompting more fish to be harvested. The level of the price will now depend on the structure of the market itself. If the market is dominated by competitive behaviour in buying, then fishers will enjoy high prices, but if the market is being controlled by monopolistic or even oligopolistic practices, then the producer is at a disadvantaged position to bargain. The different kinds of situations do exist in the fishing industry in Tanzania mainland. The way people determine prices for their fish tells the whole story about the nature of the market structure they are facing. In some places prices are predetermined by the buyer, could be by the kilogram of a certain type of unit e.g. bucket. In other places fish is auctioned and the highest bidder gets to buy. This is some kind of competition although can be abused.

7.2.4   Processing Methods

Technology, energy, type and source
The main types of fish processing found in the areas of study include fish smoking, sun drying, salting, frying, freezing and chilling. The last two methods are practised at a small scale in the coastal areas to preserve fish and prolong their shelf life while transporting to major markets locally. For Lake Victoria this is done at two levels; one level involves the preservation for local markets and the second level is done for foreign markets particularly for Nile Perch. The foreign market level requires extra processing such as gutting, cleaning, filleting, freezing/chilling and packaging. In the Lakes Tanganyika and Victoria, sardines have both local and foreign markets. Their preparation is simply sun drying on rock surfaces or on beach sand.

Survey findings show processing methods in the 4 fishing areas of Tanzania. In Lake Victoria 33% of the respondents process their fish by frying, while 18% process by sun drying, salting is done by 15% and 13% do different by having 50% of processors smoking their fish and 35% frying. Processing methods in Lake Tanganyika include smoking 34%, sun drying 22% and 38% do both sun drying and smoking. Processing methods is the coastal areas are frying 36%, sun drying 25% and salting 4%. As has been shown by the empirical findings, most of the processing technologies rely on sun drying and drying by woodfuel fire. This has an implication on the environment through excessive cutting down of trees. Anecdotal evidence show that those places where processing by smoking and frying is done, trees are in short supply.

7.2.5   Investment cost in processing.

Investments for processing technology differ greatly from one another. Some technologies used in fish drying in mainland Tanzania do require just space on the beach or on rock surfaces in order to utilise the God given drying agent- the sun. All that is required is constant supervision and monitoring to ensure the drying process is desirably achieved. Investment in processing fresh fish for export requires huge sums of money and expertise. Take the Nile Perch processing plants in Mwanza and Musoma for instance, the infrastructure required which includes facilities and equipment for various stages of the processes such as receiving bay, gutting area, cleaning area, filleting area, freezing, packaging and transporting, needs a huge financial commitment. Prime catch, a new fish processing plant in Musoma town with the capacity to process 125 tons of fish/day at full capacity to produce 50 tons of fillets. The plant cost about US$ 8million with a working capital of US$ 500,000. Other technologies depend highly on other natural resources and the environment. These are mainly drying

technologies using woodfuel. The manner, in which the harvesting of wood for drying of fish has been done over the years, has resulted into the deforestation of some areas near the fishing villages. This is an undesirable outcome with respect to the conservation of our environment. According to Gibbon (1997), investment in fish processing is quite high for factory production of Nile perch and less expensive for artisanal processing inputs. Artisanal processing inputs include kilns, wire meshing, building poles, wire brushes, scraping knives, bowls, bottles, baskets, sacks, woodfuel, salt among others. Factory processing inputs include plant buildings, machinery (a fish grading machine could cost up to US$80,000), chemicals and packaging materials. All these have to be purchased locally or abroad. Artisanal processing facilities are simple and are normally made personally by their owners or employ cheap labour to make. For instance a processing kiln with the capacity of holding between 400 – 800 pieces of fish depending on the size of the fish could cost up to US$200: - to build. The advantage on the source of materials for the artisanal processing facilities is local and mostly available from nature.

7.2.6   Constraints experienced

Constraints, which have been pointed out by fishers mostly, boiled down to lack of capital and credit sources, marketing problems and piracy for the Lake Victoria fisheries. More discussion on the fishers' problems is provided later on.

7.3   Marketing

Preamble
Fish produced in the mainland Tanzania have their markets mainly locally and in foreign customers. Fish marketing and sales in the mainland Tanzania is mainly done through small-scale traders.

7.3.1   Marketing Survey

Areas of Study
The marketing survey was conducted in 9 regions. These are as presented in the table below:

Table 11: Sample-survey areas

Area	% of Sample of 400 respondents
1. Dar es Salaam	12.5
2. Kagera	9.0
3. Kigoma	13.3
4. Lindi	7.5
5. Mara	12.5
6. Mbeya	12.5
7. Mtwara	7.8
8. Mwanza	15.8
9. Tanga	9.3

Source: Survey Data May 2001

Dar es Salaam and Mwanza one no doubt the largest markets for fish in Tanzania. Both these cities act as transit places for other local and foreign destinations. At the Mwaloni landing site in Mwanza, fish products are loaded for destinations such as Dar es Salaam, Rwanda and Burundi also Bukavu in Democratic Republic of Congo (DRC). From Mwanza Nile Perch processing plants consignments of processed fish find their way out of the country through the Mwanza airport and through Sirari border past to Kenya for farther onward destination to

Europe. At the Dar es Salaam Centre, sardines from both Lake Victoria and Lake Tanganyika are further transported to destinations to the southern regions of Mtwara, Lindi, Mbeya and across the border to Zambia. Salted Nile perch "Kayabo" Also find their way to the Southern regions and Tanga through Dar Es Salaam City.

7.3.1.1 Existing Fish Marketing Situation

The fish-marketing situation is predominantly small-scale with the huge majority of the markets being local with the exception of the Nile Perch in Lake Victoria. Sardines in both Lake Victoria and Lake Tanganyika apart from the local markets have also regional markets including Zambia, Rwanda and Burundi, Democratic Republic of Congo (DRC) markets. Although there are several types of fish from both the Lakes and the Indian Ocean, it is only a few types of fish, which are commercialised. From Lake Victoria, The Nile Perch (NP) leads the group in terms of commercialisation followed by sardines and Tilapia. NP and Sardines have both local and foreign markets while Tilapia is predominantly local market oriented. From Lake Tanganyika Sardines are the highly commercialised fish specie with markets both local and foreign. From Lake Nyasa no particular type of fish for consumption for the export market except the ornamental fish. The local markets for fish are urban centres along or near the water bodies. The major markets for fish in mainland Tanzania include the big urban centres of Dar es Salaam, Tanga, Mtwara, Mwanza, Morogoro, Dodoma, and Arusha. The major foreign fish markets include The European Union, Israel, UK, and USA, Italy, Greece, Holland, Ireland, HongKong, Gibraltar, Spain. From the coastal belt, most fish is for local markets of Dar es Salaam, Tanga, Mtwara, Lindi, and Morogoro. Exported fish by big fishing vessels are mainly shrimps of prawns. However, fish from the Indian Ocean find their way in most tourist hotels all over the country where red snapper, prawns, squid and octopus are most popular types. Fresh water fish are also found in these tourist hotels particularly Tilapia.

Findings from the marketing of fish survey shows that the type of fish mostly traded is shown to be fresh fish (53%) Dried fish (21%) and smoked fish (8%). The most popular type of fish traded from Lake Victoria is Nile perch, Tilapia and sardines. In the Lake Tanganyika 'migebuka' are the most popular, while in the coastal areas it is 'changu' 'tasi' 'kolekole' and 'vibua' emerge as most commercialised.

An interesting characteristic of the fish traders is that, 56% of the traders are migrants. Most of these moved to the fishing areas in the last decade. 22% 1991 – 1995 and 28%, between 1996 – 2001. 36% come within the same regions, where the fishing activity is done, 27% came from neighbouring countries.

Table 12: Marketing Survey Profile (n=1118)

	Item	Lake Victoria	Lake Tanganyika	Lake Nyasa	Coastal Fisheries
1	Average HH size	7	7	5	5
2	Average income/month Good season Bad season	242,2000 117,367	95,792 41,711	51,880 23,489	158,612 76,665
3	Other sources of income/month	40,505	3,981	5,602	11,594
4	Average period engaged in fish trade	6 years	10 years	8 years	13 years
5	Average Fish Trade Transactions per month	17 times	19 times	20 times	24 times
6	Amount of fish traded per month	1,635 KGs	296 KGs	60 KGs	49 KGs

Source: Field Marketing Survey, May 2001

Fish trade is a profitable undertaking but differs from area to area. As the table above shows, fish traders in Lake Victoria are making the most of money compared to fellow traders elsewhere. Coastal traders and Lake Tanganyika follow Lake Victoria traders. Lake Nyasa traders reported the lowest average income per month. The low average number of years in fish trade is for Lake Victoria fish traders. This is quite in line with the emergence of Nile Perch as the main commercial fish from the lake around 1993, attracting more people to the trade. Comparing the monthly average traded fish in all the 4 areas, Lake Victoria leads with 1,635 kilograms while the coastal area fisheries arc last with 49 kilograms. This is surprising but might be representing the existing situation since most of small-scale subsistence level fishers who are using inferior equipment and face poor market opportunities. This is the situation in Mtwara and Lindi where most of the landing sites are away from big fish markets and roads are not good.

7.3.1.2 Fish Marketing Chain

Starts with the fishers in the lakes and involves middlemen and small and large-scale traders. To be able to analyse the fish marketing chain in the various areas, we may want to look at different types/species of fish since each type of fish has its own marketing channels depending on its customers and processing method involved and the extent of commercialisation. Despite the existence of numerous fish species in both the Lakes and the Ocean, there are only a handful of widely commercialised types (i.e. fish mostly sold away from the fishing locality).

Fish traders fall in various categories. Field data show that fish traders in the areas surveyed fall into 4 major categories in the marketing chain namely; fish trading alone (55%), Processor/trader (26%), Fisher/trader (8%), and processor (6%). In both Lake Victoria and Coastal areas, a great proportion of traders buy their fish direct from fishers, followed by buying from fellow traders.

Table 13: Source of Fish Supply

Source	% of responds
1. Buy straight from fishers	50
2. Buy from other traders	17
3. Buy from processors	10
4. Buy from Auction markets	2
5. Mix of the above	21

Fish buying arrangement
Two major methods used for buying arrangements are by paying cash and through credit. In the Lake Victoria region about 19% of traders buy from the same particular fisher due to getting discounts. However 21% do not buy from particular trader because they do not get any guarantees. Likewise in Lake Tanganyika 54% do not buy from same fisher for the same reason. The situation is the same for sales.

In the Coastal region represented by Tanga, Dar es Salaam, Lindi and Mtwara 21% of traders sell on the open market and 26% depend on auction market. The main reason given is the existing of many buyers in the majority of the landing sites especially in Tanga and Dar es Salaam regions. The Southern regions of Lindi and Mtwara, road infrastructure for Dar es Salaam are in bad shape hence curtain easy access to markets. In Lake Nyasa, fishing activity in the lowest compared to the other three fishing areas, 55% of traders do not buy from a permanent fisher due to lack of guarantee of fish supply.

Table 14: Purchase arrangement

Arrangement	% respondents
1. Relying on market	67
2. Buying from particular fishers	33

Sources of Fish Supply
In all the 4 areas of study, traders buy their fish from three main source which are buying from fishers, processors and from other traders. However, variations do exist. In coastal areas are the above three existing with an addition of the fourth, which is by auction markets. 44% of respondents buy from fishers, 15% buy from other traders, 7% buy from processors and 5% buy from the auction markets.

In Lake Victoria buying direct from fishers also dominant by 54% followed by 19% of the respondents buying from other traders. Fish processors sell to 11% and the rest do a mix of the above. Auctioning does not exist. In the coastal areas, the auctioning has several advantages to the buyers in terms of good prices and tax collection to the local government. In Lake Tanganyika again auctioning does not exist and the same 3 sources as above. Here 32% of traders buy from fishers, 21% from traders and 19% from processors. The rest of the traders do a mix of above. The majority of traders in Lake Nyasa buy from fishers 81%, 10% and 8% of traders buy from other traders and processors respectively.

Selling Market for fish from Traders
Traders around Lake Nyasa sell their fish mostly to consumers (80%) and the rest sell them at a local retail market. In Lake Tanganyika, apart from direct to consumers (29%) and local market (35%) traders sell also to non-local traders (31%). The majority of traders in the coastal areas also sell direct to consumers (61%) and 22% to non-locals who process to sell in other areas in the hinterland. In Lake Victoria 39% of traders sell direct to consumers, 29% to non-local traders, 17% to local traders and 12% to local retail market.

From the source of fish and market for fish for fish traders, it could be seen the nature of transactions which are taking place and the chain involved. In the Coastal areas and in Lake Victoria and to a lesser extent Lake Tanganyika do have buyers from outside the locality and in Lake Victoria and Tanganyika foreign buyers are found to operate.

From Lake Victoria species mostly traded are Nile Perch, Sardines and Tilapia. The marketing chain for NP is as follows: -

Figure 1: Nile Perch Marketing Chain
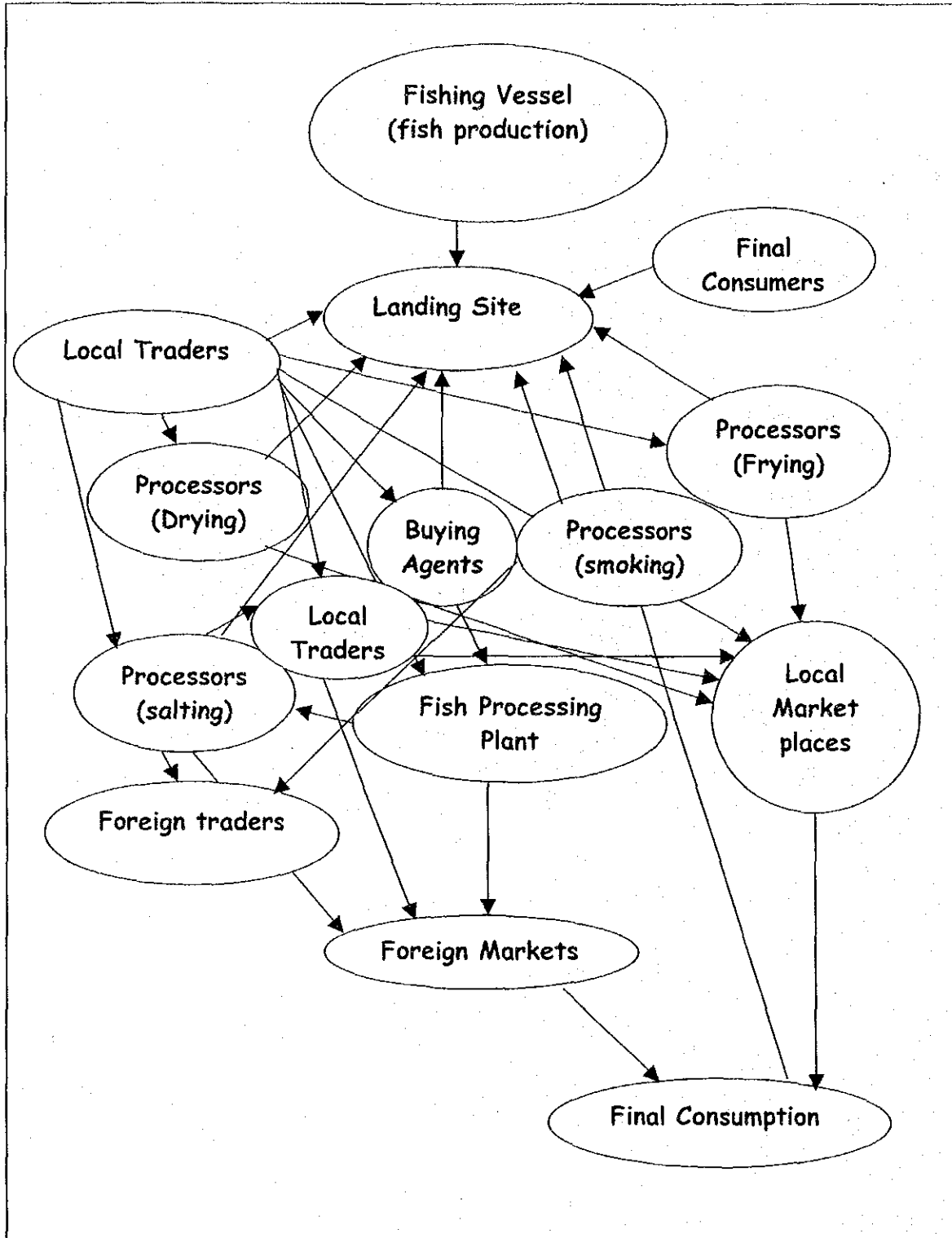
Fish marketing and sales transactions start as early in the water before fish is landed in some cases. When fish is landed, there are several people waiting to buy. Some fishers do have buyers whom they have an agreement so as to ensure market assess for themselves while missing out some benefits of competition in some cases. These buyers may be any of the ones listed in the chain i.e. private buyers, traditional small-scale processors (salt, sun drying and frying) and the agents for the modern processing plants. In some cases more than one buyer are present at the landing sites to provide a healthy competitive atmosphere in which the fishers benefit. In others situations, only one buyer and usually the agents of big private buyer is present to the disadvantage of the fishers due to monopolistic behaviour of these buyers. Apart from about 10% of the total catch which normally goes to fishers own consumption, Most NP goes to the neighbouring local markets to be sold and consumed as fresh while the other larger share go to the processing plants in Mwanza and Musoma for foreign markets.

The buyers at the landing sites include also consumers who live in the vicinity of the place or within the village in which the landing site is situated. These have to compete with other buyers, and normally will buy from fishers with small catches who do not have competitive power. The other group of buyers is mostly ladies who process fish by frying for the neighbouring markets but also for the far off local markets upcountry. This type of processed fish finds its way up to Dar es Salaam and all the regions in between Mwanza and Dar es Salaam. It is a significant market, which provides the opportunity for self-employment to women around the lake.

Fish marketing at Mtwara landing sites particularly the Shangani landing site lack proper organisation hence affects some small-scale traders negatively. Due to lack of fish auctioning, women traders are disadvantaged due to lack of capital. Young middlemen with adequate amount of money (normally Tshs 30,000/= onwards) buy fish straight from fishers and resell the same to the women at several times their purchase price without adding any value. This is an unnecessary level of the fish trade chain, which does exploit and deny especially the women fish vendors the little income they would otherwise earn. Furthermore, this arrangement denies the government revenue from fish sales.

The traditional fish processors normally take advantage of lack of buyers. These may include the fishers themselves or people they have entered into agreement to supply fish. These will normally offer a little bit less price due to the fact that they still have to process the fish and bear the risk of spoilage. This has become a stabilising factor in the areas where fish market situation has not been favourable for quite some time in terms of low prices offered and the availability of buyers. In such cases, fishers salt-dry their fish for the lucrative "Kayabo" market in DRC and elsewhere in the country. This is a good opportunity for market diversification so as to stabilise prices and fisher incomes.

The fish that finds its way to the processing plants is filleted and packaged for foreign markets. However, from the processing plants comes out rejected fish and fish frames or by-products of filleting. These find their way back to the marketing chain through the salt processors enterprise. The frames are sold either for human consumption in the form of chips or as an input to animal feed processing. The rejected fish is salted and dried for both local and foreign markets for human consumption.

Therefore, until NP fish gets to the dinner table, it passes through different hands and processes in which many people/traders are involved in making a living either through fishing, processing, loading and unloading, transporting and related activities. Apart from the

marketing chain presented above, there are also sub-chains involving fish by-products of fish frames and fish offal (mabondo).

Figure 2: Fish Marketing chain for the coastal belt
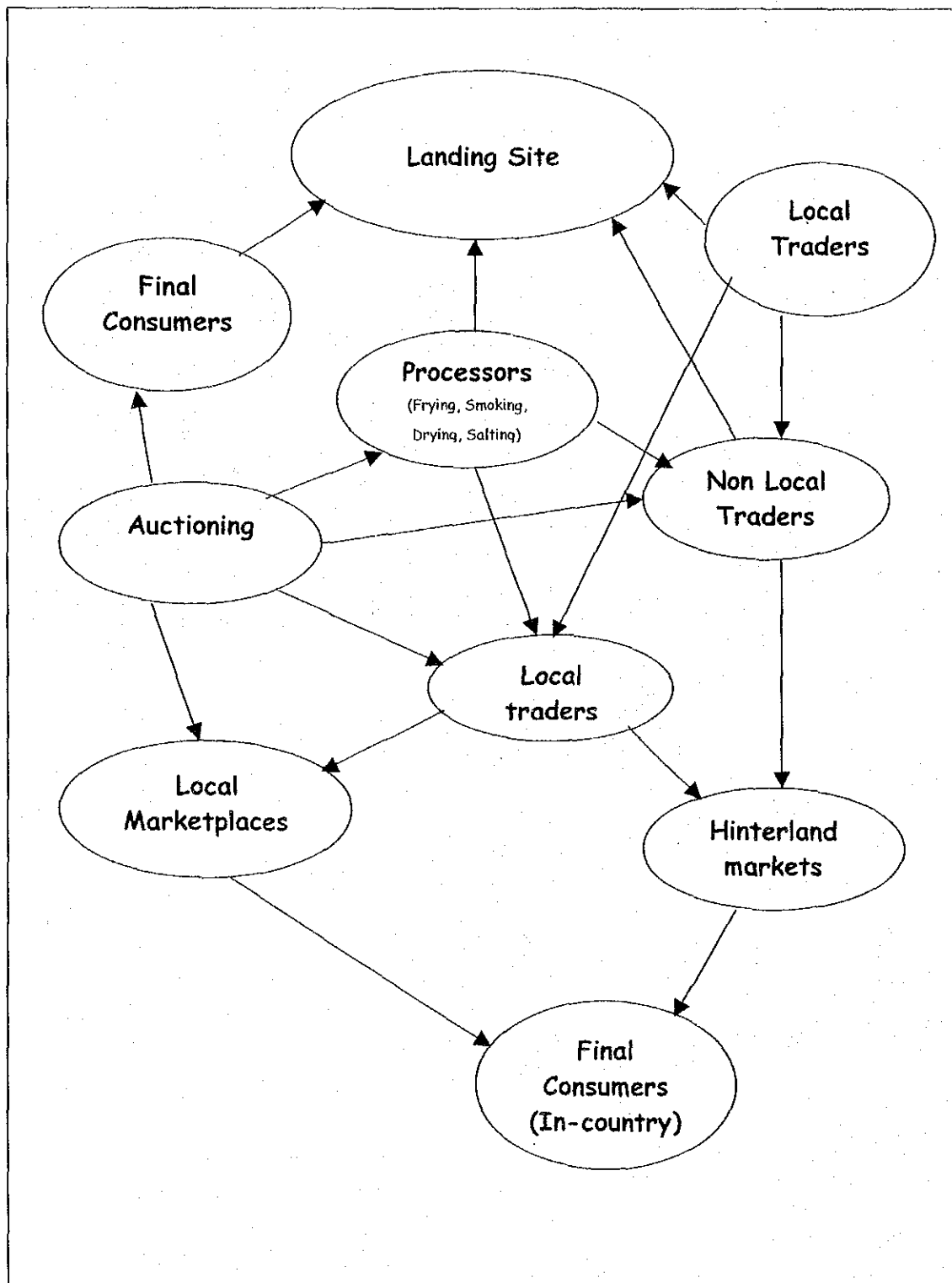
Profitability

The fish business is profitable but risky. The survey could not get reliable information on this aspect of fish trade. For the fishers, this aspect was difficult to grasp since all they cared for was what they got out of daily catch. Keeping records or even considering their labour power as input into production and therefore need to be considered, as a cost into production was an alien idea! For the traders, that was an area they would rather tell you that they "get by" without being specific on their costs of trading. The major problem, which came out, was the bookkeeping aspect. Many of the traders are kind of subsistence types who did not have the knowledge of bookkeeping. But they were also wary of mentioning their profits for fear of being given a high tax rate.

Seasonality

Fish migration and overexploitation necessitate migration of fishes from place to place. This makes fish prices change from place to place following the law of demand and supply. There is an interesting migratory of fishers' movement down south between Tanzanian fishers and those from the neighbouring country of Mozambique. During the southerly winds fishers form Mozambique will move to Tanzanian side fishing grounds of Mtwara and Lindi regions. During the northerly winds the opposite will occur legally of course! When this occurs, fish caught will be sold in the areas where they have been caught whether it is in Tanzania or Mozambique regardless of whom caught them. In the previous years when war was raging in Mozambique, the market for fish products from Mozambique used to be in Mtwara (e.g. sea cucumbers and others). In the lakes mostly the difference between the dark nights and bright night (following the movement of the moon), also the rain and dry season influence fish catch for most specie of fish.

Transport infrastructure

Availability of transport to a fish-landing site is influenced by the good/bad condition of the roads and the distance from the processing plants and major trading centres. If a landing site is far off from where the consumers are, it has the implication to add cost on the selling price. If there are other competitive sources of protein, this results into slow moving fish business and hence discouragement of the expansion of the business. In most places, the roads are bad necessitating the shifting of landing sites to more accessible places. Water transport is more common where the waters are easily navigable especially in Mara and Mwanza regions although road is also used to collect fish landed by small-scale fishers. Fish transport vessels are still not sufficient and not as cost efficient as road transport since they carry less load and use a lot of fuel not mentioning the risk involved in water transport when the weather is bad.

Modes and status

There are 2 major transport modes used to transport fish around the country. These are waterways and roadways. Air transport and train wagons are also used but not at the same level as the other two above. Waterways are mostly used to transport fish from fishing grounds/camps to landing sites where they are marketed. Road transport normally is used to transport fish to processing plants and areas and to far off fish market places upcountry (Dar es Salaam, Mtwara, Lindi, Tanga, Shinyanga, Dodoma, and Morogoro) or even across borders (Rwanda, Burundi, and DRC)

Transport facilities/operating equipment

Existing transport facilities are predominantly privately owned. Some of these are trucks used for multiple purposes. Could be used to haul different types of goods given the opportunity.

Just a few specialised fish transport vehicles exist most of which are owned by fish processing companies.

Table 14: Trading transport

Type	% of respondents
1. Vehicles	39
2. Bicycles	23
3. Head Load	17
4. Transport boat	5
5. Mix of above	16

Storage facilities

Cold storage
This is one facility, which is lacking in many places and is very important for promoting fresh fish trade to small-scale traders who can not afford to have own facilities and the capability for their sustainability.

Table 15: Storage and other trading equipment/facilities

Facility	% respondents n=1118
1. Bicycle	38
2. Frying Facilities	18
3. Cooling Box	13
4. Boat	11
5. Drying Facilities	11
6. Freezers	6.5
7. Others	2.5

As the above table shows, the most common fish storage facilities are cooling boxes and freezes. Reading from the proportion of respondents having them (13% and 6.5% respectively). The cooling boxes are inadequate since they depend on ice blokes, which are not readily available in remote fishing villages and landing sites. Fishers have to travel long distances to get these blokes which will last a couple of days before they melt away. Freezers are non existent in most landing sites except in urban major centres near the fishing villages. The distance to centres where ice blokes are available and the cost involved deters the wider use of this facility to advance trade. Around the Lake Victoria region fish collection by Nile Perch processing plants facilitate the fresh fish trade but only for fish going to the plants. These send fleets of refrigerated vans to accessible landing sites around the lake to collect fish for their plants. In the coastal areas and all over the country there used to be a public enterprise known as the National Cold Chain Foods Company (NCCFC) which used to supply fresh fish throughout the country. That company's activities have but died away due to mismanagement. The lack of these facilities discourages fresh fish business and suppresses the trade and consumption of fresh fish in the country.

7.3.1.3 Problems

The major problems faced by most traders are listed in the table below. It can be seen from the table that most of the respondents in 3 areas of study ranked the lack of capital problem as the first most severe. In Lake Victoria area the market problem is ranked the first while it is the second for Lake Tanganyika and Coastal areas. For Lake Nyasa the second most severe

problem is that of transport and marketing ranks third. Poor storage facilities such as cold storage for fish are the 3rd and 4th major problem for the Lake Victoria area and in the coastal areas respectively. These are coincidentally the most active fish trade areas of the four study areas.

Table 16: Major Problems faced by Traders

sn	Item	Lake Victoria %	Lake Tanganyika %	Lake Nyasa %	Coastal Areas %
1.	Small capital	13	49	42	23
2.	Marketing	26	13	18	20
3.	Transportation	11	6	22	7
4.	Poor working Facilities	4		2	5
5.	Poor storage Facilities	14	4	4	15
6.	High Fish price		4	4	1
7.	High running cost	1	4		2
8.	Conflict with customers		2		6
9.	No credit Facilities	7			1
10.	High Export Taxes	5			1
11.	High Taxes	2	6		
12.	Unstable Press	3	4		1
13.	Conflicts with Fisheries Officials	2		2	1
14.	None	1	2		2
15.	Decrease in amount of fish	6	4		3
16.	Security	7			4
17.	Health Hazards	2			5
18.	Conflicts among colleagues				1
19.	Other				
20.	Lack of Training facilities				
21.	Number of Respondents	149	53	50	148

7.3.1.4 Conclusions

Marketing of fish is still suppressed due to several bottlenecks including marketing infrastructure such as roads and transport, facilities such as cold storage and marketing information and organisation. There is a great potential for expanding fish trade if these obstacles are removed or reduced and hence providing much needed protein sources to a larger population at less cost.

7.4 Consumption

7.4.1 Consumption Pattern

7.4.1.1 Preamble

The purpose of fish production and marketing is that fish will be eventually consumed. The consumers' demand for fish is the case for any commodity, is the ability (income/wealth) and willingness (taste) to pay for the product that is available in the market at different prices. The changes in the price of fish will affect the consumption pattern of individuals and this will affect the production pattern of fish in a positive or negative way depending on the change. Thus, any increase in fish production and marketing should be followed with increase in demand through appropriate income and price policies.

The importance of analysing fish consumption is based on two main aspects. First, fish consumers are markets and hence sources of income for both fishermen and fish traders. Secondly, fish is high quality food that contains as much as 6% first class protein. It is rich in vitamins and also contains variable quantities of fat, calcium, phosphorus and other nutrients important for human health and growth. Fish is a valuable source of protein to many people in Tanzania both in rural and urban areas.

Consumers are willing to respond to price signals because they wish to maximise their utilities from consuming fish. However, in attempting to do so they are constrained by their budget (Heibrover and Thurow, 1981:66). Given these maximisation objective and the constraints facing fish consumer and the importance of consumer demand in influencing fish production and marketing and the overall fisheries development this report includes analysis of consumer demand for fish.

This section analyses characteristics of fish consumers in Tanzania and the subsequent factors (e.g. quality, price, species, processing, type) that influence fish demand. Analysis of consumption from both own sources (Fisher/consumers) and consumers (buying from fishermen and traders) is made.

7.4.1.2 Coverage of Fish Consumer Interviewees

(a) By Place of Residence

Fish consumer households from around the three lakes of Victoria, Tanganyika and Nyasa and from Coastal areas were interviewed. The number and proportion of interviewed consumers by place of residence are presented in the Appendix Tables.

Accordingly, a total of 690 fish consumers were interviewed in seven regions of Tanzania. These regions include Mwanza, Mara, Kigoma, Mbeya, Dar-Es-Salaam, Tanga and Mtwara. The respective share of interviewees from each region ranged between 12.6% (for Tanga) and 14.9% (for Mtwara).

(b) By Sex and Age

Out of 690 interviewed consumers, 366 of them (or 53%) were male and 324 (or 47%) were female. Data from the field survey indicate that people of all ages in the regions covered by

our study eat fish. Although there is concentration of fish consumers in the age groups between 19 to 25 years and 46 to 55 years, there is no evidence, even based on cultural reason, that children (below 18 years) and old people (above 65 years) do not eat because of reasons connected to their age (See Appendix Tables.)

(c) By Level of Education

The information from the survey reveals that both educated and uneducated people eat fish. In general, high education levels as well as illiteracy do not seem to be very influential as to whether one eats or does not eat fish (See Appendix Tables). This is partly because of the fact that in the surveyed areas fish is almost a common or traditional food, which is, consumed by people of all categories regardless their levels of education. However, in Mbeya town which is far away from water bodies that are the sources of fish the differences is obvious regarding the type of fish consumed, that is processed or unprocessed. Educated people have relatively more chance to eat fresh fish in Mbeya town mainly because with salaries they can afford to buy fresh fish from Fresh Food Company.

7.4.1.3 Fish Consumption Patterns

Fish consumption levels are analysed with respect to the amount of fish consumed, type of fish consumed including whether processed or not processed and the frequency of fish consumption.

(a) Amount of Fish Consumed

For each study area the per capita consumption of fish will be computed and compared to the corresponding estimates of between 9 and 11.8 kg of per capita fish consumption, by Bwathondi (1990, p.5). Bwathondi's estimates refer to Lake Victoria. Results from our survey show that the average per capita fish consumption are 73.3 kg for areas around lake Victoria, 76.1 kg for the Coastal area, 38.4 kg for Kigoma town and 68.8 kg for Mbeya town. These estimates are clearly above the estimates by Bwathondi. The high estimates from our survey data may partly be explained by our sample being exclusively in or around fishing communities which have little alternative to fish leading to such high consumption.

(b) Type of Fish Consumed

Tanzania's water bodies are rich in varieties of fish. The differences in availability, prices and tastes, however, have led to some fish species being more consumed in certain areas than in others. The current survey revealed these differences in the types of fish consumed in various places. The differences are also with respect to consumption of processed and unprocessed fish.

Table 17: Types of fish consumed in Tanzania

S/N	Place	1 Type Fish	% Of H/H	2 Type Fish	% Of H/H	3 Type Fish	% Of H/H	Overall	% of H/H
1	Coast Area	Changu	13.9	Kolekole	4.7	Tasi	4.4		
2	L Victoria	Sato	25.3	Sangara	7.0	Kambale	3.8		
3	L Tanganyika	Migebuka	9.3	Kuhe/Ngege	1.5	Nonzi	1.0	Sardines	4.2
4	L Nyasa	Gege	4.4	Mbasa	1.5	Mbelele	0.3		

Source: Field Survey

Fish consumption in Coastal areas and around lake Victoria appears to be dominated by three types of fish, respectively, in each area. For instance, in the Coastal areas the three leading fish types that are mostly consumed are Changu, Kolekole and Tasi. Together the three types constitute about 23% of the fish consumed in the area. In turn more than half of this share (23%) represents consumption of Changu. In areas around Lake Victoria about 36% of fish consumption involves only three fish types namely, Sato, Nile Perch and Kambale. 25.3% or about 70% of the share (36.1%) is the consumption of Sato alone. Thus, clearly Changu and Sato are by far the leading fish being consumed in the Coastal area and areas around Lake Victoria, respectively.

On the other hand the information contained in Table.... show that the dominance in terms of the few types of fish consumed is not very big in areas around Lake Tanganyika. In Kigoma town (along Lake Tanganyika) the three mostly consumed fish, Migebuka, Kuhe and Nonzi constitute less than 12% of the total fish consumed by its residents. Lack of a clear dominance by these three species is partly a result of the existence of numerous fish species that are available and consumed resulting in thinly distributed shares of various consumed fish types. Moreover, in Kigoma town Sardines is relatively more consumed by many people.

In Mbeya town (Near Lake Nyasa) fish consumption is, like for the case of Kigoma town, not dominated by three leading fish type. The share of three fish types, namely, Gege, Mbasa and Mbelele, in total fish consumption is about 6% only. Two possible reasons account for the small share. First, Mbeya town receives many types of fish for domestic consumption from various places including as far as Mwanza along Lake Victoria and from other water bodies like Lake Rukwa, Lake Tanganyika and Mtera dam. Secondly, Lake Nyasa that was supposed to be the main source of fish consumed in Mbeya town offers only small quantities (partly due to primitive fishing technologies) of various types of fish which none of them can dominate the others in terms of supply.

Fish consumption levels also differ with respect to whether fish is or is not processed. Information on preference of processed or unprocessed (fresh) fish is summarized in the following Table below.

Table 18: Consumption of Processed and Unprocessed Fish

S/N	Type of Fish	% of Households			
		First	Second	Third	Not Preferred
1	Fresh Fish	25.5	18.4	15.7	12.8
2	Processed Fish	1.3	3.6	5.8	39.3
3	Sardines	5.5	8.7	8.0	20.3

Source: Field Survey

In general as shown in Table 18 consumers prefer fresh fish than processed fish. About 25% of the surveyed households reported that they preferred fresh fish as a first choice. Taking the first, second and third choices together 60% of the households preferred eating fresh fish while only 12.8% of the households did not prefer eating fresh fish. However, comparatively, consumers residing very near or along the fishing water bodies show higher preference for fresh fish than those who are far away from the sources. The reasons behind this difference include that with long distances from sources fresh fish becomes expensive and sometimes even destroyed (loosing taste) due to poor preservation technologies. In this case for instance, in Mbeya town only about 38% of the 84 households noted that they preferred fresh fish as first to third choices, while in Kigoma town 84% of the 100 households revealed that fresh fish was their first to third choices. Likewise 55% of the 200 households in areas around lake Victoria and 58.4% of the 289 households in Coastal areas said that fresh fish was their mostly preferred fish type.

Sardines though commonly used was not the most preferred fish type as it was either the fourth, fifth or sixth preferred fish type. In fact in areas around Lake Victoria Sardines was not preferred by 38% of the 200 surveyed households. In general 20% of the total surveyed households did not prefer Sardines. Sardines are not highly preferred partly because some people regard it as a poor man's food. Poor processing technologies also contribute to the low preference of Sardines. In particular technologies in which Sardines are literally spread on the sand for sun drying contribute to the contamination of such Sardines with sand.

On the other hand however, various consumers revealed they could in future eat more Sardines if the quality of Sardines would be improved through better processing and storage technologies. Increased supply and hence relatively lower prices would encourage them to eat more Sardines in future. Specifically, about 62% of the 98 interviewed consumers in Mbeya town, 70% of the 194 consumers in areas around lake Victoria and close to 70% of 93 consumers in Kigoma town pointed out that they would eat more Sardines in future if those aspects could be dealt with. In addition more than 90% of these consumers said the motivation to eat more Sardines in future is also based on their awareness that Sardines is has high nutritious value.

Processed fish is preferred by only about 10% of the households. About 39% of the surveyed consumer households noted that they do not prefer eating processed fish. Apart from disliking the taste of processed fish it was pointed out that poor technologies, particularly smoking, led to poor quality of the processed fish. This point was strongly expressed by interviewees in areas around Lake Victoria where about 67% of the200 households said they did not prefer eating dried fish. Likewise about 42% of the 289 fish consumers in the Coastal areas do not prefer processed fish. The corresponding percentages for Mbeya town and Kigoma town are low. In Mbeya town the low percentage is mainly due to the fact that fresh fish are relatively more expensive while in Kigoma town this is partly due to seasonal shortages in the availability of fresh fish and hence high reliance on dry fish and dry Sardines.

Consumers were also asked to give opinion on the quality of fish they were eating.
In general fish consumed was generally rated to be good. About 67% of the interviewed households noted that the quality of fish they were eating was good. However, overall close to 20% of the interviewed households was of the view that the quality of the fish they were consuming was poor. Specifically, a blame for the poor quality was directed at the poor processing and storage technologies used by various small fish traders. In Mbeya (95 consumers) and Kigoma (93 consumers) towns only about 56% of the consumers were

satisfied with the quality of fish compared to 76% of the 193 consumers around lake Victoria and 68% of the 282 consumers in the Coastal areas. In Kigoma town the poor fish quality was attributed to the above poorly processed Sardines while in Mbeya town this was in reference to poorly smoked fish as well as the poor storage technologies.

(c) Fish Consumption Frequency

The majority (99%) of the 689 households involved in the survey answered 'yes' to the question as to whether they consume fish. Very few (less than 1%) revealed that they do not consume fish. The few pointed out that they do not eat non-scaled fish purely on religious beliefs. These, however, are too few to influence negatively the overall consumer demand for fish.

Table 19: Fish Consumption by Household Size

S/N	Household size (Number of people)	Number of H/H	%
1	Up to 5 Members	396	57.6
2	6 to 10 Members	258	37.5
3	11 to 15 Members	29	4.2
4	Over 15 Members	5	0.7
	Total	688	100.0

Source: Field Survey

Members of households of all sizes eat fish. However, households with less than 10 members dominate while the extremely large households (with more than 10 members) that consume fish are relatively few. One possible explanation to this phenomenon is that extremely large families are poorer and hence do not afford to buy fish for domestic consumption.

Preference on particular type of fish consumed is also partly mired in the frequency of consuming the concerned fish type. For instance, fresh fish, which, as noted above, is relatively more preferred show, is eaten more frequently than salted and fried fish and Sardines. Out of 587 households that reported to be eating fresh fish, 317 households or more than half (about 56%) said they eating fresh fish at least three times per week.

Only 329 and 305 households reported to be eating salted and fried fish, respectively. In each case more than half (85% of households eating salted fish and 65% of households eating fried fish) of the households were eating these types of fish not more than twice a week. This again confirms the above observation that based on poor quality and bad taste consumers less prefers these types of fish. Sardines that also is not preferred save for its relative easy availability is, like fresh fish, eaten by many (500 households) consumers and almost daily (as reported by about 8% of households). The fact that Sardines can be bought in small quantities makes many households with low income use it almost as a fallback when they can't afford other sources of protein (See Appendix Tables).

During the survey consumers indicated that they would definitely eat more fish if certain problems facing them could be solved.

Table 20: Main Problems Faced by Consumers when buying Fish as Identified by Households

S/N	Problem	Frequency	%
1	Very Low Income	272	42
2	Very Expensive	110	17
3	Fish Scarcity	58	9
4	Fish Poisoning	13	2
5	Most Fish Exported	8	1
6	Others	38	6
7	None	152	23
	Total	651	100

Source: Field Survey

Out of 651 surveyed households 382 of them or almost two thirds (about 60%) cited their very low income and high price as the most serious problems facing them as fish consumers. In Mbeya and Kigoma towns the cited leading problem was very low income. More than 55% of the 95 consumer respondents in Mbeya and 55% of the 93 consumers in Kigoma, pointed out that low income was the most serious problem constraining them from eating more fish. In areas around lake Victoria the cited leading problem was high prices of fish partly resulting from the high fish demand by fish processing industries in the area.

Partly because of the low income and high prices the value of fish bought per shopping for many consumers is low.

About 84% of the 630 consumers reported the low (not exceeding Tshs 2000) ranges of the value of fish per shopping of fresh fish. On the other hand more than 95% of the 350 consumers, or of the 306 consumers and of the 557 consumers, for salted fish, fried fish and Sardines, respectively, reported the value of their fish shopping to be in the same range. Thus, relatively more consumers (16%) of fresh fish made shopping with values above Tshs 2000 per shopping. The above noted high preference for fresh fish partly explains this phenomenon. In the same way the relatively low (5%) is due to low preference for processed fish and that in terms of quantities more processed fish or Sardines can be bought using the same amount of money which could buy less fresh fish (See Appendix Tables).

There are several sources from which consumers get the fish they consume.

Table 21 : Sources of Fish

S/N	Source	Frequency	%
1	Fishing Ourselves	19	3.0
2	At the Market	504	79.1
3	From Peddler	84	13.2
4	Other	30	4.7
	Total	637	100.0

Source: Field Survey

About 504 consumers or 79% of the 637 interviewees reported that they buy fish from markets while 84 consumers (or 13% of respondents) buy from fish peddlers. Few of them (about 3% only) get fish from own fishing. To reach the markets there are both transport costs and traders profit margins. Thus, where the distances from fish sources to markets are long the consumer prices are high. In addition where fish are transported in small quantities the

consumer prices are also high. Improvement in the transportation system may reduce the high fish prices and hence expand the markets for fish.

As noted above fish consumption is also constrained by low incomes.

Out of the 674 surveyed households 379 (or 56%) of them had incomes ranging between Tshs 20,000 and Tshs 100,000 only per month. For a household eating fish worthy Tshs 2,000 daily it would mean that almost two thirds of its income being spent on fish consumption alone. Given that a household has numerous other competing needs it is unlikely that per month expenditure on fish would be that high. Thus, it is crucially important to raise consumers' incomes for greater demand for fish consumed domestically in the area. In fact our survey revealed that about 72% of the 191 consumer respondents in areas around Lake Victoria noted that if their incomes increases they would also increase fish consumption. The corresponding ratios for Kigoma and Mbeya towns are 83% (of 94 respondents) and 87% (of 100 respondents), respectively. The differences of the ratios for areas around lake Victoria on one hand and for Kigoma and Mbeya on the other is consistent with the above noted factors that hinder more fish consumption in the respective areas.

7.4.1.4. Factors Influencing Fish Consumption

(a) Basic Theory

A consumer's ordinary demand function states that the quantity of a commodity that an individual unit will buy depends on various factors such as commodity prices, prices of other commodities (substitutes or complementary) and income.

$Qi = f(P_1, P_2, Y)$
Where Q_i = Quantity of commodity I demanded
P_1 = Own price
P_2 = Prices of other commodities
Y = Income

The ordinary demand function for any commodity is derived from the analysis of utility maximisation. Given amount of commodities Xi, X2, ..., Xn and non-negative prices P1, P2 ......, Pn, the constrained maximisation problem is

$$\text{Max } U = f(X_1, X_2, ..., X_n) \dotfill (1)$$
$$\text{St. } P1X1 + P_2X_2 +... + P_n X_n = Y^* \dotfill (2)$$
$$X_1, X_2, ... X_n > 0 \dotfill (3)$$

Where: U = Utility

$X_1, X_2, ... X_n$ = Quantities demanded of commodities
$P_1, P_2, ...P_n$ = Prices of commodities
        Y^* = Fixed consumer's income.
Equation (1) is a utility function that states that, the consumer derives utility from consuming n commodities.

Equation (2) is a budget constraint which states that the consumer in purchasing quantities of commodities

$X_1, X_2, \ldots\ldots, X_n$ cannot exceed his fixed income Y^*.

Equation (3) is a restriction that shows that quantities of commodities are non-negative.

Using a LaGrange we can show that at the point of maximising utility marginal utility divided by price must be the same for all commodities. This ratio gives the rate at which satisfaction would increase if an additional Tshs were spent on a particular commodity.

(b) Data, Models and Estimation Method

Data

Cross-section data, which in our case are primary data that were obtained from the fisher-households survey and the consumer survey, carried in the area covered by this study during the months of April and May 2001. In general fish consumers were categorized according to areas of respective towns in terms of high, middle and low-income areas. The inclusion of people with different levels of income was intended to avoid getting biased answers or results. All towns except Mbeya were areas situated near lakes or along the coastline. The levels and composition of fish consumption in such areas could easily be captured as they are near the sources of fish. Mbeya town is far from water bodies but was chosen because it is the largest and nearest market of fish caught in Lake Nyasa, Lake Rukwa and other water bodies.

The choice of variables

This study uses the Expenditure on fish by Households or Consumers as a dependent variable. The use of Expenditure on fish as dependent variable is preferred on the account that to obtain quantity data it is necessary that the commodity in question does not display too great a variation in quality and variety that is not the case with fish. Fish display great variation in quality and variety.

With regard to independent variables one of them will be Total expenditure (household/consumer) that is used as a proxy for income in cross-section analysis. The use of this proxy is mainly because quite often it is difficult to obtain accurate and reliable income figures from Households surveys.

Another independent variable is the Household size that in most cases greatly determines the quantity of fish to be consumed. Expenditure on alternative sources of protein is also another independent variable.

The other independent variables such as education, fish availability, taste and quality will be captured by dummy variables. For instance Taste may be captured by a dummy variable that may assume the values 1 for Households which originates where fish is traditional food and O otherwise. Education may have dummy values of 1 (for educated) and O for not educated, while quality may have 1 for good quality and Zero for poor quality and availability may have 1 for regular supply and O for non-regular.

Price is not be used in this study because we consider that in cross section analysis prices are equal to all consumers and do not change with time because of the short period considered.

Model

The model to be estimated is specified as follows:-

EF = F (TE, HS, AE, ED*, TS*, QT*, AV*, U)

Where EF = Monthly Expenditure on Fish
TE = Monthly Total Expenditure
HS = Household size
AE= Monthly Expenditure on Alternative sources of protein
ED* = Dummy variable for Education
TS* = Dummy variable for Taste
QT* = Dummy variable for Quality
AV* = Dummy variable for Availability
U = Random error Term

A double log form is proposed to be used and hence the specified equation is as follows:

$\ln EF = a_o + a_1 \ln TE + a_2 \ln HS + a_3 \ln AE + a_4 ED^* + a_5 TS^* + a_6 QT^* + a_7 AV^* + U$

Where a_o, a_1, ... a_7 are parameters to be estimated and other variables are as earlier defined.

In this study we employ Ordinary Least Squares (OLS) technique to estimate the cross section data.

Hypotheses

The specified equation is used to establish the demand for fish in the areas of our study. Specifically the following hypotheses will be tested.

(i)   Expenditure on fish responds positively to income or total expenditure. The higher the income the greater the amount of fish consumed.
(ii)   Fish consumption is positively related to Households size
(iii)   Fish consumption is positively related to taste
(iv)   Fish consumption is positively related to quality
(v)   Fish consumption is positively related to education
(vi)   Fish consumption is positively related to fish availability.
(vii)   Fish consumption is negatively related to expenditure on alternative sources of protein.

The parameters are the elasticities which will show the responsiveness of changes in fish consumption to changes in the respective independent variable e.g. Total expenditure which is a proxy for income (income elasticities).