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**Lake Tanganyika Biodiversity Project  
Socio-Economic Assessment**

*Summary and Critique of SESS Reports  
Produced Between 1996-1998*

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**Pollution control and other measures to protect biodiversity  
in Lake Tanganyika (RAF/92/G32)  
Lutte contre la pollution et autres mesures visant à protéger  
la biodiversité du lac Tanganyika (RAF/92/G32)**

The Lake Tanganyika Biodiversity Project has been formulated to help the four riparian states (Burundi, Congo, Tanzania and Zambia) produce an effective and sustainable system for managing and conserving the biodiversity of Lake Tanganyika into the foreseeable future. It is funded by the Global Environmental Facility through the United Nations Development Programme.

Le Projet sur la Biodiversité du Lac Tanganyika a été formulé pour aider les quatre états riverains (Burundi, Congo, Tanzanie et Zambie) à élaborer un système efficace et durable pour gérer et conserver la diversité biologique du lac Tanganyika dans un avenir prévisible. Il est financé par le FEM (Fonds pour l'Environnement Mondial) par le biais du Programme des Nations Unies pour le Développement (PNUD)

**Burundi: L'Institut National pour l'Environnement et la Conservation de la Nature**

**D R Congo: Le Ministère de l'Environnement et de la Conservation de la Nature**

**Tanzania: Vice President's Office, Division of Environment**

**Zambia: Environment Council of Zambia**

## Lake Tanganyika Biodiversity Project Socio-Economic Special Study Report Series

Series editors: Dr. K. Meadows, SESS Co-ordinator & K. Zwick, SESS Facilitator

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## **1 Executive Summary**

The LTBP SESS that ceased in 1998 was restarted in April 1999. The first action was to appoint a SE Co-ordinator, who, in turn, appointed a SE Facilitator. The first task was to review the status of the SESS, which was done in July 1999 by collating relevant information through published reports and networking with project workers, NGOs etc. This process included:

1. A review of the results of the SESS reports completed to date by LTBP.
2. A review of the results of relevant SE surveys completed by those outside the project, e.g., the LTR surveys.

This report is largely the result of the first exercise – a summary and brief critique of the reports undertaken by LTBP during 1996-1998. However, material from the second exercise is also incorporated into the discussion. The standard of socio-economic surveys (PRAs) conducted during 1996-7 is mixed, with some believing that the ‘socio-economic and environmental studies [are] well informed’ (Griffiths, 1997). However, during 1998 without a SE Co-ordinator or Facilitator there was a lack of progress and co-ordination and consequently an ad hoc nature to the work undertaken.<sup>1</sup> Nevertheless, some issues were clear and are discussed below in relation to the four thematic areas. It must be noted however, that these issues might only be applicable to the limited areas surveyed.

The LTBP surveys undertaken during 1996-1998 were largely limited to Tanzania. An adequate SESS was not instigated in Zambia, Congo or Burundi. Moreover, there was no co-ordinated or thematic approach to the surveys and no adequate measures were taken to appoint and train in country SE teams. Any conclusions from the 1996-1998 findings are therefore inferred from the situation in areas of Tanzania. These reports give some indication of the main economic activities and environmental threats and problems in villages around the lake. However, there is a clear need for more information on the socio-economy of the household, the basic unit of social and economic life, as well as on behaviour patterns and the factors influencing these. Specifically there is a need to address the heterogeneity of communities and break down the types of information already gathered by type of household, e.g., how are people within households related, how do they contribute economically, and how does household size and composition vary amongst wealth groups, how do sources of income and expenditure priorities vary by type of household, as well as seasonally, how does education/healthcare/ sanitation, etc, vary by type of household, etc.

## **2 Introduction**

### **2.1 Background**

The LTBP has, to a large extent, been concerned with environmental issues such as biodiversity and sedimentation. This appears to have occurred because of a focus on the environmental impacts that, it was suggested, were threatening the Lake, namely:

1. That changes in land use have led to an increase in the discharge of sediment into the lake which has an impact on biodiversity;
2. That pollution damages the water quality and affects biodiversity;

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<sup>1</sup> Griffiths also suggested that the gender perspective of the project must be strengthened at all levels by the fielding of a gender specialist. Discussions between Meadows and Mung’ong’o in July 1999 addressed this issue.

### 3. That inappropriate fishing practices affect biodiversity.

However, early results from the biodiversity and sedimentation special studies were inconclusive, which resulted in difficulties in defining the focus of the socio-economic contribution. Indeed, it appears from the 1996-1998 reports that the SESS had no clearly defined aims and objectives from the outset. Surveys were commissioned without a clearly co-ordinated approach across the riparian countries. One reason for this was security problems with Congo and Burundi in particular being at war for much of the research period. Whilst sedimentation rates may still reliably be measured during such disturbances as war, access to people during disturbances is less easily obtainable. However, insufficient efforts were made to establish and sustain a comprehensive SE programme in the other countries as well. Other problems in establishing an effective SESS were presented by the structure of the LTBP. For instance, if sedimentation, pollution, and poor fishing practises are indeed not easily proven to be the key problems in effective management of the Lake then it is problematic for socio-economists to credibly devise strategies to change current practices. Griffith (1997) posed this argument particularly in relation to fishing practices. Nevertheless some SE surveys were conducted as the nature of the project meant that SE data had to be gathered at the same time as the other SSs proved or disproved their hypotheses. A full summary of the SE reports produced is contained in appendix 1, and their main findings are discussed below.

#### **2.2 Approach**

It was suggested by Quan in 1996 that, 'thanks to Bottleburge', sufficient socio-economic material had already been gathered for Tanzania even in 1995. Yet the approach for surveys undertaken during 1996-1998 concentrated on Tanzania. Consequently the new socio-economic co-ordinator appointed in 1999 initiated a review of SE surveys undertaken by those outside the project to date (see appendix 2). Meadows (April, 1999) recommended that gaps in knowledge should be identified before proceeding with more fieldwork. However, it has been difficult to locate all of the relevant material, and this is still in progress. Difficulties are heightened by the lack of co-ordination and follow-up. For example, in 1992-4 a series of PRAs in Kigoma Region was conducted by the KIDEP, co-ordinated by UDSM. The work consisted of collection of existing data with local government officers, mapping exercises, land use recording, household questionnaires, and group discussions and village meetings to elicit projects proposals. However, there was minimal follow-up, as the exercise was not conceived as integral part of KIDEP. It was suggested that an LTBP SESS employee, Beatrice Marwa, follow up on searching for these reports, but she then left the Project, and there is no evidence that this 'follow up' took place. Similarly, it was suggested that PRA reports produced by Prof. Mascarenhas PRA were accessed through the Library of UDSM. Again it could not be ascertained for the purposes of this document whether this was done or not. Finally, Prof. CSL Chachage (Dept of Sociology UDSM) conducted a series of socio-economic profiles on lakeshore villages between Kigoma and Mpulungu in 1991, which were designed to gain an understanding of local factors. Prof Chachage was also aware of other PRA surveys undertaken by research students that would be relevant to LTBP. Due to the difficulties in accessing information and incomplete records with not central holding office for the Lake surveys it was decided to focus on surveys conducted by the LTBP. Although these are an incomplete record they are at least more easily collated from the LTBP archives. These surveys are discussed below.

### 3 Review of Socio-Economic Contribution to LTBP

#### 3.1 Geographical distribution of LTBP surveys

The SESS has undertaken studies at six locations in Tanzania, as well as a study of three sites in Zambia,<sup>2</sup> as shown in Figure 1.

*Figure 1. Location of LTBP SESS survey work 1996-8*



Geographical coverage of the lakeshore and catchment is good for Tanzania, but in Zambia there has been no work in the wider catchment (and there has been no work at all in Burundi and Congo). The results of these studies are presented in the following reports:

*Table 1 List of SESS Reports Produced by LTBP during 1996-1998*

<b>TANZANIA</b>			
Walsh, M., L. Said, B. Marwa, & K. Banister	1996	Fishing in the River Mungonya at Bubango, Kigoma Rural District, Tanzania. December 1996	8p
Lwoga, C.M.F. (Ed.)	1997	Participatory Rural Appraisal in Mtanga Village, Kigoma District: principal findings. February 1997	34p
Said, L. & P. Petit	1997	Exploratory mission in Rukwa Region	35p
Mung'ong'o, C.M. (Ed.)	1997	Participatory Rural Appraisal in Kirando Ward, Rukwa Region, Tanzania. September 1997 (Draft)	59p
Mung'ong'o, C.M. (Ed.)	1997	Participatory Rural Appraisal in Buhingu Ward, Kigoma Region, Tanzania. December 1997 (Draft)	47p
Tarimo, B.D.	1997	PRA in Buhingu Ward, Kigoma Region, Tanzania. Awareness to Action course paper. International Centre for Conservation Education.	11p
Marwa, B.N., O. Kashushu, & H. Mabocho	1997	A follow up report at Mtanga. December 1997	3p
Mung'ong'o, C.M.	1998	Socio-economic & institutional appraisal of the Mpanda-Sumbawanga catchment, Rukwa Region, Tanzania: field	10p

<sup>2</sup> These reports, however, are not available and as the authors also claim not to have copies, there is some doubt as to whether the surveys were indeed completed.

		trip report 11–23/7/1998.	
<b>ZAMBIA</b>			
Damaseke, M.	199 7	Chituta Bay - Kapeta Village PRA report	10p

Salient points from these reports are discussed below. The themes and emerging issues, from an analysis of this information, are included in the following discussion.

### 3.2 Themes

Four thematic areas for investigation on a national basis have been identified:

#### 3.2.1 Fisheries livelihoods and fishing practices

The most common fishing gears used appear to be catamarans and lift nets, beach seines, and various types of lines (see Fishing Practises SS reports for technical information on the different types of gear). Lift nets and Burundian introduced catamarans to Tanzania in the 1980s and Congolese fishermen who were following fish stocks, or fleeing war, or both. This type of gear targets *dagaa* offshore, and is thought not to significantly impact on the biodiversity of the lake. It is by far the most expensive to acquire, and is owned by only a few individuals who inherited it, or received credit through past schemes, or in a few cases, saved their earnings as hired crew. Some catamaran owners are investors who are not involved in the operation of the gear and may not even live in the fishing village. It is a lucrative business, with the division of the catch very much in favour of the gear owner. However, it is constrained by piracy, specifically, the theft of the expensive outboard engines required to reach the offshore fishing grounds. Fishermen who have had their gear stolen are unable to fish at all, or to repay any loans that they may have outstanding. Those who still have their gear fear to venture to the most lucrative and productive offshore areas. Beach seines target *dagaa*, but in the inshore areas, they also catch other species. They are thought to impact on biodiversity and fish productivity through their use in the more biodiverse habitats near the shoreline, and through damage to fish breeding and feeding grounds as they drag over the bottom of the lake. Where catches have declined, there is a tendency to use smaller and smaller meshes, which further damage the fishery by catching immature individuals. Nevertheless they require less capital than catamarans and lift nets, and employ large numbers of hired fishermen. Their legal status has changed throughout the lake over the course of the Project, and seems to be unclear to both researchers and fishermen. Lack of access to credit or viable alternative livelihoods means that even where a ban is in place and is understood, it is often unenforceable, and nets continue to be used illegally. Catches of *dagaa* are highest during the rainy season, but fishing activity is also dependent on the phase of the moon. When catches are high, prices are low, particularly as during the rainy season it can be difficult to process (sundry) the fish before it spoils. Line fishing occurs throughout the year, and is independent of the phase of the moon. Lines are widely used, as they require minimal investment. They target large fish that can be sold for high prices in urban areas, although where markets or prices are poor, they are consumed within the household too.

Fishing is hard work, and hired fishermen are poorly paid, although they do have access to cash. Many fishermen do not manage their finances well as there is a feeling that they can always go back out on the lake and earn more money, and there is a lot of drunkenness in non-Muslim villages. The state of the fishery varies. In some locations, particularly near refuges such as fishing exclusion zones off National Parks, catches remain high. In others, however, they have declined enormously, and some wealthy gear owners have diversified

into other activities, such as shopkeeping and trade, or commercial farming elsewhere. The poorer hired fishermen have fewer options, and tend to remain in the lakeshore villages where they depend on marginal subsistence agriculture.

Fishing is important to the economies of villages some distance away from the lake as men come to the lakeshore villages to work as hired fishermen. There is also an important trade in agricultural products and fuelwood between villages in the interior and many of the lakeshore villages. River fishing in the villages in the interior is of limited importance, and is undertaken by boys and youths that are not yet involved in lake fishing. River fish are consumed within the household. There are markets for fresh fish in major urban areas such as Kigoma or Mpulungu, but in the majority of villages along the lakeshore, fish must be processed as supply exceeds the local demand. Refrigeration/ice making facilities exist only in Mpulungu and Nsumbu towns in Zambia. The *dagaa* are dried in the sun on specially prepared drying grounds, which are limited, and may be rented. When dry they can be stored and transported relatively well. Large fish are smoked, which contributes to fuelwood availability problems. There have been some attempts to introduce more efficient smoking ovens, but they seem not to have been sustainable. Women and children, who are paid in kind for their labour, although some purchase fresh fish and then sell it on when they have processed it, usually undertake processing.

Processed fish, particularly *dagaa*, is sold throughout the region, as far away as Dar es Salaam and Lusaka, with major markets in the urban areas of the Copper Belt in Zambia and Lubumbashi in Congo, as well as in Burundi. Lake Tanganyika *dagaa* is highly prized, and there is considerable cross border trade, much of it not legal. Poorly processed fish not suitable for human consumption is sold as animal feed. Small scale processors and traders are often women who operate with only a few dollars worth of capital, and often make losses as a result of price fluctuations or spoilage. Large-scale long distance/cross border traders operate with many hundreds of dollars worth of capital, and usually make very large profits.

### **3.2.2 Agricultural land use and livestock**

Around much of the lakeshore flat land suitable for farming is limited, often to no more than a strip a few hundred metres wide at the base of the steep slopes of the rift valley escarpment. The principal crop is cassava, which is grown for subsistence, although a surplus may be sold. The primary cash crop is oil palms, although there is also some rice grown in river valleys. Other crops include maize, beans, and bananas, although many lakeshore villages do not meet their non-fish food requirements, and depend on trade with inland villages.

Where fishing has declined the importance of agriculture has grown. This, coupled with population growth, has resulted in often-severe land shortages and people have been forced to clear the steep slopes to farm. This clearing contributes to rapid soil erosion and runoff of rainfall, which leads to mudslides, flooding, and sedimentation of streams and the lake, as well as reduced productivity on the hillsides. In some areas fields are unusable after only two or three harvests, and new, even steeper slopes must be cleared. In villages bordering National Parks, the land issue generates tension between villagers and park authorities.

Farming is primarily undertaken by women, and is more important to poorer families. A lack of hill farming traditions and a perception that farming is still not as important as fishing, particularly to the wealthier or more influential members of many communities has meant that there have been few efforts to improve it. Nevertheless, in some areas the arrival of new practises and technologies such as the use of animal manure or ox-drawn ploughs have had



some impact. In Kigoma District the TACARE Project has promoted better hillside practices, agroforestry, and vegetable growing.

Oil palms are cultivated by men, usually from more prosperous households who can afford to set aside land for the five to seven years the trees require to reach maturity. Once they have reached maturity they produce two harvests per year for up to thirty years, and are extremely profitable. The oil is processed locally by women. Processing uses considerable amounts of fuelwood, which contributes to availability problems; in some areas the palm residues themselves have started to be used as fuel. In Kigoma District the TACARE Project has promoted high yield hybrids.

There are generally very few cattle kept in the lakeshore villages as the terrain is not suitable and tsetse is widespread, although in Rukwa Region along the southern part of the Tanzanian coast, Sukuma agropastoralists from the Central Plateau have brought in significant numbers in recent years. Goats and fowl are kept in most villages, although in smaller numbers where fishing is still important.

In the wider catchment area in Tanzania agriculture is based on extensive shifting cultivation. As populations grow and agriculture expands the natural miombo woodland is cleared, which results in increased erosion. In the central part of the catchment there is little cattle keeping due to the presence of tsetse. However, in the northern parts of the catchment in Kasulu District where soils are very poor cattle are kept to broaden the subsistence base and to support cultivation through the use of manure, as well as a means of storing any accumulated wealth. However, overstocking is a problem, which leads to soil compaction and/or erosion. Overstocking is also a recent problem in the southern part of the catchment in Rukwa Region where there has been an influx of cattle from the Sukuma areas of the Central Plateau.

### ***3.2.3 Deforestation, energy needs, and woodland management***

As a result of clearing for agriculture and demands for fuelwood for domestic use, as well as for smoking fish, processing palm oil, and producing traditional local alcoholic drinks, there are fuelwood shortages in most of the lakeshore villages. In many places there is a trade in fuelwood with inland villages. Inappropriate and uncoordinated burning also damages woodland resources, and in Tanzania in particular, the villagisation programme of the 1970s locally exacerbated the problem by raising population densities in fewer, larger villages. Loss of tree cover promotes erosion and rapid runoff of rainfall, which leads to mudslides, flooding, and sedimentation of streams and the lake; in 1997 floods destroyed 146 homes as well as crops in Kirando. In the wider catchment area in Tanzania there is further pressure on woodland resources for curing tobacco, as well as for charcoal production around urban areas, and timber extraction where suitable species exist. The Forest Reserves established for long term sustainable production have been overharvested by the District Authorities supposed to manage them, particularly now that these Authorities have become self-funding, and are struggling to meet their short term expenses.

### ***3.2.4 Population settlement and economic development***

Many of the lakeshore fishing communities are multi-ethnic, with highly mobile members moving in response to changes in the abundance and distribution of fish, as well as changes in the local political and security situation. Many are not attached to or invested in any one place, or particularly interested in terrestrial issues such as agriculture or soil conservation, in part because they often have a strong identity as fishers.

### **3.3 Emerging issues**

#### ***3.3.1. Fisheries Livelihoods and Fishing Practices***

It appears, from the findings from Tanzania, that issues of theft and security are important to fishers. If piracy was less rampant then fishers would loose less gear and offshore fishing would be less precarious. Access to credit for fishers also is an issue emerging from the surveys as is the clarification of banning orders that should be imposed in a more participatory manner. To allviate pressures of fishing diversification in fishing villages would also be advantages. With regard to fish processing where much fuelwood is used canning and refrigeration should be explored, as fishing is often seasonal.

#### ***3.3.2. Agricultural Land use and Livestock***

Use of inorganic fertilisers is minimal as the withdrawal of government subsidies has made them unaffordable, and there is little extension service, so little movement towards intensification or improved efficiency or sustainability.

#### ***3.3.3. Deforestation, Energy Needs and Woodland Management***

Along the lakeshore there are no Forest Reserves, and few local initiatives to protect woodlands or to control harvesting of trees. There have been projects in the past which have provided fast growing exotic seedlings, but it seems there has been insufficient follow up, and their actions were not sustained. In Kigoma Region the TACARE Project currently has an active village nursery programme, and also promotes agroforestry

#### ***3.3.4 Population, Settlement and Economic Development***

The main economic themes emerging from a comparison of the results of the studies undertaken to date is that fishing and farming are the primary wealth producing systems. Other economic activities serve more to redistribute wealth, either by spreading it more evenly through a community, or by concentrating it in the hands of a few. The relative importance of fishing and farming varies not only from community to community, but from household to household, and from individual to individual. It is influenced by tradition, the arrival of new immigrants with new technologies, and changing environmental situations and people's perceptions of them.

## **4 Conclusions and recommendations for further research**

### **4.1 Conclusions**

The main conclusions from this survey are that unless more investment is made in upgrading services and providing alternative livelihoods current SE practices will persist. If the LTBP technical Special Studies conclude that current practices are detrimental to the biodiversity of the Lake it has been seen from the surveys conducted in Tanzania that imposing banning orders on current practices without offering sufficient alternatives or negotiating settlements with stakeholders is unsustainable. Such imposed banning orders can not be adequately enforced. Therefore the populations around the Lake and in the Lake's catchment area must be supported in alternative livelihood practices. In some areas these have been seen to be beneficial to some. For example the palm oil projects. However, these projects have also been seen to be benefiting those already able to afford to invest in other livelihoods with the poorest, largely women being marginalised. Most of the surveys cite that access to credit prohibits economic development. Credit schemes should be investigated further. However, before recommendations can be made there has to be a greater, more comprehensive

understanding of the socio-economics of the Lake. In particular the regions that have been excluded (i.e. most of the Lakeshore) by the 1996-1998 surveys. From this survey it was concluded that the relationship between environment conservation and sustainable socio-economic development is intrinsic to the implementation of a Lake Tanganyika management plan. The aim of the Socio-economic Special Study (SESS) was redefined to provide an understanding of:

- Current livelihood strategies and SE practices around the lake and its catchment areas; and
- Ways in which sustainable livelihood strategies can be supported and current practices that may be detrimental to the biodiversity of the lake can be changed.

From this, specific proposals for action can be developed for implementation by appropriate local, national or international institutions and organisations. In the following Section recommendations for future research during July 1999 – March 2000, in order to achieve these aims are discussed.

#### **4.2 Recommendations for future research**

These reports give some indication of the main economic activities and environmental threats and problems in villages around the lake. However, there is a clear need for more information on the socio-economy of the household, the basic unit of social and economic life, as well as on behaviour patterns and the factors influencing these.

Specifically there is a need to address the heterogeneity of communities and break down the types of information already gathered by type of household, e.g., how are people within households related, how do they contribute economically, and how does household size and composition vary amongst wealth groups, how do sources of income and expenditure priorities vary by type of household, as well as seasonally, how does education/healthcare/sanitation, etc, vary by type of household, etc.

There is also a need to understand the socio-economics of the different types of fishing gear, e.g., how many of each type of gear operate in an area, who (what type of person) owns them, what is the capital investment needed, who works them (how many people), what are the returns, and how are they shared, etc. as well as the socio-cultural and economic values the different fish species. More information on past and any current credit schemes also needs to be acquired, to understand what influences their success or failure. There is also a need to understand the socio-economics of the marketing and processing of the fish; e.g., who undertakes what, and what this is worth to them.

For farming there is a need to understand how the areas planted with different crops vary by type of household, who uses hired labour, who owns livestock (shoats), who is involved in more unusual activities such as raising rabbits, and why.

For other economic activities there is a need for quantitative economic information. To set the qualitative surveys into context. Regarding the quantitative surveys, more detail is needed of social characteristics to make informed conclusions, e.g., what types of people are involved in these activities, how do incomes vary with fluctuations in fishing and farming activities and incomes. Similarly, for each type of natural resource use, e.g. extraction of timber, there is a need to understand who (what type of people) extract it, what this is worth to them, who works it, what this is worth to them, and who consumes the final product, for

instance. Although it may be beyond the scope of the SESS, it would be interesting to investigate what species of tree are preferred for different uses, and how these are distributed in the environment.

The first part of the process of obtaining a more comprehensive, standardised, and co-ordinated SE data is to commence surveys in all four riparian nations. These surveys should include more focussed PRA techniques, complemented by programmes of detailed household interviews. From this understanding, it should be possible to identify ways in which behaviours which threaten the biodiversity of the lake can change, and can change in ways that also promote sustainable and equitable social and economic development, and, thus, to produce workable proposals to implement these changes.

Participatory action which involves individuals from different institutions (government, NGOs and research institutions) can be used to strengthen linkages between these institutions and to explore ways in which their activities might be better co-ordinated in the future. This should include community-based organisations (CBOs) and formal institutions within villages, and not just the NGOs and government agencies.

Consulting local partners and developing improved communications can make better use of project resources. Meadows (April 1999) suggested that appointments in each country should be made drawing from potential partner agencies and/or country institutions, an initiative instigated in July 1999.

## APPENDIX 1 LTBP surveys 1996-8

### TANZANIA

#### Bubango Village

Bubango is located in Bitale Ward, Kigoma Rural District, north of Kigoma town and inland from the lake on the plateau above the escarpment along the road to Kasulu; it borders Gombe Stream National Park (GSNP) to the west. A SESS “topical studies” team of four people visited it. The results are reported in Walsh (1996).

The objectives of the study included familiarisation of the team with the village and its environment as a prelude to further studies in the neighbouring village of Mtanga, collection of information on the fish fauna of the river and local (river) fishing practices, and an assessment of the use of “quick topical studies”. Key findings are:

- Background: the people of the village are mostly Ha who came to clear the land for cultivation in the 1930s and 40s, but there are also some Fipa who came during the villagisation programme of the 1970s, and one of the six sub-villages has been settled by Burundians (Hutu) since 1972. Islam is the dominant religion.
- Fishing: many of the men are lake fishermen who fish from Mtanga or Mwamgongo and are thus absent from the village a lot; some own gear. Boys and youths that are not yet involved in lake fishing undertake river fishing; fish are consumed within the household. Although the species composition has not changed, there are fewer fish in the river now than in the past, and the dietary significance of river fish has decreased. The decline is blamed on the brief but widespread use of the pesticide Thiodan as a fish poison around 1970, although it is likely that other factors have contributed to failure of fish populations to recover since then.
- Farming: cassava, maize, and beans are the main subsistence crops, and oil palms are the main cash crop. Oil palms take five to seven years to reach maturity; the main harvest occurs between September and November with a second harvest in March and April. People were interested in obtaining hybrid seedlings through the TACARE project, although it was not active there at the time of the study.
- Land/relationship with GSNP: all of the land in the village is now owned by farmers; land pressure is growing, but is not yet critical as more land is still available to the east. Because of this there is little conflict with the park; although there are a few problem animals, the park or the research station employs many people, and the park has built a dispensary in the village through its community conservation/outreach programme.
- other: there is a CARITAS health and sanitation project in the village.

Of particular interest is the fact that although this is not a lakeshore community, the lake is still a major influence on the local economy, and people’s activities (lake fishing) still directly impact the lake.

#### Mtanga Village

Mtanga Village was visited by a joint SE/FPSS PRA team of 11 people between 13 and 18 January 1997, and again by a SE/FPSS “follow up” team of three people: between 21 and 24 December 1997. The results are reported in Lwoga (1997), Petit (1997), and Marwa et al. (1997).

The objectives included identifying the main socio-economic factors and trends in and environmental issues relating to “fisheries livelihoods and fishing practises, agricultural land use and livestock, deforestation and energy needs, [and] population settlement and economic development”, as well as developing institutional links. The objectives of the follow up visit included investigating changes in “fishing practises, environmental issues, and fish species” and checking on the “implementation of some agreements” made between the PRA team and the village government during the PRA visit.

- Background: approximately 2,800 people live in six sub-villages. They are primarily Ha, with some Bembe (from Congo) and Burundians living harmoniously and intermarrying. Bwali from Congo originally established fishing camps, although they have now mostly all moved on. The village proper was founded by Ha in the 1920s, who learned to fish from the Bwali. The Ha were later joined by Bembe and some Burundians (Hutu); more Burundians and Bembe in came 1965 and 1994, with some Hutu (Burundians) also coming in 1973. At the time of the PRA there were also many refugees from Burundi (Hutu) and Congo (Bembe) in transit to Kigoma. The Burundians in particular influence fishing practises and the local economy significantly. There are also fishermen from inland villages and other places on the lakeshore that rent rooms and fish from Mtanga but return home during the full moon.

- Fishing: this is the main livelihood and income generating activity in the village, although there is variation in household dependence on it. The main methods are with lift nets from catamarans, and, at the time of the PRA, beach seines. Capital is inherited or accumulated through working as crew and saving. The poorest fishermen are involved in beach seining. Piracy is a problem for the offshore fishery, but the Burundian fishermen built a small (fast) patrol boat and organised themselves to share fuel costs, etc.
- Fish processing and trading: fish are sold on the beach to traders, who are mostly women, who sell it on fresh or process it. Most operate with a small amount of capital (2,000 - 5,000/=), although there are some who operate on a larger scale. Sardines are sun dried. Drying grounds are limited, and are rented. Large fish are smoked. Fuel-efficient smoking ovens were introduced in the 1980s by the FAO project, but have mostly not been maintained. The processed fish is sold outside the village in nearby inland villages, Kigoma town, Burundi, and Kalemie (Congo).
- Farming: there is little flat land for settlement and farming, so as population has increased, people have been forced to clear and cultivate the steep slopes surrounding the village. This has led to severe soil erosion; all of the soil is lost after just two or three crops, which leads to clearing of even steeper slopes, and a continuing negative spiral. The Ha have converted from ridge cultivation to mounds, as per the Bembe, but this only slows the erosion slightly. Agriculture is secondary to fishing, although it is more important to poor families that do not own fishing gear. Women mainly undertake it, although men assist with clearing land and harvesting, especially if they are less involved in fishing. The main crop is cassava, with small amounts of maize, rice, beans, and bananas along the valleys. The village does not meet its (non-fish) food requirements; beans are bought during periods of low catch from women who come to the market from villages in the interior.
- Land: uncleared land is acquired through request to the village leadership. Cleared land is inherited, but there is no market of any significance. No public land set aside, except for the school. Lack of land constrains agriculture, and causes tension between the village and the park.
- Livestock; chickens, ducks, and some doves are kept. The area is not suitable for cattle (!), and there are only a few free ranging goats and sheep
- Tree resources: almost all of the trees in the area have been cleared for agriculture, and there is little control on the cutting of those remaining. The village does not meet its fuelwood requirements and depends on inland villages; women bring wood and charcoal to Mtanga for sale. Fast growing exotics were introduced by the FAO project in the 1980s, especially at the school, and are now propagating naturally, but there has been a poor response to TACARE.
- Relationship with GSNP: near the boundary bush pigs and baboons damage crops, consuming up to half, but the relationship is generally good as a result of the assistance provided to the school through the Community Conservation outreach program. However, land shortages affect the relationship, with numerous views on the location and demarcation of the boundary and buffer zone. People also want to be able to collect fuelwood, grass, and mushrooms in the park legally (they are currently collected illegally). Snares are set, there is some hunting with dogs and spears, and hunters often set fires in take dry season, which cause conflicts with rangers. At the time of the first PRA, people were allowed to use the beaches in the park to land beach seines, but this has not been banned
- Infrastructure and local government: There is a primary school, a clinic and a dispensary, several shops, and a mosque and several churches. The village government was poorly motivated at the time of the PRA, but by the follow up visit had implemented numerous by-laws, and made several improvements. Specifically, at the time of the PRA sanitation in the village was appalling, with very few latrines, and frequent and often serious outbreaks of waterborne diseases such as cholera; following the visit, latrines were dug, and the situation improved.

Of particular interest is the fact that in this area, lakeshore communities are highly mobile, and a survey done at a specific point in time may only be a snapshot, although overall patterns may continue. It may be difficult to implement projects with such a "community", because it changes so rapidly over time, and may not be particularly attached to a particular place. It is also interesting to note how effective participatory action research can be, and how communities can improve their own situation if motivated.

Both appraisals were limited in scope, and focussed on general conditions and the environmental impacts of human activities in the village. No household or sociological or real economic data were collected, and this would be interesting to follow up on. Furthermore, there was little information on the methods used to collect the data that were presented, which makes it difficult for the reader to evaluate them. In general, the reports were poorly written and organised, and difficult to follow. In particular there was confusion over the relationships between clearing of land for agriculture, deforestation as a result of fuelwood collection, erosion, etc. During the follow up visit there may have been too much weight attached to the words of village leaders, without verification from ordinary people, or direct observation.

The follow up report also did not make clear exactly how the rules concerning beach seining had changed, and whether these were in fact being enforced, and did not attempt to quantify the impacts of this, nor to identify what types of people were involved, and how they were surviving.

There was a focus on fishing at the expense of other economic activities, and it would be interesting to know more about these, including who was involved, and what they gained from them. It would also be interesting to follow up on the failure of the fuel-efficient stoves, which is surprising given the existence of a trade in fuelwood.

### **Ujiji, Katonga, & Kaseke**

Ujiji, Katonga, and Kaseke are located just south of Kigoma town on the lakeshore. A FPSS team of five people visited them between 4 and 28 February 1997. The results are reported in Petit (1997a).

The objectives of the study included collecting information on how income is divided between gear owners and hired fishermen, how fishermen come to own gear and local farming practises, as well as various technical aspects of local fishing practises and their impacts on the lake and its biodiversity.

- Farming/land: there is a shortage of land due to urban development, but there is some small scale farming in the Luiche valley. Farms are owned by men, but worked by women (men fish). Cassava, maize and beans are the main subsistence crops, and oil palms are the main cash crop. Although the oil palms are harvested and processed by women, men control the income. Processing is done locally with palm residues (as fuelwood is scarce) or at small factories in Kigoma town.
- Other economic activities: activities related to fishing include repairing and building boats, repairing nets, and hand braiding new nets from twine. Activities not directly related to fishing include the sale of cooked food (*Mama Ntilie*), which is undertaken by women, the sale of local banana/maize beer (*kayoga*) which is brought from the highlands daily in large quantities, and the sale of second hand clothes (*mitumba*) which is undertaken by youths who bring them from Kigoma town.
- Other: there is relatively good access to social services (a health centre, primary and secondary schools, etc.).

Of particular interest is the fact that the good communications of the area allow for most of the catch to be sold fresh, which is of more value to the fishermen and reduces the need for fuelwood for processing (smoking). Also of interest is how lucrative fishing as a hired fisherman can be; it may be difficult to identify alternative livelihood strategies which can compete with this.

### **Rukwa Region**

Rukwa Region is located along the southern part of the Tanzanian lakeshore, and is made up three Districts: Mpanda, Nkansi, and Sumbawanga. Its headquarters are at Sumbawanga town. An EE/FP/SESS exploratory team visited it between 10 and 17 June 1997 and by a FP/SESS institutional appraisal team of four people headed by Claude Mung'ong'o between 11 and 23 July 1998. The results are reported in Said & Petit (1997) and Mung'ong'o (1998).

The objectives of the exploratory study were to collect background information on the Region prior to the PRA later held in Kirando (see below), as well as to prepare for that by organising the team, identifying the site, and investigating the logistics of undertaking the work. The objects of the institutional appraisal were to collect information on the socio-economics and "institutional set-up" of the wider catchment area of the lake. The main findings of interest are:

- Isolation of area: there are minimal communications (few, very poor roads) between lakeshore communities and the main centres inland; combined with general low population density (small local markets), this

makes for low prices for fish and other agricultural products, and contributes to continued high levels of poverty.

- Fishing: the most common type of gear is lift nets, but these are used without engines due to piracy and the fear of piracy. In 1998 Mung'ong'o observed that the ban on beach seines was largely effective. Low incomes and lack of access to credit constrains fishing activities as gear is of poor quality and not well maintained or replaced regularly; casualties are high. Fish must be processed as supply far exceeds local demand; use of fuelwood for smoking exacerbates deforestation.
- Agriculture: the area cultivated increased by approximately 15% between 1996 and 1997; clearing of land is the main cause of deforestation.
- Livestock: although there is a lot tsetse, in recent times Sukuma agropastoralists from the Central Plateau have brought very many cattle to the area. Locally high densities exacerbate deforestation.
- Deforestation: this is yet further exacerbated by high demands for fuelwood for curing tobacco and for domestic use by refugees from neighbouring countries. There is flooding in lakeshore areas, erosion in the upland areas, and sedimentation of streams and rivers and the lake at their mouths. The two Forest Reserves in the Region are encroached upon by cultivators and subject to timber extraction and fuel wood collection; the Forest Department lacks the resources to prevent this.
- Local institutions: all government departments are under resourced. Local NGOs view "environment" and "conservation" as directly equivalent to "afforestation"; many are poorly managed and lacking in funds and knowledge, and none are involved in fishing.

Said & Petit (1997) also include information of the logistics of undertaking work in the Region, and both Said & Petit (1997) and Mung'ong'o (1998) provide information on local NGOs. Both also provide information on the wildlife Protected Areas (National Parks and Game Reserves) of the Region, although none of these extend to the lakeshore area.

Of particular interest is how isolated this part of the lakeshore is; it will be difficult to get people at the District and Regional level to be involved in activities along the lakeshore, let alone those at the national level in Dar es Salaam. Also of interest is the fact that tobacco seems to have promoted as an alternative cash crop without consideration of the environmental impact of processing (curing).

### **Kirando Ward**

Kirando Ward is located in Nkansi District on the lakeshore. Within the ward four villages, a joint SE/FPSS team of 14 people between 23 and 28 August 1997 visited Kirando, Katete, Kipili, and Kerenge. The results are reported in Mung'ong'o (1997) and Petit (1997), and were reported to the regional authorities in Sumbawanga. The objectives of the study were to understand of:

- Livelihood strategies of local communities, as a basis for informed intervention by the project;
- Patterns of natural resource utilisation, and the threats to natural resources and biodiversity;
- The socio-economic make-up of lakeshore communities and the key stakeholder groups;
- Institutional mechanisms whereby improved resource management and local development initiatives might be introduced".

The main findings of interest are:

- Background: Bembe fishermen from Congo first settled the area; Fipa (75-80%) now primarily inhabits it, although there are several other minorities groups. Between 1988 and 1997 the population of the ward increased by 4.5% annually, primarily as a result of natural increase, but also as result of in-migration of people from the Ufipa Plateau, the Central Plateau, and Congo. Data on population and number of households are presented in Mung'ong'o (1997a). Four Christian denominations and Islam are represented, although Islam is largely confined to Kirando village. Kirando is made up of three sub-villages, Itete, Mtakuja, and Kamwanda, and is located just inland from the lake. Katete and Kipili are both located on small bays on the lakeshore, while Kerenge is located on the landward side of Manda Island, which is approximately 1km offshore. There is a road which leads inland from Kirando and Kipili to Nananyere, but it is not passable in the wet season, and not much used in the dry season; almost all transport and communication is by water.



- Lift nets: these are used in the near offshore areas from motorised catamarans. They were only introduced to the ward in 1989. Initially gear owners went to Kigoma to recruit experienced Burundian and Congolese (Bembe) fishermen, many of these have now returned home, and although it remains a multi-ethnic occupation, crews now include many local Fipa who have since acquired the necessary skills. The catamarans are mainly based in Kerenge on Manda Island. This type of fishing can be lucrative, but requires high running costs and capital investment; low prices for fish in the area (as well as lack of access to credit) prevents gear owners from maintaining or replacing their gear, or from investing in more powerful lamps and engines which would allow them to exploit deeper waters further offshore. Piracy and strong winds in the offshore areas further limit activity.
- Beach seines: these have been banned since this study was undertaken. At the time of the study they were used throughout the area to target small fish during the day and larger fish at night during the new moon period. Each net employed eight to ten pullers, as well as two other fishermen to look for schools of fish.
- Gill nets: these are used in deeper waters around the islands to catch big or very big fish, which fetch high prices.
- Long lines: these are used inshore and offshore from sailed units. Small quantities are sold fresh in the local market; larger quantities must be smoked. Seventy-five percent of long line fishermen are Tabwa.
- Fishing incomes: these are generally low for hired fishermen (sometimes as low as 10,000/= per month), but variable. Many fishermen do not make much effort to manage their money and spend whatever they have because they feel they can always earn more in a night.
- Piracy: theft of engines and nets by primarily Congolese pirates is a recent but major concern in the area, and constrains offshore fishing activities. Very recently there have also been armed attacks on the homes of wealthy gear owners and traders who are known to have large quantities of cash on the premises. Piracy forces fishermen out of the more lucrative offshore areas into the more sensitive inshore areas; reduced income encourages the use of smaller mesh sizes, compounding the potential for damage to the fisheries.
- Marketing and processing of fish: large fish for local consumption are sold fresh at the landing; any surplus is smoked. Women and children who are paid in kind dry small fish in the sun on the beach (kusuloza). They are then sold to traders who transport them to big fish markets in all four riparian countries, from whence they go as far as Dar es Salaam and Lusaka, where the growth of a modern poultry industry has increased demand. Small fish are easier to process and transport without damage than large fish. Trading is a very competitive business, and it is difficult for small traders to survive as prices fluctuate widely and unpredictably.
- Farming: in Kirando and Kipili this has become the most important economic activity as a result of a recent perceived decline in fishing and, to a lesser extent, the recent introduction of ox-drawn ploughs and the use of animal manure by Sukuma agropastoralists from the Central Plateau. At Kerenge on Manda Island only cassava is grown, but many people living there also farm other land on the mainland. Cassava is the main subsistence crop, followed by rice. Rice is the main cash crop, followed by cassava. Rain fed rice is grown in the river valley between Kirando and Kipili; an acre yields approximately 220,000/= per year, and the majority of farms are between two and three acres, although some are as large as 40 acres. Income from the sale of rice is controlled by men, while that from the sale of cassava is controlled by women, who make up to 20,000/= per year. Coconut and mango trees are common; one coconut tree yields approximately 12,000/= per year, and lives for over 50 years. Burning clears Land. Traditionally, crop residues and other vegetation were used as green manure; recently, animal manure, which is widely available, has started to be used, primarily by full-time farmers (i.e., those who are not involved in fishing), especially those who own cattle. When the fertility of the soil has declined, typically after a few years (without the use of animal manure), the land is left fallow, traditionally for eight years, but now typically for only half that. There is no use of artificial fertilisers. Ox-drawn ploughs are a recent introduction to the area, and are not yet widely used, but, in combination with the use of animal manure, allow larger areas to be cultivated more intensively. There is a GTZ project in Kipili that has provided a press and the start-up seed for a revolving sunflower seed bank, as well as introducing soya beans and new horticultural crops, and providing extension services. There is no government extension service.
- Land: uncultivated land is held communally. The man who cleared it, or his widow, or was inherited by his eldest child mostly owns cultivated land; some is allocated to immigrants by the village government. Much land is rented particularly the limited valley land suitable for rice growing. Rent is normally paid in the form of a portion of the harvest, typically three to four bags per acre (i.e., approximately 18% of the harvest).

- Livestock: in recent times Sukuma agropastoralists have brought between 2,500 and 4,000 cattle to the area, and nomadic herdsmen occasionally bring up to an additional 6,000. During the dry season cattle range freely throughout the area. During the wet season they are grazed on fallow fields - this leads to conflicts with farmers when they stray into cultivated fields - or are taken up into the surrounding hills. Surplus milk is sold, and typically yields approximately 250,000/= per year per family. There are also approximately 900 shoats in the area, as well as chickens, ducks, and rabbits.
- Other economic activities: activities related to fishing include boat building. Activities not directly related to fishing include the sale of cooked food (*Mama Ntilie*), the sale of local beers, particularly made from honey (*wanzuki*), but also from maize or cassava (*komoni*) or finger millet (*kisusano*), and the sale of firewood, which are undertaken by women, and the sale of locally distilled spirits (*gongo*) and charcoal. In the Mtakuja sub-village of Kirando there are restaurants, guesthouses, larger shops, and large market selling clothing and foodstuffs for local consumption, and in the other villages there are small shops and kiosks selling basic household items. In addition, there are six carpentry shops in Kirando, and a number of herbalists and traditional healer practice in the area.
- Access to financial services: there are three possible sources of credit in the area: the Rukwa Association of Non-Governmental Organisations (RANGO), which offers small loans for use as seed money for local economic groups, the World Food Programme (WFP), which offers small loans to assist with animal husbandry, and the Tanzanian government's revolving Women's Development Fund.
- Flooding: this has been a problem Kirando village recently, and leads to loss of crops and destruction of homes (146 in 1997). There appears to be some understanding that is due to the loss of tree cover upstream in the catchment area, and that its effects are greater when fields extend right up to the riverbanks, although there are no bylaws governing these activities.
- Erosion: this is most severe on Manda Island, but there appears to be no action taken to reduce it, perhaps because this is primarily a fishing community. In general, farming right up to the riverbanks exacerbates it and along the lakeshore where the sandy soils are easily washed away by heavy rains, as well as by trampling by cattle; again, there are no bylaws governing these activities.
- Conflict with hippos: new fields are being cleared along the lakeshore in hippo grazing areas; hippos damage the crops in these fields, and occasionally injure or kill people, leading to animosity such that people want to have them shot.
- Trees and wood: timber is used for construction, boat building, and the manufacture of furniture, fuelwood is used for cooking and the brewing of local beers, and charcoal is produced for sale to dealers who transport it to urban areas. People from outside the area that sell it in urban areas as far away as Dar es Salaam extract much timber. Demand for fuelwood is high as each household uses approximately 3m<sup>3</sup> per week, and this has generated a market for it. Many of the more valuable species are now harder to find than in the past, and for timber species, the pieces harvested are much smaller in size. Plants are also used for medicinal and ritual purposes, and many of these species are also declining in abundance. Reduced tree cover is blamed for reduced and less reliable rainfall, and women now have to spend up to eight hours travelling to and from fuelwood collecting locations, but it is felt that continued clearing of land for agriculture is a priority. There are no bylaws governing the use or cutting of trees, but some women's groups have started nurseries and introduced fuel-efficient stoves.
- Environmental awareness: this is variable, but even where it exists, there is a lack of interest in taking action to resolve problems, especially when this would increase workloads.
- Household composition: men head most households. However, there is considerable out-migration of able-bodied men, which has resulted in a society that is approximately 60% female. The strong influence of the Catholic Church has made polygamy rare, and thus there are relatively many unmarried women, some of whom head their own households (approximately 4% of households). Even "resident" men and youths often migrate to temporary fishing camps during the main fishing season. Information on household size and composition (gender/age) and dependency ratios is contradictory.
- Wealth: successful fishermen who owned gear (including engines) and employed others typically headed wealthy households (20% of total). They could be further identified by ownership of assets such as a modern house in Kigoma, a car or other vehicle, other revenue generating equipment such as a milling machine, or luxury consumer items such as a video cassette player. Below them were households typically headed by fishermen who were less successful but still owned some gear (e.g. a boat but not an engine) (30%). These households typically had burnt brick houses with iron roofs. Below them was the largest group of households (45%), made up of people who tended to work for others and who live in traditional

thatched mud brick houses. There was also a very small group of very poor families (5%), who had few or no assets.

- Labour: agricultural activity is greatest between December and April, which coincides with the period of peak fishing activity. The primary source of labour for both farming and fishing is from family members; wealthier households use hired labour in fishing, but not in farming except during the busiest periods. Fishing, clearing of land, and cultivation of rice is undertaken by men, preparation of fields by both men and women, and all other agricultural and domestic activities by women. Out-migration of men increases women's workloads considerably. In Sukuma households, young boys do the herding of cattle, and women do the milking and processing and selling of milk.
- Expenditure: this is not broken down by wealth groups, and is hence unclear.
- Health care and sanitation: the health centre for the Kirando and neighbouring Wampembe Wards is in Kirando village, but it is short of resources (e.g. medicines!). Nevertheless it provides good health education services, and as a result, almost every household has a pit latrine. However, many people still do not boil their drinking water due to shortages of fuelwood; although the most frequent complaints are malaria and respiratory infections, diseases of insanitation (diarrhoea) are still common. There are missionary dispensaries at Kipili and the Itete sub-village of Kirando which have better supplies of medicines but their services are more expensive and thus not available to all. People also use traditional herbal remedies, which they prepare themselves or obtain from herbalists and traditional healers. Water is primarily obtained from rivers and the lake, but there are also a small number of shallow wells with pumps provided by NORAD and GTZ. However, they are not well maintained, and have been polluted during floods, when pit latrines are destroyed.
- Education: each village has a primary school, although all are short of resources (e.g., reading and writing materials). In Kipili, where a secondary school for the whole ward is being built, the village government has passed a bylaw requiring all children to attend primary school and thus educational levels there are higher, and a few young people have already been sent to secondary schools elsewhere. In the other villages, however, educational levels are very low, and many people have not completed primary education. Younger people are better educated than their parents are and men are better educated than women are, although current enrolment is close to 50% female.

Of particular interest is the way in which the local economy had absorbed new ideas and technologies in both fishing and agriculture. Also of interest is the fact that although many economic activities other than fishing and farming are undertaken in these villages, these remain the primary production systems relied upon for both subsistence and for bringing wealth in from outside, while the other economic activities serve primarily to redistribute this wealth within the villages.

It would be extremely interesting to investigate further the information collected through the household interviews, and specifically to address the heterogeneity of the community and break down the information by type of household, e.g., what types of households are headed by women, how are the people within households related, how do they contribute economically, and how does household size and composition vary amongst wealth groups, how do sources of income and expenditure priorities vary by type of household, as well as seasonally, how does education/healthcare/sanitation, etc. vary by type of household, etc.

There is a need to understand the socio-economics of the different types of fishing gear, e.g., how many of each type of gear operate in an area, who (what type of person) owns them, what is the capital investment needed, who works them (how many people), what are the returns, and how are they shared, etc. There is also a need to understand the socio-economics of the marketing and processing of the fish; e.g., who undertakes what, and what this is worth to them.

For farming there is a need to understand how the areas planted with different crops vary by type of household, who rents land, who uses hired labour, who owns shoats, who is involved in more unusual activities such as raising rabbits, and why, etc.

For the other economic activities mentioned there is a need for quantitative economic information, as well as for social information, e.g., what types of people are involved in these activities, how do incomes vary with fluctuations in fishing and farming activities and incomes, etc. Similarly, for each type of natural resource use, e.g. production of charcoal, there is a need to understand whom (what type of people) is involved, and what it is worth to them.

### **Buhingu Ward**

Buhingu Ward is located in Kigoma Rural District on the lakeshore; it borders Mahale Mountains National Park (MMNP) to the south. Within the ward three villages, a joint SE/FPSS team of 11 people visited Buhingu, Nkonkwa, and Kaliani between 8 and 12 December 1997. The results are reported in Mung'ong'o (1997b) and Tarimo (1997).

The objectives of the study included “improving understanding of:

- Livelihood strategies of local communities, as a basis for informed intervention by the project;
- Patterns of natural resource utilisation, and the threats to natural resources and biodiversity;
- The socio-economic make-up of lakeshore communities and the key stakeholder groups;
- institutional mechanisms whereby improved resource management and local development initiatives might be introduced”

The main findings of interest are:

- **Background:** The people of Buhingu and Nkonkwa are primarily Ha and Congolese (Bembe, Goma, and Kalamba), many of who are second generation inhabits Tongwe, but Kaliani almost entirely. Between 1988 and 1997 the population of the ward declined by over 50%, primarily as a result of the repatriation of Congolese refugees; those Congolese remaining in Kaliani want to stay there permanently. Seven Christian denominations and Islam are represented; Islam is the dominant religion in Kaliani and the Mgambo sub-village of Buhingu. Buhingu and Nkonkwa occupy relatively large areas of flat fertile floodplain. Kaliani, however, is limited in size by Nkonkwa to the north, the lake to the west, and the park to the south and east. The ward has no road connection inland; all transport and communication is by water.
- **Fishing seasons:** fishing activity peaks during the rainy season between October and April, and is at it's lowest in the dry season between May and July; it is also dependent on the phase of the moon.
- **Lift nets:** these are used in the near offshore areas from catamarans; in this area engines are not widely used due to piracy, and the fear of piracy, but the presence of rich fishing grounds not far offshore makes this feasible. Congolese (Bembe) and Burundian fishermen introduced lift nets in the 1980s; they are common in Buhingu and Nkonkwa, but not in Kaliani. This type of fishing is both relatively lucrative and sustainable, but is limited by piracy, strong winds in the offshore areas, and lack of access to credit.
- **Beach seines:** these have been banned since this study was undertaken. At the time of the study a few were used at Buhingu and Nkonkwa to target larger fish during both day and night, and at Kaliani to target small fish. The fishing grounds off Kaliani are sufficiently rich that only one afternoon haul per day was necessary. Each net employed six fishermen.
- **Long lines:** these are used inshore from small canoes in the MMNP 1.6km exclusion zone by park staff. Fish are usually consumed within the household, although any surplus may be sold.
- **Ownership of gear:** many lift nets and catamarans were obtained through a CRDB credit scheme in the 1980s.
- **Piracy:** theft of engines and nets by primarily Congolese pirates is a major concern in the area, and constrains offshore fishing activities. Recently there have also been armed attacks on the homes of wealthy gear owners and traders who are known to have large quantities of cash on the premises.
- **Fisheries management:** there are no local fisheries bylaws, although MMNP maintains a 1.6km exclusion zone. In Nkonkwa and Buhingu people report that some fish species are decreasing in numbers or locally extinct, but that they do not know why. In Kaliani, next to the exclusion zone, fish are plentiful (probably as a result of the exclusion zone!), and thus people cannot see a need for it.
- **Marketing and processing of fish:** women and children for local consumption is sold fresh at the landing, but most (80%) of the small fish dry fish in the sun on the beach before being sold to traders. They are then transported by boat either all the way to Rumonge, or to Kigoma, where they are sent by train as far as Dar es Salaam.
- **Farming:** although there is a strong fishing identity in the area, farming is actually more important than fishing in Buhingu and Nkonkwa, though not in Kaliani, where there is a shortage of land and very rich fishing grounds nearby. Cassava is the main subsistence crop, followed by beans. Cassava is also a major cash crop, along with oil palms; an acre planted with cassava for sale yields approximately 200,000/= per

year, while an acre planted with oil palms yields approximately 500,000/= per year. Women control income from the sale of cassava, while men control that from the sale of palm oil. In addition, in the river valleys rain fed rice is grown; most is sold to traders after harvesting. Coconut and mango trees are common in Buhingu and Nkonkwa. Fertile alluvial soils around Buhingu and Nkonkwa allow for permanent cropping; crop residues and other vegetation are used as green manure, but there is no use of animal manure or artificial fertilisers. There is no extension service.

- Land: uncultivated land is held communally. Cultivated land is mostly owned by the man who cleared it, or his widow, or was inherited by his eldest child; some is owned by people who raise or borrow enough money to buy it from those who have become engaged in other activities, and some is allocated to immigrants by the village government.
- Livestock: there are approximately 2,000 free ranging shoats in the area, as well as chickens, ducks, and rabbits. In recent times Sukuma agropastoralists from the Central Plateau have brought 100-150 cattle to the area around Nkonkwa.
- Other economic activities: activities related to fishing include boat building. Activities not directly related to fishing include the sale of cooked food (*Mama Ntilie*), the sale of local banana beer (*kayoga*), the sale of firewood, and the sale of thatching grass, all of which are undertaken by women, and the sale of locally distilled spirits (*gongo*), which is undertaken by men. In addition, each village has a small market selling clothing and foodstuffs for local consumption and there are three large carpentry shops in Buhingu. A number of herbalists and traditional healers also practice in the area.
- Flooding: this is a problem in the floodplain (!) villages of Buhingu and Nkonkwa, and leads to loss of crops. There appears to be only some understanding that this natural phenomenon is exacerbated by loss of tree cover upstream in the catchment area, and that its effects are greater when fields extend right up to the riverbanks. There are no local efforts to resolve the problem (such as constructing ditches and embankments to raise rice under a paddy system) but considerable interest in the idea of some sort of "government" (engineering/dam) solution.
- Erosion: this is most severe around Kaliani due to the steeper topography. It is exacerbated by trampling by the free ranging shoats, and by farming up to riverbanks. There are no bylaws governing these activities, nor much apparent interest in the problem.
- Trees and wood: timber is used for construction, boat building, and the manufacture of furniture. Fuelwood is used for cooking, smoking fish, processing palm oil, brewing, distilling spirits, and burning bricks. Demand is high (e.g., each household uses approximately 1m<sup>3</sup> of wood per week, the processing of palm oil in Nkonkwa alone uses 40m<sup>3</sup> per week; and the brewing of beer in Buhingu and Nkonkwa uses over 100m<sup>3</sup> per week), and this has generated a market for it. Many of the more valuable species are now harder to find (outside the park) than in the past (or even extinct), and for timber species, the pieces harvested are much smaller in size. Plants are also used for medicinal and ritual purposes, and many of these species are also declining in abundance. Reduced tree cover is blamed for reduced and less reliable rainfall, and women now have to spend several (information is contradictory) hours each day collecting fuelwood, but it is felt that it continued clearing of land for agriculture is a priority. However, there are some bylaws governing the use of trees, and the TACARE project has established nurseries in Buhingu and Nkonkwa.
- Environmental awareness: this is variable, but even where it exists, there is a lack of interest in taking action to resolve terrestrial problems, in part because of a strong fishing identity.
- Household composition: most households are headed by men, with a few headed by widows. Information on household size and composition (gender/age) and dependency ratios is contradictory. Men and youths often migrate to temporary fishing camps during the main fishing season.
- Wealth: wealthy households (20% of total) were typically headed by successful fishermen who owned gear (including engines) and employed others, as well as owning oil palm and cassava farms of several acres, and shoats. They could be further identified by ownership of assets such as a modern house in Kigoma, other revenue generating equipment such as a milling machine, or luxury consumer items such as a video cassette player. Below them were households typically headed by fishermen who were less successful (30%), but still owned some gear (e.g. a boat but not an engine). These households typically had burnt brick houses with iron roofs and owned cassava farms of at least an acre. Below them was the largest group of households (45%), made up of people who tended to work for others and who live in traditional thatched mud brick houses. There was also a very small group of very poor families (5%), who had few or no assets.

- Labour: agricultural activity is greatest between December and April, which coincides with the period of peak fishing activity. The primary source of labour for both farming and fishing is from family members; hired labour is also widely used in fishing, but not in farming except by wealthier households during the busiest periods. Fishing and harvesting of palm oil is undertaken by men, preparation of fields by both men and women, and all other agricultural and domestic activities by women.
- Expenditure: this is not broken down by wealth groups, and is hence unclear.
- Health care and sanitation: the health centre for the Buhingu and neighbouring Ilagala Wards is in Buhingu village, but it is short of resources (e.g. medicines!). Nevertheless it provides good health education services, and as a result, almost every household has a pit latrine, and 90% are reported to boil their drinking water. However, although the most frequent complaint is malaria, diseases of insanitation such as bilharzia, diarrhoea, and worms are still common. People also use traditional herbal remedies, which they prepare themselves or obtain from herbalists and traditional healers.
- Education: each village has a primary school, although the one in Kaliani only has four classes, and all are short of resources (e.g., reading and writing materials). There is no secondary school in the ward, although there are plans to build one in Igalula, the village to the north of Buhingu. Educational levels are very low, and many people have not completed primary education. Younger people are better educated than their parents are and men are better educated than women are, although current enrolment is close to 50% female.
- Relationship with MMNP: when the park was a game reserve people could fish in its waters under permit, but when it became a national park in 1985 a 1.6km exclusion zone was established. Local people seem not to have been consulted or even informed about this change at the time and in Kaliani in particular, resent it still. They claim to need more information about it (?), and, that as it is not demarcated, it is difficult or impossible for them to avoid encroaching upon it. The people of Kaliani further resent the park because they (claim to) believe that the boundary between the village and the park is not correctly demarcated, despite the fact cartographers from the University of Dar es Salaam and a Regional Commission have decreed that it is. Their refusal to accept this is related to the fact that they are a community of immigrants trying to establish themselves as an official registered village. In order to qualify the village must have enough land upon which to subsist, but as it borders the lake to the west and is already in conflict with Nkonkwa to the north, its people see the land within the park as their only hope. In the meantime they are at risk of being exploited by corrupt government officials; shortly before the 1995 general election a certificate which is possibly a fake was obtained, possibly at some cost...

Mung'ong'o's (1997) report also contains further information on the vegetation types and terrestrial fauna of the area (now primarily of the park), and the traditional uses of different animal species. Tarimo's (1997) report was submitted as part of the ICCE's Awareness to Action course and includes information about and comments on it, as well as general comments on participatory approaches.

Of particular interest is that although many economic activities other than fishing and farming are undertaken in these villages, fishing and farming remain the primary production systems relied upon for both subsistence and for bringing wealth into the villages from outside, while the other economic activities serve primarily to redistribute this wealth within the villages. Also of interest is the evidence that fish refuges can be effective in maintaining fish stocks under high fishing pressure (although there is clearly a need for education about this!).

Information was collected and analysed by the survey team, and then taken away to be presented in these reports; it does not appear that there was even a debriefing of the communities, much less any internal critical reflection on the results and their implications. Despite the large team the study seems superficial; the team visited five sites (three villages and two sub-villages) in five days, spending only a day at each, and thus, while coverage of issues was broad, it lacked depth. PRA and RRA methods are designed to be efficient, but there is a limit to this, as well as to an individual researcher's ability to absorb and comprehend information in so short a period. A team of six people spending three days in each of three sites would require the same amount of labour (actually 54 vs. 55 person-days), but would probably be in a much better position to understand the complexities of those communities.

For farming there is a need to understand how the areas planted with different crops vary by type of household, who uses hired labour, who owns livestock (shoats), who is involved in more unusual activities such as raising rabbits, and why, etc.

For the other economic activities mentioned there is a need for quantitative economic information, as well as for social information, e.g., what types of people are involved in these activities, how do incomes vary with

fluctuations in fishing and farming activities and incomes, etc. Similarly, for each type of natural resource use, e.g. extraction of timber, it there is a need to understand who (what type of people) extract it, what this is worth to them, who works it, what this is worth to them, and who consumes the final product, etc.

Finally, it would be interesting to try to determine an approximate fuelwood budget for area and compare this with published estimates of productivity in the area to estimate the annual deficit, and hence the rate of deforestation, which would appear to be high.

## **ZAMBIA**

### **Kasakalawe, Nsumbu, & Kapeta Villages**

Kasakalawe village is just west of Mpulungu on Mbete Bay, Nsumbu town is on the western portion of the Zambian lakeshore and borders Nsumbu National Park, and Kapeta village is on Chituta Bay, on the eastern portion of the Zambian lakeshore. A joint FP/SESS team of 12 people visited them in February 1997. Kasakalawe and Nsumbu were visited for a week each, and Kapeta was visited for three days. The results are reported in Petit (1997) and Damaseke (1997). The main findings are:

- Background: the population of Kapeta is approximately 350.
- Fishing seasons: subsistence fishing is carried out year round, but commercial fishing of small fish s mostly confined to the dry season (May to October) much fishing activity traditionally stopped during the rainy season (December to April) when people devoted their energies to farming.
- State of the fisheries: except for the Nsumbu National Park (NNP) exclusion zone there is evidence of serious overfishing throughout the Zambian waters of the lake; catches have been declining continuously since 1985, and many fishermen themselves now think there is a need for a closed season (except for subsistence). The NNP exclusion zone is an important refuge and harbours large adult fish; catches around it remain high (80-200kg per beach seine haul (now banned), 100-150kg per gill net set 2-3km offshore despite the same sorts of fishing pressures as elsewhere. Although much of the area is difficult to harvest anyway, there is some illegal fishing, as well as a seasonal fishing camp of 100 nets licensed by the park.
- The industrial fishery (the “Companies”): this uses purse seiners offshore. There are substantial investments in both gear and refrigeration plants; as catches decline, most of the companies are diversifying into trade, processing and transport, but still face a poor and deteriorating financial situation, especially as losses to theft by the crew are high. As catches offshore have declined, some purse seiners have moved inshore in competition with other types of gear.
- Beach seines: these have been banned since this study was undertaken. At the time of the study Lake Tanganyika was the only area in Zambia in which they were allowed, and a ban was widely predicted. They were used to target small fish at night, and were catching 2-5kg of fish per night; some net pullers were earning as little as US\$0.20/day. Each net employed eight to ten net pullers.
- Inshore seines: these are used to target larger fish during both the day and night. There are more suitable areas (with sandy bottoms) in Zambian waters than in the north of the lake, so they probably have more of an impact here. They now catch 2-5kg of fish per day.
- Chilimira nets: these are used in the near offshore areas with light boats at night; 10-14 net pullers; high capital costs (needs engines); light boat owners take half; net boat owner takes his costs out of the other half, and then half of what remain; net pullers share their half -> very low shares in recent years as inshore catches decline (disappear!) there is a move towards chilimira nets
- Lines: long lines are used offshore, and short lines are used shallow rocky areas, e.g., around Mbita Island. Very little capital investment is required, and they catch large valuable fish. Line fishing is very common, and occurs year round.
- Gill nets: these are widely used, and often come into conflict with other types of gear
- Lift net: these are very rare due to lack of capital or access to credit (following past failed credit schemes) and high running costs

## REFERENCES

- Damaseke, M. 1997. *Chituta Bay - Kapeta Village PRA report*. Lake Tanganyika Biodiversity Project Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Mpulungu. 10pp.
- Lwoga, C.M.F. (Ed.) 1997. *Participatory Rural Appraisal in Mtanga Village, Kigoma District: principal findings*. Lake Tanganyika Biodiversity Project Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. February 1997. 34pp.
- Marwa, B.N., O. Kashushu, & H. Mabuchi. 1997. *A follow up report at Mtanga*. Lake Tanganyika Biodiversity Project Fishing Practises & Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. December 1997. 3pp.
- Mung'ong'o, C.M. (Ed.) 1997a. *Participatory Rural Appraisal in Kirando Ward, Rukwa Region, Tanzania*. (Draft) Lake Tanganyika Biodiversity Project Fishing Practises & Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. September 1997. 59pp.
- Mung'ong'o, C.M. (Ed.) 1997b. *Participatory Rural Appraisal in Buhingu Ward, Kigoma Region, Tanzania*. (Draft) Lake Tanganyika Biodiversity Project Fishing Practises & Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. December 1997. 47pp.
- Mung'ong'o, C.M. 1998. *Socio-economic and institutional appraisal of the Mpanda-Sumbawanga catchment in Rukwa Region, Tanzania: field trip report, July 11<sup>th</sup> -23<sup>rd</sup>, 1998*. Lake Tanganyika Biodiversity Project Fishing Practises & Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. August 1998. 10pp.
- Petit, P. (Ed.) 1997a. *Participatory Rural Appraisals in Tanzania: Mtanga Village: January 1997*. Lake Tanganyika Biodiversity Project Fishing Practises Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. March 1997. 29pp (plus appendices).
- Petit, P. (Ed.) 1997b. *Survey on fishing practises and related socio-economic aspects at Ujiji, Katonga, and Kaseke (Kigoma Region, Tanzania)*. Lake Tanganyika Biodiversity Project Fishing Practises Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. February 1997. 15pp.
- Petit, P. (Ed.) 1997c. *Participatory Rural Appraisals in Zambia: Kasakalawe, Nsumbu, & Kapeta Villages: February 1997*. Lake Tanganyika Biodiversity Project Fishing Practises Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. March 1997. 18pp (plus appendices).
- Petit, P. (Ed.) 1997d. *The FPSS component of a joint EE/SESS/FPSS appraisal in Kirando village (Kigoma Region, Tanzania)*. Lake Tanganyika Biodiversity Project Fishing Practises Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. August 1997. 28pp.
- Said, L. & P. Petit. 1997. *Exploratory mission in Rukwa Region*. Lake Tanganyika Biodiversity Project Environmental Education, Fishing Practises, & Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. 35pp.
- Tarimo, B.D. 1997. *PRA in Buhingu Ward, Kigoma Region, Tanzania*. Awareness to Action course paper. International Centre for Conservation Education, {location}. October 1997. 11pp.
- Walsh, M., L. Said, B. Marwa, & K. Banister. 1996. *Fishing in the River Mungonya at Bubango, Kigoma Rural District, Tanzania*. Lake Tanganyika Biodiversity Project Socio-economic Special Study Report. Pollution Control and Other Measures to Protect Biodiversity in Lake Tanganyika (RAF/92/G32), Kigoma. December 1996. 8pp.