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Report No. 11

KIRANDO

Participatory Rural Appraisal in Kirando Ward, Rukwa Region, Tanzania

Dar es Salaam
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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)

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CONTENTS

1 BACKGROUND

Conservation of biodiversity is complex in that it involves walking a tight rope while balancing human interests and the interests of nature. The balancing act is further compounded by the fact that human interests are never homogeneous. They often manifest themselves in conflicting self interests resulting in interest groups locked in mortal contest for control of nature and its resources. It is imperative, therefore, that conservation of biodiversity is lodged in a socio-political framework which identifies and respects all legitimate levels of rights, responsibilities and obligations (cf. Vane-Wright, 1996). It is in line with this reasoning that the Lake Tanganyika Biodiversity Project is developing a Strategic Action Plan (SAP) for the conservation of Lake Tanganyika. In preparation for this, the Project is undertaking a series of Special Studies of biodiversity, sedimentation, pollution, fishing practices, and socio-economics. The Socio-Economic Special Study (SESS) aims to identify ways in which the Project can promote:

- participation in fisheries and wider natural resource management by local communities;
- improved, more sustainable fisheries and resource utilisation practices;
- alternative livelihood and income earning opportunities outside of fisheries, especially where lake biodiversity is threatened; and
- environmental education work, to facilitate the above, and to promote general awareness of the importance of the lake resource, especially amongst local people and local government.

1.1 Objectives of the study

The SESS is undertaking in depth participatory action research at selected sites in each of the riparian countries with the objectives of 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 key stakeholder groups; and
- institutional mechanisms whereby improved resource management and local development initiatives might be introduced.

Since January 1997 PRA investigations have been carried out in various villages in Tanzania and Zambia. The first investigation which involved a multidisciplinary approach was carried out at Mtanga village in the vicinity of Gombe Stream National Park. Results of that work are reported in Lwoga, 1997. This report contains the results of a second comprehensive PRA done in August 1997 in four villages in Kirando Ward, Nkansi District, Rukwa Region.

1.2 Methods and materials

The study was carried out by a multidisciplinary team of 14 people:

- Dr. Claude Mung'ong'o, Environmental Sociologist, University of Dar es Salaam;
- Dr. Philippe Petit, Fishing Practices Consultant, MRAG;
- Mr. Omari Kashushu, Research Officer, TAFIRI;
- Mr. Hamza Mabochi, Community Development Officer, Kigoma;
- Mrs. Beatrice Marwa, Fisheries Officer, Kigoma;
- Mr. Aristides Kashula, Forestry Officer, TACARE;
- Mr. Fredrick Malisa, Community Conservation Warden, Mahale Mountains National Park;
- Mr. Felix Eliadori, Fisheries Officer, Nkansi;
- Mrs. Pendo Malabeja, Community Development Officer, Sumbawanga;
- Mr. Peter Mgalla, Divisional Executive Officer, Kirando;
- Mr. Gerald Sangu, Community Development Officer, Kirando;
- Mr. Robert Kalyata, Agricultural Officer, Kirando;
- Ms. Dotto Mwinyikambi, Women's Representative, Kirando; and
- Mr. Steve Evison, Environmental Education Consultant, NRI.

To facilitate a comprehensive coverage of the Terms of Reference (see Appendix A) and in order to ease work in the field a manual was first compiled covering the basic PRA tools that the team would need in this and subsequent fieldwork (Evison and Mung'ong'o, 1997). Team members were given copies of the manual to study before briefing sessions at Kigoma and Kirando. Since most team members were already familiar with PRA techniques, no comprehensive training sessions were required before embarking on the actual fieldwork, which saved the team a lot of time.

The manual subdivided the issues to be addressed into five groups, each of which was tackled by specific members of the team:

- fisheries and fishing practices: Dr. Philippe Petit (Leader), Mr. Omari Kashushu, Mr. Felix Eliadori, and Ms. Dotto Mwinyikambi;
- land tenure and agricultural practices: Mr. Steve Evison (Leader), Mr. Robert Kalyata, and Mr. Gerald Sangu;
- the socio-economics of the household: Dr. Claude Mung'ong'o (Leader) and Mrs. Beatrice Marwa;
- institutions, infrastructure, markets and business: Mr. Hamza Mabochi (Leader), Mrs. Pendo Malabeja, and Mr. Peter Mgalla; and
- forestry and wildlife: Mr. Aristides Kashula (Leader) and Mr. Fredrick Malisa.

Data were collected using mapping, transect walks, timelines, seasonal calendars, daily timetables, and semi-structured interviews. Data collection began after meeting with village leaders on 23 August at Kirando village and was completed on 29 August with a visit to Katongolo and Kalungu (see Appendix B for fieldwork schedule). Each evening after dinner the team met to review the day's work and plan for the next day. Information gaps were identified and ways of plugging them were decided upon.

Table 1.1 shows the number of people who attended the various village meetings where mapping, timelines, and seasonal calendars were undertaken. Note that the count given for Kirando village is larger than the others as this was a full general meeting called to discuss many other local issues as well.

Table 1.1 Number of people attending PRA meetings

	Kirando	**Katete**	**Kipili**	**Manda-Kerenge**
Men	200	53	35	69
Women	25	40	25	18
Children	50	0	0	0
TOTAL	**275**	**93**	**60**	**87**

Source: Field Data, August, 1997

The whole team spent five days in Kigoma after the fieldwork to analyse the data and write up group reports, which form the basis of this report.

2 THE STUDY AREA

2.1 Location and accessibility

Kirando Ward is located between 07˚10'S and 07˚35'S and 30˚30'E and 30˚45'E, and is one of thirteen Wards in Nkansi District in Rukwa Region. Perched on the eastern shore of Lake Tanganyika between an altitude of 800 and 1,400m, it has an area of 1,162km^2 and is surrounded by Kabwe Ward in the north, Namanyere and Mtenga Wards in the east, and Ninde Ward in the south. To the west it is bounded by the lake which links it to the Democratic Republic of Congo (formerly Zaire) in the west, the Republic of Burundi in the north, and the Republic of Zambia in the south. It is connected by road to Namanyere 62km away. However, transportation is very unreliable, depending on occasional lorries and pickup trucks during the dry season only. Most communities, therefore, depend on lake transport using local outboard engine boats and the weekly services of the MV Liemba owned and operated by the Tanzania Railway Corporation.

2.2 Physical features

The geology of much of the Ward belongs to the Bukoban System and is characterised by the presence around Kirando village of alluvium of the Quaternary Period (IRA/Clark University, 1984). In the north and the north-east the System is characterised by the Mtakuja Conglomerates comprising conglomerates, sandstones and siltstones. In the south it is characterised by the Kipili Volcanics with a predominance of Andesite-dacite porphyrites, rhyolites and tuffs. Both the Mtakuja Conglomerates and the Kipili Volcanics are believed to have been formed during the Proterozoic Period. The soils of the Lake Tanganyika lacustrine terraces which dominate much of the Ward range from loams on the high, well-drained terraces and floodplains, to clays on the low floodplains. The climate is semi-arid with mean annual rainfall ranging between 800 and 900mm. Rainfall is very variable. The Kirando rainfall station, for example, receives a mean annual rainfall of 843mm unevenly distributed in 81 days. However, the lowest recorded value at the station is 490mm. The mean temperature is 27˚C.

2.3 Kirando Ward in profile

2.3.1 History

Kirando Ward is one of the oldest settled areas in Rukwa Region (see Appendices C – F for more details). The Ward was probably first settled by Bembe fishermen moving from the eastern parts of the present day Congo. Close cultural and linguistics affinities between the Ward (and indeed all Tanzanian lakeshore communities) and Goma in eastern Congo are still evident in all of the villages visited.

The first non-African influences probably reached the area in the middle of the 19th Century when Arab slave and ivory traders established a provisioning post at Kirando village. Some thirty years later in 1888 German missionaries belonging to the Order of the White Fathers based at Karema established a Catholic mission at Jiwenikamba in Kipili. However, German occupation of the area probably did not really take effect until after 1890 when a boma was built on Manda Island.

The successive invasions by outsiders introduced new socio-economic and cultural strands. For example, the coming of the Bembe from Goma marked the beginning of fishing and the cultivation of such crops as cassava, sorghum and groundnuts in the Kirando area. The coming of the Arabs introduced Islamic culture and influenced the planting of permanent tree crops such as coconuts, mangoes, and oil palms, which are characteristic of the area to this day. The coming of the pastoralist Tutsi from Burundi during the middle of the 18th Century introduced cattle keeping in Rukwa Region in general. However, the rinderpest epidemics of the late 19th Century decimated herds and reduced the influence of cattle in the economy of the area (URT/Kingdom of Norway, 1982:2-5). In the past two decades there has been a larger westward expansion of the agropastoralist Sukuma people and their herds from Shinyanga and Tabora Regions in the drier parts of the Central Plateau. This latest invasion has affected the area negatively though overgrazing and deforestation, but has also had positive effects through the introduction of the use of manure and ox drawn ploughs.

2.3.2 Demographic characteristics and settlement patterns

Field data indicate that in 1996 the Ward had an estimated population of 22,281 people distributed in 3,125 households in seven villages. This represents an average annual increase of 4.5% since the 1988 census. This rate of increase is confirmed by the data shown in Table 2.1 for the period 1993-6 for the four villages studied.

Table 2.1 Population in Kirando Ward 1993-6

	1993	**1994**	**1995**	**1996**
Kirando	9,285	9,684	10,112	10,535
Katete	1,718	1,792	1,869	1,949
Kipili	1,625	1,695	1,768	1,844
Manda-Kerenge	2,120	2,211	2,306	2,404
TOTAL	**14,748**	**15,282**	**17,055**	**16,732**

Source: Field Data, August, 1997

Fertility levels, and therefore potentials for growth, have been higher in Rukwa Region than in the nation as a whole (URT/Kingdom of Norway, 1982:3-3), and the 1996 population data show that children form 57% of the population. This observation notwithstanding, some of the rate of growth witnessed here would seem to be due to in-migration as well as natural increase. Discussions with local people suggest that the Ward has been the focus of immigration from the Ufipa Plateau, the eastern parts of Congo, and elsewhere, by those who come to fish, to grow rice, or to do various businesses, especially in Kirando village. The influx of Sukuma agropastoralists and their herds has further exacerbated the situation.

The Ward has seven registered villages. Masolo and Katongolo are inland, Manda-Kerenge is on an island, and Kipili, Katete, Kalungu, and Kirando are located on the *marasi* (bays) of the lake. Within Kirando village are three large *vitongoji* (sub-villages): Mtakuja; Kamwanda; and Itete. The settlement pattern is a result of the nature of the local economy, which is based on fishing and subsistence cultivation, although the concentration of households characteristic of all of the villages is probably a legacy of the Villagisation Programme of the 1970s. Village size varies from 188 households in Kipili to 556 households in the *kitongoji* of Kamwanda, with an average of 347.

2.3.3 Ethnic composition and migration patterns

Table 2.2 illustrates the ethnic groups represented in the sample villages. Kirando village is by far the most cosmopolitan community in the Ward. Its population includes all the ethnic groups resident in the other villages plus, minority groups such as Arabs, Nyakyusa, and even the Zaramo from the Indian Ocean coast, confirming that it has indeed been a major focus of immigration. Generally, however, the Fipa are in the majority in all villages. In Kirando, Katete and Kipili, for example, they form 75% of the population. In Manda-Kerenge they form about 80% of the total population.

Table 2.2 Ethnic composition of Kirando Ward

	Kirando	Katete	Kipili	Manda-Kerenge
Fipa	x	x	x	x
Tabwa	x	x	x	x
Ha	x	x		
Bende	x	x		
Bembe	x	x	x	x
Others	x			

Source: Field Data, August, 1997

3 FISHERIES AND FISHING PRACTICES

Philippe Petit, Omari Kashushu, Felix Eliadori and Dotto Mwinyikambi

3.1 Introduction

This section presents the main findings of the fisheries and fishing practices component of the PRA team; more detailed information can be found in the relevant FPSS reports. It also generates recommendations for follow-up work elsewhere around the lake, including similar exercises and in-depth studies of strategic importance for the Project to enhance interdisciplinarity in its operations.

The aim of this part of the study was to:

- identify all the fishing techniques used in the Ward;
- collect technical information on the fishing gears;
- identify the fish species caught by these gears;
- identify the local fishing techniques threatening biodiversity in the lake;
- collect samples from the catches and analyse them; and
- survey the fish trade on the beaches and at the markets.

Techniques used included sampling of fish catches to evaluate catch composition and length frequencies, and interviews with fishermen and other stakeholders to gauge technical aspects of the fishery, its catches, history, and trends. Data were triangulated by observation and reference to earlier studies elsewhere. The team observed the catches of the various gears to identify the ones likely to be destructive. The gillnets and line catches, consisting mostly of 20 cm or longer specimen, were observed but not sampled. The team concentrated its sampling on length frequency analysis of the beach seine catches.

It is often difficult to check on the mesh size of a net as fishermen normally land the fish and leave their nets at home before coming to market to sell their catches. Another problem is that fishermen often use the measurements “inch” and “centimetre” interchangeably. Petit (1995) states that the declarations of littoral fishermen about equipment are only reliable if they are the owners of the gear.

3.2 The fishing community

The team was told that the fishing skills currently used in the Ward were introduced to the area by Congolese from the north of the lake. Nonetheless, today more than 75% of fishermen are Fipa, followed by Tabwa and Ha. Some Lungu, Rundi, Bembe, Tongwe, and Bende also fish in the Ward.

The lift net fishery started eight years ago at Manda-Kerenge with one catamaran. Before that fishermen used beach seines (*mkwau* or *kokoro*) and scoop nets (*kimoli*, *lusenga*, or *kawesulo*). Lift net owners used to go to Kigoma to recruit highly trained crew from among the Rundi and Bembe, which explains why fish and gear names at Kirando resemble those from the northern part of the lake. Some of these fishermen settled, although most have now left, replaced by a generation of local fishermen aged between 18 and 40 years. However, of non-Fipa fishermen, 75% are involved in the lift net fishery indicating that it is still an attracter of non-local fishermen. All fishermen using traditional traps (*migono* or *moono*) are Fipa, while the majority (75 – 100%) of line fishermen are Tabwa..

3.3 Fishing gears and techniques

The main fishing gear is lift nets used from catamarans (*kipe*) to catch *Lates stappersii* (*mvolo*) and/or sardines (Clupeids), primarily *Stolothrissa tanganicae* (*dagaa*). Lines (*kachinga* or *msedeo*) are widely spread in the bay and around the islands. Beach seines (*kokoro ya dagaa* or *mkwau wa dagaa*) are used to catch sardines. Beach seines used to catch large inshore fish are known locally as *kokoro ya samaki* or *mkwau wa samaki*. Gillnets (*makila*) are also used.

An interesting point noted was that the word *kawesulo* refers to the light boats used with sardine beach seines at night. Historically, however, this was the name given to the scoop net or scoop net fishery, now abandoned.

A scoop net with a 1" mesh (*kabuti*) is still used by some in shallow waters close to the shore at night. One or two men paddle along the shore with a pressure lamp. When they see an immobile (sleeping) fish they come as close as possible and silently drop the net in front of it. Then one fisherman hits the water with a paddle frightening the fish, which, in panic, rushes into the waiting net. Other minor gears are traps made of reeds set in streams entering the lake (*migono)*.

Generally, many fishermen were of the opinion that their fishing gears, especially nets and vessels, were too old and technologically out-dated to be as profitable as they would wish. Problems frequently mentioned include:

- lack of proper lamps which allow the light to penetrate deep waters where schools of sardines live;
- old boats which do not allow fishermen to go far enough out;
- lack of powerful engines;
- nets were too small to allow good catches; and
- lack of credit to enable gear owners to renew the fishing fleet.

The trend in the near future, assuming that the problem of piracy stabilises, will probably be that traditional catamarans will be abandoned for the bigger and more expensive Apollo catamarans. This means that if Rukwa banks and lending institutions do not support local investment the new fishing fleet, it will belong to Kigoma and neighbouring countries' investors.

The main difference noticed between the northern and the southern parts of the lake is that in the south fishermen use beach seines to catch sardines during the day close to the shore. They call this *uvuvi wa mawindo ya mchana* ("day hunting fishery"). Two boats are used, one carrying the net and the net-pullers (8 to 10), and the other, which is smaller, carrying two men who look for the schools of sardines. When the latter sight a school they call the crew of the bigger boat to come and set the net. This activity takes place between about 06.00 and 11.00, when the crew rests, before starting again at about 15.00. The evening session lasts up to 18.30. Before it is sold the catch is normally spread on the sand to dry. If the catch consists of *Limnothrissa miodon* smaller than 25mm (known as *kasekeseke*) it is spread on nets on the beach rather than directly on the sand.

Night sardine beach seines use light boats and operate as described in Petit (1995). Fish beach seiners rarely operate during the day because the catch is low. Neither do they use light boats when operating at night. Instead, they wait for the new moon when the fish come close to the shore. Hence fish beach seiners start their work at about 17.00 just before dusk and finish at about 04.00.

The lift net fishery affects night sardine beach seining as although the light boats can pull the sardines towards the beach for the first haul, it is not possible to come back and expect to attract fish again for another haul as the catamarans create a wall of light between the deep waters offshore and the area in which the beach seines operate.

3.4 Fish identification and vernacular names

Vernacular names are generally the ones commonly used in Tanzanian waters. Nonetheless, in names like *kilwe* (*Stolothrissa tanganicae*) there is a clear Tabwa (Congolese) or Lungu (Zambian) language influence. Also of note is the influence of the crew of Rundi or Bembe origin. Kirundi fish names are often used by fishermen at Kirando. It has again proved difficult to identify the exact origin of local fish names. As most fishermen declare "The fishing community is a mixture of people from all origins; so are the fish names."

3.5 Fishing grounds and catch composition

The study of catches and fishing grounds showed that fishermen benefit from a large exploitable zone for littoral species. Different habitats provide specialised gears with specific fishing grounds, including:

- underwater islands or islands where predators prey on Cichlids and young sardines;
- muddy areas close to river mouths with there are populations of catfishes, Cyprinids and *Oreochromis*;
- shallow sandy areas where Cichlids are abundant, as are their main nocturnal predators. Fry of *Limnothrissa miodon* is also very abundant in these zones and larger species prey on them at night;
- large sandy or muddy areas 10m deep or more where most littoral species are encountered at all growth stages; and
- deep areas where gillnets catch large predators and benthic species.

Analysis of the lengths of fish caught by the beach seines has suggest that there may be areas nearby in which fish populations can regenerate despite local high fishing pressure (similar length frequencies to those recorded around the Nsumbu National Park fishing exclusion zone in Zambia).

Lift net fishermen operate offshore but remain closer than their counterparts in the northern part of the lake due to various factors, including:

- piracy, which affects a larger part of the middle of the lake;
- lack of powerful engines;
- mediocre condition and sizes of fishing gear and vessels;
- lack of lamps to attract fish in deep waters; and
- low fish prices at the Kirando market.

Lift net fishermen target *Stolothrissa tanganicae* over *Lates stappersii*. Beach seiners also said their main target was *S. tanganicae* which is easy and quick to process by sun drying as opposed to *L. stappersii* which requires fuelwood and a long smoking process. Once processed, the former is also easier to transport and is less susceptible to damage. Hence the local price of fresh *S. tanganicae* is higher than that of the *L. stappersii.*

Gillnet fishermen do not operate close to the shore because it is too shallow and "there are no fish for the *makila*". However, they do operate around the islands, areas they describe as breeding and feeding grounds. The best fishing grounds are said to be west of Manda-Mvuna and around Kondwe Island (11km and 4.5km from Kirando village, respectively).Two further good fishing grounds were identified west of Katete, one at 4.5km described as 40m deep and the other at 8.5km described as 110m deep.

The target species and average composition of the catches of gillnets differ. The gillnet fishermen said that *Lates mariae* (*sangala)* was not frequently caught in its adult state. It was mostly taken as juveniles (*keke).* The same applied to Mastacembaelids (*minzolo*). Most (90%) of the gillnets observed had meshes of 2.5 or 3" but some fishermen use bigger meshes (up to 10").

At night fish beach seiners operate in the whole of the bay and catch a mix of littoral species. Although they target sardines, the sardine beach seiners also end up catching a variety of Cichlids and juvenile *Limnothrissa miodon* and their predators as they pass through the inshore zone.

Line fishermen operate throughout the area, including offshore, using sailed boats which leave at around 04.00 and return around midday. Their target is *Lates stappersii* and other *Lates* spp. If the catch is small they sell it at the market, but if it is high they must arrange to have it smoked.

3.6 Other factors affecting fishing

3.6.1 Winds and currents

The impact of winds and currents on fishing activity is reduced in the bay at Kirando which is protected by islands. Fish schools from the offshore area are even pushed towards the bay by the main north and south oriented winds. However, in the southern part of the lake winds can cause a lot of problems for the lift net fishery, or even prevent fishermen from going offshore. The westerly *malungu* wind which blows between August and September pushes the juvenile *Limnothrissa miodon* into the bay, as the northerly *kaskazi,* the dominant wind between September and March/April, does for sardines. However, both these winds blow unpredictably and disturb the catamarans. The *kaskazi* may blow for three days without stopping, and is the most feared wind during the wet season. The southerly *kusi* pushes both sardines and *Lates stappersii* towards the beach. It is the most common wind during the dry season between April and August and also disturbs fishing activity. The south-westerly *lunangwa* wind during August and September starts around 04.00 and makes fishing nearly impossible. The *mwela* blows off the land every morning throughout the year, and it is this which carries the line fishermen's sail boats out.

The trend for lift net fishermen has been to increase the length of the ropes. Initially only 40m or less, the average length is now about 75m. Manda-Kerenge fishermen declared that they want to increase it even more, ideally to 120 to 150m. However, drifting can reduce the efficiency of a lift net, keeping it astern of the boat and not as deep as if the ropes were vertical. In fact, fishermen stated that underwater currents below 40m are very strong and a problem for the lift net fishery off Kirando as the fish cannot follow the boat if it is drifting fast, and the net does not remain below the lamps. In Kirando it might, therefore, be a waste of effort to increase the length of the ropes.

3.6.2 Piracy

Piracy on the open waters is a major concern of fishermen at Kirando. Theft of nets and engines has been reported in the sample villages throughout the last few years. The problem only started about ten years ago. To date, the police have recorded incidents of theft worth 80,000,000 - 100,000,000 TSh in Kirando Ward alone. Fishermen at Manda-Kerenge, who are most involved in the offshore fishery, are presumably the primary victims. The obvious result has been reduced lift net activity and hence reduced catches and incomes.

The gangs which attack the fishing units comprise six to eight men armed with machineguns. All sources indicate that they come from Congo, possibly deserters or renegades from the Mobutu regime's army. With the coming to power of the Kabila regime things have improved; there is exchange of information between the two countries, and stolen gear is sometimes recovered. However, the gangs have changed tactics. As reported in Mtanga and in Zambia, groups of 20 or more armed men have started to land on the shore and attack houses, specifically targeting rich gear owners or traders who are likely to have large amounts of cash on the premises as a result of a lack of banking facilities.

People would like to see the government show more concern about this problem. A police speedboat is currently based at Kipili, but interviewees were of the opinion that the police do not do enough. It was claimed, for example, that when a camp is attacked it takes the police two to three days to come to the rescue. At times the pirates are said to have stayed in the area for as long as two days before leaving.

3.7 Markets and trade

The catches landed in the sample villages fall into three main groups. The littoral fish caught by the beach seines are normally sold fresh on the beach for local consumption. The sardines, however, are usually dried and sold to middlemen who transport them to large fish markets in the four riparian states and beyond. Lake Tanganyika sardines are reported to be in high demand in urban centres as far as Lusaka in Zambia, Harare in Zimbabwe, and Bukavu, Goma, Kisangani, Lubumbashi and Kinshasa in Congo. Within Tanzania they are popular in Dar es Salaam, Tabora, Dodoma, Mbeya and other smaller towns. The growth of modern poultry industries in many of the urban centres of East and Central Africa has increased the demand for sardines and small fry. Such varied sources of demand complicate attempts to regulate fishing activity, as there are simply too many stakeholders at too many levels, many of whom are too far from the lake to have any knowledge of and/or concern for it.

Ten years ago *Lates stappersii* were all consumed locally. Now more than 90% is smoked and sold outside the area, with major markets in Burundi and South Kivu in Congo. Generally, fish prices vary according to the laws of supply and demand. At Kirando, for example, a large *Boulengerochromis microlepis* can be bought from a fisherman for 1,000 - 1,200 TSh. At Sumbawanga the same fish can fetch as much as 3,000 TSh, while a similar fish caught at Ujiji near Kigoma could fetch between 5,500 and 6,000 TSh.

Due to the large area of exploitable water and the different fishing grounds of different gears, there are few conflicts, even when the wind pushes the fish into the inner part of the bay and the night sardine beach seines join the fish beach seines. The major source of conflict is the share of the catch or payments made to hired fishermen. For example, although the Rundi and Bembe lift net fishermen were impressed by the quantity of sardines caught in the area, most of them resigned after delays in the payment of their wages. In addition, some gillnet fishermen are paid according to the quantity of fish caught irrespective of type (i.e. value). Many fishermen are being paid around 10,000 TSh as monthly wages for a daily 12-hour job. These wages can hardly sustain life even in such a poor area as Rukwa Region.

3.8 People's perception of the fishery and the environment

People's perceptions of the long term sustainability of the fishery in the study area differ from village to village. In Kipili, which is an old fishing centre with a culture influenced by Christianity, interviewees demonstrated a high level of awareness of the issues. Fishermen were, for example, aware of the Fisheries Act of 1970 which prohibits the catching of “small fish”. However, with the coming of piracy the team was told that people started limiting their fishing activities closer to the shore. They also changed to using smaller meshes, to maintain catch levels.

Although there is lack of unanimity, most fishermen in Kipili believe that fish is disappearing globally because of the improvements in fishing techniques and the use of small meshes “which catch the fish with their eggs”. However, the lack of unanimity suggests that there are fluctuations in the abundance of fish from year to year, and/or that there has not been a systematic degradation of stocks.

The fishermen in Katete demonstrate the worst side of the picture. Most interviewees seemed not to care a damn about over-exploitation or sustainability of resource use. The fishermen at Kipili described them thus: “Fishermen at Katete are not real fishermen, they go fishing some days and as soon as they get some money they stop fishing to drink until they have no money left; then they go back fishing.” Such resource users have no real incentive to conserve resources.

4 LAND TENURE AND AGRICULTURAL PRACTICES

Steve Evison, Robert Kalyata and Gerald Sangu

4.1 Access to land

Much of the land in the Ward is held communally. The land that people cultivate is usually cleared from the bush. After a while, when the land has been put under permanent cultivation it becomes the property of the man who cleared it. It becomes an inheritable asset to be passed over to a man's dependants after his death. The majority of cultivated land in the area has thus been inherited. However, after the Villagisation Programme and the coming of new systems of local administration, some land was also allocated to immigrants by village governments. The team was further told that in the past, if a man died his brother would usually marry the widow and take over both the deceased's land and family responsibilities. This is no longer the practice. Now land is kept by the widow unless she remarries, in which case it is passed to the children.

Today much land is also rented, particularly land suitable for growing rice. Rice is the area's most recently introduced cash crop, but suitable valley land is limited in distribution, and thus it, or access to it, has become valuable. Rent is usually in form of sharecropping, whereby the owner of the land is paid part of the harvest. The usual price is three to four bags per acre (approximately 15% of the harvest). Some land owners reportedly rent out land that has been left fallow and needs clearing again; the renter has to clear it before planting his crop, but the following year the owner then takes it back again. This type of tenure arrangement (expensive land rental) has been found to discourage tree planting and the adoption of soil conservation measures in many parts of Tanzania.

4.2 Crop cultivation

4.2.1 Crops grown and yields

Crop production is currently the main economic activity upon which the people of the Ward depend. However, it was not always like this - its importance has increased with the perceived decline in fishing, as well as with the influx of Sukuma agropastoralists. These people have, so to speak, revolutionised agriculture in the area by introducing the use of manure and ox drawn ploughs, which make both increases in productivity and expansive cultivation possible.

Rain fed rice is the main crop for both subsistence and cash. It is grown by those (mainly men) who have access to the better valley land. A well tended acre of rice can produce between 20 and 25 bags, which at current prices fetches between 9,000 and 12,000 TSh per bag. Although the majority have *vijaruba* (rice plots) of between two and three acres, some people own as much as 40 acres. The varieties most commonly grown are *Bwana, Supa, Kihogo, Tule,* and *Mkia wa nyumbu.* Variety *Bwana* is the most popular.

Another crop which is as least as important as rice for subsistence is cassava, grown by almost every household. Much as rice is controlled by men as a cash crop, women depend on the sale of surplus dried cassava as their main source of cash. However, the sale of cassava might only yield 20,000 TSh per year. A well tended 7m long ridge can produce about two 20 litre tins of dried cassava, each of which sells for 1,000 TSh (or 1,200 TSh in the wet season). The varieties most commonly grown are *Kirizi, Bayeka, Mguu wa kwale, Kilombelo, Kazinda, Kabunga* and *Maliasili.* Variety *Kirizi* is by far the most popular.

Other crops grown primarily for home consumption as a supplement to the diet include maize, sweet potatoes, beans, and groundnuts. Maize is usually grown as a secondary crop. In fact, much of the maize consumed in the area is imported from the Ufipa Plateau or Congo across the lake. Prices fluctuate between 7,800 and 9,000 TSh per 100kg bag. A number of local bean varieties are grown, including *Kunde, Kabanima, Kigoma,* and *Ngurunga.* Table 4.1 illustrates approximate yields of the major crops.

Table 4.1 Yields of major crops in Kirando Ward (bags/acre)

	Kirando	Kipili	Katete	Manda-Kerenge	Katongolo
Rice	20	18	-	-	20
Cassava	10	8	2	8	10
Maize	10	5	3	-	15
Potatoes	4	4	3	-	4

Source: Field Data, August, 1997.

GTZ has introduced sunflowers to women's groups in Kipili through a revolving seed bank. They gave each group a cup of seeds, which the women grew, returning the same amount from their harvests the following year. Currently a press is being tried by one of the women's groups to investigate the possibility of oil production. GTZ has also introduced soya beans.

The main horticultural crops are tomatoes (mainly *Moneymakers*), cabbages, and onions. In Kipili GTZ has also been involved in introducing improved practices and new crops and varieties. There, lettuces and Chinese cabbages are also grown. One individual has a particularly impressive vegetable garden, and also grew many fruits, such as oranges, lemons, guavas, pawpaws, mangoes, passion fruits, three types of bananas, and neem. He is now involved in grafting fruit tree for sale to others.

In Kirando village there are a lot of coconut palms, which were first introduced by the Arabs. One interviewee said that he had planted his trees in 1947, and that they still yield about 120 coconuts per tree per year. He sells these for 100 TSh each. His trees were, however, showing half a metre of exposed roots which he attributed to the severe soil erosion which had been occurring in the village centre over the last few years due to floods.

However, although mango trees are common, most people have few if any other fruit trees. There is little cultivation of oil palms, and only a few *shambas* in damper areas have bananas or sugar cane.

4.2.2 Storage

Many people do not store much of their harvest. Cassava, which is the main staple food, is harvested as it is needed directly from the fields. Women typically collect some every few days, and leave the rest in the ground. Rice is usually sold after harvesting, although some is stored in *vihenge* (storage huts). The *vihenge* observed were built with mud but without dung, which helps the mud to harden and reduces weevil and other pest damage. The largest *vihenge* were those of the immigrant Sukuma. Maize is stored in small quantities in the roofs of houses where smoke helps to reduce pest damage. Larger quantities are stored elsewhere.

Major crop pests include termites, rodents, monkeys, warthogs, and birds. Major crop diseases include mosaic viruses, which attack cassava and tomatoes, and cassava mealy bugs (*Phenacoccus manihoti*) which attack cassava primarily.

4.2.3 Cropping patterns, methods and seasonal calendar

The fields are generally in the areas surrounding the villages, but may be up to one and a half hours walk away. The rice fields for all of the villages in the Ward are in the valley of the River Mkamba. Farming on Manda-Kerenge Island is somewhat different in that the fields there are almost exclusively for cassava. However, many households also farm other land on the mainland.

The agricultural system is primarily a fallow system. Fields are cleared from the bush and cropped for between one and three or more years. Then they are left to fallow, as the soils are exhausted. Traditionally the fallow period lasted for eight years or more, but increasing populations have resulted in fallow periods being reduced to as little as three years in some cases, which is generally not enough time for fertility to have been restored.

Rice is first grown in a nursery and then transplanted to the fields. Some people germinate the seed in their homes before planting in a nursery. There is no large scale irrigation, even along the main rivers, and all of the rice is rain-fed. Village leaders requested outside assistance for the development of irrigation systems, but there seem to be no local efforts being made towards this.

Most planting is done on ridges 1.5 - 2m apart, except in the very sandy soils along the lakeshore. Maize and cassava are usually planted together, the dominant crop being cassava. Cassava is planted on top of the ridge or on the sides. Usually this is done alternately, but it depends on personal preference and the width of the bank. Very occasionally maize was seen planted on its own. The maize seed is usually selected from the previous year's harvest, although some better-off people in Kipili said they grew hybrid varieties from seed purchased in Nkansi. While some people select the best seed, the majority are less discerning, and may plant as many as five or six seeds in one hole to ensure a harvest. These are not always thinned out and thus the best harvest possible is not always achieved. Sometimes beans are planted in the same hole as maize, although the beneficial effects due to nitrogen fixation were not always understood. A few interviewees also grow pigeon peas, although they are not aware of the soil fertility benefits of these either.

New fields are usually burnt to remove the vegetation. In the following seasons the soil is usually turned to cover the crop residues as a compost, although some continue to burn. Nobody interviewed knew about nitrogen loss due to the sun, although moisture loss was appreciated by some. However, nobody interviewed practised mulching, except on horticultural crops, and then only for seed germination, after which it was removed. One woman said she was aware of the technique and its purpose in stopping water loss, but that there is a problem of termites.

Animal dung is used for crop establishment and fertilisation by some, particularly livestock keepers, who are most familiar with it, and fulltime farmers with time to experiment. Fisherman who have little time for farming tend not to use it, either because they feel it is too much work, or because they do not understand how to without burning the seed. Informants in Kipili noted that availability of dung was not a problem. As they put it, there are so many cattle that one can just go and collect it from the paths and open grazing areas. No inorganic fertilisers are used in the study area.

The main farm implements used in crop cultivation are hand hoes, a variety of machetes, and a few ox drawn ploughs. Hand hoes have been used in this area from time immemorial. Long before the arrival of the factory made *Jembe Ulaya* (European hoe), people in the area developed a fairy efficient hoe which is still known as *Jembe Ufipa* (Ufipa hoe), manufactured by traditional blacksmiths in Kipili and elsewhere on the Ufipa Plateau. It had a wider blade than the factory made ones, and a tail-like piece instead of a ring for fixing it to the handle, but was very heavy to carry and use.

Ox ploughs are a very recent arrival in the Ward, introduced by the Sukuma sixteen years ago from the so-called "cultivation steppe" in the Central Plateau. Almost two decades later the technology is, however, yet to be fully incorporated into the farming system of the study area.

Figure 4.1 illustrates a general seasonal calendar for the study area. Note the concentrated demand for agricultural labour between December and April. This demand is compounded by a peak in fishing activities during the same period. Fishing impacts on farming activities by reducing the area cultivated, the timing of planting and the intensity of the cultivation methods used.

Figure 4.1 Seasonal calendar for Kirando Ward

	Rice	**Cassava**	**Maize**	**Fishing**
September	Tilling	Preparation of fields	Preparation of fields	
October	Tilling	Preparation of fields	Preparation of fields	
November	Tilling		Preparation of fields	
December	Planting	Planting	Planting	>< >< ><
January	Planting	Planting	Weeding	
February	Weeding	Planting	Weeding	
March	Weeding	Planting	Harvesting	>< >< ><
April	Weeding	Planting	Harvesting	>< >< ><
May	Harvesting			
June	Harvesting			
July				
August				

Source: Field Data, August, 1997

Division of labour between the sexes varies from one household to another. Generally, however, burning and clearing tends to be done by men, cultivation by both sexes, and planting, weeding and harvesting primarily by women. Rice cultivation tends to be under the control of men, whereas the cassava fields are left more to women.

Extension services are as they are throughout the country as a result of retrenchments and low wages. All of those interviewed reported little or no contact with agricultural officers. The Ward Agricultural Officer runs the main guest house at Kirando village and seemed to be too busy with that to be of much help to farmers. However, it is hoped that the level of activity and commitment will improve through the recent appointment of a new Divisional level officer. Furthermore, the International Fund for Agricultural Development (IFAD) has recently been supporting extension services and have built a new house and provided a motorbike for the new officer.

4.3 Livestock keeping

4.3.1 Types and number of livestock kept

Large scale livestock keeping is a very recent phenomenon in the Ward. It started less than two decades ago with an influx of Sukuma agropastoralists from the Central Plateau searching for water and more and better and pastures for their herds. The influx started as a trickle of five households, but now there are over 100 and more are continuing to arrive. Currently, the Sukuma keep between 2,500 and 4,000 heads of cattle in the area. In addition to this, there are also nomadic herders who occasionally bring in as many as 6,000 more animals at a time. Currently there are also 20 improved breed cattle kept under zero-grazing conditions under a small scale dairy cattle project financed by the World Food Programme (WFP).

Approximately 900 goats and sheep are also kept in the area. Most keepers own between two and three shoats, although a few have as many as 20. GTZ has also introduced some 25 improved breed goats to women's groups in Kipili. The project seems to be working well and people are very keen to continue with it.

Very few pigs were seen in the area. In Kipili GTZ has introduced a small number on a trial basis in households which showed an interest. One of these households was visited, but the animal was not well kept; it was short of food and suffering from a severe worm infestation. Other animals kept in small numbers include chickens, ducks, and rabbits.

4.3.2 Grazing patterns, seasonality and methods

During the dry season cattle graze freely throughout the area, feeding on any remaining crop residues, as well as the little grass available. This is the time when evidence of heavy grazing pressure can be seen. During the wet season they graze on the fallow fields amongst the cultivated ones. Some interviewees reported crop damage, while others felt it was not a big issue. If crops are damaged, the owner of the animal is supposed to pay compensation. However, it seems that this depends somewhat on the power, standing, and contacts of the person affected. At the time of the study there was a fairly large group of people who were not happy about the presence of the Sukuma and their cattle, although others appreciated their influence on the agricultural system through the introduction of the use of manure and ox drawn ploughs. Additional grazing during the wet season is sought in the surrounding hills, with cattle being taken up on a daily basis. Some cattle herders set forest fires to encourage fresh growth. At night the cattle are kept in a corrals made of thorny branches and bushes, with a guard.

Cattle keeping is primarily a male activity, while other smaller animals are cared for by both men and women. Boys are generally responsible for herding, with two to three typically responsible for taking a herd of 60 to 500 cattle to pasture. Women are usually responsible for milking and the processing and marketing of milk.

4.3.3 Livestock diseases

Common cattle diseases include Contagious Bovine Pleuro-Pneumonia (CBPP), East Coast Fever (ECF), and Black Quarter. CBPP is the most dangerous, and kills a lot of animals. There is no dipping station in the area, but the cattle are sprayed five times a year. Vaccines and veterinary drugs are in short supply, so many livestock keepers use traditional herbal medicines such as the powdered *ng'andangolwa* or *mpondya*. The more well-to-do order antibiotics from medical stores as far away as Mbeya and Dar es Salaam.

4.4 People's perception of land resources and the environment

There has been a significant problem of flooding in recent years in Kirando village, leading to the destruction of houses and loss of crops (see Appendix C). There is some recognition that this is due to over-harvesting of trees, particularly upstream in the catchment, and that the effects are exacerbated by farming right to the edge of rivers, but this comprehension was not universal. There are no local bylaws to control such practices at present. The village government in Kirando felt that improvements in the education system would help to curtail these activities, and so during problem ranking, put education as a high priority.

Farming is expanding as populations grow and poor practices exhaust the soil. New fields are being cleared along the lake's shore, replacing reed beds, and along the main river, cutting into the remaining woodlands. These are the refuges of hippos, which are now forced to look for food in the fields themselves, raising the animosity of the affected farmers. However, the causal reason is not fully appreciated, and the solution offered by local people is that the hippos should be shot.

Generally, it is felt that there is less rain than there used to be and that the rains are increasingly unreliable. This is perceived to be due to over-harvesting of trees, but this is felt to be necessary due to the need for agricultural expansion to combat soil exhaustion. Field observations show that there are extensive tracts of cleared land, and the problem should, therefore, be how to optimise the use of this land, rather than clearing new fields from the bush.

Soil erosion was observed in a number of places, including Mswa Hill where there was evidence at the base of the hill of deposition of woodland soils from the slopes above. The problem of sheet erosion was most severe on Manda-Kerenge Island, where hill soils have been washed down the slopes leaving only very rocky and stony soils above (although they are visibly better at the bases of the hills!). People appear to understand the forces and processes at play here; some even said that they understand contour farming. However, a considerable number of farmers were still not even making their ridges across the slope.

While some people appreciate that trees around fields may reduce soil loss, they feel that tree roots are a nuisance when tilling, and that shading of crops can be a problem. However, people know about pollarding, as this is done to mango trees, which suggests that tree management or even agroforestry would not be completely alien. Currently, however, use of trees in agroforestry systems is not known, and people leave them in fields for shade only. The general impression was that for many people these issues are not paramount as they view themselves as fishermen first as opposed to farmers. This was, however, somewhat different when talking to those further inland at Katongolo.

4.5 Conclusion

For many along the lakeshore agriculture is a secondary activity. However, just inland many people are primarily herders or farmers or both. In the main, even those whose primary activity is fishing do some subsistence farming. Agriculture, therefore, has an important impact on the lake and the lakeshore environment. The largest impacts were seen to originate from six major factors:

- new fields encroaching onto riverbanks and the shores of the lake where the sandy soils are particularly easily eroded;
- low intensity agricultural practices without sufficient fallow periods leading to soil exhaustion and constant expansion into new areas. This is linked to a lack of knowledge of alternatives;
- agriculture taking second place to fishing to the extent that some issues are not addressed despite the possession relevant knowledge;
- heavy cattle pressure in some areas;
- burning of vegetation to encourage fresh grass in the open grazing areas; and
- a lack of local bylaws and joint action.

Further impacts result from removal of trees on the hills surrounding the area for timber, fuelwood, and poles.

The general level of environmental understanding seemed to be fair, although it varies among individuals. However the commitment to effect change was far less for a number of reasons:

- change may increase workloads;
- there is no motivation to innovate as everyone else is doing the same thing;
- trees, while low in number in the main valley, are not seen as being particularly important in this area;
- soil erosion, while recognised, does not seem to have reached the point where people feel the need to do something about it, perhaps in part because they can still get access to other land when they need it;
- forest fires are started by different types of people for different reasons, all of which need to be addressed for effective control; and
- riverbank damage, again while recognised, is not fully appreciated and again needs to effect everyone.

To overcome these issues there needs to be a combination of education, local government commitment, local bylaws, and local policing, as well as possibly some District level legislation, e.g. regarding riverbank and lakeshore protection.

5 THE SOCIO-ECONOMICS OF THE HOUSEHOLD

Beatrice Marwa and Claude Mung'ong'o

5.1 Introduction

The objective of this part of the exercise was to improve understanding of household characteristics, dynamics, and survival strategies. The first data collection tool used was wealth and social group definition. Informed local team members were asked to define what constitutes “wealth” in the study villages, and then, on the basis of this definition, to identify socio-economic groups.

The ranking criteria in all villages were comparable, and were based on ownership and control of property. Ownership and control of fishing gear and assets such as a modern house, a transport boat with an outboard engine, a lorry or car, a milling machine, or a television and video cassette player, and certain businesses were unanimously identified as important criteria of wealth, although surprisingly, ownership of land and livestock were not.

Hence, a rich household was defined as one that owns a combination of the assets mentioned above, and is able to manage them appropriately. This group is small in all villages, typically comprising less than 20% of households. The majority are better off fishermen who employ and control many other fishermen. Below them is a second group comprising about 30% of households, typically less successful fishermen, or livestock keepers: people who have a boat but not an engine; people who cannot afford to have a burnt brick house with a corrugated iron roof, and whose clothes are usually less smart; but people who work for themselves. Below these two groups is a third much bigger group (45%) to which belong households whose members work for others. These live in mud brick houses with thatched roofs, and generally cannot afford to send their children to school. Below this is a very small, almost invisible group, of very poor households (5%) who live in simple grass huts, or even have nowhere to live, and who have few worldly possessions. To this group of households belong the tramps and beggars.

After these wealth groups had been identified, a sample of households to be interviewed was drawn from each group using the observable indicators identified above. A semi-structured checklist of questions was then used to collect information on household size and composition, educational levels, sources of livelihoods, expenditure priorities, labour use and availability, access to financial resources, health and sanitation, and gender relations and the division of labour. Other data collection tools used included daily timetables, seasonal calendars, and direct observation.

5.2 Types of households

In Tanzania it is normal to find rural households headed by men, if not the husband, then a close kin: a son; a brother; or an uncle. In Kirando village, for example only 4% of households are headed by women. One might expect these female household heads to be either divorced or widowed, but in this case many have never been married. Investigations revealed that women outnumber men – for example in Kirando village by 1.5 to 1 – as a result of a tradition of out-migration of able bodied men (URT/Kingdom of Norway, 1982:3-3). The strength of the Catholic Church in particular has resulted in some women remaining unmarried rather than being part of polygynous households. Some remain within their parents’ or brother’s households, but some become *wasimbe*, enjoying the sexual favours of lovers (a practice strongly frowned upon by the Church) and heading their own households as independent single mothers.

5.3 Household size and composition

Sizes of households in the study area vary greatly depending on the type of household and nature of the village. In Kirando village, for example, where the town-like nature of the community necessitates for many people to stay in one household the size ranges between eight and 15 people, with an average of ten. In Kipili, however, the sizes range between five and eight with an average of six.

In general fertility levels seem to have decreased somewhat in the study villages in recent times. Currently a woman conceives between six and ten pregnancies in her lifetime, down from six to 15 a decade ago. However, typically only five to seven of these babies live to maturity. Age of first pregnancy seems also to have decreased considerably; with girls as young as 13 reported to have given birth, although it was not clear how common this is.

5.4 Dependence ratios

A dependence ratio is the total number of dependant children, elderly and disabled people in a household divided by the number of able bodied adults who form the labour force. In the study area the ratio of dependence varies considerably between one village and another as is illustrated by Table 5.1. On average, however, the ratio of 2.1:1 is quite reasonable given the variety of natural resources available.

Table 5.1 Dependence ratios in Kirando Ward

	Adults	Children	Elderly/disabled	Total dependants	Dependence ratio
Kirando	2.9	6.0	1.0	7.0	2.4
Katete	1.4	2.0	0.1	2.1	1.5
Kipili	1.3	6.2	0.5	6.7	5.3
Manda-Kerenge	1.3	1.1	0.8	1.9	1.5
Katongolo	1.8	2.1	0.3	2.4	1.3
Kalungu	1.1	2.1	0.2	2.3	2.2
Masolo	3.1	4.2	0.2	4.3	1.4
TOTAL	**12.8**	**23.7**	**3.1**	**26.8**	**2.1**

Source: Field Data, August, 1997.

5.5 Educational levels

Except for Kipili, the educational level of most people is very low. Many have gone through primary school but a considerable number have not finished the required seven years of study. This is because they have left school at an early age, the boys to go fishing, and the girls to help with farming. Hence a very negligible number go through to secondary school. Generally, educational levels of women are lower than those of the men, although those of the youth are higher than those of their parents.

In Kipili, where the first secondary school in the Ward is under construction, the village government has passed a bylaw stipulating that every school aged child must go to school. This has helped to keep the majority of children in school throughout the year. Educational levels here are, therefore, a bit higher than in the other villages, and a few young people have already gone to secondary schools in other areas.

5.6 Sources of livelihoods

5.6.1 Agriculture

For many residents, crop production is the main economic activity, and its importance is increasing with the perceived decline in fish stocks, and with the influx of the Sukuma agropastoralists in the area who have introduced the use of manure and ox drawn ploughs. For details, see section 4.

5.6.2 Fishing

Until a decade ago fishing was the main economic activity depended upon by the people of the Ward. However, in recent years fish catches have declined, and are no longer able to satisfy household requirements. For example, elders report that a decade ago sardines were so plentiful that during the fishing season an individual fisherman could fill between 20 and 30 bags per day, while today it is difficult to get even one bag, and a typical catch averages only two or three 20 litre tins. The catamarans have to travel far offshore to get satisfactory catches thus exposing themselves to dangers of piracy. For details, see section 3.

Fishing involves a cross section of the community from gear owners to hired fishermen. Terms of employment are negotiable and temporary. There are also those who process and trade fish. Processing (*kusoloza*) involves cleaning, sun drying, etc., and is usually undertaken by women, who are usually paid in kind. Middlemen buy the processed product and transport it to markets far and wide.

5.6.3 Livestock keeping

Large scale livestock keeping is a very recent phenomenon in the study area. It started less than two decades ago with the coming of Sukuma agropastoralists in searching of pasture. For details see section 4. Milk and meat are sold to the local community. Generally, the production of milk is minimal, with an average Sukuma household getting only about ten litres per day, half of which they consume. Surplus milk can be sold for 140 TSh per litre.

5.6.4 Business

A major business in all villages is the processing and selling of fish and fish products. Other businesses differ from one village to another. For example, in Mtakuja there are businesses characteristic of urban areas, including restaurants, guest houses large shops, and a hectic market. The other villages, on the other hand, have smaller businesses such as small shops and kiosks which sell basic household items. For details see section 6. A popular informal sector business in all villages is the brewing of traditional beers, which is monopolised by women. The strongest and most popular beer is *wanzuki* made from honey. Other common beers include *komoni* and *kisusano* made from maize or cassava and finger millet, which may contribute to food shortages in Katete and Kipili. There were also rumours that *gongo* is distilled, and there was evidence of high levels of alcohol misuse.

5.7 Expenditure priorities

Expenditure priorities differ from one individual to another, from one household to another, and from place to place. Table 5.2 illustrates the expenditure priorities of some social groups.

Table 5.2 Expenditure priorities of some social groups in Kirando Ward (%)

	Fishermen	Male farmers	Women
Buy farm land	10	46	-
Build a house	-	22	-
Food	30	18	45
Clothing	20	-	17
Household expenses	-	-	10
Health care	-	-	28
Entertainment	40	14	-

Source: Field Data, August, 1997

Note the prominence of extra-household expenditure priorities for men and inter-household expenditure priorities for women. In most rural communities in Tanzania household provisioning is the responsibility of women. Note also the difference in priorities between male farmers and fishermen. Men in arduous and dangerous but rewarding jobs, such as fishing, often spend a lot of their money on entertaining. If a fisherman spends all his money, there is always the possibility for him to go back to the lake and catch some more fish and earn some more money. A farmer, however, has to plan his expenses from season to season.

5.8 Labour use and availability

In Tanzania most households depend on the labour force available within the household. When demand exceeds supply they resort to communal labour such as work parties (Mung'ong'o, 1995:107). In Kirando Ward family labour is still depended upon for both agriculture and fishing. However, in times of crisis in farming, such as during the weeding and harvesting periods, *kibarua* (hired labour) is preferred to work parties, although costs are high by local standards (for example, 11,000 TSh to have a one acre rice field tilled, or 16,000 TSh to have the seedlings transplanted, with total costs for all labour for a one acre rice field ranging between 36,000 and 40,000 TSh). Households with fishing gear normally use their youths as hands. When that labour force is not enough outsiders are also hired. Hence, during the fishing season many youths drop out of school.

5.9 Access to financial resources

The basic sources of livelihoods for the people of the Ward are the lake and the land, and every member of the community has the birthright to exploit these resources to the best of his or her ability. In addition to these, however, there are several institutions which have shown willingness to offer loans and/or development assistance, including:

- the Rukwa Association of Non-Governmental Organisations (RANGO), which offers small loans as seed money to local groups;
- the International Fund for Agricultural Development (IFAD), which has recently helped the local Department of Agriculture with working tools (including much needed transport facilities) and technical know-how;
- GTZ, whose involvement is concentrated in issues of food and nutrition;
- the World Food Programme (WFP), which gives out small loans for animal husbandry; and
- a revolving Women's Development Fund provided by the Government of Tanzania.

However, all of these institutions are based outside the area. There are also serious problems of delayed or non-repayment of loans. Most recipients invest in agriculture, but this is fraught with problems of poor technology and unpredictable weather. Those who invest in fishing claim that the business is not so certain these days as catches have declined. At the same time, the number of traders has increased, making trading very competitive and unpredictable, with the price of a 50kg bag of sardines fluctuating between 12,000 and 50,000 TSh in a very short time. Such fluctuations send many small traders out of business.

5.10 Health and sanitation

There are several government and missionary dispensaries, and Kirando village has a health centre for the whole Ward. However, its services are not satisfactory, as it has too few staff, too little medicine, and no functional operating facilities. Generally, health education is provided to mothers who visit clinics, but efforts need to be made to reach all groups of people. People did seem to be aware of the necessity of good sanitation, and although the quality of facilities differed greatly both between and within villages, every home visited had a pit latrine. The people of Manda-Kerenge distinguished themselves as those with the most well kept pit latrines and surroundings generally. Hence it was surprising to learn that diarrhoea and worms were second only to malaria as the main health problems. Although many people know about the need to boil drinking water, they do not because of a shortages of fuelwood and/or because they do not like the taste.

5.11 Gender relationships

5.11.1 Women's labour and time use

Apart from the biological roles of motherhood, women in the Ward spend their time provisioning for their families, cooking, cleaning the house, etc.. Much time is also spent outside the house doing agricultural work, petty business, and attending to community development activities. Figure 5.1 illustrates the daily schedule of a typical woman during the dry and wet seasons. Collecting fuelwood is not reflected here since due to shortages, this activity takes between eight and nine hours. Hence when the need arises a whole day is set aside, normally a Saturday or a Sunday.

Figure 5.1 Women's daily schedules in Kirando village

	Dry season	**Wet season**
0400		Wake-up, fetch water
0500		Prepare children's food
0600	Wake-up	Leave for fields
0700	Fetch water, clean-up	Farmwork
0800	Breakfast	Farmwork
0900	Petty business, handcrafts, etc.	Farmwork
1000	Petty business, handcrafts, etc.	Farmwork
1100	Visit market	Farmwork
1200	Prepare lunch	Farmwork
1300	Lunch	Farmwork
1400	Lunch	Farmwork
1500	Rest	Go home, prepare & eat lunch
1600	Hair plaiting, handcrafts, etc.	Farmwork
1700	Handcrafts, entertainment, etc.	Farmwork
1800	Fetch water	Farmwork
1900	Prepare dinner	Return home & prepare dinner
2000	Dinner, prepare to sleep	Dinner, prepare to sleep
2100	Sleep	Sleep

Source: Field Data, August, 1997

In other villages the workload of woman is increased many fold due to the out-migration of able-bodied men who leave for two months to three years to seek economic advancement in Mpanda and elsewhere. Few of these migrants were reported to remit anything home to help their womenfolk cope with provisioning the family.

5.11.2 Women's control of resources and income

In the tradition of the Fipa and the Tabwa the man controls all household resources and income generated. Even when a woman buys a piece of land from the proceeds of her businesses, it falls under her husband's control. Women can only control land inherited from their families of origin. However, the first child of a family, regardless of sex, traditionally inherited the property of the deceased father - including land - and five such land-owning women were encountered in Katete during the study.

5.11.3 Women's participation in decision-making processes

Village governments have been ordered by the Prime Minister's Office to set aside 20% of leadership positions in the village government structure for women. Thus women are, in principle, in a position to participate in decision-making processes at the village/community level. However, most of the women elected seem to lack the experience and confidence necessary to play an effective representative role, and many can hardly articulate the issues important to them as representatives of their fellow women. At the time of this study none of them had called meetings to identify and discuss issues important to women, and many ordinary women did not even know that there were women representatives in the village government.

6 INSTITUTIONS, INFRASTRUCTURE, MARKETS AND BUSINESS

Hamza Mabochi, Pendo Malabeja and Peter Mgalla

6.1 Introduction

Institutions visited included schools, dispensaries, religious institutions and the market. Further discussions were also held with individual businessmen and women in Kirando village.

6.2 Institutions

6.2.1 Schools

The Ward has five primary schools with a total of 1,644 pupils, 39 teachers and 435 desks (Table 6.1). All have seven classes.

Table 6.1 Primary schools in Kirando Ward

	Number of students					Streams	Avg. class (stream) size
	Male		Female		Total		
	#	%	#	%			
Kirando (Itete)	257	53	227	47	484	13	37.2
Kirando (?)	267	51	257	49	524	14	37.4
Katete	104	55	86	45	190	7	27.1
Kipili	96	52	88	48	184	7	26.3
Manda-Kerenge	135	52	127	48	262	8	32.8
Total	**859**	**52**	**785**	**48**	**1,644**	**49**	**33.6**

Source: Field Data, August, 1997

The school at Itete was established in 1938; the others were all established in 1974. Many of the buildings are old and dilapidated, and there is no housing for teachers. There are also serious shortages of both reading and writing material, and only one desk between almost four pupils.

Except for Kipili, the educational level of most people is very low (see section 5.5), with high dropout rates, particularly for girls, who often leave school to marry while still young; for example, at the time of the study, the final year class at Itete Primary School included only 43% of the girls who had started together in the first year.

There are currently no secondary schools in the Ward, but efforts are being made to renovate the old Fisheries Department compound at Kipili and turn it into a secondary school. The administration block, two classrooms, and some teachers' offices have already been completed.

6.2.2 Medical facilities

There is a 15 bed health centre in Kirando village, two dispensaries in Kipili, and one in the Itete *kitongoji* of Kirando. The health centre was built in 1974 and serves the two Divisions of Kirando and Wampembe. It has a total of 21 staff, and an operating theatre, but lacks instruments and electricity. The supply of medicine is generally very inadequate at both the health centre and the government dispensaries, which depend on the monthly Essential Medicine Programme kits. Missionary dispensaries at Kipili and Itete are able to offer better in-patient care and more medicines, but the costs of treatment there are too high for many. The most common complaints are malaria, upper respiratory tract infections, diarrhoea, venereal diseases, anaemia, and skin conditions.

6.2.3 Religious institutions

The dominant religions are Christianity and Islam. Christianity is represented by all the major denominations, including Roman Catholics, Anglicans, Moravians, and Lutherans. Islam is represented by the Sunni, Ahammadiya, and Jaba. Islam is mostly confined to Kirando village. Religious institutions play an important role in providing social services such as dispensaries and schools. However, they are yet to play a discernible role in environmental education, an area of co-operation which may prove valuable to the Project in the future.

6.3 Infrastructure

6.3.1 Transport

The Ward is connected to Namanyere inland by a 62km long road. There are also 4km of internal of dirt road built by the villagers themselves. However, transportation is very unreliable, depending on occasional lorries and pickup trucks during the dry season only. Most people, therefore, depend on lake transport using local outboard engine boats and the weekly services of the MV Liemba.

6.3.2 Water sources

People depend on water from rivers and the lake for domestic use and for watering livestock. The Ward has a total of six rivers, the Mkamba, the Lwamfi, the Kavunja, the Kalaswi, the Wausubo and the Mlembwe. Other water sources include shallow wells and pumps constructed by individual households with the help of NORAD and/or GTZ. However, a third of these are not functioning as a result of droughts which lower the water table, or flooding which contaminates them, or uncontrolled use by people or livestock. Lack of organised community management means that once a water source is polluted, it is not rehabilitated, but simply abandoned.

6.4 Markets and business

The Ward has a major market in Kirando village, established during the British Colonial period. Initially run by an Arab business community, control has now reverted to the local government. The market has several shops which sell clothing and groceries. Many people come from outside Kirando to sell commodities such as maize, beans, and finger millet which are not produced in large quantities within the Ward. Local people generally do not sell their commodities at the market, as rice is stored and sold from the home to traders, and sardines are bought by middlemen directly from the drying grounds.

7 FORESTRY AND WILDLIFE

Aristides Kashula and Fredrick Malisa

7.1 Introduction

The team assessed the impacts of harvesting and general utilisation of the natural resources of the land and lake. On the land there is hunting and harvesting of wildlife, timber, pole, and fuelwood extraction, charcoal production and the harvesting of medicinal plants. On the lake there is harvesting of animals such as hippos, crocodiles, and other reptiles. Methods included semi-structured interviews and discussions, transect walks, and direct observation.

7.2 Forest resources

7.2.1 Forest types

Four vegetation types were identified:

- the plateau woodland in the eastern part of the Ward. This includes the Itembo, Irambo, Mtimuka and Mwanga forests which form the newly declared Lwamfi Game Reserve. Valuable timber species such as *Pterocarpus angolensis* (*mninga*), *Piper guineaensis* (*mpilipili pori*), *Afzelia quanzensis* (*mpakakofi*), *Milicia excelsa* (*mvule*), and *Khaya anthotheca* (*mnyovu*) are still available and harvestable under licence;
- the dry woodland of Mswa Hill, Chongo-Katete Hill and the hills in Kipili and on Manda-Kerenge Island. Much of this woodland has been destroyed by recurrent fires. The remaining vegetation include species such as *Parinuri curoterifolia* (*mnazi pori*), *Pterocarpus tinctorius* (*mkurungu*), *Lannea* spp (*nakiumbu*), and *Diplorlinchus condylocarpon* (*msongati*);
- scrub and bushes associated with *Acacia* spp. occupying relatively large areas between Kirando, Katongolo, and Katete. The few remnant indigenous trees and shrubs suggest that these are former forests degraded/destroyed by agricultural conversion and fire; and
- riverine vegetation along the lakeshore and the Lwamfi and Mkamba rivers composed of reeds such as *Phragmites mauritanius* and small trees and shrubs such as *Sesbania sesban.* These strips are currently under threat of clearing for agricultural expansion, which has already resulted in observable sedimentation of the lake.

7.2.2 Forest and tree tenure

The forests in the Lwamfi Game Reserve are controlled by the Game Division of the Ministry of Natural Resources & Tourism. Outside the reserve, much of the natural forest exists as common property, but neither village governments nor traditional institutions have laid down any regulations to manage or safeguard it. Collection of forest resources such as fuelwood or poles is open to all, and no one seems to be concerned with the ongoing destruction resulting from agricultural expansion and uncontrolled fires.

7.2.3 Uses of forest products

7.2.3.1 Timber

Most of the timber produced in the area comes from the forests in Itembo, Irambo, Mtimuka and Mwanga. All major species are in short supply due to increases in demand for construction, boat building, and furniture making. According to one carpenter there have been great changes in both the abundance and size of timber trees in recent times. For example, the distance travelled to harvest timber is said to have also increased from four to nine hours during the last five years, and logs now typically only yield nine to ten boards, as opposed to 24 in the past.

In the village of Kirando there are six carpentry (furniture) workshops which use about 600 boards per month, mostly *mninga* and *mpakakofi*. Timber is also required for making cargo, passenger, and fishing boats, and again *mninga* and *mpakakofi* are the preferred species, as they are durable, comparatively light, and resistant to decay. About 350 boards are needed to build a cargo boat, although they are built less frequently than furniture.

Increased demand for timber has attracted people to the timber extraction business, and in the last seven years the number of dealers in Rukwa Region has more than doubled to 18. These dealers operate under licence, but their activities are often not checked and more wood is sometimes taken than is permitted.

7.2.3.2 Fuelwood

Miombo (*Brachystegia* spp) species are preferred for fuelwood, which is collected by women for domestic use, for brewing traditional beers, and for sale. Two decades ago women spent only an hour travelling to and from fuelwood collection areas, but today it takes up to eight hours. In a week a typical household uses about four headloads consisting of 15 - 20 pieces approximately 280cm long with a girth of 45cm ($3.2m^3$ in total). Demand for fuelwood has increased with the increase in beer brewing. The team was told that at least ten 200 litre drums were brewed each day in Kirando village alone, and that each drum requires about $1m^3$ of wood. This has caused the emergence of a group of women who collect fuelwood for sale.

7.2.3.3 Charcoal

Very few people produce charcoal for local consumption in the study area. Much of the charcoal produced here is commissioned by eight licensed dealers from the neighbouring Regions of Mbeya and Iringa and sold in the urban centres of Sumbawanga, Namanyere and Mbeya. Between 480 and 560 bags of charcoal are produced monthly.

7.2.3.4 Medicinal uses

People have a wide knowledge of the medicinal uses of local trees and shrubs. A licensed herbalist/traditional healer told the team that he uses combinations of tree and shrub species to treat a wide range of illnesses, including headaches, intestinal problems, mental illnesses, and evils spells. Tree species used include *Morus alba* for headaches and *Syzygium cumnii* for dizziness. He complained, however, that some tree species are now difficult to find as woodland and forest are cleared for agricultural expansion.

7.2.4 Tree planting

Except for fruit trees such as mangoes, coconuts, oranges, etc., which were introduced to the area long ago, planted trees are not very common in the Ward. In the mid 1980s the government launched a District-wide tree planting programme, but this received a very lukewarm reception, perhaps because tree resources were still plentiful. However, a few individuals and institutions such as schools, religious missions, and dispensaries planted seedlings, and today species such as *msonobari* (*Senna siamea*), *mkungu* (*Albizia lebek*), and *mzambarau* (*Syzygium cumnii*) grace the landscape in all of the study villages. Problems with tree planting include uncontrolled bush fires, uncontrolled grazing and browsing, and termites.

7.2.5 Conservation of trees and forests

7.2.5.1 Local beliefs, customs, and folktales related to trees

The team learned that historically trees and shrubs used for ritual and religious functions were conserved, for example, individuals of species of *mkuyu* (*Ficus thoningii* and *F. zanzibarica*) which were traditionally used as places of worship and of sacrifice to local gods to prevent calamities such as drought, locust plagues, famine, and disease. Traditional ideologies inculcated a strong belief in the minds of the people that these trees were able to harm whoever attempted to cut or harm them, and many remained undisturbed for a long time. The elders complain, however, that such beliefs are losing their hold due to modernity and the advent of new religions which worship distant gods with no direct relationships to nature and the local environment.

7.2.5.2 People's perception of trees and forests

Attitudes differ by social group. Women, for example, consider trees as sources of energy for domestic use and local beer brewing, and of fruit for their children, and showed a remarkable awareness of the importance of increasingly scarce wood resources. Organised groups had even initiated some measures to try to reduce the fuelwood crisis, such as establishing and running their own tree nurseries, and the introduction of the *bana matumizi* fuel efficient stove. For fisherman trees are sources of timber for making boats, canoes, and fishing gear. To farmers, some trees are good for maintaining soil fertility. However, most farmers would not hesitate to fell a tree during farm preparation if it would create too much shade for the crops. Cattle keepers consider woodlands and forests as pastures and shade for their animals, but they also harbour tsetse flies, ticks and other harmful vermin and parasites, which could be got rid of by felling the trees. To charcoal dealers the forest is a factory and a good short term source of income. When the good trees have declined in number, they leave for other more lucrative areas.

7.3 Wildlife resources

The Ward borders the Lwamfi Game Reserve, which influences the species recorded. No animal census has been done in the study area, but the following were mentioned by villagers and the Ward Wildlife Officer:

- carnivores, including lions, leopards, jackals, hyenas, civets, and otters;
- herbivores, including various types of antelope and gazelle, eland, sitatunga, buffalo, bushpigs, warthogs, and hippopotami;
- baboons and other primates; and
- reptiles, including a variety of snakes, crocodiles, tortoises, monitor lizards, etc.

Different wildlife species have different uses, as illustrated in Figure 7.1.

Figure 7.1 Wildlife utilisation ranking

Animal	Meat	Sale	Medicine	Decoration	Traditional
Lion	•	•	•••	•	••
Leopard				•	
Jackal	••		•		
Civet	•		•••		
Otter	•••		•••		
Sitatunga	•			•	
Buffalo	•				
Hippopotamus	•••	•	•		•••
Baboon					
Snakes			•	•	•
Crocodile	••	•	••	•	
Tortoise	•	•••	••	•	•

Source: Field Data, August, 1997.

Notes:

- lion: internal parts are used to make *hirizi* (local talismans); the bones are used in rituals and worship; the mane is worn in order to threaten others;
- leopard: the skin is highly valued.
- jackal: parts of the body are used as a cure for epilepsy;
- civet: parts of the body are used as an aphrodisiac and to treat some mental illnesses;
- otter: the reproductive organs are used as medicine for strengthening male reproductive capacity;
- hippo: the bones are mixed with the bark of *mninga* and used to treat general pain and leprosy; and
- tortoise: part of the tail is used to treat people with haemorrhoids;

According to local informants there has been a decline in animal populations in the last two decades as a result of increased human populations and expansion of settlements and farm land, and over-harvesting for highly sought after meat and trophies. Increased immigration of people from Congo is said to have exacerbated the situation as new meat preferences (e.g. the eating of baboons) and demands for trophies have been introduced to the area.

7.4 Conclusion

It appears that in the past animals were abundant in the study area, and interacted little with humans. Wildlife utilisation was minimal as people depended on fish for protein. However, in the last two decades population increase has caused expansion of agricultural lands and settlements. Along with increased exploitation of forest resources such as timber, poles, fuelwood, and wood for charcoal production, this has resulted in disturbance and destruction of habitats. Animals such as buffaloes and sitatunga are no longer seen in the area, while hippos have turned to farmland for grazing, and become aggressive, killing and maiming people.

8 CONCLUSION AND RECOMMENDATIONS

8.1 Environmental impacts of production

8.1.1 Fishing

There is lack of unanimity on the issue of degradation of fish stocks, and people's perceptions of the long term viability of the fishery differ from village to village. While in some villages people have demonstrated a high level of awareness, others care little about over-exploitation or sustainability of resource use. Unsustainable practises result from:

- the incidence of piracy which has forced fishermen to limit their activities closer to the shore and caused a change to the use of smaller meshes which catch both juvenile and adult fish; and
- the growth of modern poultry industries in the urban centres of the region, which has increased the demand for sardines and juvenile forms.

Furthermore, varied sources of demand complicate attempts to regulate fishing as there are too many stakeholders at too many levels, the majority of whom are too far from the lake to have any knowledge of and/or concern for its biodiversity.

8.1.2 Land use practices

The largest land use impacts on the environment of the lake were seen to originate from:

- new fields encroaching onto riverbanks and the shores of the lake where the sandy soils are particularly easily eroded;
- low intensity agricultural practices without sufficient fallow periods leading to soil exhaustion and constant expansion into new areas. This is linked to a lack of knowledge of alternatives;
- agriculture taking second place to fishing to the extent that some issues are not addressed despite the possession relevant knowledge;
- heavy cattle pressure in some areas;
- burning of vegetation to encourage fresh grass in the open grazing areas; and
- a lack of local bylaws and joint action.

Further impacts result from removal of trees on the hills surrounding the area for timber, fuelwood, and poles.

8.1.3 Use of forest and wildlife resources

Pressures on forest and wildlife resources result from agricultural expansion, as well as over-harvesting of animals, poles, timber, and wood for domestic use and charcoal production, and uncontrolled burning. The effects of these are exacerbated because much woodland and forest exists as common property. Neither village governments nor traditional institution have laid down regulations to manage or safeguard them, and collection of resources such as fuelwood or poles is at the discretion of the individual, with no one concerned with the ongoing destruction.

8.2 Environmental awareness

The general level of environmental understanding seemed to be fair, although it varies among individuals. As a group, women showed the highest levels of awareness, particularly with respect to wood resources, and have even initiated measures to alleviate fuelwood shortages, such as establishing and running tree nurseries and adopting energy saving stoves. However the commitment to effect change was far less among other groups for a number of reasons:

- change may increase workloads;
- there is no motivation to innovate as everyone else is doing the same thing;
- trees, while low in number in the main valley, are not seen as being particularly important in this area;
- soil erosion, while recognised, does not seem to have reached the point where people feel the need to do something about it, perhaps in part because they can still get access to other land when they need it;
- forest fires are started by different types of people for different reasons, all of which need to be addressed for effective control; and
- riverbank damage, again while recognised, is not fully appreciated and again needs to affect everyone.

8.3 Problems and prospects for improved resource utilisation and management

To overcome these issues there needs to be a combination of education, local government commitment, local bylaws, and local policing, as well as possibly some District level legislation, e.g. regarding riverbank and lakeshore protection. However, the following issues will be important to consider when planning interventions.

8.3.1 Perception gap

Government officials and local natural resource users often have different perceptions of environmental problems (cf. Kikula, 1986). While the official view is drawn from the little formally collected data available, and often derived from generalising global scientific ideas, local land users' views are based upon direct observations, local values, and personal experiences. The final interpretation of change in various indicators and the assessment of its impact on natural resources is often coloured by such differing backgrounds. For example, a study in Kondoa District found that despite extensive gullying villagers did not perceive it to be a major problem as many of them had grown up seeing it all their lives, and considered it to be a natural phenomenon (Dejene *et al.* 1997:18). Thus it will be important to enhance local resource users' abilities to interpret change according to new circumstances, and to improve local knowledge by intermarrying it with scientific knowledge.

8.3.2 The politics of conservation

Many rural people are suspicious of the intentions of outsiders who come in with new ways of doing things, often as a result of bad experiences with previous state interventions.

8.3.3 Low levels of education

Educational levels in lakeshore communities are very low, and environmental education programmes should bear this in mind when considering methods of imparting knowledge and learning. The situation among women is particularly important, as although they are the least educated, they are the most aware of environmental problems, and the most willing to take action to solve them or ameliorate their effects.

8.4 Protected Area management

Recognition that successful management of Protected Areas (PAs) ultimately depends on the co-operation and support of local people has been growing among conservationists and natural resources managers in many places in the world. Projects like the Communal Area Management Plan for Indigenous Resources (CAMPFIRE) in Zimbabwe and the Lwangwa Integrated Resource Development Project (LIRDP) in Zambia have been established under such assumptions, and have recently taken the limelight as models of this supposedly new outlook in the management of natural resources in PAs (Wells & Brandon, 1993).

This outlook is not new to Tanzania. The problem of environmental degradation has been a concern of the government for a very long time. However, earlier conservation efforts generally not only ignored the needs of communities living in and adjacent to game and forest reserves, but also deprived them of means of subsistence through eviction or restrictions on access to land, pastures, and forests. Conservation programmes therefore become indistinguishable from the destructive aspects of the dominant patterns of development (Ghai, 1994:7). It was in realisation of these weaknesses in the prevailing approaches to conservation that institutions such as the Ngorongoro Conservation Area Authority began experimenting with the idea of *multiple land use*, with the aim of integrating biological conservation, conservation of the archeologically important features of the area, and livestock grazing by the resident Maasai pastoralists (Boshe, 1989). Twenty-five years of largely successful implementation have led not only to emulation by other conservation areas, but also to the emergence of a new rural development paradigm in Tanzania.

The underlying assumption of the paradigm has been that local communities can best manage natural resources such as wildlife and forests if they are assured of clearly defined user rights, proper incentives, and the information and know-how to do it. Local people are thus expected to participate in the process of design, establishment, and management of conservation areas. The aim of such a participatory approach to decision-making is to allow all stakeholders to express their objectives in natural resource use and management, and to decide on how these can best be achieved. Furthermore, it allows stakeholders to evaluate the alternative uses of ecosystems according to their specific rationales, and hence empowers local people to make better use of and protect their environment. At a more theoretical level, it provides better information for use in resource management as a result of the intermarriage of indigenous and scientific knowledge (Tacconi & Benett, 1995:93).

According to the Tanzanian legislation governing wildlife and forestry conservation, however, Community Based Natural Resource Management (CBNRM) is not possible in National Parks (NPs) and Forest Reserves (FRs) as they are both still governed by the concept of non-consumptive protection and exclusion. Thus, devolution of management responsibilities to village governments and the development of a conservation system based on sustainable natural resource use according to local needs and priorities may, therefore, not be possible in the near future in the absence of a major review and amendment of the relevant legislation.

Furthermore, there are problems with administrative structures in the forestry sector. At the national level there is the Forestry and Beekeeping Division (FBD), which defines policy and lays down guidelines for the management of FRs, and is actively involved in the management of industrial plantations, watersheds, and community based afforestation and soil conservation projects. However, recent changes in the country have devolved much power to the District Councils, which are substantially independent of the central government, and which each include a District Natural Resources Office (DNRO). But, there is no direct link between the FBD and the DNROs, making it difficult to identify whom local communities should deal with in order to progress CBNRM projects.

A similar confusion exists within the institutions managing wildlife resources. While NPs operate under the direct management of TANAPA, Game Reserves are under the control of the Director of Wildlife in the Ministry of Natural Resources & Tourism, and neither of these institutions have any direct links with the local institutions at the District level or below. Meanwhile, however, both NPs and FRs are facing tremendous pressures from the communities living adjacent to them, which require local solutions.

8.5 Community Based Natural Resource Management

Over and above the awareness raising campaigns and token incentives currently offered to local communities by TANAPA, there is need to find new approaches that will genuinely involve local communities in the management of natural resources and allow them to reap their rightful benefits now and in the future. An example of an innovative approach to CBNRM is provided in the Marine Parks and Reserves Act of 1994. The objectives of the Act are to:

- protect, conserve, and restore the species and genetic diversity of living and non-living marine resources and the ecosystem processes of marine and coastal areas;
- to stimulate the rational development of under-utilised natural resources;
- to manage marine and coastal areas so as to promote sustainability of existing resource use, and the recovery of areas and resources that have been overexploited or otherwise damaged;
- to ensure that villages and other local resident users in the vicinity of, or dependent on a marine park or main reserve are involved in all phases of the planning, development and management of that marine park or reserve, share in the benefits of the operation of the protected are, and have priority in the resource use and economic opportunity afforded by the establishment of the marine park or reserve;
- to promote community-oriented education and dissemination of information concerning conservation and sustainable use of marine parks and reserves; and
- to facilitate research and to monitor resource conditions and uses within marine parks and reserves.

The Act is now being implemented in the Mafia Island Marine Park.

At another level, there is need to create local FRs with local control of all aspects of management and utilisation. An example of such an effort is reported from the Coast Region where Regional and District Authorities have produced a Coast Region Forestry Action Plan (CRFAP) in realisation of the need to translate the national Forestry Action Plan into an implementable plan and process at the Regional and District level. According to the CRFAP document, the protection of forests and biodiversity is envisaged through, first, clear demarcation and protection of District FRs, and secondly, through encouraging villages to set aside Village FRs (RDD's Office, 1991). The rationale for this is the belief that the Districts are more likely to want to take protect their FRs because of their catchment values and revenue earning potential, while villages are more likely to want to manage their FRs for sustainable production of fuelwood, poles, etc.

However, initiatives such as these require that institutional mechanisms for improved community resource management be put in place. Village and local governments need to be strengthened to be able to manage their natural resources sustainably. However, many local leaders have little knowledge of natural resource and environmental management. Thus environmental education programmes should include as a priority capacity building for local government institutions and officers.

Many local communities have specialised meetings where important issues are threshed out and consensus reached. One such institution which could be useful to the environmental education programme in the Ward is the local *Vikao vya Kobasheka.*

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APPENDIX A: TOR FOR THE NATIONAL SOCIAL SCIENCES CONSULTANT

1. In Dar es Salaam: become familiar with Project documentation on the SESS, EE, Rukwa Region and the work to date in Tanzania; meet with the PRA facilitator/trainer Steve Evison, agreeing on respective roles and methods of investigation for the PRA fieldwork; liase as necessary with the Scientific Liaison Officer, Kelly West and FPSS leader, Philippe Petit in Kigoma to plan the logistics of the field mission.

2. Travel to Kigoma, meet with Project staff to continue planning the fieldwork, becoming familiar with PRA work to date and that of FPSS, and agreeing on a clear division of labour with the FPSS leader, and meet with local members of the PRA team.

3. Travel to Rukwa and co-ordinate the assembly of the Rukwa PRA team members, attending any necessary meetings with local government and NGOs. Participate fully in a PRA planning and training session for the whole team at a local venue to be arranged.

4. Lead and co-ordinate the PRA fieldwork and analysis of findings by the whole team, to follow immediately, ensuring adequate coverage of the following points, as a complement to the detailed FP investigations led by Philippe Petit:

- livelihood strategies generally;
- availability of agricultural land, crop production, arable provisioning and incomes;
- forest and other terrestrial resource management issues, including the adequacy of land cover, energy and wood supplies, and the likely degradation and erosion risks;
- stakeholder groups and social differentiation at village level, gender issues; and
- village level institutions and leadership; links with the state, NGOs and development projects.

5. Ensure that the Rukwa Regional and local government authorities are kept fully informed about the fieldwork mission and its outcome, organising a delegation from the team to travel to Sumbawanga to debrief.

6. Discuss with the FPSS leader the question of characterising the socio-economic significance of different fishing practices in specific locations, and assist him to do so for the fieldwork sites.

7. On the basis of the fieldwork and background knowledge of the region, assess the incentives and constraints for improved community resource utilisation and participation in natural resource management. Consider what would be required for a longer term study on strengthening Protected Area management in both Rukwa and Kigoma Regions by developing incentives and institutional mechanisms for improved resource management by local communities.

8. Identify and recommend possible initiatives for in-depth socio-economic research in the area, development assistance and income generating activities which the Project could directly support or promote.

9. On return via Kigoma and Dar es Salaam debrief in full to the SLO (in Kigoma) and the Project Co-ordinator (Andy Menz, in Dar) covering overall findings, recommendations, logistics of the mission, and performance of team members, including any advice for the conduct of future PRAs, for follow up EE work, and the training needs of team members. Leave an outline or draft report, with recommendations for the Project team in Tanzania.

10. Within ten days of the end of the mission (or within a period to be agreed with the PCU) provide a full report in hard copy and electronic format (preferably MSWord 6, or compatible) to meet the ToRs, integrating the contributions of the different team members and the PRA results. Be available to revise the report according to comments received from the Project team in Tanzania and the SESS/EE Co-ordinator at NRI, UK.

APPENDIX B: ITINERARY

21/08/97	Depart Kigoma aboard MV Liemba
22/08/97	Arrive Kirando
23/08/97	Meeting with village leaders; PRA at Kirando village
24/08/97	PRA at Kirando village
25/08/97	PRA at Kirando village
26/08/97	PRA at Katete
27/08/97	PRA at Kipili
28/08/97	PRA at Manda-Kerenge
29/08/97	Visit Kalungu (FP Team) and Katongolo (SE Team)
30/08/97	Depart Kirando aboard MV Liemba
31/08/97	Arrive Kigoma
01/09/97	Report writing at TAFIRI, Kigoma
02/09/97	Report writing at TAFIRI, Kigoma
03/09/97	Report writing at TAFIRI, Kigoma
04/09/97	Report writing at TAFIRI, Kigoma
05/09/97	Debriefing of SLO at Kigoma
06/09/97	SE and CM travel to Dar es Salaam aboard ATC
07/09/97	PP and Rukwa travel to Sumbawanga
08/09/97	Debriefing of Regional Heads at Sumbawanga

APPENDIX C: HISTORY OF KIRANDO VILLAGE

1888	German Catholic Missionaries of the Order of the White Fathers build a church at Jiwenikamba and establish a mission.
1900	The villages of Katambo and Mtakuja are joined to form the present day Mtakuja sub-village.
	The European John Komm arrives.
	River Kavunja floods for the first time due to heavy rains.
	Mzee Mtambala moves to Kirando from Goma and introduces the cultivation of cassava, sorghum and groundnuts.
1934/35	Year of the locusts: much of the rice and sorghum crop is destroyed resulting in a major famine. Chief Mwene Kapele exhorts his people to cultivate more.
1936	The Catholic Church at Kirando is completed. The Catholic Mission at Jiwenikamba moves into the new premises.
1939	WWII: some villagers are conscripted into the King's African Rifles and go to fight in Burma.
1954/55	The Independence struggle reaches Kirando. The first TANU office is established.
	Second hand clothes locally known as *kafaulaya* are introduced by Christian missionaries.
1962	Lake Tanganyika floods for the first time due to the blockage of Lukuga outlet in eastern Congo. Many gardens on the lakeshore are destroyed.
1971	River Kavunja floods again destroying a considerable number of homes.
1974	The Villagisation Programme is at its most intense. Houses in the surrounding areas are burnt down to force people to concentrate in Kirando, and the population almost triples.
1978/79	Cholera hits for the first time and affects many people.
1980	River Kavunja floods, forcing people to move out of Itete temporarily.
1985	River Kavunja floods again. A total of 120 houses are destroyed.
1986	Lufungulo the Pirate, a deserter from the Zairian Army, begins his notorious activities in the area.
1995	Lufungulo the Pirate is captured by the Tanzanian authorities.
1997	River Kavunja floods again devastating a major part of Kirando village. A total of 146 houses are destroyed, along with three quarters of the pit latrines, which pollutes many shallow wells.

Source: Villagers at Kirando, 24 August 1997

APPENDIX D: HISTORY OF KATETE VILLAGE

1940	Mzee Rupia and his brother Kazimoto, originally from Goma, move to Katete from Wampembe and establish a fishing camp.
1950	Mzee Rupia and his brother return to Wampembe, but seven fishing households remain.
1962	Lake Tanganyika floods. People are forced to leave the shore for higher ground.
1974	The Villagisation Programme is at its most intense. People from surrounding villages are concentrated at Katete. Mr. Jeronimo Kasogela is elected for the first time as the Chairman of the Village Council under one-party rule.
1975	The primary school is completed.
1995	Mr. Jeronimo Kasogela loses his leadership of the Village Council to Mr. Boziano Mwandamila.
1996	Mr. Jeronimo Kasogela is reinstated as the Chairman of the Village Council under multi-partyism.

Source: Mzee Nicholas Mfuswa and six villagers at Katete, 26 August 1997

APPENDIX E: HISTORY OF KIPILI VILLAGE

Kipili is purportedly named after a huge puff adder which lived in one of the many caves in the village. For fear of the snake the cave became a sacred place of prayer and sacrifice.

1888	Kipili is a small village of thirty to forty households, many from Goma, fishing and cultivating rice, bulrush millet, sorghum and maize.
	German Catholic Missionaries of the Order of the White Fathers build a church at Jiwenikamba and establish a mission.
1920	The port is built by the British administration.
1938/40	Some areas around Kipili are prospected for minerals.
1941/42	WWII: the late Matias Tanganyika, Josefu Mselepete, Aloisi Kiteni and others are conscripted in the King's African Rifles and go to fight in Burma.
	Mzee Kamwanga is imprisoned for six months in the Sumbawanga District Prison for assaulting the DC's cook who had tried to molest a village woman.
1959/60	The port is closed due to lack of business and poor relations with the community.
1970/71	The primary school is completed.
1974	The Villagisation Programme is at its most intense. People from Jiwenikamba and surrounding villages concentrate in Kipili doubling the population.
1979	Ugandan War: villagers contribute in cash and kind to help the war effort.
1988	The village dispensary begins its operations in the old Rest House.
1991	A Moravian Mission is established.
1992	An Austrian, Mr. Hristo Blige, starts work on the *Leopold Hotel* on Kikopyo Bay.
1994	Kipili is joined to Kalungu and Katongolo by a road built by the villagers themselves.
1997	Renovation of the former Fisheries Institute to house a secondary school (on-going).

Source: Four elders at Kipili, 27 August 1997

APPENDIX F: HISTORY OF MANDA-KERENGE VILLAGE

1880	Mzee Manda from the Ufipa Plateau settles on the island which becomes known as Manda Island.
1890	The German administration builds a boma. Their houses with sloping roofs are called *kerenge* by the local population, and the island becomes known as Manda-Kerenge.
	German Catholic Missionaries of the Order of the White Fathers at Jiwenikamba free slaves captured by Arab traders what is now Congo and resettle them at the mission and on the island.
1915/18	WWI: the late Mzee Josefu Makaranga and others are conscripted to fight for the Germans.
1919	The British administration take over from the defeated Germans.
1939/45	WWII: Mzee Kantemba, John Chubwa, Fideli Balagemwa and others are conscripted and go to fight in Ethiopia and Burma.
1957	The first TANU branch is opened at Manda-Kerenge by Mr. Leo Pinda and his associate from Mbeya.
1969/70	Communal fishing activities begin in the village. Groups of fishermen are given free fishing gear by the government.
1974	The village's fishing gear is stolen by unknown people.
1984	The village receives a loan of fishing gear worth 100,000 TSh.
1985	The loaned fishing gear is stolen. The government provides 80,000 TSh to repay the loan.
1994	The dispensary is completed, but lacks staff and medicine.

Source: Mzee Urbano Mpepo, Paulo Kisi, Michael Chezi, and Liberatus Wankoka, 28 August 1997