Environmental Management and Biodiversity Conservation of Forests, Woodlands, and Wetlands of the Rufiji Delta and Floodplain

A Socio-Economic Profile of the Rufiji Floodplain and Delta

Emmanuel R. Mbiha and Ephraim M. M. Senkondo

Technical report No. 6, Volume 1 (of 3)

March 2001

For more information please contact

Executive Summary

The study

1. The study was conducted in the Rufiji flood plain and Delta, covering ten villages.
2. The purpose of the study was to produce a socio-economic profile of the Rufiji flood plain and Delta.
3. The methodology used involved a review of literature and existing information and a review of the methodologies used by REMP for the pilot villages.
4. Data for the study were collected using a structured questionnaire and checklist, and through observations and discussions with key informants.
5. Data analysis was done using Statistical Package for Social Sciences (SPSS version 9)
6. Despite a few additions, the REMP methodology for pilot village baseline data collection is adequate to monitor changes and assist in monitoring, evaluation and impact assessments.
7. Past studies in the Rufiji valley have generally been led by the Bureau of Resource Assessment and Land use Planning (BRALUP) now the Institute of Resource Assessment (IRA) of the University of Dar Es Salaam.
8. Despite past attempts in studying the Rufiji district, there have been little improvements in socio-economic studies.

Agro-ecological Zones (AEZ)

9. Two main classifications of Rufiji AEZ are narrow AEZ and wide/finer AEZ.
10. This study followed the finer AEZ as described by Havnevik (1983) due to the gradual variations in economic activities and other factors as one moves westwards from the Delta. This assists in identifying differences in economic activities in a relatively small area. The second justification for this method is due to the significant differences that were observed with respect to important factors across the finer AEZ.

Ethnic groups, migration patterns and population characteristics

11. The major ethnic group in the district is 'Wandengereko'. Other groups include "Wanyagatwa" who are mainly found in the Rufiji Delta, "Wamatumbi" who are mainly found in the southern part of Rufiji. There are also a substantial number of "Wapogoro" and "Wangindo" in the area.
12. There is a blend of cultures in the area, between the coastal 'Swahili' culture and the Persian Gulf States. Islam is an integral part of the Rufiji culture.
13. Two main migration patterns were noted in the survey area - seasonal migration and migration from other areas. Whereas the former is very prominent, the later is not significant with many households within the survey areas.
14. Generally, dependency ratio is worsening i.e. more people are depending on a few who are able to work.

Major economic means of survival.

15. Major means of survival in the survey area include agriculture (flood plain and delta agriculture), fishing, forest products, livestock keeping (mainly poultry) and small business.
16. Crop production is constrained by vermin attack on crops, unpredictable weather (floods and drought), low inputs due to lack of capital and poor production technologies.
17. Fishing is limited by lack of storage facilities, the threat of animals such as crocodiles and hippopotamus, poor transport facilities, poor fishing equipment, low prices and lack of a reliable market. Similar problems are noted in other economic activities.
18. A specific problem in mangrove harvesting and export is the lack of a market and market information. The presence of parasitic plants locally known as *nganjila* also affects the growth of mangrove trees.
19. Livestock (mainly poultry) production is ranked the third most important way of sustaining livelihoods in the flood plain and Delta. Production levels and prices offered are important in stimulating production of livestock for sale, particularly chickens.

Natural resources and the environment

20. The district has vast natural resources including part of the Selous Game Reserve, fishing potential, fertile land and labour availability.
21. Accessibility to the available natural resources depends mainly on the nature of the resource. For example, the use of licences from the local government determines the accessibility to timber and fish resources. Inheritance and clearing land (in consultation with the village government) determine agricultural land accessibility.
22. Responses regarding the state of the environment now and in the past show that it is deteriorating. The finding that availability of natural resources is becoming increasingly difficult for households supports this. Reasons for this include overexploitation, population growth, poor management, unpredictable weather, illegal harvesting and uncontrolled bush fires.
23. Generally, the respondents in the survey area showed a positive attitude towards the environment, giving a positive indication towards acceptance of environmentally related interventions.

Household characteristics

24. The majority of the respondents could be considered "productive", being below 60, with an average of six years of Koranic or Government Primary education.
25. However, a large proportion of the respondents (42.3%) did not attend formal (either Koranic or Government Primary) education.
26. There are a number of ways respondents cope with food shortages. These include buying food, requesting assistance from relatives, requesting assistance from governments, eating alternative foods and trying alternative crops.

Household energy sources

27. The main household source of energy is firewood, charcoal, coconut husks etc. Women are usually given the responsibility for firewood collection.
28. A review of household energy needs showed that fuelwood was not a traded commodity in the survey area, and therefore contributes very little to household income. There is little market incentive to grow trees for fuelwood.
29. Despite the fact that the majority of household energy is derived from trees, respondents do not plant fuelwood trees. The reason being that trees grow naturally and are still plentiful.

Expenditure items

30. Expenditure items in the survey area were categorised into food or other household expenses.
31. The largest expenditure on food consisted of fish, rice and maize. These are the main food items in the area. For other household expenses, consumables such as household items, clothes etc. were ranked the highest.
32. Other items with a high expenditure included fishing, savings and education. Savings in the survey area appeared to be a high expenditure item. This may be an indication that savings and credit schemes may be accepted within the area in the future.

Trade and Marketing

33. Despite the fact that there are a number of road networks within the district, the majority are only passable during the dry season. There are also mainland and Delta waterways, on which canoes are the major means of transport. The poor infrastructure has adversely affected accessibility to markets.
34. Production of commodities at a household level is mainly aimed at household consumption with little surplus for sale.
35. The main tradable goods include agricultural crops, livestock, forest products and fish.

Recommendations

36. Because of the worsening dependency ratio, it is recommended that there is a need for improving production technologies in order to increase productivity within all brackets of livelihood generation.

36 Although people generally have a positive attitude towards the environment, the environment is deteriorating faster now than it has in the past. It is recommended that there is a need for more organised local use and management of natural resources in order to control sustainable use and preserve biodiversity.

37. Because the majority of the people did not attend formal education, there is a need for educational campaigns and sensitisation whenever a new development is proposed.

38. Improved market availability, through better transport infrastructure is recommended in order to obtain higher prices and reduce marketing costs. Improved Market information is also required for locally exported commodities such as mangrove poles.

39. Because of the general perception that trees are abundant and that there is no need of planting trees, it is recommended that educational campaigns be introduced to change this perception.

40. Due to high expenditure on purchasing food crops that could otherwise be produced locally, it is necessary for an overall improvement in production, processing and storage techniques to reduce cash expenditure such items.

Preface

In March 2000 Drs Emmanuel R. Mbiha and Ephraim M. M. Senkondo of the Department of Agricultural Economics and Agribusiness of Sokoine University of Agriculture entered into an agreement with the World Conservation Union (IUCN) - Eastern Africa Regional Office. The agreement required them to conduct a socio-economic profile of Rufiji Flood Plain and the Delta, selection of additional project villages and to design a monitoring and evaluation system for the project. These tasks were implemented with close collaboration with the REMP (MUMARU) of Rufiji District.

Acknowledgements

Glossary of Abbreviations

AEZ	Agro-Ecological/Economic Zones
BRALUP	Bureau of Resource Assessment and Land use Planning
CCM	Chama Cha Mapinduzi political party
CUF	Civic United Front political party
DANIDA	Danish International Development Agency
IRA	Institute of Resource Assessment
IUCN	World Conservation Union
MMDA	Mkongo Mloka Development Association
NEMC	National Environment Management Council
REMP	Rufiji Environment Management Project
SGR	Selous Game Reserve
TEHIP	Tanzania Essential Health Intervention Project
ToR	Terms of Reference
UDP	United Democratic Party
URT	United Republic of Tanzania

Rufiji Environment Management Project - REMP

Project Goal
To promote the long-term conservation through 'wise use' of the lower Rufiji forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably and the livelihoods of the area's inhabitants are secured and enhanced.

Objectives

- To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and Floodplain.

- To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on wise use principles.

- To promote awareness of the values of forests, woodlands and wetlands and the importance of wise use at village, district, regional and central government levels, and to influence national policies on natural resource management.

Project Area
The project area is within Rufiji District in the ecosystems affected by the flooding of the river (floodplain and delta), downstream of the Selous Game Reserve and also including several upland forests of special importance.

Project Implementation
The project is run from the district Headquarters in Utete by the Rufiji District Administration through a district Environmental Management Team coordinated by the District Executive Director. The Project Manager is employed by the project and two Technical Advisers are employed by IUCN.
Project partners, particularly NEMC, the Coast Region, RUBADA, The Royal Netherlands Embassy and the Ministry of Natural Resources and Tourism, collaborate formally through their participation in the Project Steering Committee and also informally.

Project Outputs
At the end of the first five –year phase (1998-2003) of the project the expected outputs are:
An Environmental Management Plan: an integrated plan for the management of the ecosystems (forests, woodlands and wetlands) and natural resources of the project area that has been tested and revised so that it can be assured of success - especially through development hand-in-hand with the District council and the people of Rufiji.

Village (or community) Natural Resource Management Plans: These will be produced in pilot villages to facilitate village planning for natural resource management. The project will support the implementation of these plans by researching the legislation, providing training and some support for zoning, mapping and gazettement of reserves.

Established Wise Use Activities: These will consist of the successful sustainable development activities that are being tried and tested with pilot village and communities and are shown to be sustainable

Key forests will be conserved: Forests in Rufiji District that have shown high levels of plant biodiversity, endemism or other valuable biodiversity characteristics will be conserved by gazettement, forest management for conservation, and /or awareness-raising with their traditional owners.

Table of Contents

List of Figures

List of Tables

1   Introduction

The socio-economic profile study was conducted in Rufiji District. Rufiji district is one of six districts in the Coast region, the others being Bagamoyo, Kisarawe, Kibaha, Mafia and Mkuranga. Rufiji is located to the south of the Coast region. The Rufiji River, the largest in river in Tanzania, intersects the district. The river floods annually - albeit irregularly, this flooding has large impacts on the livelihoods of the people living in the district. The floods create specific conditions in the area for agriculture and fishing (the major economic activities), leading to a 'flood dependent production system'. The floods also make most of the district difficult to reach by regular means of transport.

The socio-economic profile was conducted under the auspices of the Rufiji Environment Management Project (REMP). The general goal of REMP is to promote the long-term conservation through "wise use" of the lower Rufiji natural resources (forests, woodland and wetlands). The aims of the 'wise use' are conservation of biodiversity, maintaining the critical functions of the natural resources, use of renewable natural resources sustainably and to ensure that the livelihood of the areas' inhabitants are secured and enhanced. Detailed information is contained in the project document (URT, 1997).

During the first phase of five years of the project the main objectives of REMP are:
a) To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and floodplain
b) To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on "wise use" principles
c) To promote awareness of the values of forests, woodlands and wetlands and the importance of "wise use" at village, district, regional and central government levels and to influence national policies on natural resource management emphasising the non-sectoral, multi-biome, integrated approach to the environment.

The main focus for the socio-economic profile is the flood plain and the Delta areas of the district (see figure 1). The main reasons for selecting the Delta and flood plains - as presented in the project proposal document URT (1997:6-7), follows recommendations by the National Environmental Management Council (NEMC), the Word Wide Fund for nature (WWF), International Union for Conservation of Nature (IUCN) and others. The aim was to assess the biodiversity and plan for their conservation. Perhaps the most important reason for this study is the recommendation by Prof. Semesi, which among others emphasises that there is a need for a management plan of the area, and that for conservation efforts to succeed and become effective there is a need for developing a programme of support to local people. For an effective design and targeting of an environmental development programme, it is important to understand the socio-economic and cultural circumstances of the target population and the factors that influence their behaviour towards the use and conservation of natural resources and the environment. This is one of the justifications of undertaking this study. In addition, it has generally been observed that when designing environmental management projects, past interventions to the communities have been based exclusively upon the perceptions of outsiders to the community. As a result, many interventions have been introduced into communities without first understanding the socio-economic circumstances of the people at the `grassroots'. To avoid the problems associated with the `top down' interventions, the socio-economic component is considered to be important

1.1   Approach and methodology
1.1.1   Purpose of the Consultancy and the Terms of Reference (ToR)
The overall study has three main objectives, which are to:
Produce a socio-economic profile of the flood plain and Delta,
Select additional villages for project intervention and
Design a system for monitoring the socio-economic impact of the project.

The detailed terms of reference are presented in appendix 2.

This report is designed to address the first objective, which has the following sub-objectives/activities:
- Review existing information,
- Review the methodology used by REMP for the pilot village baseline and make recommendations regarding the gaps in the present data base, and
- Design and implement a baseline study of 10 further villages.

Two main research methodologies were used to generate data and information required for the socio-economic profile:

- Desk study and review of literature (see section 2).
- Socio-economic survey covering the Agro-Economic Zones (AEZ) of the flood plain and Delta.

1.1.2   Sampling and data collection methods

In the designing of the socio-economic survey, sampling of the villages in the flood plain and Delta were based on the finer AEZ defined by Havnevik (1981), (see section2). Initially, it was proposed that the sampling should follow the four identified AEZ (i.e. Western flood plain, Central flood plain, North and South Delta). However, a literature review of the area has shown that economic activities change gradually when moving westwards from the Delta area and there may be significant differences within the finer AEZ. The decision to use finer AEZ in sampling the households was done purposely in order to test whether there are significant differences within those finer AEZ.

Following Boyd *et al.* (1981) the households involved in the socio-economic survey (n) were picked in such a way that the sampling fraction (n/N) is at least equal to or greater than 5%, where N is the number of households in the village. The households were then chosen at random using the list prepared by the village government. The head of household or his/her representative was interviewed using a structured questionnaire (Appendix 1).

Table 1 shows the sampled villages, the proposed number of households to be sampled, and the actual number of households sampled. Generally, there are insignificant discrepancies between the proposed number of households to be sampled and the actual number sampled.

Table 1: Sampled villages and households in the flood plain and Delta

AEZ	Villages	No. households[1]	Proposed sample size	Actual Sample size		
				Male	Female	Total
Inner Delta North	Muyuyu/Njia nne	868	43	32	12	44
Inner Delta South	Chumbi B	216	11	15	0	15
Delta North	Mfisini/Mchinga/ Salale	382	19	9	7	16
	Nyamisati	204	10	9	1	10
Delta South	Mbwera East	295	15	16	3	19
	Maparoni	292	15	10	1	11
North Flood Plain	Mgomba Kusini	425	24	17	7	24
South Flood Plain	Utunge Nyanda	255	13	11	2	13
West Valley	Mloka	368	18	12	3	15
	Ndundunyikanza	294	15	12	3	15
Total		3599	183	143 (78.6%)	39 (21.4%)	182

[1] The number of households was extracted from Rufiji District Socio-economic profile 1997.

In addition to the use of a structured questionnaire, the socio-economic survey obtained more data and information through observations and discussions with key informants. In this survey, the key informants were elders, members of village government, primary school teachers, in-charge of health centres/dispensaries and village extension workers where available.

1.1.3 Data base and data analysis
For the purpose of data analysis and retrieval, two types of data entry were carried out. The first was data entry in Microsoft access as part of the requirements of REMP. In this case, two diskettes containing the data as well as a CD were presented to REMP. These diskettes were provided together with zipping software, as the files were too big to fit in normal diskettes. The data were also converted to Microsoft excel and were sent to REMP-Utete.

The second type of data entry was on a statistical package for the purpose of statistical data analysis. The Statistical Package for Social Sciences (SPSS) version 9.0 for windows was used to analyse the data. The main analyses were descriptive statistics such as cross-tabulation and frequencies, comparison of means - such as sample means and one way ANOVA, and data reductions using factor analysis. The results of the analyses are presented in section 3.

1.2 The report
The report is organised into 4 sections. Section two presents the literature review with particular emphasis on flood plain and Delta areas. The review covers previous studies in the area, agro-ecological zones, population and demographic characteristics, sources of livelihood strategies, natural resources and their management strategies, and infrastructure and access to markets. Section two also covers the review of methodologies used by REMP for the pilot village baseline.

Section three presents the results of the survey, incorporating the results of both the questionnaire and informal surveys.

Section four presents the major conclusions emanating from the study and the recommendations made.

2   Literature Review of Rufiji District

2.1   Studies in the Rufiji Delta and Flood plains

Generally, it can be said that studies in the Rufiji valley have been led by the Bureau of Resource Assessment and Land use Planning (BRALUP) now the Institute of Resource Assessment (IRA) of the University of Dar-es-salaam. The studies ranged from scientific investigations of the resources of the area (e.g. MacDonald, (1978) and Yoshida, (1974) to socio-economic studies (e.g. Conyers *et al.* 1971; Sandberg, 1974, Lema (1979); Bantje, (1980 a and b) etc). Some of these studies are reviewed under respective subheadings of interest in this section.

Despite these past studies, there have been little improvements in terms of socio-economic studies. Some recent studies that are related to socio-economics are those supported by DANIDA road project, for example DRDP (2000), DANIDA (1998) and URT and DANIDA (1998). One of the most important conclusions that was drawn from these studies includes a lack of updates of the many studies that were conducted in the late sixties and seventies. In fact, there is little follow up of the valuable findings within these studies. For example, the movement of people from flood prone lowlands to higher grounds has received little attention. This seasonal migration of people to their farming land in the flood plain (for approximately six months) has for example an effect on school attendance by children.

2.2   Agro-ecological/economic Zones

In describing the natural/economic conditions of an area - specifically for agricultural production, rainfall, temperature and soils are important. Based on this, a description on the essence of agro-ecological/economic zones (AEZ) seems to be the best way to corroborate the natural and economic conditions of an area. An AEZ is normally based on rainfall, temperature, altitude and evapo-transpiration or the length of the growing period (production system).

The aim of this section is to review earlier classifications of Rufiji district AEZ particularly the flood plain and the Delta areas in order to come out with a current appropriate AEZ. This is mainly because as time passes there may be variations in major economic activities as well as ecological conditions. The former may be due to changes in infrastructure (as a result of environmental changes such as deforestation and flooding patterns) or changes in institutional, political or cultural variables.

Agro-economic/ecological zonation in Rufiji district can be traced back to 1971 when Conyers *et al.* attempted to define them. According to Conyers *et al.* (1971), the district could be divided into five zones namely Coastal, Kibiti, Rufiji valley, Southern Rufiji and North-western Rufiji. Of particular interest to REMP is the Rufiji valley, which according to Conyers *at al.* (1971), can be subdivided into three sub-zones as follows:

- Delta area, eastern Mbwera division and southern Ndundutawa subdivision
- Lower valley (up to Utete) including western Mbwera, most of Ikwiriri, southern Kikale and north-eastern Mohoro division
- Upper valley (Utete to Mpanga) central part of Rusende-Mtange division

Another recent broad classification of geographical zones in the district is that presented by DANIDA (1998). According to DANIDA, the district is characterised by three main geographical zones namely:

- Flood plains situated on either side of the Rufiji River. Ranging between 10 and 25 Km's wide.
- Rufiji inner and outer Delta and coastal belt zone. The area is characterised by sandy and alluvial soils, which are very suitable for mangrove tree vegetation. There are about 31 islands with 19 registered villages.

- The North and South hill zone, which extends from the Rufiji flood plains to the borders of Kisarawe and Mkuranga Districts in the North and Kilwa/Liwale Districts in the Southern area called the Matumbi Mountains.

In order to summarise the characteristic features of major agricultural systems, Havnevik (1983) presented three broad AEZ of Rufiji district as: The flood plain agricultural system, the Rufiji Delta agriculture and Rufiji hill agriculture. This can be considered a narrow classification, which does not consider details pertaining to intermediate areas between the zones.

Due to variations in economic activities, Havnevik (1981) further subdivided Rufiji district into more finer AEZ as dictated by the objectives of their study, extent of transport or access (e.g. access to markets) and on the finding that economic activities change gradually when moving westwards from the Delta area. These are as shown in table 2.

Table 2: Finer AEZ as classified by Havnevik

Zone	Location
North Hill	Outside Delta and flood plain
South Hill	Outside Delta and flood plain
West valley	Flood plain
Flood plain north	Flood plain
Flood plain south	Flood plain
Inner Delta north	Delta area (bordering flood plain)
Inner Delta south	Delta area (bordering flood plain)
Delta north	Delta area (towards the ocean)
Delta south	Delta area (towards the ocean)

See also figure 1

Details of these can be seen in figure 1 and in Havnevik (1981). The advantage of these finer AEZ is that they provide more accurate data for the management of economic activities and natural resource management. This is in contrast to wider AEZ that do not identify smaller variations.

The Rufiji district profile (1997) defines AEZ narrowly, which is similar to earlier classifications of AEZ by Conyers *et al.* (1971) and the narrow classification by Havnevik (1981) mentioned above. According to the district profile, URT (1997) the district is divided into the following agro-ecological zones namely the flood plain, the Delta and the plateau zone.

For the purpose of REMP project, some considerations are necessary when deciding on the AEZ. The first and foremost (which was also considered by the above mentioned classifications) relates to the livelihood strategies of the people residing in the flood plains and the Delta. What are the main economic activities of the people? The second concerns the natural resources that are available in these areas. The main question is how are these natural resources utilised and managed? What are the sensitive areas in terms of natural resource use and management?, and how can the population be involved in the wise use of the natural resources? Based on these queries, the narrow classification of AEZ may not be sufficient to summarise all them.
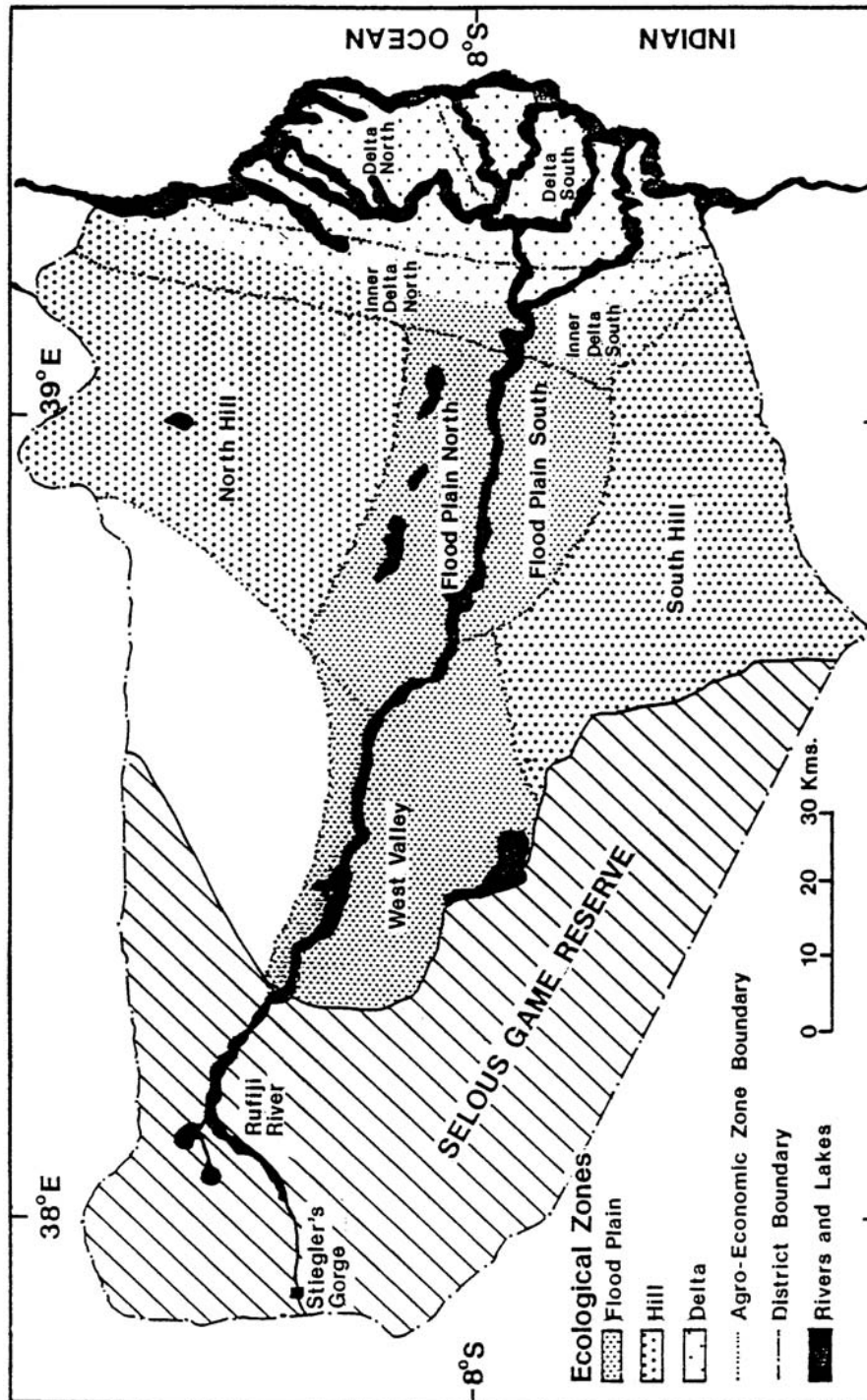
Figure 1: Rufiji District Agro-ecological/economic Zones (After Havnevik (1981)

2.3   Population and demographic characteristics

The major ethnic group in Rufiji district is "Wandengereko". Other groups include "Wanyagatwa" who are mainly found in the Rufiji Delta, and "Wamatumbi" who are mainly found in the southern part of Rufiji. There are also a substantial number of "Wapogoro" and "Wangindo" from neighbouring districts who are believed to have moved into the area/country during the Iron Age (URT District profile, 1997).

The history of Rufiji District is linked to the development of the coastal Swahili culture and the trade links between the East African coast and the Persian Gulf countries. As a result there is merging/link of cultures. Even today, there are a few people of Arab origin in the district. Because of a strong Muslim influence, Islam is an integral part of the Rufiji culture guiding both the religious and social systems.

Table 3: Population comparisons

Category	1978 census	1988 census	% change
Male	64249	74223	15.52
Female	71293	78437	10.02
Total	135542	152660	12.63
Dependency ratio	98.18	105.82	

Source: URT (1988) Population census Regional Profile (COAST) Bureau of Statistics.

A comparison was carried out between the 1978 and 1988 population census. The results are summarised in table 3. The results show that there is an increase in population of about 12.63% over the period. This gives roughly an annual growth rate of 1.3%.

Similarly, the dependency ratio changed from 98.18 in 1978 to 105.82 in 1988, implying that the proportion of the population that is unable to work (Children below 4 and adults above 65) has increased. This implies more production activities are required in order to meet the increasing population as well as the worsening dependency ratio. The dependency ratio may have further worsened now, but in the absence of a recent population census it is difficult to make reliable projections.

The population census of 1988 shows that about 25% of the population of the district live in the Delta area. According to the estimates made by the DANIDA (1998) report, about 54.8% and 38.4% of the Coast region population are in Soft-core and Hard-core[2] poverty respectively, and these figures are above the national averages of 51.1% and 35.9% respectively.

2.4   Sources of livelihood strategies
Farmers in the Rufiji flood plain and the Delta area have evolved a system of land use over time that is well adjusted to the uncontrolled and unpredictable floods of the Rufiji River. This land use system is based on inter-planting and rotating rice, maize, beans and to a lesser extent cotton. In addition, there is utilisation of available natural resources like fishing in the rivers and lakes, harvesting of wood (large forests of mangrove) and non-wood products.

Generally, household incomes in Rufiji district consist of two main components (Havnevik 1983). The first component comprises income related to primary and secondary productive activities such as agriculture, forestry, fishing and crafts. The second component consists of transfers and tertiary incomes such as remittances.

---

[2] Soft Core poverty as defined by the World Bank is the level of income of T.Shs 46,173 and Hard Core poverty is defined at Tshs 31,000 per capita per annum.

2.4.1   Agriculture

Agricultural cultivation in the Rufiji District is dominated by the flood plain agriculture. Estimates show that about two thirds of the population in the district is dependent on flood plain agriculture (Havnevik, 1981). Another two agricultural systems - which are of less importance, are the hill agriculture and the Delta agriculture.

According to Lema (1979), the Rufiji flood plain agriculture is characterised by two cultivation periods, which overlap each other. These are the *masika* (flood period) and the *mlau* (flood recession period).

The main characteristics defining flood plain agriculture, includes the domination of soils by clay - which are associated with high moisture retention capacity, but difficult to till. Other dominant soils are the 'mbaringa' soils, which are found in elevated grounds. These are medium textured soils with excellent physical properties. Another important feature is the floods. According to Havnevik (1981) the floods have various roles in the Rufiji valley and Delta as follows:
Compensating for shortage of rainfall;
Regeneration of soil fertility and;
Creation of favourable conditions for dry season cultivation and sustaining a large mangrove forest in the Rufiji Delta.

The Rufiji Delta agriculture, as according to Havnevik (1981) can be divided into two categories. The first category is the 'outer Delta' characterised by a shortage of land, sandy soils and high salinity due to tidal water. The flood of Rufiji river (if favourable) brings a lot of fresh water that lowers the salinity, and creates conditions favourable for rice production. This makes the agriculture flood dependent. During low floods the water becomes more saline and hence lowers the crop output. The second category is the 'higher ground' - on some Delta islands, where rain-fed rice and other crops like coconut can be produced. However, in some villages, coconut production has drastically declined due to diseases attributed to coconut lethal yellow.

The Rufiji hill agriculture consists of cultivation on the hills to the north and south of the Rufiji River. The areas are characterised by low fertility, which results in low yields. However, due to various physical characteristics, the areas have a wide range of crops including maize, sesame, and bananas.

Generally, crop production in the District is below the available potential (DANIDA, 1998). This can be attributed mainly to the low utilisation of the potential land that is cultivable, low agricultural technologies and vermin attacks to crops. The area being near forest and game reserves is vulnerable to vermin attack. Estimates put the destruction due to vermin up to 40% (DANIDA, 1998).

Regarding labour division, women undertake most of the agricultural activities which include transportation of agricultural inputs to the farm and produce back to the households. Men do assist in harvesting but are generally responsible for marketing of the produce (DANIDA, 1998). Very few women participate in fishing. Apart from the above responsibilities, women are also involved in undertaking other household activities, which include collecting water and firewood, food processing and preparation.

2.4.2   Fishing

Fishing is the second major economic activity in Rufiji District. Small-scale fishermen using poor fishing gear dominate the fishing activities. Fishing carried out in the Rufiji River, the Delta and some inland lakes formed by the flooding of the river. In good rainfall years, the lakes are replenished by fresh water. Some fish are also able to migrate to the lakes.

The main outlet for the fish catches is the local market. A fish processing company located at Nyamisati used to be a big market for prawns. However, the plant is no longer operating.

2.4.3   Forest products

The forests in the district contain a variety of valuable hardwood species. Three major ways exist in exploiting Rufiji forests for cash income. These are mangrove exploitation, charcoal production and logging (timber). These are normally allowed by obtaining a license from the District Forest Officer. Available data from the district show that this has been a lucrative source of revenue for the district (Table 4).

Table 4: Revenues from Forest products collected in Rufiji District

Year	Revenue collect in Tsh
1989	3,143,360
1990	7,256,687
1991	11,435,500
1992	9,436,934
1993	16,536,822
1994	21,887,822
1995	40,275,007
1996	36,634,183

Source: URT District profile 1997

The data shows that there has been an upward trend in revenue collection from forest products (in nominal terms). Since revenue collection is normally based on the volume harvested, the increase in revenue indicates the rapid increase in forest exploitation.

Despite the increased revenue collection, the district has been blamed for the rapid increasing deforestation (URT District profile, 1997). The main reason for this has been the increasing demand for forestry and agricultural products in the district and also in neighbouring Dar es Salaam.

In addition to the above, non-timber forest products are exploited. These include grass for roofing, materials for basket and mat making and bee keeping.

2.5   Natural Resources and management strategies

Rufiji district has about 60 % of its land under Forest reserve and Selous Game Reserve, (DANIDA, 1998). In addition, there are extensive open areas or unreserved areas that are considered environmentally vulnerable.

Selous Game Reserve (SGR) is the largest in Africa and is important both as a tourist attraction and as an extensive sanctuary for a range of flora and fauna (DANIDA, 1998).

According to the report by DANIDA, (1998) there are 15 designated forest reserves in the district, of which the District Council manages two. The Mangrove Forest Reserve covering the major part of the Rufiji Delta is directly under the Ministry of Natural Resources and Tourism. The Mangrove Forests are unique in Tanzania and contain the largest concentration of mangrove species in Eastern Africa covering about 54,000 ha. The mangrove ecosystem is an important resource, which supports a variety of life forms such as crocodiles, monkeys, hippopotamus, a variety of fish including prawns and many bird species. Mangroves protect the coastline against destructive sea waves, help in microclimate stabilisation etc. As a result, wise use of the mangrove forests would allow these benefits to continue. The most important threats to mangrove forests include harvesting of poles, firewood, charcoal, salt making and agricultural expansion.

DANIDA (1998) states that certain areas of the district have been surveyed and found to have a bio-diversity of local, national and probably international importance. These areas are the Kiwengoma and Nyamakutwa forest reserves in the South of the district as well as the Kichi Hills South of Utete, which forms part of the SGR open areas. Unreserved areas bordering the SGR north of Mloka and South of Rufiji River around Lake Utenge are also considered important for biodiversity.

Local resource use and management play an important role in shaping the status of biodiversity. In Rufiji district, resource use depends on the type of land ownership that exists in the area such as protected/reserved areas and other types of ownership ranging from inheritance, village government and land exchange through selling or distributing to relatives.

2.5.1 District Resource Potential and Utilisation

Resources are a major component, which determine the level of economic activities in an area. Efficiency in resource utilisation and productivity are crucial aspects of development.

Rufiji district has important resources including fertile lands, arable land, fishing potential, tourist attractions (SGR and the Delta areas) and labour availability.

DANIDA (1998) points out that arable land in Rufiji district is estimated to be 1,067,000 ha, out of which only 62,000 ha (6%) are cultivated. This implies that there is potential for increasing agricultural production.

Other resource use potential in the area includes the utilisation of the Rufiji River for hydropower generation and irrigated agriculture.

Fishing is considered to be the second major economic activity in the area after agricultural production. However, small-scale fishermen dominate fishing in the area, with poor fishing gears. The catch per unit effort is usually low.

2.6 Infrastructure and access to markets

2.6.1 Road transport

Despite the fact that there are a number of road networks within the district, they are only passable during the dry season. Road connections between the district and other parts of the country are fairly good. A road from Dar es Salaam to Lindi passes through Kibiti and Mohoro through the Ndundu or Utete ferries. Despite the frequent operational problems such as breakdowns and shifting of the sandbanks of Rufiji River (URT District profile, 1997), the connection has been very important to the district and neighbouring regions to the North and South.

According to DANIDA (1998), transport infrastructure falls into the classified and unclassified categories. Classified transport infrastructure (which includes trunk, regional, district and feeder roads) gives detailed information regarding the length and condition of the infrastructure. DANIDA, (1998) points out that the length of classified roads in Rufiji district is 982 km. District and feeder roads in the district are mainly earth roads with very few gravel roads. Unclassified transport infrastructure comprises of tracks and footpaths, which are used principally by bicycles or people walking on foot. It is reported in DRDP (2000) that the Mkongo-Kipo road is used by more than 2000 bicycles, considered to be less than those on foot. DRDP (2000) further points out that there are two main categories of bicycle users. The first consists of households or individuals who own bicycles and the second consists of those hiring for personal travel as well as transporting various loads.

Table 5: Assessment of the District and feeder roads in Rufiji

	Roads			Bridges			Culverts		
	Length (km)	Fair %	Poor %	Number	Fair %	Poor %	Number	Fair %	Poor %
Gravel[1]	35	70	30	9	40	60	40	60	40
Earth	613	60	40	12	30	70	0	40	60
Overall	648	65	35	21	35	65	20	50	50

Source: Adopted and modified from DANIDA (1998)
Fair means significant defects and need for periodical maintenance
Poor means extensive defects and therefore need to be reconstructed or rehabilitated
[1] There is only one gravel road (Kibiti to Ruaruke)

District and feeder roads assessment was done by DANIDA (1998) (Table 5). The assessment shows that about 65% of the roads have significant defects and are in need of periodical maintenance, while 35% needs reconstruction or rehabilitation. Similarly, 35% of the bridges and 50% of the culverts have significant defects and are in need of periodical maintenance, while 65% of bridges and 50% of culverts need reconstruction or rehabilitation.

The above shows that road infrastructure is poor and becomes even worse during the rainy season. This has implications on accessibility of both input and output markets.

2.6.2   Waterways

Waterway transport in Rufiji District can be divided into the mainland and Delta areas (DANIDA, 1998). The mainland waterway transport is predominantly the Rufiji River. As already mentioned, there are two ferries crossing the river at Ndundu and Utete, while canoes primarily dominate the rest of the transport.

In the Delta areas the dominant mode of transport are canoe and by foot. There are numerous points, which are served by the canoes in the Delta areas. The canoes are useful in people as well as agricultural and other essential goods transport. In most cases harvested mangrove poles are also transported using canoes to the main collection points. However, the Delta water is governed to large extent by tidal water, which necessitates timing in order to have smooth navigation. There are very few motorised boats and mostly are belonging to specific projects such as Mangrove, REMP, Health, water department and the Kindwitwi Leprosy Centre.

The main constraints in waterway transport can be summarised as:
Difficult to haul large loads at a time because of the use of canoes;
Problem of mud in many waterways as a result of erosion in upper Rufiji river and;
Problems of crocodiles and hippopotamus.

2.7   Review of the methodology used by REMP for the pilot village baseline
The aim of this section is to review the methodologies used by REMP to collect baseline information for the selected villages. REMP used a structured questionnaire (Household Profile Form SENR). The questionnaire is well formulated and the questions are considered adequate in collecting baseline information. However some modifications are needed to make the questionnaire suitable even for monitoring and evaluation of the socio-economic changes over time.

First observation relates to items that can be calculated and inserted by the researcher without bothering the respondents. For example calculation of net value of production should not appear in a questionnaire as this can later on be calculated after getting the necessary data such as amount produced, amount consumed, price per unit of the amount sold and the associated costs.

Second observation relates to specific modifications and additional questions that were thought to be necessary in baseline data collection. These additions were made as follows:

- On household characteristics the question is modified as shown in appendix 1. This includes among other things the household structure age-wise and who actually works in the family farm.

- Accessibility to education, health by family members. This question was found important in getting the household's view on school attendance and reasons for not going to school, as well the adequacy of the health centres in terms of drug availability, affordability by members etc.

- Question on the attitude towards the environment –one more question was added to capture the attitudinal concept, where people are asked questions and respond whether they agree or disagree to statements that are believed to be measuring the attitude towards the environment.

- The question of gender division in firewood collection and the time taken was also considered important and was added in this study. The question on whether villagers buy firewood and at what price was found important

- A question on ethnic characteristics as well as demographic and migration patterns was found missing in the questionnaire by REMP.

- In order to measure the wealth index a number of various household assets were included and respondents are to indicate the number, year when bought, at what price and the expected useful life. This index can be monitored to observe the changes that might have occurred as a result of a particular project intervention

- In order to look at household income based on the expenditure patterns, the question on expenditure was modified to include household expenditures and other expenditures.

- A question on access, ownership and control of resources by gender was also included; and finally

- The question on trading and marketing characteristics as well as on credit were found necessary

Based on the above modifications, there will definitely be some minor data gaps which when filled will improve the socio-economic profile of the project villages.

3   Results of Questionnaire Survey

3.1   Household characteristics

Table 6 shows the main household characteristics. On average the age of the respondents is 49, implying that many of the interviewed farmers are in the productive ages of below 60. In general there are significant differences in age across the finer AEZ of the survey area.

Table 6: Household characteristics by AEZ

Means of	Inner Delta North (n=43)	Inner Delta South (n=15)	Delta North (n=25)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=180)	F-test
Age	44(13)	49 (18)	49 (12)	54 (15)	54 (15)	53 (16)	46(16)	49(15)	2.309*
Years of formal education	7(2)	6 (1)	6 (1)	6 (2)	6 (3)	6 (3)	7 (1)	6 (2)	0.752
HH size	7 (3)	7(1)	9(4)	8 (3)	6 (3)	8(3)	7 (2)	7(3)	2.083*
No adult males	2(1)	2(2)	2(2)	2(1)	2(1)	1(1)	1(1)	2(2)	1.344
Number of adult females	2(0.8)	2(2)	2(2)	2(1)	2(1)	2(1)	2(1)	2(1)	0.871
No working in HH farm	3(2)	4(2)	4(2)	4(3)	3(2)	4(2)	3(1)	4(2)	1.011
No of adult male working in the farm	1(1)	2(2)	2(2)	2(1)	2(1)	1(0)	1(1)	2(1)	1.4
No of adult female working in the farm	1(1)	2(2)	2(1)	1(1)	2(1)	1(1)	1(1)	2(1)	1.1

Source: Survey data

*Means that there are significant differences between AEZ with respect to age and Household size at 5% level.

Numbers in parentheses are standard deviations. The figures are rounded up.

3.1.1   Education

The majority of the respondents have an average of 6 years of formal education/national primary education. There is no significant difference in number of years of formal education across the AEZ. (Table 6). Over the sample, the minimum number of years in education is 1 while the maximum is 12. The results show further that the most frequent number of years in education is 7 (with 56% of the respondents), followed by 4 years (with18% of the respondents).

Table 7 shows that only 57.7% of the respondents received formal education. The rest have both adult education and religious studies. This has implications in formulating training programmes for the people. Discussions with primary school teachers show that many children prefer attending religious schools than formal primary education. This is mainly because of the strong Islamic culture and probably due to the 'high' cash contributions to formal primary schools. The study was not able to get data that dis-aggregate between the adult education and the religious studies.

Table 7: Percentage distribution of respondents by attendance to formal education and AEZ.

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182)
				Percent of respondents				
Yes	61.4	46.7	57.7	56.7	41.7	69.2	66.7	57.7
No	38.6	53.3	42.3	43.3	58.3	30.8	33.3	42.3

Source: Survey data

Household size differs significantly across the finer AEZ, with an average of 7 persons per household. Delta north has the highest mean household size (Table 6)

Table 6 also shows gender participation in household farm. The results show that there is slightly bigger number of females working in the farm (mean 1.61) as compared to adult males working in the farm (mean 1.59). However, the differences are not significant (t=0.411, p=0.682). Despite the above results, discussions with key informants show that the time actually spent by female members is higher compared to the time spent by male members in the farm activities. This supports the finding by DANIDA (1998) that women undertake most of the agricultural activities in the farm.

3.1.2   Marital Status and social organisations in the survey area

The majority of the respondents in the survey areas are married (Table 8). Whereas, the percentage of married persons is greater than 80% in all other areas, in North flood plain the married proportion of people is below 80%. However there are no significant differences across the AEZ regarding marriage.

Table 8: Percentage distribution of respondents by marital status and AEZ

Marital statues	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182)
				Percent of Respondents				
Married	93.2	93.3	96.2	93.3	79.2	100	83.3	90.7
Single	0.0	6.7	0.0	0.0	8.3	0.0	3.3	2.2
Divorced	4.5	0.0	3.8	3.3	0.0	0.0	3.3	2.7
Widowed	2.3	0.0	0.0	3.3	12.5	0.0	10.0	4.4

Source: Survey data (2000)

On average about 68% of the respondents are married to one woman and the rest are married to more than one woman (Table 9). There is no significant difference across the AEZ with respect to the number of wives (F=1.312, p=0.255).

The basic unit of organisation is the household. The household has a head, normally a man even if he has more than one wife (exception is few female headed households). Labour division, decision-making and other organisations are part of the household responsibilities.

Another level of organisation is that found at groups and village level. There seem to be trust in village leadership as requests for meetings are made through the village leaders and many people tend to turn up in such meetings. The village government normally has around 25 members of which 4 up 8 members are women.

Table 9: Percentage distribution of respondents by number of wives and AEZ

No. of wives	Inner Delta North (n=37)	Inner Delta South (n=14)	Delta North (n=22)	Delta South (n=28)	North Flood Plain (n=18)	South Flood Plain (n=12)	West Valley (n=23)	Total (n=154)
				Percent of Respondents				
1	75.5	71.4	63.6	57.1	61.1	58.3	82.6	68.2
2	21.6	21.4	22.7	32.1	33.3	33.3	17.4	25.3
3	2.7	7.1	4.5	10.7	5.6	8.3	0.0	5.2
4	0		9.1					1.3

Source: Survey data (2000)

Discussion with the villagers shows that women are free to participate in any of the leadership positions, only that they do not stand for the highest posts. However, they feel that women are fairly represented in the village governments. Women speak freely in meetings organized by the village

government and estimates puts women attendance in meetings at between 10-25% of all the participants

There are various organised groups in the survey area including production groups, political parties, development associations and football clubs. Islamic religious groups were found to be strong in the survey areas. Among the frequently mentioned groups are UDP (United Democratic Party), CUF (Civic United Front), UWT (women group of the Chama Cha Mapinduzi, CCM), Youth group of CCM, Mkongo Mloka Development Association (MMDA), Islamic groups and CCM. There are specific days of the week set aside for community development work.

3.1.3   Tribes population and migration patterns

The major ethnic group in the survey areas is "Wandengereko" (67% of the respondents, table 10). Other tribes are "Wanyagatwa", "Wangindo" and "Wamatumbi".

Table 10: Percentage distribution of respondents by tribe and AEZ

Tribe	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182)
				Percent of respondents				
Mndengereko	72.7	93.3	38.5	66.7	62.5	84.6	70.0	67.6
Mngindo	13.6				29.2	7.7	3.3	8.2
Mmakonde	2.3			3.3				1.1
Mmatumbi	2.3	6.7		10.0	4.2	7.7	3.3	4.4
Mluguru				3.3			3.3	1.1
Mhehe	2.3						6.7	1.6
Mpogoro	4.5						6.7	2.2
Mnyagatwa			61.5	6.7				9.9
Mgogo	2.3							.5
Mmwera				3.3				.5
Mtupa				3.3				.5
Mnongwa				3.3				.5
Mkutu					4.2		3.3	1.1
Muwanda							3.3	0.5

Source Survey data (2000)

In the Delta North there are more "Wanyagatwa" as compared to "Wandengereko". These results support the findings reported in the district profile (URT District profile, 1997). See also section 2.2.

Dependency ratio

Dependency ratio was calculated from survey data as the proportion of the family members who are unable to work in the farm to the members who are actually working on the farm. The results are presented in table 3.6. The result shows that the overall dependency ratio in the survey area is 138.2%. This shows that there are more people (38.2%) who depend on others as far as agricultural production is concerned. However there were high variations in dependency ratio within households (Standard deviation of 123.4, Table 3.6). Inner Delta south recorded the lowest dependency ratio of 96.2 that implies that the number of family members working in the farm is greater than those who are not working in the farm by 3.8%. The highest dependency ratio was recorded in Delta North (185%, Table 11). The dependency ratio within the finer AEZ did not show any significant difference (F= 1.07, p=0.383).

Table 11: Means of dependency ratio (%) by AEZ

AEZ	Mean	N	Std. Deviation
Inner Delta North	143.0	44	96.7
Inner Delta South	96.2	15	82.5
Delta North	185.3	26	201.0
Delta South	138.6	30	101.5
North Flood Plain	123.5	24	132.3
South Flood Plain	136.6	13	77.3
West Valley	122.3	28	113.3
Total	138.2	180	123.4

Source: Computed from survey data. 2000

A comparison was made between this cross-sectional dependency[3] ratio and the dependency ratio reported in 1978 and 1988 population census. The results show that the dependency ratio has increased from 105.82 in 1988 to 138.2 in 1999, indicating a worsening dependency ratio. Dependency ratio obtained by TEHIP (Tanzania Essential Health Interventions Project) in RDSS (Rufiji Demographic Surveillance System also shows an increase in dependency ratio (i.e., 110). As pointed out earlier, there is a need for improving the productivity of agriculture in order to meet the requirement of the population, which is unable to work in the farm. This includes among others the improvement in production technologies.

Migration Patterns

Migration patterns in the survey area were looked at in two ways. The first one is the migration from other areas to the survey areas, including movement from other villages, wards, districts and regions. The second one is the seasonal migration within the survey areas mainly for agricultural and fishing purposes.

The interviewed respondents generally indicated that they have been living in their current village for 32.years (Table 12). This implies that their families have moved into the current villages over 30 years ago. There are variations within the AEZ with respect to years the respondent has been living in the village.

Table 12: Average number of years the respondent has lived in village

AEZ	Mean	N	Std. Deviation
Inner Delta North	26	44	10
Inner Delta South	28	15	14
Delta North	35	25	24
Delta South	45	29	17
North Flood Plain	34	24	17
South Flood Plain	24	13	14
West Valley	30	29	14
Total	32	179	16

Source Survey Data, 2000

The highest number of years is recorded in Delta South (45 years) and the lowest in inner Delta north (16 years, Table 12). There is significant difference among the AEZ with respect to number of years the villager has been living there (F=5.0, p=0.00).

---

[3] Note that the census dependency ratios covered the whole district and the calculation may not be exactly the same as in this report. The results should therefore be interpreted carefully. We were not able to get reliable village population statistics, with exception of very few villages.

Table 13: Where the respondents were living before coming to the current village (% of respondents)

Item	Yes	No	Specific name of district/region
Neighbouring village	32.4 (59)	67.6 (123)	
In this (current) division	14.3 (26)	85.7 (156)	
Neighbouring division	3.4 (6)	96.6 (172)	
Outside the district	0.6 (1)	99.4 (174)	Mkuranga 100 (1)
Outside the region	8.5 (15)	91.5 (161)	DSM 73.3 (11), Lindi 20.0 (3) Dodoma 6.7 (1)

Source: Survey data. Numbers in parenthesis are respondents.

However, table 13 shows further that there were very few migrations to the current village, which occurred recently, from neighbouring village, district and regions. It seems the majority of the respondents were born in the villages they are living now.

For those few who migrated to the villages they are living now, the main reasons for this are itemised in table 14. The governments' programme of villagisation, which took place in the seventies, has been the major reasons for migration. This reason is followed by the search for better agricultural lands (Table 14).

When asked which months they migrate for agricultural activities (seasonal migration), the results show no consensus among the respondents. From the results, it seems that farmers are migrating throughout the year. This depends on the local conditions of the farm. This in a way supports the finding by Lema (1979) that the two agricultural seasons (Mlau and Masika) overlap. Informal discussions and observations show that some farmers migrate permanently to their fields. Majority found movement to and from the farms to be laborious, time wasting and risky, as they have to cross the river using canoes. Although farmers did not mention explicitly, these seasonal migrations have adverse effects on school attendance by children, children either come late or do not come to school at all. The problem of young children crossing the river twice a day to attend school is the main problem.

Table 14: Reasons for migrating to the current village by AEZ (percent of respondents)

	Inner Delta North (n=27)	Inner Delta South (n=10)	Delta North (n=10)	Delta South (n=7)	North Flood Plain (n=13)	South Flood Plain (7)	West Valley (n=19)	Total (n=93)
Job seeking				14.3				1.1
Villagisation	66.7	90.0	10.0		76.9	57.1	78.9	61.3
Follow parents	7.4			14.3	7.7		10.5	6.5
Decided to come back home	7.4		20.0	14.3	15.4		10.5	9.7
Follow spouse (after marriage)	7.4		30.0					5.4
Govt. Transfer	3.7							1.1
Searching for agric. land	7.4	10.0	40.0	57.1		42.9		15.1

Source: Survey data (2000)

3.1.4   Health and other services
Health services

At least every village surveyed is serviced by a health centre/dispensary. In some villages like Nyamisati, Mbwera east, Mgomba Kusini and Chumbi B have ward dispensaries, which serve all the villages in a ward. In the west valley, Mloka and Ndundunyikanza receive health services from nearby villages (Mwaseni and Nyaminywili respectively). The government mainly funds the health centres in the survey area, with some support from various donors such as TEHIP and UNICEF.

Generally health services are accessible to many residents and the treatment and consultation is done free. In case a patient is referred to other hospitals, some costs are involved which are to be met by the respondents. However, in case of problems, people normally seek assistance from relatives or sell crops and/or livestock.

Discussions with health officers/clinicians show that the following the main health problems in order of importance are:
- Malaria
- Anaemia
- Eye infections
- Respiratory tract infections
- Skin diseases
- Worms
- Diarrhoea
- Pneumonia
- Nutritional disorders
- Dysentery and
- Ear infections

Other diseases include filariasis, which is more common in the delta, and sexually transmitted diseases, which are common in 'urban' areas such as Ikwiriri. Most of the above mentioned diseases can be treated in the health centres unless there are further complications.

Outreach and health education campaigns undertaken in almost all the health centres. The main concentration of the training has been on general health (boiling water for drinking, construction and use of toilets) outbreak of diseases and family planning.

Problems related to health services vary within AEZ and villages. The most reported one is fewer health workers and transport and communication problems. (The later has improved duet to the provision of radio calls to some health centres). In Mgomba Kusini the problem of congestion of patients is highly felt by the respondents. However, two important constraints, not clearly expressed by the villagers, are the construction and use of latrines and the source of drinking water.

Observations showed that very few households have latrines. This is mainly a problem in the delta areas. This is a health hazard especially because the main source of drinking water is from shallow wells, which are easily contaminated during the rainy season. In some villages such as Mloka, and Chumbi, well-constructed domestic water facilities were available (constructed during villagisation period), however nothing is in operation today due to various problems, including management and theft of pumps.

One of the reasons latrines are not constructed, especially in the delta area, is the cost involved due to instability of sandy soils. Construction of a stable latrine involves the use of cement and or drums, which are expensive. Cost effective ways of constructing latrines need further exploration.

Other services
Other services provided range from private provision of consumer goods, crop purchases and transport to group services provided by special groups in the villages.

The role of private initiatives in the provision of consumer goods is remarkable. In all the villages surveyed, there are small shops, restaurants, and local markets, which provide a variety of goods to the community. In villages such as Mloka and Mgomba Kusini there are private pharmacies which complement the efforts of the health centres. Private individuals are also involved in buying agricultural crops and in the provision of inputs. The problem of poor services by private initiatives has been a concern to many villagers.

Provision of transport has been the role of the private initiatives. Private transport providers dominate road transport as well as water transport. Road transport ranges from head loads to wheelbarrows, bicycles and motorised transport (see also section 2, section 2.5).

Services provided by groups were observed only in Mbwera east, Maparoni, Muyuyu and Chumbi B. The groups in Mbwera east and Maparoni are mainly women groups involved in pottery, salt making, credits and prawn fishing. In Muyuyu village there are production groups as well as theatre arts groups.

3.2 Main occupation and economic activities

3.2.1 Man occupations

The main occupation of people in the flood plain and Delta is agriculture. On average more than 80 % of people, depend on agriculture as their main sources of livelihood (Table 15). Other occupations are fishing, wage employment and petty business.

Table 15: Percentage distribution of respondents by main occupation and AEZ

Occupation	Inner Delta North (n=43)	Inner Delta South (n=15)	Delta North (n=25)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=180)
Percent of Respondents								
Farmer	95.3	80.0	80.0	96.7	87.5	84.6	86.7	88.9
Fisherman	2.3	6.7	8.0	3.3	4.2	0.0	0.0	3.3
Employed	0.0	6.7	0.0	4.2	15.4	0.0	0.0	2.8
Business	2.3	0.0	8.0	0.0	0.0	0.0	10.	3.3
Carpentry	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.6
Forest harvesting	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.6
Weaving	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.6

Source: Survey data (2000)

When asked to mention the main sources of income generating activities (Table 16), the responses support the findings in table 15 and the documented literature (see section 2), i.e. that for the majority of people the most important income generating activities in order of importance are: agriculture, fishing, livestock, petty business and forest products (Table 16). All these activities have implications on the management of the environment in the area. For example, expansion of agriculture especially Delta agriculture leads to the destruction of mangrove forests. Similarly, the increasing demand for forest products poses a threat to open woodlands in the survey area. Promotion of income from non-wood/timber forest products may reduce pressures of obtaining incomes from forest harvesting for timber, poles and charcoal.

Table 16: Proportion of respondents practicing various activities

Income generating activity	Proportion of the respondents (%)
Agriculture	94.5
Fishing	28.6
Livestock	15.4
Petty business	14.3
Forest products	11.5
Non-timber forest products	6.6
Salt making	5.5
Paid employment	3.8
Tailoring	3.3
Carpentry	2.7
Fish trading	1.6
Masonry	1.6
Remittances	0.5
Bee Keeping	0.5

Source: Survey data. (2000) Some farmers have more than one income generating activities

3.2.2 Agriculture

Prices of various crops in an area are important in determining the income accrued from agriculture. Prices together with the amount produced by a particular household will determine the gross income generated.

Table 17 shows the mean prices of various crops grown by farmers in the flood plain and Delta. There is a large variation in prices within the AEZ, as indicated by the standard deviations. The crops with high overall price variation are maize, cassava, cowpeas and rice. Lowest price variation is noted in coconut and pumpkins. There is no clear reason explaining price variations. However, there are only two crops that show significant differences in price within the AEZ. These are Rice (F=2.091, p=0.07) and cashew nut (F=35.6, p=0.00). The results above suggest two main conclusions. Firstly, the variation in prices among the households shows that prices are negotiated between private buyers and households. Secondly average prices charged, among the AEZ with respect to many crops are not statistically different.

Table 17: Unit prices of various crops per unit by AEZ (1999/2000 cropping season)

AEZ		Rice (Tsh/ bag)	Maize (Bag/bag)	Cassava (Bag/bag)	Pumpkin (Tsh/ piece)	Cowpeas (Kg/Kg)	Pigeon peas (Bag/bag)	Coconut (Nut/nut or piece)	Cashew nuts (Kg/Kg)	Sesame (Kg/kg)
Inner Delta North	Mean	11000.0	10285.7	4833.3	250.0	275.0	12000.0	27.50	407.1	292.2
	N	14	7	6	1	2	1	2	21	9
	Std. Dev.	5114.1	4498.7	1169.0	.	176.8	.	10.6	69.7	121.1
Inner Delta South	Mean	11601.5	9933.3	7500.0	100.5	150.0			465.5	
	N	10	3	2	4	1			10	
	Std. Dev.	6749.9	7072.0	6364.0	107.4	.			64.7	
Delta North	Mean	9812.5	20000.0					31.7	500.0	
	N	8	1					3	1	
	Std. Dev.	4423.5	.					16.0	.	
Delta South	Mean	7714.3	6000.0	5625.0		400.0		22.5	490.0	
	N	7	1	4		1		4	5	
	Std. Dev.	2360.4	.	2495.8		.		2.9	572.7	
North Flood Plain	Mean	12750.0	11500.0	4000.0	50.0				395.0	346.2
	N	8	4	1	1				6	8
	Std. Dev.	4334.2	6191.4	.	.				146.1	113.1
South Flood Plain	Mean	11500.0	9583.3		96.0	5260.0			303.3	
	N	3	6		5	5			3	
	Std. Dev.	1802.8	3555.5		55.5	11037.1			134.3	
West Valley	Mean	12312.5	8833.3	8000.0	200.0				413.0	390.6
	N	8	6	1	3				10	8
	Std. Dev.	3654.1	2714.2	.	0.0				123.5	123.9
Total	Mean	10991.6	10153.6	5607.1	127.3	3044.4	12000.0	26.7	420.8	341.0
	N	58	28	14	14	9	1	9	56	25
	Std. Dev.	4741.4	4597.2	2558.4	83.9	8235.3	.	10.00	182.3	121.74

Source Survey data, (2000)

Standard deviations indicate that variation in gross income (from agriculture) is high. The highest mean income in the survey area is from cowpeas, coconut, rice, maize and cashew nuts. However all these crops high a variation in price (Table 18).

Table 18: Gross value of output for various crops by AEZ

AEZ		Maize	Cassava	Pumpkin	Cowpeas	Pigeon peas	Coconut	Cashew nut	Sesame	Rice
Inner Delta North	Mean	69,571	73,000	25,000	13,500	6,000.0	27,000	79,804	57,811	137,286
	N	7	6	1	2	1	2	21	9	14
	Std. Dev.	48,449	112,374	.	14,849	.	18,385	91,823	82,822	129,754
Inner Delta South	Mean	100,933	18,000	51,250	126,000				60,660		197,815
	N	3	2	4	1				10		10
	Std. Dev.	69,012	16,971	43,277					43,765		152,947
Delta North	Mean	20,000					614,667	1,250,000		332,750
	N	1					3	1		8
	Std. Dev.	.					1,026,560	.		288,155
Delta South	Mean	30,000	16,875		48,000		82,437.5	30,200		91,143
	N	1	4		1		4	5		7
	Std. Dev.	.	5,893				78,541	35,245		45,707
North Flood Plain	Mean	96,000	24,000	6,500				77,800	31,700	162,500
	N	4	1	1				6	7	8
	Std. Dev.	67,171	.	.				77,201	17,520	106,234
South Flood Plain	Mean	138,500		77,900	8,442,400			14,467		82,833
	N	6		5	5			3		3
	Std. Dev.	172,336.9		125,303	18,759,386			13,515		76,561
West Valley	Mean	63,166.76	40,000	66,667				66,690	29,750	151,625
	N	6	1	3				10	8	8
	Std. Dev.	48,010.1	.	30,551				105,580	23,640	131,616
Total	Mean	86,921.428	43,250	59,000	4,712,555.69	6,000.0	247,527	86,796	40,842	171,753
	N		14	14	9	1	9	56	24	58
	Std. Dev.	91,744.8	75,080	76,663	13,982,909	.	584,930	176,762	53,075	164,321

Source: Survey data (2000)

Loses and strategies for Improving crop production

When the respondents were asked about their understanding on the proportion of crop losses their responses are as reported in table 19.

Table 19: Amount of main crop lost each season by AEZ

Extent of loss/AEZ	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182
				Percent of respondents				
Less than a quarter	43.2	6.7	65.4	63.3	20.8		10.0	35.2
A quarter to a half	38.6	66.7	26.9	33.3	45.8	53.8	36.7	40.1
More than a half	18.2	26.7	7.7	3.3	33.3	46.2	53.3	24.7

Source: Survey data, 2000

The survey area crop lost each year is estimated at a quarter to half of main harvests (40%, Table 19). 24.7 % of respondents indicated they lose more than a half of crops. However, there is variation in the estimated crop losses within the AEZ: West valley (53.3% of respondents), South flood plain (46.2% of respondents) and North flood plain (33.3% of respondents) lost more than a half of their harvests in the season 1999/2000. As was noted in the literature review (see section 2.3.1) destruction of crops by vermin is one of the main factors explaining low productivity of agriculture. This is supported by the

above findings, where the West valley, South flood plain and North flood plain zones have higher estimate of losses to more than a half of crop harvest, mainly because these zones are surrounded by forests and game reserves.

A higher percent of respondents in North Delta (65.4%) and Delta south (63.3) estimated their crop losses to be less than a quarter. Respondents attributed crop losses to be due to (in order of priority): vermin attack, bad weather (flood, droughts), lack of input/low input use due to lack of capital and poor agricultural production technology/knowledge. These findings are similar to previous reports for the district (see DANIDA, 1998).

3.2.3   Fishing

Fish statistics from the survey area are divided into two categories, namely statistics for finfish and statistics for prawns (Tables 20 and 21).

Whereas finfish operations are done in all the AEZ, prawn fishing was only observed in three AEZ namely Inner Delta North, Delta north and Delta south.

The mean total finfish catch per year ranged from 344 kg in Delta North to 900 kg, in inner Delta South. There are variations within AEZ as shown by the standard deviations. There are no significant differences among the AEZ with respect to total catch per year, price per kg and costs incurred per year (Table 20). However, there are significant differences with respect to amount of finfish consumed at home, the gross value of production and the net value of production.

Table 20: Statistics of fish (finfish) by AEZ

AEZ		Total catch per year (Kg)	Amt. cons. Per year (Kg)	Price per Kg	Costs per year	Gross value per year	Net value per year
Inner Delta North	Mean	452.25	75.7	363.9	31491.8	157875.0	130095.0
	N	12	14	18	17	12	12
	Std. Dev	288.48	78.7	145.3	33481.7	113075.9	120500.4
	Min.	63	1	200.0	3000.0	40000.0	3000.0
	Max.	960	250	800.0	117000.0	420000.0	417000.0
Inner Delta South	Mean	900.00	198.0	437.5	34500.0	225000.0	195000.0
	N	1	2	4	4	1	1
	Std. Dev.	.	229.1	249.5830	39000.0	.	.
	Min.	900	36	250.00	.00	225000.0	195000.0
	Max.	900	360	800.00	90000.0	225000.0	195000.0
Delta North	Mean	344.0	276.7	528.5714	59000.0	540000.0	527500.0
	N	3	9	7	8	2	2
	Std. Dev.	336.29	308.8	539.9	68046.2	254558.4	258094.0
	Min.	72	2	100.0	5000.0	360000.0	345000.0
	Max.	720	840	1500.0	200000.0	720000.0	710000.0
Delta South	Mean	430.0	75.3	388.9	48771.5	129000.0	109333.3
	N	3	6	9	7	3	3
	Std. Dev.	413.9	96.9	196.5	34115.9	124165.2	130143.5
	Min.	120	2	100.0	12000.0	36000.0	16000.0
	Max.	900	252	800.0	100000.00	270000.0	258000.0
North Flood Plain	Mean		2538.0	377.5	105250.0		
	N		2	4	4		
	Std. Dev.		3538.4	326.6	130627.7		
	Min.		36	10.0	26000.0		
	Max.		504	800.0	300000.0		
South Flood Plain	Mean	450.0	26.7	280.0	21333.3	153000.0	145000.0
	N	2	3	4	3	2	2
	Std. Dev.	42.4	27.1	164.1138	23180.5	80610.2	83438.6
	Min.	420	10	120.0	6000.0	96000.0	86000.0
	Max.	480	58	500.0	48000.0	210000.0	204000.0
West Valley	Mean	375.2	198.8	330.0	73625.0	225000.0	142750.0
	N	2	5	5	4	2	2
	Std. Dev.	318.2	209.1	249.0	63181.5	190918.8	83085.0
	Min.	150	4	100.0	6000.0	90000.0	84000.0
	Max.	600	480	600.0	158500.0	360000.0	201500.0
Total	Mean	447.8	257.2	387.8	48218.2	197386.3	168847.3
	N	23	41	51	47	22	22
	Std. Dev.	288.9	788.8	263.6	57168.3	162273.9	163760.8
	Min.	63	1	10.0	0.0	36000.0	3000.0
	Max	960	504	1500.0	300000.0	720000.0	710000.0
F-test		F=0.42, p=0.9	F=4.7, p=0.0*	F=0.5, p=0.8	F=1.28, p=0.29	F=2.45, p=0.07*	F=2.6, p=0.06*

Source: Computed from Survey data (2000)
         * Means that the coefficient is significant at p<10%

The mean overall net value of production is positive, indicating that respondents are able to cover their production costs and end up with a positive margin. This shows that fishing in Rufiji flood plain and Delta is a paying enterprise.

Table 21: Statistics of fish (Prawns) by AEZ

AEZ		Total catch per year (Kg)	Amt. consumed per year (Kg)	Price per Kg	Costs per year	Gross value per year	Net value per year
Inner Delta North	Mean	85.0	18.0	1500.0	5750.0	127500.0	121750.0
	N	2	1	2	2	2	2
	Std. Dev.	77.8	.	0.0	6010.4	116672.6	110662.2
	Min.	30	18	1500.0	1500.0	45000.0	43500.0
	Max.	140	18	1500.0	10000.0	210000.0	200000.0
Delta North	Mean	2821.6	126.2	1350.0	145366.7	3439440.0	3273000.0
	N	5	5	6	6	5	5
	Std. Dev.	3407.7	150.6	403.7	228339.0	3643645.8	3531586.3
	Min.	188	2	900.0	11000.00	282000.0	130800.0
	Max.	8448	366	2000.0	600000.00	7603200.0	7583200.0
Delta South	Mean	498.0	12.00	1300.0	25200.0	867600.0	842400.0
	N	2	1	4	2	2	2
	Std. Dev.	568.5	.	346.4	6788.2	1064054.2	1070842.5
	Min.	96	12	1000.0	20400.0	115200.0	85200.0
	Max.	900	12	1800.0	30000.0	1620000.0	1599600.0
Total	Mean	1697.1	94.4	1358.3	93410.0	2131933.3	2032588.9
	N	9	7	12	10	9	9
	Std. Dev.	2765.3	134.4	334.3	183074.5	3042016.1	2934198.5
	Min.	30	2	900.0	1500.0	45000.0	43500.00
	Max	844	366	2000.0	600000.0	7603200.0	7583200.0
F-Test		F=0.92, p=0.45	F=0.34, p=0.7	F=0.12, p=0.33	F=0.55, p=0.6	F=1.09, p=0.34	F=1.04, p=0.4

Source: Computed from Survey data (2000)

There were no significant differences with respect to prawn statistics presented in table 21. The net value of production of prawns per year is positive indicating that the fishermen realise profits in this enterprise.

Over the whole sample, 70 % of respondents indicated that fish harvest losses per year are less than a quarter (Table 22). In the west valley, about 60% of the respondents indicated that fish harvest loss is a quarter to a half as compared to 40% who indicated that it is less than a quarter

Fishermen are confronted by a combination of constraints, which lead to fish losses. These problems in order of priority are:

- Lack of storage facilities. Storage facilities are necessary to increase the shelf life of fish in order to get better prices for fresh fish;
- Problems of river animals such as crocodiles and hippopotamus. These animals have even rendered some inland lakes inaccessible for fishing;
- Poor transport facilities to the markets;
- Poor fishing equipment;
- Low fish prices especially during peak periods, and;
- Lack of reliable markets. Due to poor transport and storage facilities the only available markets are the local markets.

Table 22: Amount of fish harvest lost per year by AEZ

	Inner Delta North (n=17)	Inner Delta South (n=4)	Delta North (n=12)	Delta South (n=7)	North Flood Plain (n=4)	South Flood Plain (n=4)	West Valley (n=5)	Total (n=53)
	Percent of respondents							
Less than a quarter	70.6	50.0	83.3	85.7	75.0	50.0	40.0	69.8
A quarter to a half	23.5	25.0	8.3	14.3	25.0	50.0	60.0	24.5
More than a half	5.9	25.0	8.3					5.7

Source Survey data (2000)

Based on the above, various measures could be introduced to increase the overall profits from fishing. The respondents proposed the following measures in order of priority:

- Use modern fishing equipment. Making the modern fishing equipment available in the survey area can facilitate this. Encouraging local stockists in various ways can assist in availing the equipment to the area;
- Making modern storage facilities available;
- Availability of adequate capital for investment, for example, encouraging credit facilities to assist smallholder fishermen;
- Provision of reliable market outlets, coupled with improved transport infrastructure;
- Control or management of dangerous river/lake animals, and;
- Reduction of fishing levies/fees.

Employed fishermen

Ten people engaged in fish trading from the sample gave the following information. 70% indicated that fish trading value losses are less than a quarter. Fish traders from south flood plain and the west valley indicated that the loss is a quarter to a half (Table 23). Only 10% of the fish traders indicated that the loss is more than a half, and this is mainly from the inner Delta north zone.

The reasons for fish losses from trading are similar to those reported for smallholder fishing. Main reasons for loss of fish in trading are poor storage facilities, price fluctuations and poor transport infrastructure.

When asked to mention ways to improve profits from fish trade, respondents suggested the following:
- Availability of capital for example from credit provision;
- Availability of reliable markets;
- Efforts to stabilise fish prices, and;
- Encouraging co-operation between fish traders.

Table 23: Loss in terms of value from fish trading per year by AEZ

	Inner Delta North (n=3)	Inner Delta South (n=1)	Delta North (n=2)	Delta South (n=1)	North Flood Plain (n=1)	South Flood Plain (n=1)	West Valley (n=1)	Total (n=10)
	Percent of respondents							
Less than a quarter	66.7	100.0	100.0	100.0	100.0			70.0
A quarter to a half						100.0	100.0	20.0
More than a half	33.3							10.0

Source: Survey data (2000)

3.2.4   Forest and forest products

Table 24 presents statistics of timber forest products of Mninga, Mkongo and Mvule by AEZ.

Table 24: Statistics of timber forest products (Mninga, Mkongo Mvule) by AEZ

Zone		Amt harvested/ HH/year.	Amt. used for home consumption.	Price per piece.	Costs per year	Gross value/ year/HH	Net value per year/HH.
Inner	Mean	255.0		3000.0	13500.0	275000.0	261500.0
Delta	N	2		2	2	2	2
North	Std. Dev.	346.5		2828.4	14849.2	318198.0	303348.8
	Min.	10		1000.0	3000.0	50000.0	47000.0
	Max.	500		5000.0	24000.0	500000.0	476000.0
Delta	Mean	2.00	2.00	3000.0	6000.0	6000.0	0.0
North	N	1	1	1	1	1	1
	Std. Dev.	.	.	.	.	.	.
	Min.	2	2	3000.0	6000.0	6000.0	0.0
	Max.	2	2	3000.0	6000.0	6000.0	0.0
West	Mean	1000.0	3000.0	4500.0	700000.0	4500000.0	3800000.0
Valley	N	1	1	1	1	1	1
	Std. Dev.	.	.	.	.	.	.
	Min.	1000	3000	4500.0	700000.0	4500000.0	3800000.0
	Max.	1000	3000	4500.0	700000.0	4500000.0	3800000.0
Total	Mean	378.0	1501.0	3375.0	183250.0	1264000.0	1080750.0
	N	4	2	4	4	4	4
	Std. Dev.	475.6	2119.9	1796.9	344624.8	2168851.6	1825440.8
	Min.	2	2	1000.0	3000.0	6000.0	0.0
	Max.	1000	3000	5000.0	700000.0	4500000.0	3800000.0
F value		F=2.33, p=0.4	F=0.66, p=0.86	F=0.11, p= 0.91	F=807.4, p=0.03*	F=69.2, p=0.08*	F=53.8, p=0.09*

Source: Computed from survey data (2000)

* Indicates that the statistic is significant at p>10%

The results show that only 4 of the total respondents (182), are involved in timber harvests from the forest. This figure should be interpreted with caution because it seems that some respondents fear to give the true picture in forest harvesting. Some may be doing it illegally without license. Only three AEZ indicated that they harvest timber (Inner Delta north, Delta north and West valley.)

For those who are harvesting timber the net value per year are positive, showing that the business is paying and has profits. There are significant differences across the AEZ with respect to costs of timber forest products per year, gross value of output per year and net value of output of timber products per year.

With respect to Mpingo statistics, only two AEZ were involved, namely inner Delta north and Delta north. Again only 4 respondents were involved in Mpingo harvest. The business of Mpingo harvesting according to the survey data is profitable as the respondents can cover their production costs and remain with a positive margin (Table 25). There is no significant difference across the AEZ with respect to the statistics reported in table 25.

Table 25: Statistics of Mpingo by AEZ

AEZ		Amt harvested by hh per year	amt. used for home consumption	price per piece	Cost per year	Gross value per year/ hh	Net value per year /hh
Inner Delta	Mean	640.0		1233.3	30000.0	1063333.3	1040000.0
North	N	3		3	2	3	3
	Std. Dev.	539.3		1537.3	0.0	1679355.0	1994041.1
	Min.	20		200.0	30000.0	10000.0	150000.0
	Max.	1000		3000.0	30000.0	3000000.0	2970000.0
Delta	Mean	4.00	4.00	1000.0	4000.0	4000.0	0.0
North	N	1	1	1	1	1	1
	Std. Dev.	.	.	.	.	.	.
	Min.	4	4	1000.0	4000.0	4000.0	0.0
	Max.	4	4	1000.0	4000.0	4000.0	0.0
Total	Mean	481.0	4.00	1175.0	21333.3	798500.0	1040000.0
	N	4	1	4	3	4	3
	Std. Dev.	543.1	.	1260.6	15011.1	1469932.7	1673110.8
	Min.	4	4	200.0	4000.0	4000.0	0.0
	Max.	1000	4	3000.0	30000.0	3000000.0	2970000.0
F-value		F=1.04, p= 0.41	-	F=0.02, P=0.91	-	F=0.3, p=0.64	F=0.4, p=0.64

Source: Computed from survey data (2000).

Table 26 shows the amount of wood products lost by AEZ, in the survey area. The table shows the number of people involved in wood products is only 25 out of a sample of 182 people. The majority of people involved in wood products (76%) estimate the losses to be less than a quarter (Table 26).

The opinions of the respondents regarding losses of wood products can be summarised as follows:
- Price fluctuations;
- High taxation rates;
- Most buyers are defaulters;
- Lack of reliable markets;
- Poor transport infrastructure including road accidents;
- The use of inferior cooking stoves;
- Poor harvesting tools;
- Wildfires.

Table 26: Amount of wood (products) lost by AEZ

	Inner Delta North (n=4)	Inner Delta South (n=3)	Delta North (n=8)	Delta South (n=6)	North Flood Plain (n=2)	West Valley (n=2)	Total (n=25)
				Percent of respondents			
Less than a quarter	75.0	33.3	100.0	66.7	100.0	50.0	76.0
A quarter to a half	25.0			33.3			12.0
More than a half		66.7				50.0	12.0

Source: Survey data, 2000

When asked the ways to improve profits from wood and wood products, respondents gave the suggestions:
- Government to regulate prices, however this is in contradiction with government policy on prices, following the liberalisation of trade.
- The use of modern harvesting equipment

- Tax reduction by the government
- Improve transport infrastructure and
- The use of modern fuel-efficient stoves.

Mangrove harvests and exports
A detailed discussion with villagers at Mfisini, Mchinga and Salale gave an insight to harvesting and export of Mangrove trees in the Delta. The discussion showed that as years pass by, there is a decrease in area under mangrove trees. This is mainly attributed to (in order of priority): expansion of agricultural land; increased harvesting and the presence of a parasitic plant locally known as *'nganjila'*. Respondents argue that control of the parasitic plants will improve the production of the mangrove trees. This is done manually using machete. However, it requires strong villagers' participation (as was done during the colonial period).

Mangrove trees are harvested by local people for domestic use as well as for export. The main destination is Zanzibar. The marketing channel is as depicted in figure 1.

Individual harvesters at the village level sell their trees to middlemen 1. The individual harvesters have no control on the price. The few middlemen (1) determine the prices, and they export the trees to Zanzibar, where they again sell them to few middlemen (2). These middlemen in Zanzibar determine the price and since the middlemen (1) have already incurred transport costs they have to take the price offered. In Zanzibar, the trees are either sold to individuals or exported. The main problem encountered is lack of market and market information. The current market is narrow i.e. only Zanzibar, as prices fluctuate, market information can assist in making selling decisions.
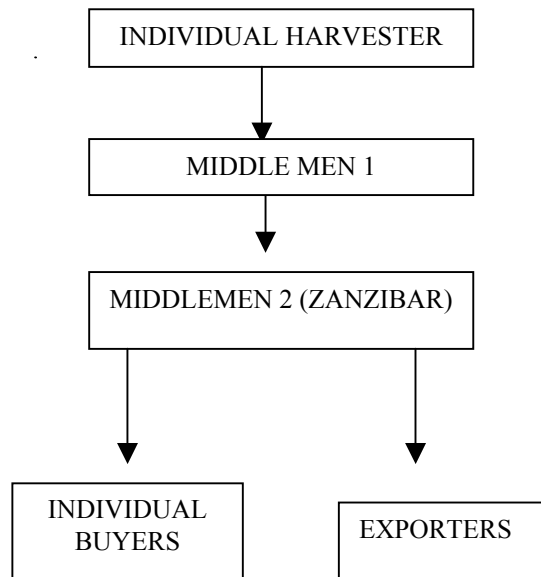
Figure 2: Marketing Channel for Mangrove trees

Non-timber forest products
Among the non-timber forest products utilised are 'miaa' or sometimes-called 'milala' and 'ukindu' Tables 27 and 28 gives the statistics of miaa and ukindu in the survey area by AEZ.

Table 27: Statistics of miaa/milala by AEZ

AEZ		Amt harv. /year/hh (fungu)	Amt. used for home consumption (fungu)	Price per fungu	Cost per year miaa/milala	Gross value of miaa per hh/year
Inner Delta North	Mean	100.0		10.0	500.0	1000.0
	N	1		1	1	1
	Std. Dev.	.		.	.	
	Min.	100		10.0	500.0	
	Max.	100		10.0	500.0	
Inner Delta South	Mean	650.0	600.0	10.0		6500.0
	N	2	2			
	Std. Dev.	494.9	565.69			
	Min.	300	200			
	Max.	1000	1000			
Delta North	Mean	1000.0	500.0	10.0	5000.0	1000.0
	N	1	1	1	1	1
	Std. Dev.	.	.	.	.	.
	Min.	1000	500	10.0	5000.0	1000.0
	Max.	1000	500	10.0	5000.0	1000.0
Delta South	Mean	1075.0	30.0	10.0	1000.0	10750.0
	N	2	1	2	1	2
	Std. Dev.	1308.1	.	0.0	.	13081.5
	Min.	150	30	10.0	1000.0	1500.0
	Max.	2000	30	10.0	1000.0	20000.0
North Flood Plain	Mean	75.00	5.00	11.0	6000.0	900.0
	N	3	1	2	2	2
	Std. Dev.	61.4	.	1.4	0.0	424.3
	Min.	5	5	10.0	6000.0	600.0
	Max.	120	5	12.0	6000.0	1200.0
South Flood Plain	Mean	100.0	100.0	12.0		1200.0
	N	1	1	1		1
	Std. Dev.	.	.	.		.
	Min.	100	100	12.00		1200.0
	Max.	100	100	12.00		1200.0
West Valley	Mean	2105.0	30.00	85.0	8250.0	35750.0
	N	2	1	2	2	2
	Std. Dev.	2679.9	.	91.9	9545.9	6010.4
	Min.	210	30	20.0	1500.0	31500.0
	Max.	4000	30	150.0	15000.0	40000.0
Total	Mean	757.08	266.43	27.1	5000.0	12125.0
	N	12	7	9	7	8
	Std. Dev.	1180.2	366.27	46.1964	5008.3	16136.1
	Min.	5	5	10.0	500.0	600.0
	Max.	4000	1000	150.0	15000.0	40000.0

Source: computed form survey data (2000)

On average, households realise a gross income of Tsh 12,125 per annum from harvesting of miaa/milala. The average net income per household is Tsh7, 125 (Table 27). The overall figures show that harvesting of Miaa/milala is a profitable undertaking. If constraints are removed, profitability of non-timber forest products can further be increased (see below).

Table 28:Statistics for Ukindu harvesting by AEZ

AEZ		Amt. used for home consumption (fungu)	Price per fungu	Cost per year	Gross value /yy/hh	Net value of /yy/hh	Amt harvested/year/ hh (fungu)
Inner Delta North	Mean	50.4	53.6	200.0	7771.4		356.64
	N	7	9	1	7		11
	Std. Dev.	68.7	29.6	.	12546.5		590.1
	Min.	3	12.0	200.0	1000.0		3
	Max.	200	100.0	200.0	36000.0		2000
Inner Delta South	Mean	200.0					200.0
	N	1					1
	Std. Dev.	.					.
	Min.	200					200
	Max.	200					200
Delta North	Mean	445.7	48.9	204233.3	106194.4	-71608.3	3350.36
	N	6	9	6	9	6	11
	Std. Dev.	592.6	14.5	240829.4	119477.1	185806.1	4769.76
	Min.	4	30.0	3400.0	750.00	-450000.0	4
	Max.	1600	80.0	600000.0	300000.0	28600.0	12000
Delta South	Mean	30.0	27.8	1600.0	10100.0	18900.0	641.7
	N	1	6	2	5	2	6
	Std. Dev.	.	19.6	1979.9	9581.2	2687.0	709.2
	Min.	30	10.0	200.0	1500.0	17000.0	30
	Max.	30	50.0	3000.0	21000.0	20800.0	2000
North Flood Plain	Mean	16.50	40.0	350.0			27.7
	N	2	1	1			3
	Std. Dev.	19.0	.	.			23.6
	Min.	3	40.0	350.0			3
	Max.	30	40.0	350.0			50
Total	Mean	193.5	45.2	122915.0	50507.1	-48981.3	1403.4
	N	17	25	10	21	8	32
	Std. Dev.	387.2	23.5	207950.2	90655.3	162531.0	3099.7
	Min.	3	10.0	200.0	750.0	-450000.0	3
	Max.	1600	100.0	600000.0	300000.0	28600.0	12000

Source: computed form survey data (2000)

The overall mean gross income from harvesting 'ukindu' ranges from 750 Tsh to 300,000 Tsh, with a mean of 50,507 Tsh over the AEZ (Table 2.23). However, the overall net income is negative due to higher production costs, especially in Delta north. However, it is important that the results be interpreted carefully because farmers' cost estimates may have been high. There was no significant difference among the AEZ with respect to the variables reported in tables 27 and 28.

The amount of non-timber forest products lost per season is less than a quarter (Table 29). This is indicated by 84.4% of the respondents who use non-timber forest products. It is only in the inner Delta North, Inner Delta south and Delta north where a few respondents indicated that they lose between a quarter and a half (Table 29).

Table 29: Amount of non-timber products lost each year by AEZ

	Inner Delta North (n=8)	Inner Delta South (n=2)	Delta North (n=9)	Delta South (n=8)	North Flood Plain (n=2)	South Flood Plain (n=1)	West Valley (n=2)	Total (n=32)
Less than a quarter	87.5	50.0	66.7	100.0	100.0	100.0	100.0	84.4
A quarter to a half	12.5	50.0	33.3					15.6

Source: Survey data, 2000

Losses of non-timber forest products occur when products are harvested during the rainy season. Respondents indicated that quality losses during rainy seasons are high. Other losses occur during transportation. Threat by wild life is a hindrance to harvesting in some parts of the survey area particularly those surrounded by game and forest reserves.

In order to improve profitability of non-timber forest products, the following actions are recommended by the respondents:
- Improve capital availability
- Improve markets
- Harvest the products during dry season
- Apply alternative drying/processing methods such as steam drying
- Improve transportation
- Use proper handling/storage structures
- Control wild fires
- Form co-operatives among the harvesters

3.2.5 Livestock production

Livestock production is important in sustaining the livelihoods of the people residing in the Rufiji flood plain and Delta. Respondents ranked it the third among the main sources of income. Livestock kept include cattle, goats and chickens.

Goats

The results of the survey show that goats are kept mainly in three AEZ namely, Delta north, Delta south and north flood plain. Ten households are involved in goat production out of a sample of 182 households.

Table 30: Statistics for household goat production by AEZ

AEZ		HH yield per season (number)	HH yield/year (number)	Amt. used for hh cons. (number)	Price per goat (Tsh)	Annual cost of production (Tsh)	Gross value of production (Tsh)	Net value of production (Tsh)
Delta North	Mean	6.0	6.0	2.0	15000.0	16000.0	90000.0	74000.0
	N	1	1	1	1	1	1	1
	Std. Dev.	.	.	.	.	.	.	.
	Min.	6	6	2	15000	16000	90000.0	74000.0
	Max.	6	6	2	15000	16000	90000.0	74000.0
Delta South	Mean	4.5	7.3	2.4	8666.7	11666.7	53333.3	46333.3
	N	4	6	5	6	3	6	3
	Std. Dev.	1.0	4.1	1.1	3502.4	10692.7	19745.0	36774.1
	Min.	4	2	1	5000	5000	30000.0	6000.0
	Max.	6	12	4	15000	24000	84000.0	78000.0
North Flood Plain	Mean	8.3	30.7	8.0	14000.0	7950.0	452000.0	602550.0
	N	3	3	3	3	2	3	2
	Std. Dev.	4.9	38.4	10.4	1732.1	3606.2	583161.2127	724006.6
	Min.	5	8	2	12000	5400	96000.0	90600.0
	Max.	14	75	20	15000	10500	1125000.0	1114500.0
Total	Mean	6.1	14.2	4.2	10900.0	11150.0	176600.0	236350.0
	N	8	10	9	10	6	10	6
	Std. Dev.	3.3	21.6	5.9	3984.7	7569.35	334714.9	431224.2
	Min.	4	2	1	5000	5000	30000.0	6000.0
	Max.	14	75	20	15000	24000	1125000.0	1114500.0

Source: Survey data (2000)

Goat production statistics are presented in table 30 and show that goat production is mainly for sale (overall average of 10 goats out of 14 produced are sold, Table 30). The average annual yield of goats is slightly above 14.

Table 30 shows that goat production is a high income earning enterprise giving an average annual net income of 236,350 Tsh. The results show further that there are no significant differences in the statistics provided in table 30 across the AEZ.

Cattle production
Only four households out of the sampled 182 undertake cattle production. These households are from south Delta AEZ.

The average household cattle production per year is five head of cattle. The net value of production is positive, indicating that cattle production is a viable enterprise in the area (table 31).

Table 31: Statistics of Cattle production by AEZ

AEZ		HH yield per season (number).	HH yield/year (number)	Amt. used for hh cons (number)	Price per cattle (Tsh)	Annual cost of production Tsh).	Gross value per year per hh (Tsh)	Net value of production per year per hh (Tsh)
Delta South	Mean	3.7	5.5	1.00	51666.67	9503.3	185000.0	175496.7
	N	3	4	3	3	3	3	3
	Std. Dev.	2.8	6.4	0.0	28431.20	11647.10	112583.3	104322.6
	Min.	2	1	1	20000	10	75000.0	69000.0
	Max.	6	15	1	75000	22500	300000.0	277500.0
Total	Mean	3.7	5.5	1.0	51666.7	9503.3	185000.0	175496.7
	N	3	4	3	3	3	3	3
	Std. Dev.	2.1	6.4	0.0	28431.2	11647.1	112583.3	104322.7
	Min.	2	1	1	20000	10	75000.0	69000.0
	Max.	6	15	1	75000	22500	300000.0	277500.0

Source: Survey data (2000)

Chicken production
Chickens are important types of livestock in the Rufiji Delta and Flood plain. About 75 (41%) respondents reported to have participated in chicken production. The overall mean production per household per year is 57 birds (minimum number is 2 and the maximum number is 500, Table 32). The highest mean annual production was recorded in South flood plain and the lowest in Delta north. However there are variations as indicated by the standard deviations.

Across the AEZ four variables were significantly different namely:
- Mean yield of chicken production per household (F=2.28, p=0.05);
- Mean price of chicken (F=2.5 p=0.03);
- Mean gross value of income from chickens (F=3.29, p=0.00), and;
- Mean net value of production per year (F=4.24, p=0.00).

Since mean annual production costs across the AEZ was not statistically different, it follows that the main factors which have accounted for the differences in net annual income per year per household are the level of production and prices offered. From the results, we may conclude that to improve chicken production in the area production constraints and good markets need to be addressed.

Table 32: Chicken production statistics by AEZ

AEZ		HH yield per season (number)	HH yield/year (number)	Amt. used for hh (Number)	Price per chicken (Tsh)	Annual cost of production	Gross annual income (Tsh)	Net annual Income (Tsh)
Inner Delta North	Mean	15.3	47.8	26.63	994.67	3800.0	43960.0	36000.0
	N	9	15	16	15	5	15	5
	Std. Dev.	13.3	28.4	41.9	513.4	3492.9	31255.8	15248.0
	Min.	2	10	2	0	2000	0.0	15000.0
	Max.	40	120	170	1600	10000	120000.0	54000.0
Inner Delta South	Mean	18.8	78.3	16.1	1514.3	14600.0	107142.91	93000.0
	N	4	7	7	7	5	7	5
	Std. Dev.	8.5	30.0	7.5	796.7	9208.7	48057.0	61619.8
	Min.	10	30	7	600	3000	45000.0	21000.0
	Max.	30	120	24	3000	24000	180000.0	168000.0
Delta North	Mean	14.3	38.9	13.6	1291.0	8000.0	62620.0	37050.0
	N	9	13	13	10	5	10	4
	Std. Dev.	11.3	31.7	12.7	638.0	6204.8	55320.7	29159.5
	Min.	3	2	3	10	1000	200.0	-800.0
	Max.	40	100	40	2000	15000	200000.0	65000.0
Delta South	Mean	12.0	57.7	15.3	1145.5	4625.0	73500.0	54375.0
	N	5	11	11	11	4	11	4
	Std. Dev.	8.4	51.2	13.7	314.2	2868.7	77301.7	35250.0
	Min.	4	10	2	700	500	7000.0	23000.0
	Max.	25	180	48	1500	7000	270000.0	99500.0
North Flood Plain	Mean	16.8	47.4	29.0	1228.8	10414.3	75571.4	65157.1
	N	6	9	9	7	7	7	7
	Std. Dev.	16.8	39.6	48.8	354.6	12207.3	53974.9	50841.2
	Min.	3	6	3	500	500	10000.0	5000.0
	Max.	50	120	156	1500	30000	150000.0	143500.0
South Flood Plain	Mean	30.0	131.4	14.3	1433.3	1066.7	170166.7	260933.3
	N	4	7	7	6	3	6	3
	Std. Dev.	21.9	173.6	8.4	640.8	901.9	168440.4	206799.4
	Min.	4	20	4	800	200	20000.0	125800.0
	Max.	50	500	30	2500	2000	500000.0	499000.0
West Valley	Mean	9.9	40.9	7.8	723.8	5983.3	37172.9	42112.5
	N	8	13	11	12	6	12	6
	Std. Dev.	9.1	26.8	7.7	451.3	3539.7	37292.1	48687.4
	Min.	0	5	0	5	1500	75.00	-1425.0
	Max.	25	100	25	1500	10000	120000.0	114000.0
Total	Mean	15.6	57.2	18.0	1131.1	7500.0	71179.0	73596.3
	N	45	75	74	68	35	68	34
	Std. Dev.	13.1	64.9	27.3	564.7	7816.5	75630.0	89237.8
	Min.	0	2	0	0	200	0	-1425.0
	Max.	50	500	170	3000	30000	500000.0	499000.0

Source: Survey data (2000)

The majority of respondents indicated that the amount of livestock losses due to various causes ranges from less than a quarter (40% of respondents) to a quarter to a half (35% of respondents, Table 33). However, a substantial number of respondents in South flood plain (44%) and in West valley (38%) indicated that the losses are more than a half.

Table 33:Amount of livestock lost by AEZ (Percent of respondents)

	Inner Delta North	Inner Delta South	Delta North	Delta South	North Flood Plain	South Flood Plain	West Valley	Total
Less than a quarter	50.0		50.0	72.2	31.3	11.1	30.8	39.6
A quarter to a half	27.8	80.0	33.3	16.7	37.5	44.4	30.8	35.4
More than a half	22.2	20.0	16.7	11.1	31.3	44.4	38.5	25.0
Number of respondents (n)	18	10	12	18	16	9	13	96

Source: Survey data (2000)

The reasons given for livestock losses are, in order of priority, as follows:
- Vermin attack;
- Diseases;
- Lack of proper livestock management strategies e.g. deaths during calving;
- Theft.

It is important to note that the respondents may have various combinations of the above reasons.

The respondents suggested a variety of ways of improving livestock production in the survey area. The most important ones, in order of priority, are as follows:
- Improvement in veterinary services;
- Vermin control;
- Improvement in livestock housing;
- Zero grazing;
- Improve management practices, and;
- Improve theft control.

3.2.6   Other economic activities
Salt making
Salt making was reported in only two AEZ namely Delta north and Delta south. In these zones, only a few respondents were involved in salt making i.e. five in Delta north and six in Delta south.

Table 34: Statistics of salt production by AEZ

AEZ		Quantity made per season (Kg)	Quantity made per year (Kg)	Amt. salt for home use (Kg)	Amt. sold (Kg)	Price (Kg/Kg)	Gross Revenue (Tsh)	Cost incurred on salt (Tsh)	Net revenue (Tsh)
Delta North	Mean	294.0	294.0	55.0	316.7	90.0	26166.7	39250.0	-17833.3
	N	5	5	4	3	5	3	4	3
	Std. Dev.	152.2	152.3	10.0	115.5	30.0	12210.0	58094.0	81985.3
	Max.	500	500	70	450	120	36000	125000	30000.0
	Min.	70	70	50	250	50	12500	1000	-112500
Delta South	Mean	1066.7	1116.7	62.5	862.5	48.9	38250.0	35050.0	-24566.7
	N	6	6	4	4	7	4	6	3
	Std. Dev.	825.6	900.3	25.0	636.9	16.8	33089.5	56950.6	37130.4
	Max.	2600	2600	100	1700	80	85000	150000	8000.0
	Min.	250	250	50	200	30	12000	6000	-65000.0
Total	Mean	715.5	742.7	58.7	628.6	66.0	33071.4	36730.0	-21200.0
	N	11	11	8	7	12	7	10	6
	Std. Dev.	716.2	774.1	18.1	540.7	30.5	25275.9	54143.8	57041.2
	Max.	2600	2600	100	1700	120	85000	150000	-112500.0
	Min.	70	70	50	200	30	12000	1000	30000.0
F test		F=4.19, p=0.07*	F=4.0, p=0.08*	F=0.31 p=0.6	F=2.05, p=0.21	F=9.34, p=0.01*	F=0.35, p=0.6	F=0.01, p=0.9	F=0.02, p=0.9

Source: Computed from Survey data (2000)

* Means that the coefficient is significant at p<10%

Table 34 shows statistics of salt production in the two AEZ of Delta north and Delta south. There is significant difference in the amount of salt made per season, amount made per year and the price of salt. The other variables did not show significant differences (Table 34). Delta south has significantly higher amount of salt made compared to Delta north but has significantly lower prices of salt compared to Delta north. This supports the law of supply and demand, where large amounts of salt supplied in delta south is associated with low prices of the product. Since there are few producers in each zone, the results suggest that to improve salt production more market outlets are required to absorb the product without significantly reducing the price.

Table 34 shows that the net revenue from salt making is negative in both zones. Assuming that the respondents did not exaggerate the costs, there is a need of improving the production efficiency by employing cost effective methods of producing salt. Of the costs involved, fuel wood seems to be an important cost item. Exploring other methods such as solar drying may reduce the costs of production at the same time conserving the environment.

3.3   Attitude towards the environment

In order to capture the respondents' attitude towards the environment, several questions were asked. The first question relates to the respondents' perception of the state of the environment. The majority of the responses show that the state of the environment ranged from good and fair (28.6%) to bad (45%) (Table 35). A relatively high number of respondents in Delta north (34.6%) and Delta south (28.6%) showed that the environment is very bad and is getting worse. Taking into consideration that only 4.6% of the respondents have assessed the state of the environment as very good, generally the responses suggest that something has to be done to improve the environment.

The second approach in assessing respondents' attitude towards the environment, involved various statements that are believed to be measuring attitude towards the environment and the respondents were requested to indicate their agreement or disagreement to those statements. The nine statements were both derived from other studies (Magayane, 1995, Senkondo 2000) and adapted or newly constructed based on the objectives of the research as well as on the validity of the items/statements. Factor analysis was used as a method of item analysis using Principal Component Analysis (PCA) as a method of factor analysis (See Hotelling, 1993, Kim and Mueller 1978 and Norusis (1992)

Table 35: State of the environment by AEZ (Percent of respondents)

	Inner Delta North (n=44)	Inner Delta South (n=14)	Delta North (n=26)	Delta South (n=28)	North Flood Plain (n=22)	South Flood Plain (n=12)	West Valley (n=29)	Total (n=175)
Very bad and getting worse	22.7	14.3	34.6	28.6	18.2	25.0	6.9	21.7
Bad	43.2	50.0	34.6	50.0	59.1	41.7	41.4	45.1
Good and fair	34.1	28.6	23.1	17.9	13.6	33.3	44.8	28.6
Very good and getting better		7.1	7.7	3.6	9.1		6.9	4.6

Source: Survey data (2000)

The use of PCA makes it possible to identify the 'best' factors in terms of explaining the variance of the sample. It gives uncorrelated, linear combinations of the observed variables in a rank order. Ranking is based on the amount of variance in the sample accounted for by the linear combinations. The first linear combination of observed variables (Principal Components) accounts for the largest amount of variance in the sample followed by the second and so on.

Table 36: Items/statements and their factor loadings, measuring positive attitude towards the environment.

Item	Researchers' hypothesis	Outcome from respondents	Factor Loading[a]
A1.In order to make some money and survive I have to do some things which are not good for the environment	Disagree	Disagree	-0.4
A2.We are required to conserve the environment in order to have higher yields (Fish, forest products, etc)	Agree	Agree	0.3
A3.The way we are fishing now is not good and cannot last for ever	Agree	Agree	0.7
A4.There will be plenty of opportunities for our children as far as the environment is concerned	Disagree	Agree*	0.6
A5.We need to make changes in our farming practices for the benefit of the future	Agree	Agree	0.6
A6. Involvement of the villagers in wildlife management is the best way of controlling poaching	Agree	Agree	0.3
A7.Growing trees in our farms is one way of protecting our forests	Agree	Agree	0.6
A8. I worry that the land will not produce much when our children will take over farming	Agree	Agree	0.4
A9.I cannot afford to worry about preparing for the future	Disagree	Agree*	0.4

[a]Un-rotated factor loading (rounded up)
* Means that there is a difference between the researchers' expectations and the respondents actual answers
Extraction Method: is Principal Component Analysis.

The Eigen Value shows the total variance explained. Eigen Value was used as a measure of variability of the factors. Selection of the items/variables was based on the Eigen Value of the extracted factor. Items falling under the factor with the highest Eigen Value have their respective factor loading. The higher the factor loading the more that item contributes to the total score of that factor. Eigen Value and factor loading are generated directly by SPSS/PC+ during factor analysis (Norusis, 1992). The factor with the highest Eigen Value (normally >1.0) was selected to give the score for the attitudinal concept depending on the relative factor loading of the items. A factor loading of items of at least 0.4 is preferred. According to Kim and Muller (1978:10), a factor loading of < 0.3 is not normally considered as substantial

Table 36 shows the results of factor analysis as well as the researchers' and farmers' opinions on the items. The highest selected extracted factor accounted for 24.7% of the variations. All the items in the selected factor have the recommended factor loading of at least 3.0, and are therefore considered as reliable measures of the attitudinal concept (Table 36). There is a difference between the researchers' hypotheses and the outcome of the survey in items A4 and A9, i.e. farmers agree that there will be plenty of opportunities for their children and they agree that they cannot afford to worry about the future (Table 36). This shows that there is poor/negative attitude towards 'intergeneration equity'.

Table 37: Respondents showing positive attitude towards environment (Agree or disagreeing to various items) by AEZ

Item	Inner Delta North	Inner Delta South	Delta North	Delta South	North Flood Plain	South Flood Plain	West Valley	Total
				Percent of respondents				
A1 (Disagree)	40.9	23.3	46.2	37.9	27.2	23.1	53.4	39.7
A2 (Agree)	93.2	93.3	88.5	93.1	100.0	100.0	96.6	94.4
A3 (Agree)	44.2	53.3	65.4	55.1	50.0	77.0	52.0	54.4
A4 (Disagree)	40.5	53.4	18.0	48.1	52.4	69.2	33.3	40.6
A5 (Agree)	86.1	86.7	92.4	82.7	95.2	92.6	79.3	87.0
A6 (Agree)	64.7	73.3	79.2	89.2	68.4	84.6	82.4	77.3
A7 (Agree)	81.8	80.0	84.6	86.2	68.2	92.3	86.7	82.7
A8 (Agree)	70.4	60.0	65.4	78.6	63.6	84.7	63.4	68.8
A9 (Disagree)	48.8	66.7	42.3	35.7	45.5	46.2	57.2	44.6
Overall	63.4	65.5	64.7	67.4	63.4	74.4	67.2	65.5

Source Survey data (2000)

The respondents do not put much emphasis on what will happen in the future as far as the environment is concerned. However there are mixed feelings as indicated in table 37.

The percentage of respondents who disagree with items A4 and A9 are 40.6% and 44.6% respectively, implying that more than 50% of the respondents have negative attitude towards these items (i.e. either disagree or not decided). This calls for a need to link the environment and future generations when undertaking environmental education. However, in Inner Delta south, and west valley AEZ, they indicate a higher numbers of respondents disagreeing with item A9 and South flood plain and inner Delta south have high numbers of respondents disagreeing with A4 (Table 37). This shows that in these zones there is a good linkage between the environment now and what will happen in the future. The majority of the respondents in these zones perceived the state of the environment as 'bad' (Table 35).

Generally, respondents in the survey areas show a positive attitude towards the environment (more than 60% of the respondents table 37). This indicates a positive sign that interventions related to environmental management are likely to be accepted in the area.

When asked to compare the availability of natural resources for household use now and ten years ago, the majority of the respondents indicated that it is not easy now (88.5%, Table 38)

Table 38: Respondents indicating easiness of availability of natural resources today compared to 10 years ago by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (=182)
				Percent of respondents				
Yes	4.5	13.3	3.8	20.0	20.8	15.4	10.0	11.5
No	95.5	86.7	96.2	80.0	79.2	84.6	90.0	88.5

Source: Survey data (2000)

The results indicate that as years pass, the availability of natural resources to households is becoming more difficult. The main reasons for this are a combination of the following:
- Overexploitation/uncontrolled harvesting
- Population growth
- Unreliable weather/climatic conditions
- Poor technologies for example in agriculture
- Poor management strategies
- Illegal harvesting
- Presence of large scale fishing companies and
- Uncontrolled bush fires

It is surprising to note that the respondents are not associating the various economic activities with environmental degradation (Table 39). This may be attributed to wrong information by respondents fearing that their current economic activities will be regarded as illegal. Among the sampled respondents, only 34% were able to relate some economic activities and environmental destruction. They argued that economic activities such as tree harvesting, over-fishing, unplanned harvesting of natural resources, shifting cultivation, fire accidents and clearing land for agriculture are responsible for environmental degradation.

Table 39:Responses on whether or not economic activities affect the environment by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n =182)
				Percent of respondents				
Yes	31.8	26.7	53.8	46.7	33.3	38.5	10.0	34.1
No	68.2	73.3	46.2	53.3	66.7	61.5	90.0	65.9

Source: Survey data, 2000

When asked to mention environmental changes that they would like to see happening in their villages, the respondents were thinly spread in the following measures:
• More controlled harvesting of natural resources and induce sustainable harvesting;
• Formation of environmental conservation groups;
• Create alternative economic activities;
• Provision of education/training in natural resources use and conservation;
• Establish by-laws for natural resources conservation;
• People participation in natural resource management;
• Encourage tree planting;
• Improve infrastructure and access to markets;
• Clear demarcation of reserved lands;
• Increased government interventions in natural resource management;
• Use of improved farming technologies and discourage shifting cultivation, and;
• Improve capital availability, through credit provision.

3.3.1   Dependency and access to natural resources
Apart from the information provided in table 3.4 above, on attitude towards the environment, the respondents in the survey area are dependent on the natural resources for their livelihood. The question of dependency and access to natural resources is therefore very important.

The main natural resources available in the survey area are as follows:

• Rufiji river: This river cuts across the survey area. Towards the Indian Ocean it turns out into a series of Deltas. This river is mainly used for fishing, provision of flood plains for agriculture on both sides along the river, water for wild life and navigation/transport.

• Lakes: These are inland lakes formed as a result of flooding of the Rufiji River. In the survey area a number of these lakes are available. The main uses of these lakes are for fishing and provision of drinking water. The flooding Rufiji River replenishes the number of fish.

• Forests: The forest resources can be categorised into forest reserves, village forests and woodlands. The main uses of forests are for firewood, building poles and timber. Available trees include *Mkongo (Afzelia quanzensis)*-for timber, *Mninga (Pterocarpus angolensis)* –for timber and *Mpingo (Dalbergia melanoxylon)* for curving. Other non-timber forest products available are milala, honey and ropes. These forests and woodlands also have varieties of wildlife animals and birds. In the Delta available forests are mainly mangrove forests. Mangrove forests are rich in various species of Mangrove. Important species include Mkandaa (*Ceriops tagal)*, Mkoko

(*Rhizophora mucronata)*, Mkomafi (*Xylocarpus granatum).* There are varieties of animal species and birds, which were unfortunately not classified in this survey. The main uses of mangrove forests are for building poles and firewood (also salt making). Along the channels packs of poles are seen which we were told are exported to Zanzibar.

- Agricultural resources: The survey area provides a variety of agricultural lands. These ranges from the flood plains along the Rufiji river (also flood areas of the Delta) to outside of the flood plain for rain fed agriculture. In the western valley these areas are known as *Baweni*. In the Delta, agriculture benefits from the floods of Rufiji River in both bringing the alluvial soils and diluting the salinity of the ocean waters.

The main economic activities in the area are dependant on the availability of the above-mentioned natural resources. There are various ways of accessing the above natural resources by the people:

- Access through license to timber products, which is normally under the control of the Local government. Access to non-timber forest products such as *milala* is free to all but in some villages fees are to be paid to the local government.

- Access to agricultural land is mainly based on traditional ownership, where households inherit land from their fore fathers and use it as a clan land. Clearing new land is also practised with the blessings from the village government. Purchase of land was rarely observed.

- Access to fishing is almost open to all, but we were told that some fishing levies have to be paid to the local government.

3.4   Coping with food surpluses and shortages

About 73 % of the respondents indicated that they sometimes realise surplus production. The respondents indicated various uses of the surplus production as itemised in table 40

Table 40: Main uses of surplus production by AEZ

	Inner Delta North (n=30)	Inner Delta South (n=12))	Delta North (n=21)	Delta South (n=22)	North Flood Plain (n=14)	South Flood Plain (n=10)	West Valley (n=23)	Total (n=132)
	Percent of respondents							
Sell it and save the money			4.8	18.2	7.1			4.5
Buy livestock	10.0	33.3		4.5	7.1		13.0	9.1
House repairs/ build	3.3	16.7	4.8	4.5	14.3	30.0		7.6
Buy tools, fishing gear/equip	10.0		14.3			10.0		5.3
Buy household goods	13.3	16.7	9.5	9.1	7.1	20.0	8.7	11.4
Buy clothes	36.7	8.3	23.8	36.4	14.3	10.0	43.5	28.8
Buy food	20.0	25.0	19.0	22.7	42.9	20.0	26.1	24.2
Education	3.3		19.0		7.1			4.5
Capital	3.3		4.8					1.5
For agric. Production				4.5		10.0	8.7	3.0

Source   Survey data 2000

The main use of food surplus is to buy clothes, followed closely by buying food items. The second use shows the concern of the respondents on food security. Saving of surplus in terms of cash is normally not done by many respondents. The exception is in Inner Delta south where livestock purchase is the most important use of surplus (33% of respondents, table 40).

Table 41:Respondents experiencing food shortage by AEZ

Response	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182)
	Percent of respondents							
Yes	97.7	80.0	80.8	86.7	95.8	92.3	93.3	90.7
No	2.3	20.0	19.2	13.3	4.2	7.7	6.7	9.3

Source: Survey data, 2000

The results of the survey show that the majority of the respondents (90%) face food shortage during some parts of the year (Table 41). That is why whenever there is a food surplus priority is directed towards the purchase of food (Table 40). Respondents gave wide range of reasons why they face food shortages. The main reason is low agricultural production that is caused, in order of priority, by the following reasons:

- Unreliable weather (including drought and flooding). As mentioned earlier (section 2) flood is an important factor in agriculture in both the flood plain and the Delta. Floods are also important in fishing especially in inland lakes;
- Crop loss due to vermin attack (this has also been emphasised in previous sections and in section 2);
- Inadequate capital to invest in agriculture and other economic enterprises (including poor technology and small agricultural plots);
- Inadequate labour force (mainly due to personal risks such as sickness during peak seasons and high dependency). The calculation of dependency ratio (section 3.1.3) supports this finding. The calculation shows that there are more people (38.2%) who depend on others as far as agricultural production is concerned;
- Selling crops soon after harvest in order to meet immediate cash demanding needs, and;
- Lack of reliable transport and market infrastructure contributes to losses in output especially those of perishable goods.

However, respondents are not remaining silent when faced by food shortages. There are a number of coping strategies that are undertaken. These include buying food (64.3% of respondents), begging assistance from relatives (14.4% of respondents), begging assistance from the government (6% of the respondents) and eating alternative foods, (3.9% of respondents).

Another way the households adjust themselves to food shortage is to try out new crops, fishing methods, alternative use of wood products etc.

Table 42: Respondents who tried new crops, fishing methods wood product use by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (30)	Total (n=182)
				Percent of respondents				
Yes	43.2	60.0	30.8	36.7	54.2	30.8	30.0	40.1
No	56.8	40.0	69.2	63.3	45.8	69.2	70.0	59.9

Source: Survey Data (2000)

In this survey, results show that only 40% of the respondents tried new methods when faced by production problems (Table 42). Inner Delta south and north flood plain had relatively many respondents who tried new methods. It is important to note this when disseminating new technologies to the survey area. Training and creating general awareness may be necessary.

When asked about given opportunities to learn something in order to improve their livelihood, the respondents had many areas of interest. However, the most frequently mentioned areas. in order of priority, are training in:
- Modern agricultural skills;
- Business skills;
- Carpentry skills;
- Modern livestock keeping;
- Tailoring, and;
- Handicrafts.

The responses above show a desire for respondents to improve agricultural and livestock skills as well as training in other off-farm income generating activities such as business, tailoring and handicrafts.

3.5   Household energy sources and needs
3.5.1   Types of fuelwood used
Although there are different combinations of fuels used in the survey area, the results show that firewood is the main source of fuel (Table 43). A substantial number of respondents from Delta north and south use a combination of firewood and coconut husks. It can be concluded that sources of fuel such as charcoal, kerosene and crop remains are used to supplement firewood (Table 43).

Table 43:   Respondent using different sources of fuel by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182)
				Percent of respondents				
Firewood	97.7	100.0	65.4	83.3	79.2	100.0	90.0	87.4
Charcoal					8.3			1.1
Firewood and coconut husks			23.1	16.7				6.0%
Firewood and kerosene	2.3		3.8					1.1
Firewood and Charcoal			7.7		8.3		10.0	3.8
Firewood, Charcoal, Kerosene					4.2			0.5

Source: Survey data (2000)

The majority of the respondents use the 'three stone system' for cooking (about 98% of the respondents). Only two percent of the respondents indicated that they use charcoal stoves.

3.5.2   Fuelwood collection and responsibilities
The responsibility of firewood collection assists in deciding whom to target when disseminating firewood related technologies. Firewood collection in the survey area is mainly the responsibility of women .Men and children are only supporting female members in firewood collection (Table 44)

Table 44: Fuelwood collection by household members

Members	Percent of respondents
Women	83.2
Women and men	64.7
Men and children	35.7
Men	27.6
Women and children	18.8
Children	6.8

Source: Survey data (2000)

3.5.3   Trade in fuelwood
83 % of the respondents do not buy fuelwood. Only 17% buy fuelwood (Table 45). It is only in north flood plain where 50% of respondents indicated that they buy fuel wood. Trading in fuelwood in the north flood plain may be due to proximity to local urban markets and even distant markets of Dar es Salaam.

Table 45: Respondents buying fuelwood by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=182)
Yes	4.5	13.3	23.1	20.0	50.0		10.0	17.0
No	95.5	86.7	76.9	80.0	50.0	100.0	90.0	83.0

Source   Survey data (2000)

The overall results have two implications. Firstly, that fuelwood in the survey area is not traded and therefore contributes very little to household cash income. The incentive to grow trees for the purpose of obtaining fuelwood is not well facilitated by the market. The second implication is that fuelwood is mainly collected for household use.

Table 46 shows the mean prices of fuelwood, time spent in collecting firewood, frequency of collection and quantity of fuel used by AEZ. There are variations in the mean values obtained from table 46 as indicated by the standard deviations. The highest mean price of fuelwood was in Delta south. Generally, the prices of fuelwood differed significantly among the AEZ. However, very few respondents indicated that they buy fuelwood.

Time spent in collecting fuelwood ranged from 92.7 minutes in south flood plain to 223.5 minutes in the North flood plain with an overall figure of 126.9 There is a significant difference among the AEZ with respect to time spent in collecting firewood (Table 46). Although firewood collection is most often done on multipurpose trips (e.g. travelling to distant farm plots for farming as well as collecting fuelwood), time taken to collect fuelwood affects time allocated for other production activities. On average, the frequency of fuelwood collection is twice per week. When compared with studies done elsewhere in Tanzania, the overall figure of time taken to collect fuelwood is lower than that reported from Babati district of 192 minutes (Senkondo, 2000).

The mean quantity of fuel wood used per week is about four head loads. However, Delta south AEZ has a higher value of 10.8 head loads per week. Probably there are high energy demanding activities such as salt making.

Table 46: Means of price of firewood, time spent in collecting firewood, frequency of collection and quantity of fuel used by AEZ

AEZ		Price per bundle/head loads of fuel wood	Time spent in collecting fuel wood (minutes)	Frequency of fetching fuel wood per week	Quantity of fuel used per week (head load)
Inner Delta North	Mean	300.0	107.1	2.3	2.4
	N	2	40	43	41
	Std. Dev.	0.0	85.0	1.3	1.1
Inner Delta South	Mean	200.0	111.0	2.0	2.9
	N	2	15	14	14
	Std. Dev.	0.0	117.3	0.9	1.9
Delta North	Mean	166.7	102.7	2.0	3.5
	N	6	26	26	23
	Std. Dev.	81.7	92.8	1.4	2.0
Delta South	Mean	275.0	146.7	2.3	10.8
	N	6	29	29	30
	Std. Dev.	117.3	140.6	1.6	37.68
North Flood Plain	Mean	122.5	223.5	2.0	2.7
	n	12	20	20	23
	Std. Dev.	91.4	119.0	.60	3.42
South Flood Plain	Mean		92.7	2.4	2.8
	n		11	12	12
	Std. Dev.		84.0	1.4	2.7
West Valley	Mean	233.3	109.8	1.7	2.2
	n	3	28	29	29
	Std. Dev.	57.7	72.2	0.7	1.2
Overall	Mean	187.7	126.9	2.1	4.1
	N	31	169	173	172
	Std. Dev.	105.2	108.5	1.2	16.0
F-value and p		F=2.61 p=0.04*	F=3.98 p=0.00*	F=1.24 p=0.28	F=1.09 p=0.37

Source: Survey data (2000)

*Means the item is significant at the specified level

3.5.4 Tree planting for fuelwood

During the design of this study, it was hypothesised that tree planting is one way of increasing fuelwood availability to the villagers. However, a very small proportion of the villagers indicated that they plant trees (11.6%, Table 47). Delta south has relatively bigger number of respondents who planted trees.

Table 47: Proportion of the respondents growing trees by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=26)	Delta South (n=29)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=181)
Yes	11.4	13.3	23.1	27.6				11.6
No	88.6	86.7	76.9	72.4	100.0	100.0	100.0	88.4

Source: Survey data (2000)

The main reasons as to why respondents do not plant trees are (in order of priority):

- Trees grow naturally and there are still many, there is no reason for planting more trees. This reason suggests that the villagers' perception regarding trees is that they are still abundant. To change this perception there is a need for educational campaigns and actual involvement of villagers in tree planting;
- They do not have skills in propagating naturally growing species;
- The planting materials are not available at the moment;
- Planting trees is looked at as uncommon practice in the survey areas;
- Land constraints, and;
- Some species, for example mangrove, requires special growing conditions, which are not available in the area (for example Delta homesteads and the flood plains).

Those few who grow trees, gave the following reasons:
- They grow trees for harvesting fruits/nuts;
- They grow trees for earning cash (cash crops such as coconuts);
- Just following the government directive of planting trees;
- Plant for medicinal purpose, and;
- Environmental protection.

3.5.5 Asset index as a proxy for wealth

Seventeen items of durable assets were included in the questionnaire (Appendix 1). The respondents were asked to indicate the number of durable items they owned, the initial value and the expected useful life. The information in this question was combined into an index (Asset), which gives an indication of the wealth status of the households. The asset index was calculated as follows:

$$AI = \sum_{n=1}^{n=17} k\,[(OV-D)/OL]$$

Where n = number of assets/items owned by a farmer where n = 1,…,22

k = the number of a particular asset owned by the farmer
AI = asset index
OV = original value
D = depreciation (straight line depreciation method was used)
UL = Useful life

The asset index is the proportion of the remaining value of the assets summed over all the assets owned. Assumptions were made regarding the nature of the depreciation and the salvage value of the assets. For simplicity, the assets were assumed to depreciate at a straight-line method and the assets are used until they do not have any value (Salvage value =0). In practice however, some of the assets may not be depreciating at a straight-line method and may also have some value at the end of the useful life. Appreciation of the assets in the course of use was also not considered.

Table 48 and figure 3 give the statistics of the calculated asset index by AEZ. The results show that there are high variations in the asset index as indicated by the standard deviation. Highest asset indices were recorded in South flood plain, Inner delta North and Inner delta south. However, there are no overall significant differences between the AEZ as indicated by the F-test.

Table 48: Means of asset index by AEZ

AEZ	Mean	n	Std. Deviation
Inner Delta North	2563.7	44	4370.5
Inner Delta South	2555.3	15	3516.1
Delta North	1665.2	26	2742.5
Delta South	1073.6	30	1532.1
North Flood Plain	2306.5	24	3141.3
South Flood Plain	3095.1	13	4606.7
West Valley	2092.6	30	2706.6
Overall	2115.4	182	3330.4
F value	F=0.94 p=0.5		

Source: Computed from the survey data (2000)
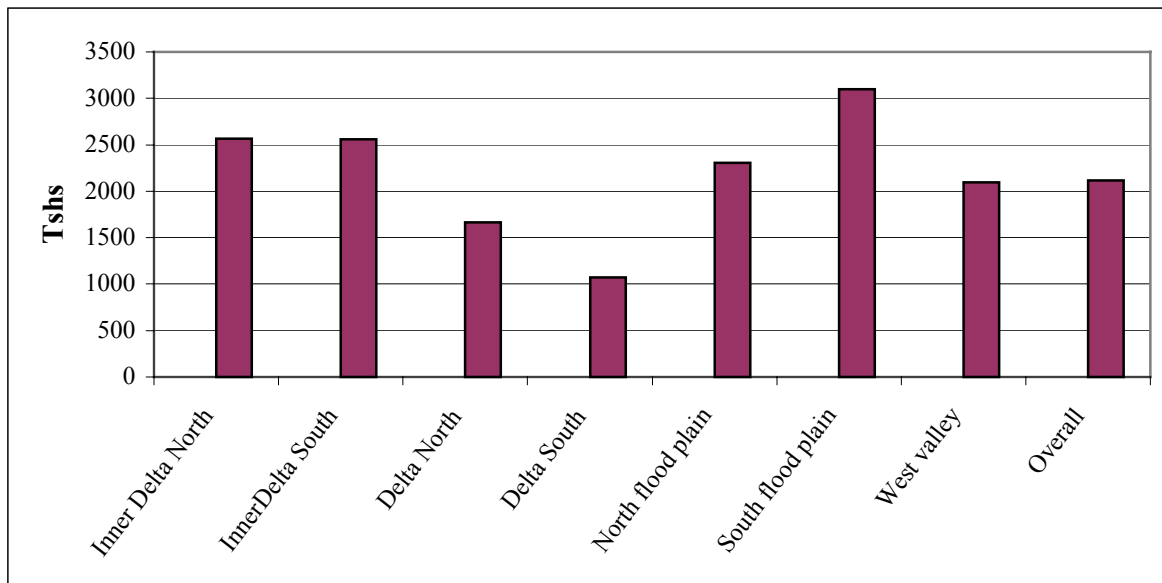
Figure 3: Mean asset index by AEZ

3.6   Expenditure

The aim of soliciting information about expenditure was to single out high expenditure items in the household as well as using it as a proxy of income generated by the households. It is believed that when asking about expenditure, respondents are willing to give information rather than asking them about the incomes obtained from various economic activities.

For convenience and ease in getting data from respondents, the expenditure items were categorised in two main items namely expenditure on main food items and expenditure on other household items.

3.6.1 Expenditure on food items

Respondents were asked how much money they spent per year on various food items (see appendix 1). The results are summarised in figure 4 and the detailed statistics per AEZ are presented in Appendix 3.

The highest food expenditure items are fish, rice and maize. Inner Delta north has highest expenditure on fish while Delta south had highest expenditure on rice. Delta north also recorded high expenditure on fish, rice and maize. The overall highest expenditure is for fish. This was an expected result because the main food items in the survey area are fish, rice and maize (figure 4 and appendix 3).
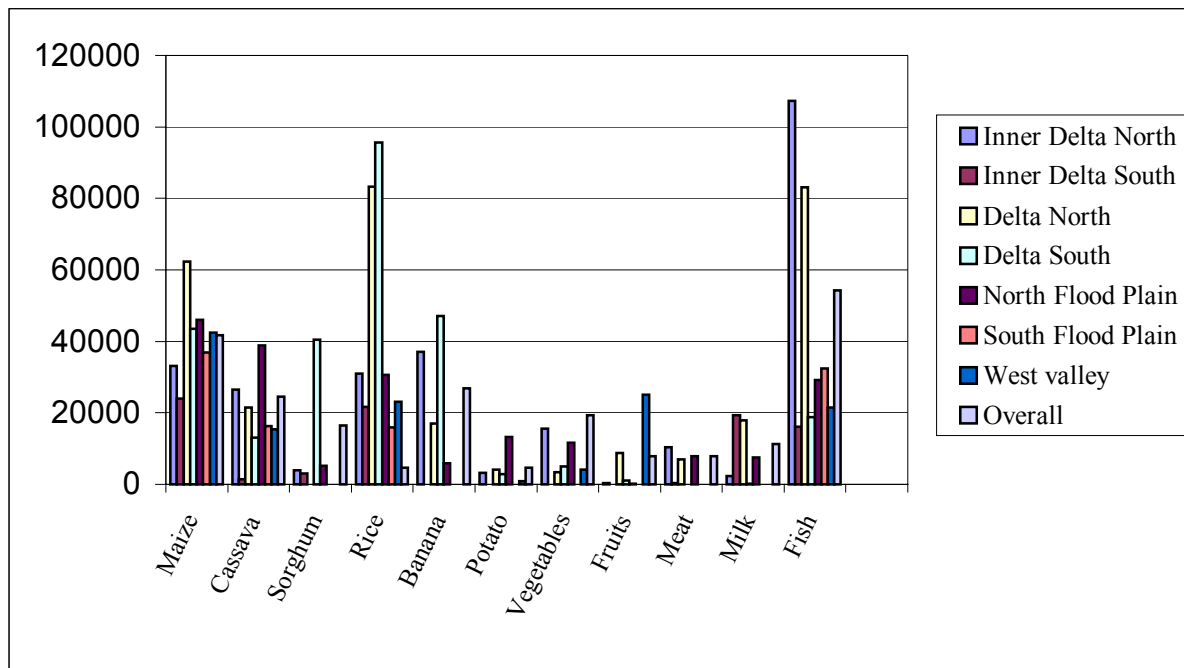
Figure 4: Expenditure on food items in the sampled households
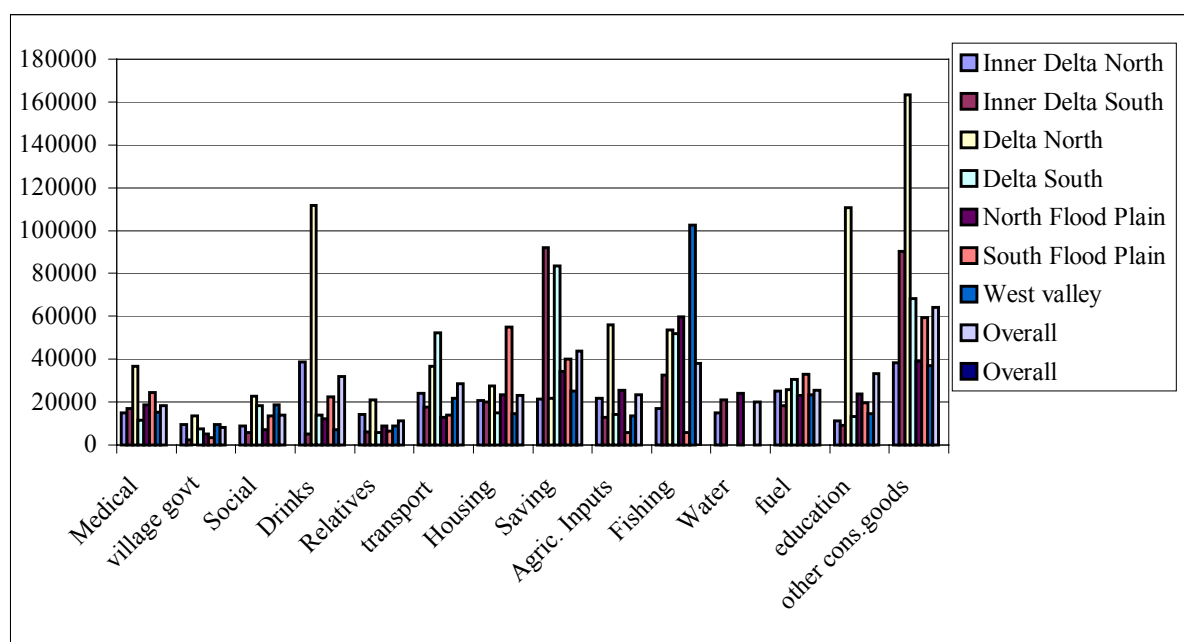
Figure 5: Other expenditure items in the household

3.6.2   Expenditure on other household items

Respondents were presented with a list of different household items and asked how much the household spent per year for each item (see also appendix 1). The results are summarised in figure 5 and detailed statistics per consumer item per AEZ are presented in appendix 4.

Figure 5 and appendix 4 show the expenditure on other items in the household. The highest expenditure items in the sampled area are other consumption good such as household items, clothes etc. Other high expenditure items are fishing, savings and education. Savings in the survey area seemed to be high and are next to consumption goods expenditures. This may give an indication of the future acceptance of the savings and credit schemes in the area. The lowest expenditure item is contribution to the village government. This may be interpreted as either the contributions are set at the lowest level or people have a negative attitude towards the village government. This is an issue, which need further investigations.

Delta north has highest expenditure on other consumer goods, education and drinks/refreshments.

3.7   Marketing and trading characteristics

It was mentioned in section 2 that transport infrastructure (road and waterways) play an important role in access to markets. The major means of transport of crops to market in survey areas are, in order of importance: bicycle, canoe, head and motorised transport. For fish transport, the majority use motorised transport (48%), followed by bicycle (29%) and on foot (23%). Sometimes a combination of the above mentioned is used. Lorries are mainly used to transport timber forest products (magogo) (more than 50% of the harvesters). For non-timber forest products the local means of transport are canoes, head, bicycle, and when distance travel is needed 'jahazi' (for Zanzibar markets) and lorry transport (for Dar es Salaam markets) are essential.

For most agricultural crops, the selling period is right after harvest i.e. between July and October. Food crops are normally sold to individual buyers, neighbouring villages and to retailers and traders. For cash crops like cashew nuts and sesame the main outlets are private traders, retailers and other middlemen.

The main destination of timber forest products (Magogo) is Ikwiriri. Harvesting and selling is normally done during dry period (June to December). The main buyers are timber processors and retailers/traders/middlemen.

Table 49: Mean overall quantities of selected commodities traded in the survey area

Commodity	Mean	n	Std Deviation	Min.	Max.
Magogo (pieces)	26.7	3	15.3	10	40
Finfish (Kg)	3987.3	22	9807.2	40	45000
Ukindu (Vichanga)	1479.0	11	2297.9	30	6000
Cashewnut (Kg)	107.4	11	129.6	9	450
Timber (pieces)	700.0	1	-	700	700
Simsim (Kg)	145.0	6	132.0	20	360
Rice/paddy (Kg)	558.3	12	436.7	120	1500
Maize (Kg)	1053.3	3	861.7	60	1600
Sweet potatoes (Kg)	100.0	1	-	100	100
Peas (Kg)	295.0	6	411.4	20	1000
Chickens (number)	21.0	5	22.2	8	60
Coconut (number)	3384.0	5	2624.7	120	6000
Salt (Kg)	733.3	3	152.8	600	900
Prawns	105.0	3	95.4	3	192

Source: Survey data (2000)

Destination for non-timber forest products (mainly ukindu and milala) is both the local markets (individual consumers, retailers/middlemen in Rufiji district) and outside markets of Zanzibar and Dar es Salaam (individual consumers, retailers/middlemen of Dar es Salaam and Zanzibar).

Quantities of traded commodities are detailed in Appendix 5 (by AEZ) and a summary of the means of the overall commodities traded is shown in table 49. Table 49 shows that there are variations in quantities sold as indicated by the standard deviations (and the maximum and minimum numbers), and the overall number of households involved in the trading process is small (ranges form 1 to 22). Commodity traded by the highest number of households is prawn

3.8   Credit Availability

Table 50 shows that only 9% of respondents received credit. Inner Delta south has slightly more villagers who received credit followed by North flood plain (Table 50).

Table 50: Proportion of respondents who received credit by AEZ

	Inner Delta North (n=44)	Inner Delta South (n=15)	Delta North (n=25)	Delta South (n=30)	North Flood Plain (n=24)	South Flood Plain (n=13)	West Valley (n=30)	Total (n=181)
	Percent of Respondents							
Yes	6.8	20.0	8.0	10.0	16.7	7.7	6.7	9.9
No	93.2	80.0	92.0	90.0	83.3	92.3	93.3	90.1

Source: Survey data (2000)

Those few who received credit were mainly in the form of cash, goats, fishnet and milling machine (Table 51).

Table 51: Distribution of respondents by type of credit by AEZ

	Inner Delta North (n=3)	Inner Delta South (n=3)	Delta North (n=2)	Delta South (n=3)	North Flood Plain (n=4)	South Flood Plain (n=1)	West Valley (n=2)	Total (n=18)
	Percent of Respondents							
Cash	100.0	100.0	100.0	66.7	25.0	100.0	100.0	77.8
Milling machine				33.3				5.6
Goats					50.0			11.1
Fishnet					25.0			5.6

Source: Survey data (2000)

The main sources of credits are itemised in table 52 which shows that most of the credit is from individuals (i.e. friends, neighbours and relatives).

Field results from different parts of the country (Kashuliza *et al*. 1998:44, Senkondo 2000) have shown that informal lending has made positive contributions to both consumption and production activities of the rural people. However, the results suggest that informal lending is still far from being a specialised activity, but rather a side activity integrated into other enterprise undertakings of various farmers and businessmen. In addition, an organised informal lending in a form of traders or farmers' association was not observed in the study area

Table 52: Distribution of respondents by source of credit and AEZ

Source	Inner Delta North (n=3)	Inner Delta South (n=3)	Delta North(n=2)	Delta South (n=3)	North Flood Plain (n=4)	South Flood Plain (n=1)	West Valley (n=2)	Total (n=18)
	Percent of Respondents							
Individuals (friends, neighbours, relatives etc)	100.0	100.0	50.0	66.7	25.0	100.0	100.0	72.2
RDD				33.3				5.6
Private company (Fruit de la mer Ltd)			50.0					5.6
Iran Islamic Organization					75.0			16.7

Source: Survey data (2000)

There is high variation in the mean value of credits obtained (Table 53). The mean value ranged form Tsh 5,000 in South flood plain to 370,000 in Delta north. There is no significant difference among the AEZ with respect to the monetary value of credits received (F=2.41 p=0.106).

Table 53: Mean value of credit (Tsh)

AEZ	Mean	N	Std. Deviation
Inner Delta North	53333.3	3	45092.5
Inner Delta South	11000.0	3	8544.0
Delta North	370000.0	2	381837.7
Delta South	29500.0	2	28991.4
North Flood Plain	14500.0	4	13850.4
South Flood Plain	5000.0	1	.
West Valley	5400.0	2	565.7
Total	62694.2	17	152063.0

Source: Survey data (2000)

It is concluded, there are credit constrains in the survey area. Formal credits from banks and other financial institutions are not available in Rufiji Delta and flood plains. Yet, the villagers are complaining of low capital availability in all of their economic activities.

4   Conclusions and Recommendations

The study was conducted in the Rufiji flood plain and Delta, covering ten villages. The purpose of the study was to produce a socio-economic profile of flood plain and Delta. The methodology used involved the review of literature and existing information and review of the methodologies used by REMP for the pilot villages.

Data for the study were collected using a structured questionnaire and checklist (Appendix 1), and through observations and discussions with key informants. A total of 182 households were involved, including 21.4% of the households' respondents being women.

The following are the main findings, conclusions and recommendations

Past studies in the Rufiji valley have generally been led by the Bureau of Resource Assessment and Land use Planning (BRALUP) now Institute of Resource Assessment (IRA) of the University of Dar Es Salaam. Other recent studies conducted by others covered specific projects in Rufiji district. Despite the past attempts in studying the Rufiji district, there have been little improvements in socio-economic studies.

Many attempts have been made to classify Rufiji district into AEZ. Two main classifications are identified, narrow AEZ and wide/finer AEZ. The present study followed the finer AEZ as described by Havnevik (1983). There are two main justifications of using the finer AEZ. The first, as already pointed out, is due to variations in economic activities and other factors gradually as you move westwards from the Delta. This helps to identify differences in economic activities in relatively smaller areas. The second justification is related to significance differences that were observed with respect to important factors across the finer AEZ. These indicate that there are some factors, which are not uniform across the finer AEZ. Some of these factors/variables include (to mention a few): age of respondents, household size, means of prices of various commodities, costs of production of some crops, number of assets owned etc.

The major ethnic group in the district is 'Wandengereko'. Other groups include "Wanyagatwa" who are mainly found in the Rufiji Delta, "Wamatumbi" who are mainly found in the southern part of Rufiji. There is substantial number of "Wapogoro" and "Wangindo".

There is cultural merge/link between the coastal 'Swahili' culture and the Persian Gulf States. Islam is an integral part of the Rufiji culture.

Two main migration patterns were noted in the survey area as seasonal and migration from other areas. Whereas the former is very prominent, the later is not significant with many households originating from the survey areas. Seasonal migrations were found to have adverse effects on school attendance by children.

Generally, dependency ratio is worsening i.e. more people are depending on a few who are able to work. This calls for improvement in production technologies in order to increase productivity of major means of livelihood.

- The major diseases in the area
- Malaria
- Anaemia
- Eye infections
- Respiratory tract infections
- Skin diseases
- Worms
- Diarrhoea
- Pneumonia

- Nutritional disorders
- Dysentery and
- Ear infections

Dispensary staffs are able to treat the above diseases unless there is a major complication. The main constraints to health services are few health workers and transport and communication problems

Major means of survival in the survey area is agriculture (flood plain and delta agriculture, about 94% of the respondents). Other means of livelihood is fishing (28.6% of the respondents), forest products (timber and non-timber, 18.1% of the respondents), livestock (15.4% of the respondents) and petty business (14.3% of the respondents). However there are reported losses in the above means of survival.

Crop production is constrained by vermin attack on crops, bad weather (floods and drought), low inputs use due to lack of capital and poor production technologies. Fishing is constrained by lack of storage facilities, marine/river animals such as crocodiles and hippopotamus, poor transport facilities, poor fishing equipment, low prices and lack of reliable markets. Similar problems are noted in other economic activities. Specific problems for mangrove harvesting and export, is lack of market and market information. Parasitic plants locally known as *nganjila* negatively affect the growth of mangrove trees.

Livestock production is ranked as the third important way of sustaining the livelihood of the people in flood plain and Delta. The main livestock kept are chickens, goats and cattle. Production levels and the prices offered are important in stimulating production of livestock for sale, particularly chickens.

The district is endowed with vast natural resources including Selous Game Reserve, fishing potential, fertile land and labour availability. Therefore, more organised local use and management of natural resources will play an important role in shaping the life of the people and biodiversity. Accessibility to the available natural resources depends mainly on the nature of the resource. For example the use of licences form the local government determines the accessibility to timber and fish resources, inheritance and clearing land (with consultation with the village government) determine agricultural land accessibility.

Despite the fact that there are a number of road networks within the district, the majority are only passable during dry season. There are also mainland and Delta waterways, which depend on canoes as a major means of transport. Poor infrastructure adversely affects accessibility to markets.

Despite some few additions, REMP methodology for pilot village baseline is adequate to monitor changes and assist in monitoring, evaluation and impact assessments.

The majority of the respondents are in productive age of below 60 with an average of six years of education. However, a big proportion of the respondents (42.3%) did not attend formal education. The implication of this is that educational campaigns and sensitisation are necessary whenever a new development is proposed.

Responses regarding the state of the environment now and in the past show that it is getting worse and suggest that something have to be done to improve the environment. Generally the respondents in the survey area show a positive attitude towards the environment (60% of respondents), giving a positive sign for acceptance of environmental related interventions.

As years pass by the availability of natural resources to households is becoming difficult. Some of the reasons for this include overexploitation, population growth, poor management, unreliable weather, illegal harvesting and uncontrolled bush fires.

There is a number of ways respondents cope with food shortage. These include buying food, begging assistance from relatives, begging assistance from governments, eating alternative foods and trying out new crops.

The main household source of energy is derived from trees in form of firewood, charcoal, coconut husks etc. The responsibility of firewood collection is on women members. Overall results on household energy needs show that fuelwood is not a traded good in the survey area and therefore contribute very little to household income. The incentive to grow trees for the purpose of obtaining fuelwood is not well facilitated by the market.

Despite the fact that household energy is derived from trees, respondents do not plant trees. The reasons are that trees grow naturally and are still many. The implication is that villagers perceive trees as abundant. To change this perception there is a need for educational campaigns.

Expenditure items in the survey area were categorised into food and other household expenditures. The highest expenditure on food turned out to be fish, rice and maize. These are the main food items for the area. For other household expenditures, other consumption goods such as household items, clothes etc ranked the highest. Other high expenditure items are fishing savings and education Savings in survey area seemed to be high expenditure item. This may give indications of the future acceptance of savings and credit schemes in the area. Overall improvement in production, processing and storage techniques will reduce cash expenditure on food items.

Production of commodities at the household level is mainly aimed at household consumption with a little surplus for sale. Very few households (22) were involved in trading. The main tradable goods include agricultural crops, livestock, forest products and fish. Improvement in transport infrastructure is likely to stimulate production for sale.

5 References

Bantje, H. (1980a) The Rufiji Agricultural Systems. Impact of Rainfall, Floods and Settlements. Bureau of Resource Assessment and Land use Planning (BRALUP). Research Paper No. 62. University of Dar es Salaam.

Bantje, H (1980b) Floods and Famines, A study of Food Shortages in Rufiji District. Bureau of Resource Assessment and Land use Planning (BRALUP). Research Paper No. 63. University of Dar es Salaam.

Boyd, H.W.; R. Westfall and S.F. Stasch (1981) Marketing Research. Text and Cases. Homewood, Illinois, Richard D. Irwin

Conyers, D., Ayo, J.N. and D.O. Luoga (1971) Agro-Economic Zones of Coast and Morogoro Regions. Bureau of Resource Assessment and Land use Planning (BRALUP) Report No. 48. University of Dar es Salaam.

DANIDA (1998) Road Sector Programme Support. A profile of Rufiji District with Particular Reference to Travel and Transport.

DRDP (2000), District Rural Roads Development Programme: Socio-economic Baseline Study on the Mkongo –Kipo road. COWI Tanzania Consulting Engineers

Havnevik, K. J. (1983) Analysis of Rural Production and Incomes, Rufiji District Tanzania. Institute of Resource Assessment (IRA) paper no. 3. DERAP Publications Bergen.

Hotelling, H. (1933) Analysis of A Complex Statistical Variables into Principal Components. *Journal of Education Psychology 24: 417-441, 498-520.*

Kashuliza, A.K., Hella, J.P Magayane, F.T. and Mvena, A.S. (1998) *Role of informal and semi-formal finance in poverty alleviation*. Research in Poverty Alleviation (REPOA) Paper 98.1.

Kim, J. and Mueller, C.W. (1978*) Factor Analysis: Statistical Methods and Practical Issues*. Newbury, Sage University Paper.

Lema (1979) Crop Water Requirements and Beneficial Flood for Rufiji Flood Plain Agriculture. Bureau of Resource Assessment and Land use Planning (BRALUP) Research Report No. 36

MacDonald and Partners (1978) Integration of Rufiji River Plain Irrigation Development. Stiegler's Gorge Power and Flood Control Development. Study Identification. Cambridge

Magayane, F.T. (1995) Farmers' Adaptive Effort to Soil Erosion and Land Productivity Decline: The case of Uluguru Mountains, Tanzania. Urbana-Champaign, University of Illinois.

Norusis, M.J. (1992) *SPSS/PC+ Professional Statistics*^{TM} Version 5.0.
Sandberg A. (1974) Socio-economic Survey of Lower Rufiji Flood Plain Rufiji Delta Agricultural Systems. Bureau of Resource Assessment and Land use Planning (BRALUP) Research Paper no 34

Senkondo E.M.M. (2000) Risk Attitude and Risk Perception in Agroforestry Decisions: The case of Babati District, Tanzania. *Mansholt studies 17*. Wageningen Agricultural University

TEHIP, (1999) Tanzania Essential Health Intervention Projects. Rufiji Demographic Surveillance System. Dar es Salaam

URT (1997) Rufiji Delta and Flood Plain: Environmental Management and Biodiversity Conservation of Forests, Woodlands and Wetlands Project phase one. Project Proposal prepared by IUCN in Collaboration with Rufiji District Administration

URT and DANIDA (1998). Rufiji District: TA to Rufiji District Council Road Sector Support Programme. District Roads Development Project (DRDP); Village Travel and Transport Project (VTTP) Inception Report. COWI Tanzania Consulting Engineers

Yoshida, M. (1974) Agricultural Survey of the Lower Rufiji Plain. The Ministry of Water Development and Power, Dar es Salaam.

6   Appendices
Appendix 1: Questionnaire and Checklist

A: The questionnaire
Socio-economic Profile of Rufiji Floodplain and Delta (Baseline Study)
Sababu ya kukuhoji ni kuelewa uchumi wa kaya katika kijiji hiki. Kaya yako ilichaguliwa kwa mafano tu. Taarifa unayotoa zitakuwa siri. Takwimu hizi zitasaidia kutafuta njia mbadala zakujaribisha kuinua uchumi wa kijiji pamoja na kuboresha usimamizi wa mazingira.

Name of the Respondent………………………………… Name of the Household head if not the respondent…………………………………………………………..
Village:……………… Subvillage:………………………Street……………………..
Ward:………………………………………….
Division:…………………………………………………
Date……………………………..   Enumerators' Initials…………………………
Household characteristics

Item	Value	Response
Gender of the head of HH	Male=1, Female =2	
Age of the HH head/respondents	Years	
Marital status of the head of HH/respondent	Married=1 Single = 2 Divorce =3 Widowed =4	
Number of wives	Number	
Main occupation of the present head of HH	Farmer = 1 Fisherman =2 Employed =3 Business =5 Masons Other (specify)	
Education of the head of HH	Years of formal education	
	Certificate attained	
Household size	Number	Number working in family farm
Male adults	Number	Number working in family farm
Female adults	Number	Number working in family farm
Children (12-17 years)	Number	Number working part time
Children (<12 years)	Number	Number working part time
Tribe of the respondent	Name the tribe	

Accessibility to education by family members
Is every children of the age of going to school able to get a place? Yes =1 No = 2
If no what are the reasons for not going to school

Accessibility to health
How many dispensaries or health centres do you have in the village? ----------------------
Are you financially capable of paying for the services offered? YES =1 NO =2
If no how do you cope with health services?
If no dispensaries/health services where do you get the service?
Health service   Distance involved
Economic activities and value of production

Household economic activity ranking

Please list the main economic activities, which help to sustain your household. (IN ORDER OF PRIORITY)

Economic activity/income generating activity	Rank	Proportion of income coming from this source
Agriculture		
Fishing		
Forest (timber, poles, firewood etc)		
Non-timber (Ukindu, milala, au majani mengine)		
Salt making		
Livestock		
Others specify		

Economic activities and income from them

(a) Agriculture

Crop	Output/hh per season (Kegs) or bags	Amount consumed / (kgs)	Amount sold	Unit price
Rice				
Maize				
Cassava				
Pumpkins				
Cowpeas				
Green peas				
Pigeon peas				
Other legumes				
Coconut				
Cashewnut				
Simsim				
Fruits				
Sugarcane				
Green vegetables				
Other crops				

What amount of main crop (rice, maize, and cassava) is lost each season?

Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the causes of the losses?

What do you think will increase profits from agriculture?

Fishing

Type of fish	Average daily catch (Tenga / kg.)	No of fishing days per month	No of fishing days per year	Total catch per year	Amount consumed per year. Kgs.	Price per tenga/kg/unit (fresh or processed)	Costs per year. (labour, gear,)
Finfish							
Prawns							
Other (crab, lobster, squid, octopus)							

How much of the fish harvested is lost per year**?**
Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the reasons for fish losses?

What do you think will increase profits from fishing?
Employed fisherman

Average number of fishing trips per week	Payment per fishing trip Tsh value	Number of fishing weeks per year.

What do you think can increase profits for an employed fisherman?

Fish trading

Type of fish	Average daily purchase (Tenga / kg.)	No of buying days per month	No of buying days per year	Total amount of fish traded per year (kgs)	Average difference between buying Price and selling price per tenga/kg (fresh . processed	Costs per year. (labour, transport, processing, packing,)
Finfish						
Prawns						
Other (crab, lobster, squid, octopus)						

How much do you lose in terms of value from fish trading per year
Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the main reasons for the losses in fish trading?

What do you think can increase profits in fish trading

Primary Harvester of Wood Products (mkata boriti, mpasulsihaji wa mbao, mkata fito au kongowele, kuni, ……..)

Type of product	Total amount harvested by the household per year	Amount used for home consumption.	Price per unit	Costs per year
Mbao za mninga, mkongo, mvule ……….				
Mpingo, vipande, magogo				
Magogo ya msekeseke,				
Boriti				
Kuni				
Fito				
Mkaa				

What proportion of income from wood and wood products is lost per ?

Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the reasons for the above losses**?**

What do you think can increase profits from wood and wood products

Non-timber forest products.

Type of product	Amount harvested /hh/season (unit /headload, fungu, gunia)	total amount harvested per year/household	Amount used for home consumption.	Price per unit	Costs per year
Miaa/milala					
Ukindu					
Umondo mwingine					
Madawa					
Magamba					
Gundi					
Miche					
Matunda e.g. fulu					

How much in terms of value is lost each year?
Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the reasons for the above losses?

What do you think can increase profits from non-timber forest products

Salt making

Amount made per season /hh (bags)	Total amount made per year (bags)	Amount used for home consumption	Price per unit	Price per unit	Costs per year

What are the annual losses in salt making
Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the reasons for the above losses in salt making?

What do you think can increase profits from salt making?

Livestock production

Type of livestock product	Household yield of product per week/month/ season	Household Yield per year	Amount used for household consumption	Price per unit (whole chicken for , egg, kg of meat, litre of milk)	Annual costs of production
Chicken for egg production or for fattening					
Chicken for meat					
Chicken eggs					
Goat meat					
Cattle meat					
Milk					
Others					

What are the annual losses in Livestock production?
Tick one box only

Less than a quarter	A quarter to a half	More than a half

What are the reasons for the above losses in livestock production?

What do you think can increase profits from Livestock production?

Other Economic activities

Amount harvested by HH per season	Total Amount harvested by the household per year	Amount used for home consumption.	Price per unit	Costs per year

What are the annual losses in the above enterprises Tick one box only

Enterprise	Less than a quarter	A quarter to a half	More than a half

What are the reasons for the above losses?

Enterprise   Reasons

What do you think can increase profits from the above enterprises?

Enterprise   Strategy to profits

Savings/Insurance

When you have a surplus what is your main use of it? Tick only one box. Enter other option if appropriate.

Sell it and save the money	
Buy livestock e.g. chickens, goats, cattle	
Do house repairs/build	
Buy tools, fishing gear equipment	
Buy household goods	
Buy clothes	
Buy food	
Buy a canoe	
Others Specify.	

Food Security

Does the household experience shortages main food items?   YES … NO…
If yes what are the reasons for food shortages?

_____

_____

_____

If yes how do you cope with food shortage? (Give the main coping strategy) *Tick one option only*

Strategy	Response	Extra explanation
Buy food (list the food items bought)		
Eat an alternative food… what? List them)		
Beg assistance from relatives, friends or neighbours.		
Beg assistance from government.		
Others (specify)		

Alternative Enterprises

Has your household tried any new crops, ways of growing crops, fishing methods, wood product use, handicraft ideas, or other project during the past five years? YES---- NO -----
If YES what are they?
If NO what are the main reasons

If given the opportunity to learn something to improve your livelihood , which could be your choice
Enter one item only.

Attitude towards the environment

How do you see the state of the environment and natural resources in this village (forest, land, fish, and wild animals including birds)? Give the following score Between 1 and 10, depending on how you see them: Very good and getting better (10), good and fair (5), bad (3), very bad and getting worse (1).
Score--

Please indicate whether you strongly agree =1, agree = 2, not decided =3, disagree = 4 and strongly disagree = 5 to the following statements

1.   In order to make some money and survive I have to do some things which are not good for the environment
2.   We are required to conserve the environment in order to have higher yields (Fish, forest products, etc)
3.   The way we are fishing now is not good and cannot last for ever
4.   There will be plenty of opportunities for our children as far as the environment is concerned
5.   We need to make changes in our farming practices for the benefit of the future
6.   Involvement of the villagers in wildlife management is the best way of controlling poaching
7.   Growing trees in our farms is one way of protecting our forests
8.   I worry that the land will not produce much when our children will take over farming
9.   I cannot afford to worry about preparing for the future

Is it easier today compared to 10 years ago, for the HH to get its natural resources requirements? YES ----- NO-----
If YES what are the main reasons (Give in order of priority)

If NO give the main reasons in order of priority

Do you think your economic activity effect the environment? YES …………… NO……….. No

If YES in what main way?

What change would you like to see in your village as far as environment/natural resources are concerned?

What type of change can you make in the environment around you?

Household Energy Needs
What is the main fuel is used for cooking?

Firewood	
Charcoal	
Coconut husks/ shells	
Other crop remains	
Other materials	

What kind of stove is usually used? *Select/enter one option only.*

Three stones	
Other –what?	

Mention three main types of tree species used ?(*Enter in the box below)*

Tree species/local name / kiswahili/ scientific name

Does this Household plant those trees mentioned above? YES……………NO……………..

If YES mention three main reasons for growing trees

\
\
\
\

If NO mention three reasons as to why the HH does not grow trees

\
\
\
\

Quantify the household fuel use per week? …………Headloads /Bags

Who fetches fuelwood? (Prioritise) Key: Women=1 Men =2 children =3 Women and children =4 Women and men = 5, Men and children =6

What is the frequency of collecting fuelwood per week --------------------------------

How long does it take to collect one headload of fuel (wood /husks etc.).   …………………. Hours)…………Minutes

Do you buy fuelwood YES=1 NO=2
If YES what is the price? ---------------------------- per headload/bundle

Ethnic characteristics, demographic and migration characteristics

How long have you been living in this village--

Before the above-mentioned years where were you living
Item   Specify name
Neighbouring village
In this Division
In neighbouring division
Outside the district
Outside the region
Others (specify)

If you migrated to this village what reasons made you to migrate

Please indicate annual migration patterns within the village/villages as dictated by economic activities

Economic activity	Months	Migration destination
Agriculture		
Fishing		
Salt making		
Use of forestry products		
Others (specify)		

Household assets and expenditure pattern

Please indicate the assets you have

Asset	Number	Year bought	Price	Useful life
Tractor				
Oxen plough				
Bicycle				
Canoe				
Motor vehicle				
Radio				
Radio cassette				
Spongy mattress				
House with corrugated iron sheet				
Cement floor				
Burnt bricks or block walls				
Hurricane lamp				
Charcoal stove				
Torch				
Panga				
Hoe				
Axe				
Motor boat				
Sewing machine				
Sprayer				
Fishing nets				
Others specify				

Which of the following products do you purchase for home use?

Product	Yes=1 No =2	Period		Approximate quantities	Money spent
		From (month)	To (month)		
Maize					
Cassava					
Sorghum					
Rice					
Bananas					
Sweet potatoes					
Vegetables					
Fruits					
Meat					
Milk					
Fish					

Other household expenditures

Please estimate other household expenditure

Item	Amount
Consumer goods (Household items, clothes)	
Medical expenses	
Village govt. contributions (e.g. Development levies, taxes, cess licence fees)	
Social occasions (e.g. Contributions to funerals, weddings, ngoma and other cultural/traditional events)	
Beer/other refreshments	
Payment to relatives	
Transport	
House building & repair	
Savings	
Expenditure on agricultural inputs	
Expenditure on fishing inputs and gears	
Water	
Fuel for cooking/lighting (kerosene, fuelwood, charcoal)	
Education expenses	

Access, control and ownership of resources (by gender)

In this household who owns what?

Name of Asset or Resource   Ownership pattern (whether joint or individual)

-----------------------------------   --

------------------------------   --

-------------------------------   ---

Trading and marketing characteristics

Where do you sell your products to earn cash?

Name of product	Type of buyer	Location of the transactions

If the sale point is not at home
How far is it --

Give more details on marketing

Name of product	Average amount sent to market per trip, kg	Mode of transport	Frequency of going there	Name of market

For each product/market transaction last season indicate

Name of product	When do you harvest	When do you sell	Who buys the product	How much was sold in total

How can markets be improved?

Credit
Have you ever got any credit?

Which Kind(s)?

Which source(s)?

Give details on credit

Type of credit	Source	Value in Tsh	Value in Kind

What conditions were you given to get the credit?

Did you meet the conditions? e.g. repayment

B: The checklist
This checklist was used as a guide in formal discussions with key informants

Village Leaders
Ask village government leaders about their composition and female representatives
About the available natural resources- access and control
Population data and migration patterns
Externally funded projects in the village
By laws existing with respect to the utilisation and management of natural resources
Village groups existing
Major economic activities
Marketing organisations
Area and land use in the village
Other key informants
Mangrove tree harvesting, utilisation and constraints
Fishermen harvesting, types of fish constraints
Salt making
Other economic activities

Education
Discuss with head teacher regarding number of students, teachers, constraints, education performance
formal and non-formal education etc.

Health
Discuss with medical office in charge
Availability and accessibility of health facilities
Important diseases
Measures taken to control
Availability of essential drugs
External funding or support to health services
Outreach activities
Accessibility and location of health facilities

Appendix 2: Terms of Reference for the socio-economics of the Rufiji Flood Plain and Delta

1   Introduction

The Rufiji Environment Management Project based at Utete town, the headquarters of Rufiji District, Tanzania has as its goal to promote the long term conservation through "wise use" of the Lower Rufiji forests, woodlands and wetlands such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably and the livelihoods of the area's inhabitants are secured and enhanced". The three main objectives of the project's first five-year phase are;-
to promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and flood plain.
To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on "wise use" principles.
To promote awareness of the values of forests, woodlands and wetlands and the importance of "wise use" at village, district, regional and central government levels and to influence national policies on natural resource management emphasising the non-sectoral, multi-biome, integrated approach to the environment.

2   Background
There are fifty-two villages in the flood plain and Delta of the Rufiji River. Basic information on population, service provision and economic activities has been collected for each of the villages using secondary sources. Preliminary Rapid Appraisals have been made in eleven villages the purpose of these appraisals was to select suitable pilot villages. A detailed report of the methodology and implementation of the selection process is available. Detailed direct baseline studies covering population, household size, gender of head of household, dependency ratio, economic activities, have been carried out in four Pilot villages which are already selected in each of the four major agro ecological zones i.e. Western flood plain, Central flood plain, North Delta, South Delta. Sample household studies have been carried out to get baseline information on household income and expenditure, sources of income, coping strategies, energy usage, agricultural, fisheries, forest product and poultry yields.

REMP/MUMARU has a policy of implementing all activities from a gender perspective, thus all input (data) is expected to be gender disaggregated

3   Objectives of the consultancy
The proposed study has three major objectives
The production of a socio-economic profile for the flood plain and Delta
The selection of additional villages for project intervention and
The design of a system for monitoring the socio-economic impact of the project.
4   Tasks of the consultancy
The detailed activities envisaged for the achievement of the three main objectives of this consultancy are outlined below:

4.1   Production of a socio-economic profile of the Rufiji flood plain and Delta
4.1.1   Review existing literature e.g. Socio-economic studies of Village Travel and Transport Project and District Roads Development Project.
4.1.2   Review the methodologies used by REMP for the pilot village baseline studies and make recommendations regarding gaps in the present database.
4.1.3   Design and implement a baseline study of 10 further villages including studies of
        4.1.3.1 access to education
        4.1.3.2 health and other services
        4.1.3.3 economic activities and net value of production
        4.1.3.4 socio-cultural and ethnic characteristics

      4.1.3.5 dependence and pressure on natural resources
      4.1.3.6 access to resources
      4.1.3.7 control and ownership of resources
      4.1.3.8 social organisation
      4.1.3.9 wealth and poverty
      4.1.3.10 livelihood security
      4.1.3.11 trading and marketing characteristics
      4.1.3.12 migration and demographic trends
      4.1.3.13 attitude to the environment
      4.1.3.14 environmental management initiatives and activities

(For all the above include gender desegregated data)

4.1.4   Produce socio-economic profile of the flood plain and Delta which covers the issues mentioned in 4.1.3 above and also addresses the following topics

4.1.4.1 Socio-economic zonation of the Rufiji flood plain and Delta, including necessary data for input to geographical information systems (GIS) in order to produce thematic maps.

4.1.4.2 Descriptions of the distinguishing characteristics of each zone defined in 4.1.4.1

4.1.4.3 Comments on whether the consultant's zonation corresponds with the four agro-economic zones arbitrarily chosen by REMP. If not, how it differs and why

4.1.4.4 Migration inward, outward and within the flood plain and how it relates to socio-economic status

      4.1.4.5 Population trends in the flood plain and Delta

4.2   Identify four additional villages for project intervention.
        Apply REMP criteria, as in Appendix 1, attached

4.3   Design a monitoring system for the project impact on target population's livelihoods

4.3.1   Identify indicators of project impact that are within the capacity of the district council to monitor

4.3.2   Develop and describe in detail a proposed system for monitoring which includes a schedule of action (what, who, when), means and costs and will have the following characteristics; simple, within the responsibility of the district council, involves local communities, includes a feedback mechanism into future planning at all levels.

5   Outputs

5.1   A socio-economic profile of Rufiji flood plain and Delta (including a gender profile), as described in 4.1

5.2   The names of the four villages identified for project intervention, as described in 4.2 above.

5.3   A description of a system for monitoring the impact of the project on target communities' livelihoods (as in 4.3 above)

6   Expertise required

The consultant will have an education background in socio-economics, sociology, economics, natural resource economics, rural economics or agro-economics with at least 5 years experience of designing and implementing field studies regarding socio-economic issues. The consultant will have experience of factors affecting the livelihood security of the communities, particularly migrant communities.

The consultant will also have at least five years experience of project monitoring and evaluation systems will be required. Expertise in computer database programmes preferably MS access is also necessary. Swahili language skills will be an advantage.

7   Reporting

Three reports will be prepared corresponding with the three outputs mentioned in 5.0 above. Drafts of all three reports will be prepared in English and submitted in MS word floppy disk and hard copy, as per the reporting schedule below. The final report, including a Swahili summary will be submitted on or before September 15th 2000. Data should be presented on floppy disk using MS access and MS excel programmes.

Output	Report	Date expected
5.1	Draft. social-economic profile of Rufiji flood plain and Delta	June 30th 2000
5.2	Draft. Identification of four further villages for REMP intervention	July 15th 2000
5.3	Draft. A description of a system for monitoring the impact of REMP on target communities' livelihood	August 15th 2000
	Final report incorporating the above three reports and a Swahili summary	September 15th 2000

8   Time schedule

The work should be carried out during a five-month period, of which three months (including at least 45 days in the field) is envisaged for the socio-economic profile and two months for the socio-economic monitoring system

Costs of the consultancy

The details of the fees payable are outlined below

Item cost	Cost US$	Total cost US$
Daily subsistence allowance	148 person days @20 per day	2960
Enumerators allowance	208 person days @20 per day	4160
Operational costs (stationary, office costs, transport costs (Morogoro-Dar), data entry	Lump sum	1000
Professional fees	100 person days @ 120 per day	12000
Total cost		20120

Appendix 3: Mean Expenditure on food items

AEZ / expenditure on		Maize (Tsh)	Cassava	Sorghum	Rice	Banana	Potato	Vegetables	Fruits	Meat	Milk	Fish
						Tsh						
Inner Delta North	Mean	33049.1176	26548.1481	4000.0000	30909.0909	37100.0000	3180.0000	15540.0000	297.5000	10333.3333	2266.6667	107256.0000
	N	34	27	1	22	2	2	5	4	3	3	25
	Std. Dev.	36094.7486	42076.5911	.	30589.9309	50770.2669	2291.0260	13563.1117	469.0682	6658.3281	1222.0202	428412.4522
	Min.	200.00	3000.00	4000.00	360.00	1200.00	1560.00	2000.00	40.00	3000.00	1200.00	100.00
	Max.	168000.00	219000.00	4000.00	120000.00	73000.00	4800.00	36500.00	1000.00	16000.00	3600.00	2160000.00
Inner Delta South	Mean	23950.0000	15000.0000	3000.0000	21600.0000					400.0000	19300.0000	16175.0000
	N	8	1	1	5					1	3	8
	Std. Dev.	14980.6542		.	18568.7910					.	33168.8107	16796.6621
	Min.	2600.00	15000.00	3000.00	10000.00					400.00	100.00	100.00
	Max.	50000.00	15000.00	3000.00	54000.00					400.00	57600.00	36000.00
Delta North	Mean	62298.6667	21500.0000		83283.0769	16933.7500	4085.0000	33331.1111	8737.5000	7000.0000	17925.0000	83077.0667
	N	15	11		13	4	8	9	8	1	4	15
	Std. Dev.	77591.8267	23624.6481		125372.4440	15772.4796	2840.1115	30387.6605	10087.4147	.	25020.9745	281497.3547
	Min.	260.00	1500.00		400.00	20.00	100.00	1500.00	100.00	7000.00	100.00	50.00
	Max.	273000.00	78800.00		465280.00	41000.00	6240.00	99000.00	27000.00	7000.00	54000.00	1098000.00
Delta South	Mean	43531.6667	13090.0000	40500.0000	95612.8571	47125.0000	2933.3333	5000.0000	1150.0000		100.0000	18805.0000
	N	24	10	2	14	4	3	2	2		1	12
	Std. Dev.	55882.4518	13063.8135	31819.8052	185641.7393	53085.4264	2685.7649	.0000	1202.0815		.	17535.0125
	Min.	760.00	1800.00	18000.00	3500.00	3000.00	1000.00	5000.00	300.00		100.00	200.00
	Max.	201600.00	36500.00	63000.00	720000.00	109500.00	6000.00	5000.00	2000.00		100.00	60000.00
North Flood Plain	Mean	45985.7143	38927.7778	5250.0000	30622.2222	6000.0000	13200.0000	11562.5000	250.0000	7940.0000	7533.3333	29223.3333
	N	21	18	2	18	1	2	4	2	5	3	15
	Std. Dev.	82244.3693	82081.5578	6717.5144	28574.4344	.	3959.7980	5108.7140	70.7107	6809.4053	6401.0416	28897.6758
	Min.	400.00	1200.00	500.00	4000.00	6000.00	10400.00	6000.00	200.00	1200.00	200.00	50.00
	Max.	388800.00	360000.00	10000.00	105000.00	6000.00	16000.00	18250.00	300.00	17000.00	12000.00	80000.00
South Flood Plain	Mean	36833.3333	16375.0000		15980.0000							32366.6667
	N	6	4		5							6
	Std. Dev.	26967.8821	15277.2980		10791.7561							38942.0424
	Min.	12500.00	4500.00		1600.00							100.00
	Max.	72000.00	36500.00		27500.00							90000.00
West Valley	Mean	42502.2727	15407.6923		23144.6154		950.0000	4100.0000	25143.3333			21512.5000
	N	22	13		13		2	3	3			16
	Std. Dev.	39008.0165	11872.1987		29183.6417		1202.0815	3235.7379	40614.0325			15287.3750
	Min.	200.00	700.00		400.00		100.00	1800.00	30.00			100.00
	Max.	150000.00	36500.00		95040.00		1800.00	7800.00	72000.00			36000.00
Total	Mean	41663.5385	24591.6667	16416.6667	46013.7778	26944.6667	4600.0000	19401.3043	7858.9474	7810.0000	11364.2857	54220.2680
	N	130	84	6	90	15	13	23	19	10	14	97
	Std. Dev.	54531.2537	46148.6681	23669.4247	92305.2620	33646.1386	4555.1363	22769.8210	17240.6815	6226.1902	19500.9509	243267.6027
	Min.	200.00	700.00	500.00	360.00	20.00	100.00	1500.00	30.00	400.00	100.00	50.00
	Max.	388800.00	360000.00	63000.00	720000.00	109500.00	16000.00	99000.00	72000.00	17000.00	57600.00	2160000.00

Source: Computed from survey data (2000)

Appendix 4: Mean Expenditure on other household items

AEZ		Other consumer goods	Medical	Village govt.	Social occasions	Refreshments	Relatives (payment)	Transport	House build./repair	saving	agricultural inputs	fishing	Water	fuel	education
								Tsh							
Inner Delta North	Mean	38454.55	14940.00	9397.14	8710.00	38713.33	14235.29	24054.05	20873.33	21500.00	21809.52	17066.67	15000.00	25096.67	11140.74
	N	44	25	35	40	15	17	37	30	10	21	15	1	36	27
	Std. Dev.	32557.25	15163.22	11056.92	7673.36	89339.90	18796.71	20879.21	37405.13	16675.00	23561.87	19864.03	.	27744.79	10044.53
	Min.	6000	2000	1000	300	500	1000	4000	200	5000	2000	700	15000	2160	2000
	Max.	150000	50000	50000	30000	354000	60000	100000	200000	50000	90000	60000	15000	130800	40000
Inner Delta South	Mean	90200.00	17071.43	2531.82	5890.91	5000.00	6000.00	17777.78	20033.33	92000.00	12750.00	32500.00	21000.00	18267.69	9125.00
	N	13	7	11	11	1	6	9	9	5	6	2	1	13	8
	Std. Dev.	214083.29	20392.87	2363.92	3455.56	.	4049.69	10231.54	41359.22	82280.01	9918.42	17677.67	.	12837.91	9295.74
	Min.	2000	500	300	1000	5000	2000	6000	1300	10000	1500	20000	21000	1800	2000
	Max.	800000	50000	8000	10000	5000	12000	30000	130000	200000	26000	45000	21000	48000	30000
Delta North	Mean	163333.33	36600.00	13753.33	22800.00	111800.00	20937.50	36619.05	27371.43	21760.00	55938.46	53700.00		25682.50	110872.73
	N	21	12	15	20	5	8	21	14	5	13	6		16	22
	Std. Dev.	315869.17	34032.50	11398.86	25149.24	206075.71	34374.45	28366.31	43329.78	19211.66	163858.50	51170.89		22184.10	434264.91
	Min.	10000	5200	800	1000	10000	1000	2000	3000	2800	700	20000		520	1500
	Max.	1500000	100000	38500	100000	480000	100000	100000	150000	50000	600000	156200		90000	2050000
Delta South	Mean	68285.71	11429.41	7368.42	18173.04	13755.00	5857.14	52307.69	14882.35	83555.56	14328.57	52000.00		30547.62	13335.29
	N	28	17	19	23	8	7	26	17	9	14	5		21	17
	Std. Dev.	113427.69	9440.46	10714.53	15093.57	17841.27	6283.01	62927.11	13878.41	194161.73	13022.02	32710.85		23443.11	18915.90
	Min.	4000	1300	1000	1980	2800	3000	5000	2000	10000	2600	10000		3000	2200
	Max.	480000	40000	43000	50000	52000	20000	300000	55000	600000	50000	100000		92080	80000
North Flood Plain	Mean	38978.26	18535.71	5066.67	7300.00	12250.00	8714.29	12900.00	23500.00	34200.00	24545.45	59833.33	24000.00	23250.00	23614.29
	N	23	14	15	17	6	7	20	14	5	11	6	1	22	14
	Std. Dev.	46699.83	14736.75	5192.26	5820.65	16461.32	2214.67	7979.58	51337.12	48147.69	27562.16	47625.27	.	14813.11	27578.95
	Min.	1500	2000	500	500	500	5000	4000	1000	10000	4000	1000	24000	3000	2500
	Max.	200000	50000	20000	20000	40000	10000	40000	200000	120000	70000	132000	24000	72000	94600
South Flood Plain	Mean	59500.00	24500.00	3250.00	13427.27	22500.00	6500.00	14000.00	55170.00	40000.00	5800.00	5666.67		33016.67	19825.00
	N	12	5	6	11	2	4	6	10	4	5	3		12	8
	Std. Dev.	72018.31	17628.10	2361.14	17073.55	10606.60	2380.48	5727.13	142726.55	53541.26	5215.36	3785.94		47111.43	34172.91
	Min.	1000	500	2000	200	15000	5000	10000	1000	10000	3000	3000		5600	2000
	Max.	250000	40000	8000	50000	30000	10000	25000	460000	120000	15000	10000		156000	104000
West Valley	Mean	36946.43	15311.76	9575.00	18667.31	7187.50	8800.00	21578.95	14682.35	25181.82	13500.00	102500.00		23355.17	14742.11
	N	28	17	20	26	8	10	19	17	11	13	2		29	19
	Std. Dev.	34687.05	12694.09	17490.81	31535.53	6187.18	6160.81	14724.57	14146.03	42312.69	11958.26	137885.82		16407.22	22447.16
	Min.	5000	500	1500	600	500	1000	3000	800	2000	500	5000		300	2000
	Max.	150000	50000	73000	108000	20000	20000	50000	50000	150000	45000	200000		78600	100000
Total	Mean	64210.65	18235.05	8182.23	13813.04	31794.22	11211.86	28485.51	23180.18	43751.02	23334.94	38056.41	20000.00	25358.26	33121.74
	N	169	97	121	148	45	59	138	111	49	83	39	3	149	115
	Std. Dev.	141345.80	18897.33	11375.18	18967.26	86461.70	16659.68	34368.38	53570.47	91969.13	66617.12	45014.70	4582.58	24104.85	191090.87
	Min.	1000	500	300	200	500	1000	2000	200	2000	500	700	15000	300	1500
	Max.	1500000	100000	73000	108000	480000	100000	300000	460000	600000	600000	200000	24000	156000	2050000

Source: Computed form survey data (2000)

Appendix 5: Mean quantities of various commodities marketed

AEZ		Total amt sold – magogo (pieces)	Total amt sold -fish (kg)	Total amt sold –ukindu (vichanga)	Total amt sold –cashewnut (kg)	Total amt sold -timber (pieces)	Total amt sold -simsim (kg)	Total amt sold -rice/paddy	Total amt sold -maize (kg)	Total amt sold - pumpkin (pieces)	Total amt sold -peas (kg)	Total amt sold -chicken	Total amt sold -coconut (nuts)	Total amt sold -salt	Total amt sold -prawns kg
Inner Delta North	Mean	20.00	1140.73	156.67	100.00			140.00		50.00	40.00	15.00	120.00		
	N	2	11	3	1			1		1	2	1	1		
	Std. Dev.	14.14	2289.63	135.77	.			.		.	28.28	.	.		
	Minimum	10	40	30	100			140		50	20	15	120		
	Maximum	30	8000	300	100			140		50	60	15	120		
Inner Delta South	Mean	40.00	200.00		177.50			1073.33		525.00	600.00				
	N	1	1		4			3		2	1				
	Std. Dev.	.	.		190.68			395.14		459.62	.				
	Minimum	40	200		10			720		200	600				
	Maximum	40	200		450			1500		850	600				
Delta North	Mean		3900.00	2266.67				1050.00					5600.00		105.00
	N		2	3				1					1		3
	Std. Dev.		2969.85	3233.16				.					.		95.39
	Minimum		1800	400				1050					5600		3
	Maximum		6000	6000				1050					5600		192
Delta South	Mean		15000.00	2866.67				350.00				26.67	5000.00	733.33	
	N		1	3				1				3	2	3	
	Std. Dev.		.	2802.38				.				28.87	1414.21	152.75	
	Minimum		15000	600				350				10	4000	600	
	Maximum		15000	6000				350				60	6000	900	
North Flood Plain	Mean		1200.00	200.00	52.00		95.00	600.00		100.00		8.00			
	N		1	1	1		2	1		1		1			
	Std. Dev.		.	.	.		63.64	.		.		.			
	Minimum		1200	200	52		50	600		100		8			
	Maximum		1200	200	52		140	600		100		8			
South Flood Plain	Mean		1434.00	200.00	200.00				1550.00	102.50	363.33				
	N		2	1	1				2	2	3				
	Std. Dev.		1366.13	.	.				70.71	137.89	551.57				
	Minimum		468	200	200				1500	5	30				
	Maximum		2400	200	200				1600	200	1000				
West Valley	Mean		12026.25		29.75	700.00	170.00	268.00	60.00	166.67			1200.00		
	N		4		4	1	4	5	1	3			1		
	Std. Dev.		22004.61		33.87	.	158.75	163.46	.	57.74			.		
	Minimum		105		9	700	20	120	60	100			1200		
	Maximum		45000		80	700	360	500	60	200			1200		
Total	Mean	26.67	3987.32	1479.09	107.36	700.00	145.00	558.33	1053.33	211.67	295.00	20.60	3384.00	733.33	105.00
	N	3	22	11	11	1	6	12	3	9	6	5	5	3	3
	Std. Dev.	15.28	9807.18	2297.95	129.61	.	132.02	436.74	861.70	250.45	411.42	22.18	2624.74	152.75	95.39
	Minimum	10	40	30	9	700	20	120	60	5	20	8	120	600	3
	Maximum	40	45000	6000	450	700	360	1500	1600	850	1000	60	6000	900	192

Source: computed from survey data (2000)