Shortcomings of Linkages between Environmental Conservation Initiatives and Poverty Alleviation in Tanzania

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ABBREVIATIONS

GTZ	German Technical Cooperation
IRA	Institute of Resource Assessment
IRALAS	Innovative Rural Action Learning Areas
NGO	Non Governmental Organisation
PRA	Participatory Rural Appraisal
SCAPA	Soil Conservation and Agro-forestry Project in Arusha
SGR	Saadan Game Reserve
TANAPA	Tanzania National Parks
UMNP	Udzungwa Mountains National Park
UNDP	United Nations Development Programme
ULANGACO	Ulanga Rice and Cotton Company
URT	United Republic of Tanzania
VEO	Village Executive Officer
WWF	World Wildlife Fund
ZFR	Zaraninge Forest Reserve

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ABSTRACT

This study has established many potential links between environmental conservation, economic activities and poverty alleviation. The economic activities can be both at a commercial scale and at a subsistence level. We have established that agricultural based commercial enterprises that provide employment and boost the local and national economies are not sustainable without conserving the environment that forms the source of water. Conservation measures around such enterprises also protects them against flooding and other environmental calamities. Yet, it was noted that despite these linkages such economic investments do not support the environmental conservation initiatives.

At the subsistence level, there is a big potential for integrating environmental conservation and poverty alleviation. Intensification of smallholder agriculture (e.g. through agro-forestry systems) that serves both to conserve the environment and contribute to the household economy is a possible area. Tree and grass "farming" for tree products, fruits, hay and thatch material is a viable activity that can serve in both environmental conservation and income generation. Related activities include bee keeping.

This study has demonstrated that these opportunities are not being effectively utilised for a number of reasons including, among others, lack of education and skills. This applies to both communities and the extension staff. The extension personnel is ill equipped to effectively demonstrate many of the agricultural intensification technologies to an extent that the target groups get disillusioned and give up. Poor, lack of both markets and the knowledge about the markets for the produce discourage invasiveness. In some areas land shortage is a serious impediment. Lack of community participation and lack of effective representation of women in community activities are some of the constraints.

1.0 Introduction

1.1 Background

This study is a survey of conservation initiatives and interventions that can, at the same time, be used as entry points for addressing issues of poverty alleviation. Hitherto the fairly well established poverty-environment dualism has in most cases been looked at from the causative point of view, i.e. that poverty exacerbates environmental degradation and vice versa.

The poverty-environment concept has been extensively discussed among academics and development workers alike. The work of Kates and Chen (1993) is a case in point. The question that has not been properly addressed in the process this discussion is how measures geared towards solving environmental degradation could also be used as means of alleviating poverty.

This study aims at identifying these interventions that are specifically geared at addressing environmental degradation but which can at the same time be packed and sold to alleviate poverty. Examples of such interventions are agricultural intensification systems that include agro-forestry, tree planting and conservation of vegetation. There is a big potential for such systems to be used in addressing environmental degradation, food security and poverty alleviation through sale of trees and crops. For example, the national tree planting campaigns in Tanzania that started from the 1970s would have made much more impact to the rural poor if they had been sold as multi-purpose initiatives rather than purely as environmental conservation strategies much as the poor communities may not necessarily appreciate such an approach.

On face value, one would have expected that the rural poor would have taken opportunities offered by these interventions. Paradoxically, despite the fact that over 50 per cent of the population in Tanzania is living below the poverty line, there are many instances where poor households have not responded to such multipurpose interventions. This study, intended to establish the factors behind this paradox and also assess the potential of such an approach.

1.2 Objectives of the Study

This study has been done in two phases. The first phase was essentially exploratory in nature and had three objectives as follows:

- First, to take stock of existing interventions that were potentially multipurpose in function. The origin of the interventions, how they were packaged when they were first introduced in the study areas was of particular interest. Also, the study endeavoured to establish the organisational structure and management of such interventions;

- Secondly, to establish how far these interventions could be used to address environmental and social issues, including poverty alleviation; and
- Thirdly, to establish explanations as to why the opportunities for multipurpose gains of the various functions are not being more widely taken up by even the poor communities.

It was envisaged that the information, which was obtained in the first phase, would form the basis for a more in-depth study during the second phase. The in-depth study in the second phase was intended to determine in detail the contribution of the interventions to the potential multi-purpose poverty alleviation functions. Possibilities for replication to other areas with similar conditions were also assessed during the second phase of this study. This paper presents the results of the study.

1.3 Significance of the Study

The results of this study reveal the opportunities and constraints facing the adoption of multi-purpose environmental conservation interventions that simultaneously address environmental issues, poverty alleviation, and other socio-economic issues. It is expected that the study results will facilitate creation of synergy of related initiatives and minimize diverse (often) sectoral rural development initiatives. The main objective is to reduce contradictory messages and reduce duplication of initiatives that inundate the rural communities thus putting unnecessary demands on people's time.

1.4 Methodology

1.4.1 Sampling Strategy

The data was collected from three sample areas (see Fig. 1) selected to represent different physical, climatic and socio-economic conditions. The three areas include: the surroundings of Zaraninge Forest Reserve (Bagamoyo district), areas adjacent to Udzungwa Mountains National Park and Selous Game Reserve, the sugar and teak estate (Kilombero district); and the extremely eroded landscape of the Kisongo Ward in Arumeru district, Arusha region.

Sample villages surrounding Zaraninge Forest Reserve (ZFR) in Saadani were, Matipwili-Wami and Mkange. The eight villages covered in the areas adjacent to the Udzungwa Mountains National Park, the Selous Game Reserve and sugar and teak estates were: Mwaya, Mgudeni, Mang'ula A and B, Mhelule, Mikoleko, Msalise and Kanyenja. In Kisongo Ward of Arumeru District, two villages were covered, these were: Engorola and Ngorbob.

The idea for this research came from the observation made by the senior author of this research report during some previous work in Kilombero area that the areas adjacent to Udzungwa National Park faced acute shortage of wood

resources resulting into a lot of pressure on the park for wood fuel both for domestic and local brewing uses by the surrounding communities. It was then felt that tree planting in the areas adjacent to the park would have a multiple value by relieving pressure on the park vegetation thus playing an important conservation role and secondly conservation of such an important catchment would continue to sustain the local economy in terms of water supply, agriculture, tourism, etc. At the same time, the excess of the planted trees could be sold as wood fuel, timber, building poles etc. thus contributing to poverty alleviation.

Similar observations were made in many other areas of the country which influenced the selection of villages to be visited. Thus, one of the selection criteria was the relative proximity to protected areas such as the Zaraninge Forest Reserve (ZFR), the Saadani Game Rerseve (SGR) and the Udzungwa Mountains National Park (UMNP). Other villages such as those of parts of the Kilombero Valley were selected based on their proximity to large-scale plantations or settler farms. Kisongo Ward was selected because of observed conservation activities that link very well with poverty alleviation initiatives.

1.4.2 Data Collection Techniques

A combination of data collection methods were used in this study, including PRA Workshops, meetings with village leaders and key informants, and focus group discussions.

Like in all rural communities in Tanzania, the micro level administration of the three study areas revolves around the Village Council. The village meetings in the sample villages comprised 25 members including the Village Chairperson and the Village Executive Officer (VEO) who are also members of the village council. The Councils have the mandate to make decisions on all matters of public resource use in the village. There are three Statutory Committees of the Village Council, namely, planning and finance, social service and community development and security.

Without exception, there was no evidence that these committees met at regular intervals. It was, nevertheless, interesting to note that relatively young educated people occupied both the village chairmanships and the VEO in the three study areas. This indicates that education has become an important factor even among these people in matters of governance and dealings with politico-economic forces from outside the village.

Meetings with village leaders and key informants were held in village offices where VEOs, chairperson, and other members of the village governments provided general information on major economic activities in the village, their relationship to natural resource use and management and on major conservation initiatives and how these, if any, have helped alleviate poverty in the local

communities. Various human population characteristics were also gathered during these meetings. Unlike the other study areas, Kisongo Ward is mostly dominated by pastoralist, data were virtually absent in the village and ward offices.

In each village visited, PRA workshops were held with the village council leaders, village elders, members of women groups, tree planting groups and the general public. During the workshops the objectives of the study were introduced to the participants. Broad discussions were then held to determine the various conservation initiatives and linking them to the key issue of poverty alleviation.

Focused group interviews took place with selective numbers of villagers in the three sample areas. The aim was to fathom the issues raised in the PRA Workshops and allow the opinions and views of those who could not speak to be recorded. It was also intended to gauge de facto and possible local participation in resources management for poverty alleviation in some detail; especially so in terms of gender and generational differentiation to resources management and utilisation.

Participatory mapping to outline physical and spatial aspects of land and sea resource use could not be accomplished as expected due to lack of time. However, important sites such as tree nurseries, local woodlots, buffer zone demarcations, were visited with the objective of on site ground verification.

More information was sought from the focused group discussions: land tenure and land use, Game Reserve and forest conservation and exploitation for meat, fuel wood, medicine and other cultural aspects. Gender differences in perception and interests were closely observed during the discussion process. In all cases efforts were made to verify the sources and identify possible areas of misinformation.

Hence, although the period of research was only four weeks, the conclusions made in this study are indicative of what is taking place in the three sample areas. There is substantial potential for extrapolation of these results to other areas.

2.0 The Location and Socio-Economic Context of the Study Areas

2.1 Locational context and other features

The study was conducted in villages surrounding the Zaraninge Forest Reserve (ZFR) that covers about 17,869 ha, areas adjacent to the Udzungwa Mountains National Park and sugar and teak estates in Kilombero district and in villages found in Kisongo Ward of Arumeru district.

These sites were strategically selected to capture different resources bases. For example, the resource endowment of the Zaraninge Forest Reserve (ZFR) located

in the coastal belt is different from that of Kisongo, which is in the semi-arid environment. The areas adjacent to the Udzungwa Mountain National Park (UMNP) are also different from the two. These differences in resource endowment give different potentials and pose different challenges in the attempts to address poverty alleviation. By covering the three areas the study covers a cross section of issues that could be relevant to many other areas not covered in the study.

2.1.1 Zaraninge Forest Reserve (ZFR) Sample Area

The ZFR is one of the approximately 39 coastal forests in Tanzania. The area receives good rainfall, typical of the coastal belt. The settlements around it are fairly spaced out. Thus population pressure on land is minimal. However, given the highly sandy nature of the soils, the level of mineral leaching is very high. This has necessitated communities in the area to adopt shifting cultivation because of the depletion of nutrients. Under this land management system a plot of land is occupied for a maximum of two years; after which a new plot has to be cleared from nearby woodland or in the ZFR. This practice has had serious implications on the health and biodiversity of the forest reserve. The situation as indicated in the paper, has necessitated the introduction of various land management interventions by the World Wildlife Fund (WWF) in the area.

The demographic characteristics of the areas surrounding the ZFR are historically linked to the growth and decline of Saadani as a port of entry to Tanzania mainland. The Port is in Saadani, which is a very old settlement. It was founded several centuries ago before the first Arab set foot on the Tanzanian coast (Chami, personal comm.). More recently it has witnessed the comings and goings of slave raiders, conquerors and adventurers of many racos (IRA, 1997).

A gravestone on the dilapidated cemetery of the village, for example, shows that the gentleman lying there is none other than the Church Missionary Society cleric James Redman who, in the name of Christ, lived, died and was finally buried in Saadani in 1892. Another gravestone is dedicated to one Stuhl, a German trooper who was buried there in 1893. Two stone ruins indicate the location of German fortresses in the area. They both have the characteristic thick walls of early German architecture in Tanzania. One of them has the distinct defensive gun turrets on its western wall. Indeed, the place where the ruin with the gun turrets stands is to this day still known as Bomani, the place of the fortress.

The population growth rates for Greater Saadani as a whole are very difficult to determine. Nevertheless the estimated population for the three villages was 14,756 persons. Not only are the various sub villages (vitongoji) widely scattered, but population movements in and out of the village are also so fluid that clear trends of growth are difficult to determine. During the fishing season between the months

of February and May, for example, an average of 250 people are believed to move into Saadani Village from as far north as Pangani and as far south as Bagamoyo. This number may vary from one year to another depending on fish yields and other economic variables such as accessibility of the village (IRA, 1997). Table 1 illustrates the population characteristics of the ZFR three villages of Greater Saadani.

Table 1: The Population Characteristics of Three Villages

Village	Mkange	Saadani	Matipwili
Population	3,935	1,260	3,950
Households	787	294	792
Children	2,060	573	2,216
Elderly/Infirm	427	94	241

Source: *Mkange Ward Executive Office, December 1999*

The fluidity of population movements within the village makes it even more difficult to determine household sizes. Rough estimates seem to suggest that the household size for the area as a whole was merely 4.6, which is below the national average of 6.0 persons per household characteristic of many rural communities in Tanzania. Most likely the coastal villages have low sizes because of migration to Dar es Salaam.

The data for Saadani Village are, however, more informative. They indicate that much of the study area is sparsely populated. The village had a human population of 573 and 294 households giving a household size of about 2.0 persons, which is just a third of the national average.

The coastal culture of the people, the proximity to the forest reserve and a number of such related aspects were of particular interest to researchers for the interpretation of observations that were made in the area.

The ethnic composition of Greater Saadani is very much influenced by its proximity to Tanga region whose border is only about 10 km north of Saadani Village explaining why the Doe and the Zigua predominantly inhabit the village. Other groups include the Kwere who inhabit much of the environs of Bagamoyo south and west of Greater Saadani. There are also some descendants of the Nyamwezi and Makonde who came in during the colonial period as migrant labourers in the sisal and cashewnut estates that proliferated the area then but are now defunct.

Despite such a variety of ethnic groups, Saadani's culture is largely Islamic which

to a very large extent is determined by the place's closeness to Zanzibar and the people's long-standing association with Arab influence and Islam.

2.1.2 The Udzungwa Mountain National Park (UMNP) Study Area

The Udzungwa Mountain National Park study area on the other hand, is in the interior of Tanzania (about 350 km from Dar es Salaam). It is sandwiched between the Udzungwa Mountain National Park, the Kilombero Sugar Plantations and the Selous Game Reserve. The settlements covered in the study area are dense and confined between the foot slopes of the mountains and the sugar plantations in the plains. Communities have severe shortages of land and tree products that include fuel wood for domestic and local brewing use.

Park regulations prohibit any form of consumptive use of the resources in the national park and as such communities around the park are only allowed two days (Fridays and Sundays) to collect dry fuel wood from the national park. The ecological implications of such practice are not known. At the time of this study, a Masters degree student from the University of Dar-es-Salaam was conducting a study to establish the implications of collecting biomass from the forest.

The collection of fuel wood from the park, twice a week, does not seem to be enough. As a result, various initiatives have been introduced, mainly by the WWF that are geared towards providing alternative resources. This is, however, being done as a way of conserving the national park rather than directly benefiting the communities financially. Poverty alleviation issues are secondary and they are not being addressed in this case.

The human population in the 17 villages in the eastern parts of the UMNP is generally increasing rapidly (see Table 2) partly due to migration into the sugar estates from other areas outside the Kilombero Valley. People come as labourers in the sugar estates, or they come to seek land in villages such as Sonjo, Msolwa Ujamaa and Signali still endowed with ample virgin arable land.

On average, however, the rate of migration is highest in "urbanised villages" like Mkamba, Msolwa Station and Kiberege where people come in as labourers in estates and/or as employees in the service sector of the economy. High birth rates also contribute substantially to population growth as rightly observed by NorConsult (1995:9-10).

The population density in Kilombero District stands at around 16 persons per km^2 but the effective density is much higher (as high as 32 persons per km^2 or even hither in some of the villages) since protected areas such as the UMNP and the Selous Game Reserve occupy a large part of the district.

The intercensal population increase observed in Table 2 varies between individual villages probably due to variable performance of the local economies. This variability in population growth will most likely continue to characterise the demographic pattern of the area for the next decade or more with "urbanised villages" getting more people than the typically rural ones.

Table 2: Population Change of the 17 Villages in the Eastern Parts of the UMNP

Ward	Village	1978	1988	1999
Kidatu	Mkamba	6,711	7,243	4,978
	Kidatu	5,094	4,483	8,269
	Msolwa S	3,041	8,065	7,228
Sanje	Msolwa U	1,628	2,361	3,746
	Sanje	3,089	3,972	5,228
Mkula	Sonjo	776	1,925	1,774
	Mkula	2,522	2,046	2,864
	Katurukila	1,850	2,027	2,889
Mang'ula	Mang'ula	2,905	1,631	4,735
	Mang'ula	2,419	1,034	4,234
	Mwaya	706	1,326	6,831
	Ichonde	1,158	1,856	1,877
Kisawasawa	Kisawasawa	1,703	2,337	2,475
	Kisawasawa	1,290	-	-
Kiberege	Kiberege	2,728	4,191	5,714
	Signali	1,724	2,973	6,600
	Mkasu	851	1,256	1,302
Total		**40,195**	**48,726**	**70,744**

Source: *1978 and 1988 Census Data; Kidatu and Mang'ula Divisional Offices, 2000.*

Migration into the Kilombero area is causing not only land shortage but is also increasing cultural diversity. Although cultural diversity has opened up opportunities for nation building in various societies, including Tanzania, at the local level such diversity tends to loosen the social fabric characteristic of homogenous communities. Hence, more often than not it causes disharmony that, in the case of communities living in the eastern part of Udzungwa Mountains, has an influence on the implementation of environmental conservation innovations and other developmental programmes.

Normally, the ways, which the communities use to conserve their environments, are influenced by their cultural values. A good example is the waning away of the belief that the Udzungwa Mountains are the home of the mountain god Bokela and other lesser gods who can help people in times of problems. For what ever they are worth, these values have played significant roles of conserving the mountain wildlife. This has been observed in many other parts of the world. In the focus group discussions very few people could relate themselves to this belief. Those who did were the elderly from the indigenous ethnic groups signifying that these values have disappeared with time.

To many of the younger generation interviewed such believes seemed meaningless and even profane. Cultural diversity due to migration, the influence of modern religions such as Christianity and Islam and the entrenchment of the money economy have made the traditional rituals and institutions that held these communities together obsolete.

2.1.3 The Kisongo Study Area

The Kisongo ward is about eight km west of the Arusha Municipality on the road to Makuyuni. Relative relief of the area is moderate, generally less than 50m (Murray-Rust, 1973). It exceeds 100m in the north. Rainfall is typical semi-arid (i.e. less than 1000m) and is strongly seasonal. This is reflected by the vegetation cover, which is sparse and typical of semi-arid environments. The dominant species are Acacia drepanolosium, Acacia Sp; Balanites aegyptiaca and commiphora spp. What would be grassy patches are heavily overgrazed. Overall the area is heavily degraded.

The area has very few trees, heavily overgrazed and seriously eroded. Poor land management as related to crop farming and livestock keeping is significantly contributing to the degradation process. However, there are other contributory factors. For example, some areas of the Burka Coffee Estate, Lakikilaki and Magongo companies, Manyara Estates, all located in the Ngorbob and Likamba Villages, are under lease but they are uncultivated and left unattended. As a result, there is misuse of land leading to the land degradation process.

In some parts of the Manyara Estates, the gullies are over six meters deep. The land degradation process is progressively contributing to land shortages. For instance, in the Olkaria and Orng'oswa Villages some farms are literally being washed away. This is turn, is reducing household incomes, since cultivation, which is the main activity, is at the blink of coming to a halt.

Population pressure on the neighbouring Mt. Meru has led to the expansion of the sedentary Waarusha and Wameru into these areas. The Waarusha in-migrants have displaced the former typical pastoral Masaai. The Waarusha cultivate in addition to keeping cattle. Because of low productivity, these areas have always supported sparse human population.

3.0 The Missing Links Between Environmental Interventions and Poverty Alleviation Efforts in the Area Adjacent to the ZFR

3.1 INTRODUCTION

This section discusses the missing links between environmental interventions and poverty alleviation efforts in areas adjacent to the Zaraninge Forest Reserve. The effectiveness and shortfalls of the different interventions including tree planting, agriculture, community management of resources and protected area approach and beekeeping are examined.

3.1.1 Tree Planting

Tree planting activity is a component of the Coastal Area Conservation Project, which is assisted by the WWF. The Project Manager is based in Dar es Salaam, assisted by field assistants who work with the village governments. There are also interactions with Divisional and Ward authorities. The interventions are primarily implemented through voluntary groups - such as women and men, schools, religious groups and individuals. This is the case with insitu conservation of the degraded vegetation, which does cost the protection of an area. This shortfall points towards poor extension system. Furthermore, the extension system takes sectoral approaches, which makes it difficult to have a holistic over view of sustainable development. The major objectives of the project include: the protection of key forests, and the provision of an alternative wood resource supply for the communities living around the protected areas.

Performance of the activity could further be improved. The analysis of the nurseries in the Mkange Village revealed that seedling production is very low - totalling only 12,496 in 1999. Seedling production by groups and individuals is exceptionally low, only 12 per cent of total production. The nurseries are also not well planned to produce seedlings for income generation. This is partly because of lack of expertise and meagre resources for seedling production. When interviewed, all the nursery owners and some other people pointed out that foresters supplied the seeds to them. The villagers were not involved in the choice of species. Not surprising, fruit tree seedlings are relatively few.

It did not seem like anybody is taking the initiative of teaching the communities even some of the basics of tree nursery management. As a result the villagers have little technical skills to run the nurseries on their own and even those few who go outside the village for "training", on their return do not often impart the knowledge to others. This is a phenomenon that is not unusual with the "study tour syndrome". However, experiences elsewhere like, like for instance, with the UNDP Capacity 21 Programme in Mbozi and Sengerema have proved that if study tours are well executed, they can be extremely useful.

The other reported limitation to tree planting is lack of water that curtails the expansion and the start of new nurseries. This is a paradox because the water table in the coastal belt is generally high and a simple shallow well would do the trick but this is not happening. As a result tree planting has not made an impact either environmentally, or in terms of poverty alleviation despite the enormous potential.

3.1.2 Agriculture

Agriculture is the backbone of socio-economic and subsistence livelihood in the survey area but there is a bigger room for improvement, particularly, in terms of the technology being used. With the current state whereby the hand hoe is the main instrument used to work on the small plots, unimproved seeds, lack of use of fertilizers and hence characterised by shifting cultivation and low innovative skills, agriculture cannot be portrayed as the backbone of the economy.

Intensive farming is the principle strategy for slowing down or even stopping environmental degradation in most places in Tanzania. Such intensification of agriculture has a big potential of doing well in the study area given the coastal climate and the proximity to urban markets. However, much of agriculture in this area is still based on shifting cultivation using the hand hoe. Most of the villagers interviewed were aware of this contradiction but were unable to reverse the situation. Poverty and lack of skills had outweighed the community's desire for intensification of agriculture. This was apparent, for example, in the Gongo sub-village in Matipwili Village. Thus showing a situation where the vicious circle of poverty has to be broken if we are to make headways. Short of it, poverty, which is deeply entrenched, seems to re-enforce itself.

Some of the main agricultural crops are maize, millet, cassava, coconuts and sunflower. In some areas such as the Gongo sub-village, pineapples are grown mainly for income generation although to a very limited scale. The increase in population leads to reduction of fallow periods to below four years and low agricultural skills, farm productivity is declining. Hence surplus crops to sell in order to boost household incomes have also declined substantially as illustrated in Table 3.

Furthermore, in settlements like Saadani land is becoming even scarcer. The SGR and the Indian Ocean surround the village. There are, therefore, land conflicts partly caused by the state intervention of creating the SGR in 1968.

Only a few households in Gongo sub-village in Matipwili and Mkange Villages practise agro forestry. The major problem is that the concept is not well understood by both the villagers and grassroot "experts". For example, the choice of species is at times a problem. In Matipwili-Wami a village leader had cut the Cassia siamea trees that had overgrown in his farm to reduce shade to

other crops. The trees had been grown in the spirit of practising agro-forestry. According to him, he did not know what to do with those trees once they matured. The extension staff had not provided any advice on the matter.

Thus the choice of trees for agro-forestry and the practice itself clearly indicates that the concept is not well understood by both the "experts" and the communities. This is unfortunate because at the time of introduction of the technology, it raised false expectations. After a while it became obvious to the community that these expectations could not be met.

Therefore, there are, generally, very few interventions in agriculture. The authorities have generally neglected it and it is almost still hoe-dependent with shifting cultivation as the order of the day. Intensive farming is badly needed not only for crop production and income generation but also to slow down environmental degradation and increase crop output. A ready market for some of the crop products is also an important consideration. According to the key informants, for example, production of cotton has had to cease in the whole of Miono division due to lack of marketing facilities for that crop.

Table 3: Crop Productivity Per Hectare in Bagamoyo district

Crop	Productivity from Research Plots	Productivity from Smallholder Farms
Maize (Bags)	45.0	20.0
Paddy (Bags)	70.0	7.0
Millet (Ton)	2.8	1.0
Cassava (Ton)	20.0	2.5
Cashewnut (Bag)	60.0	12.0
Cotton (Ton)	3.5	1.0

Source: *Bagamoyo District Offices, 2000*

3.1.3 Community Management of Resources and Protected Area Approaches

The community development approach is in line with both the National Forest Policy of 1998 and the Wildlife Policy of 1998. Both policies advocate the involvement of communities in the management of natural resources. The approach tries to decentralise the ownership and management of the resources to the villages.

Approaches to community resource management have been started in five villages in the study area. The objectives of such an intervention is to bring resources as

close to the communities as possible and also to use the reserves for income generation from products and tourist fees, hence alleviating poverty. This approach is also in line with the spirit of the local government reform that is currently being undertaken in a number of districts in the country.

Unfortunately, the village reserves concept has not been well explained to the communities in the sample villages. Judging from early behaviour of staff from the Division of Forestry and Beekeeping, many people think this is the latest gimmick of the government wanting to grab more land.

Buffer Zonation Around the ZFR and Establishment of a National Park

The divisions of Forestry and Beekeeping have also tried to re-introduce buffer zonation, which is an old approach to management of Forest Reserves. The German Administration in the then Tanganyika first introduced the approach. The idea was to create a user zone around the forest. The user zone (buffer zone) was normally planted with fast growing Eucalypitus species to provide wood materials to people living around forest reserves.

The objective of establishing buffer zones in the study area is two pronged. Firstly, is to slow down forest/game reserve encroachment. Secondly, is to allow people to benefit from such zones, especially in areas that have land problems such as Saadani. In these buffer zones people are allowed to obtain natural resources products such as firewood, building poles and thatch grass.

However, more than 98 per cent of the villagers interviewed in the survey area were opposed to buffer zonation for various reasons. Firstly, after the re-survey of ZFR boundaries that was conducted by the staff of the Forest Division, some of the farmers have been ordered to move back 500 metres from the former boundary for the establishment of buffer zones. Some villagers argue that the buffer zones should be established in the reserves rather than in people's farms or in public land.

In Gongo sub-village in Matipwili, for example, some people were bold enough to say they would not allow such interventions to take place in their village area. Some openly claimed that buffer zones were a neat way for the government to grab more land from them. Moreover, most of the villagers claimed that they were not involved in the decisions that led to the idea and the actual demarcation of the buffer zones.

Further to the buffer zoning of the Forest Reserve, there has been the Saadani Ecosystem Management Plan. At the time of this study, preparations for this initiative were in the final stages. According to the Bagamoyo District authorities, GTZ was supporting the initiative. The aim of the initiative was to establish a

national park to include some public land forests such as those in Mkange Ward. The Mkwaja Ranch had also been bought for this purpose.

The ultimate objective of the project is to conserve the forestland, establish ecotourism and research activities. Once again the villagers claimed that they were not properly involved. This further shows that the various conservation approaches are not effectively capitalised upon to alleviate poverty among the local people.

3.1.4 Bee Keeping

Beekeeping is another relatively new forest-based intervention being encouraged by WWF in the area. Nevertheless, the linkage between tree planting, bee keeping and poverty alleviation is not being articulated in these initiatives. There is a pilot initiative by WWF in Mkange Village where, according to the village Chairman, there are three traditional and two modern beehives. Unfortunately, there was no information regarding the production of honey and beeswax. Nonetheless, if well planned, the activity can conserve the environment (by people not cutting down trees in traditional beekeeping niches) and raise people's incomes without much investment. Similarly, there is very little being done on the development of agriculture to address both food security and poverty alleviation.

3.2 Emerging Issues

It was evident during this study that the local communities did not effectively participate during the planning stages of the environmental interventions. The interventions were initiated without any regard to the community's felt needs. They were not even adequately involved in making important decisions that directly touch their livelihoods. For example, out of the 102 people interviewed in Saadani, Matipwili-Wami and Mkange villages, 96 per cent complained of lack of participation. This was especially the case in the establishment of buffer zones, which they perceived as "encroachment in reverse", i.e. buffer zones being established in village farm/public land instead of being carved out from the periphery of ZFR.

A sample survey of such groups was done in the Mkange Village. It was observed that the majority of the groups (about 70 per cent) were essentially women. But ironically women representation in the village governments was relatively low. In Makange, women's representation was 26 per cent, while in Matipwili-Wami and Saadani their representation was only 24 per cent and 20 per cent, respectively. This shows that the participatory governance structures are not balanced and the inputs of an active group of the community is ignored.

Another issue is that the groups are segmented. They are not interacting enough to formulate large environment – poverty alleviation initiatives. For example,

the Mkange groups could jointly start a big tree/fruit nursery and start woodlots for conservation and sale of poles, charcoal and firewood to semi-urban areas like Miono and Chalinze. This is an opportunity that is being missed as illustrated by the following example:

One medium size earth charcoal kiln can produce between 20-30 bags (1 bag = 28 kg). A household can produce between 40-60 bags or construct two kilns per month. The going price (in the year 2000) for a bag was 1,000 Tanzania shillings. This is an equivalent earning of between 40,000 and 60,000 shillings a month- a sum above the minimum wage in Tanzania.[1] It should be noted that because of the shrinking wood resources women currently spend about five hours, two ways, to collect firewood. A head load of firewood lasts only for two or three days.

There is lack of sectoral coordination. For example, all of the environmentally related interventions were separately addressing the sectors of agriculture, wildlife, or forestry. There were no inter-linkages between the various sectors.[2] In both Matipwili-Wami and Mkange, for example, the bwana shambas (agricultural/ extension officers) complained that they were not consulted at all in the selection and planting of tree species introduced by the foresters for agro forestry. Some discussions with the villagers indicated that inter-sectoral consultations were rarely satisfactory.

The introduction of well-meant innovations initiatives or technologies without involving the people in the decision-making process seems to do a lot of damage. Most of the interventions by the Government and the donors, like WWF have not taken a full-fledged integrated approach. There has been little participation of the people. Overall therefore there is a lack of coordination between organs of the government at both the central and local level. The establishment of Village or Community Forest/Game Reserves and buffer zones is a case in point. As shown in Table 4 most of the local communities have serious reservations about these innovations and view them with suspicion. It was also evident from the field that people's enthusiasm for planting trees was "cooling off".

[1]However, because of the shrinking wood resources, this not be sustainable.
[2]This is not peculiar to the study area.

Table 4: Reasons for Not Planting Trees (in %)

Reasons	Mkange	Matipwili
Land shortage	96	75
Seedling/seed unavailability	40	55
Have enough wood	33	68
Unacceptable environmental interventions (e.g. buffer zones)	82	80
Little involvement by experts and village officials	85	63

Source: *Field Data, December, 1999*

4.0 The Missing Links Between Environmental Conservation, Agriculture and Poverty Alleviation in Areas Around Commercial Enterprises: The Case of Mang'ula Ward, Kilombero District

4.1 Introduction

The Mang'ula Ward is characterised by land alienation for environmental conservation and commercial enterprises. These include the Udzungwa Mountains National Park, Selous Game Reserve, Kilombero Sugarcane Company (ILLOVO) plantations, Ulanga Rice and Cotton Mills Company, and Kalunga Forest Reserve partly planted with rubber and owned by the General Tyre Company. This land alienation has precipitated problems and raised some pertinent issues.

This section deals with the various interventions, some of which are geared towards conservation while others are commercial enterprises. Both interventions are examined in terms of how they do or may address poverty related issues. The relevance of the double pronged approach of concurrently addressing both environmental conservation and poverty alleviation in such situations is examined. The economic activities of the Kilombero sugar cane company and the Ulanga Rice and Cotton Company are discussed first.

4.2 Activities of Sugar Production

One of the dominant agricultural production activities carried out in the Kilombero Valley on the north eastern side adjacent to the UMNP is both large scale and smallholder sugarcane production. There is also a sugar-processing factory in the area. Thus the sugar industry has a number of stakeholders ranging from sugar cane growers to sugar producers.

Cane production is dependent on both rain-fed and irrigation agriculture. Much of the water originates from the Udzungwa Mountains as water from the numerous streams and rivers flow from the mountains. This link between conservation and commercial enterprises clearly shows how conservation can directly benefit the commercial enterprise. The general expectation is that commercial enterprises would in return support conservation initiatives. This issue is, however, not pursued further because it is not the focus of this paper.

With the exception of ILLOVO no other sugarcane grower processes sugar locally. All the commercial sugar growers depend on ILLOVO as a single market for their sugarcane. ILLOVO buys the cane and processes it in their factory at Kidatu. The factory produces about 50,000 tons of brown sugar annually. The sugar is then sold within and outside Tanzania. What follows is a description and analysis of the main stakeholders identified in the sugar industry, the level of production and other related resource use and production aspects.

4.3 The ILLOVO Kilombero Sugar Company

Until recently, the dominant producer of sugarcane in the Kilombero Valley was the Kilombero Sugar Company, a former parastatal company under the Sugar Development Corporation (SUDECO). The public company has been sold under the on-going privatisation scheme in Tanzania and is since 1997 owned by the ILLOVO Sugar Company of Natal, South Africa. The company has a total area of 13,000ha within the valley, 61 per cent of which is planted with sugar cane. In the next three years the cultivated area is expected to expand by 30 per cent.

The Kilombero based ILLOVO Sugar Company is engaged in large scale sugarcane production and sugar processing. It owns two large sugarcane plantations, Kilombero One (K1) and Kilombero Two (K2), which are one of the two major sources of raw materials for its factory in Kidatu. The other source is the sugarcane grown by the local people in their own farms - i.e. the out growers. Most of the out growers grow sugar in small farms with sizes ranging from 1 to 5 acres, with very few small farmers having farms of more than 10 acres.

Approximately 45,000 tons of brown sugar is produced annually (Table 5). The Company intends to expand production to 600,000 tons of cane with the bulk of the expansion area occurring within the out growers' area. The ultimate objective is to reach the production capacity of 1 million tons of cane and produce 100,000 tons of brown sugar.

Table 5: Sugar Production at ILLOVO 1981/82 - 1996/97

Production Year	Amount of Sugar (Tons)
1981/82	43,000
1982/83	48,900
1983/84	47,300
1984/85	44,600
1985/86	43,000
1986/87	47,900
1987/88	42,300
1988/89	41,500
1989/90	43,500
1990/91	55,100
1991/92	58,700
1992/93	58,400
1993/94	58,400
1994/95	52,100
1995/96	44,900
1996/97	37,800
Average Production	**45,141**

Source: *ILLOVO Offices, 2000.*

ILLOVO is the largest employer in the Kilombero Valley. It has on its payroll about 700 permanent employees and some 2,000 others who are employed on temporary terms in the harvesting season between June to December. Over 99 per cent of the employees are recruited in Tanzania. It is difficult to establish how many come from within Kilombero and nearby areas, as a good number have migrated from elsewhere in Tanzania. However, most of the temporary labour is from Morogoro and Iringa Regions. There are many people who are still poor. Therefore the local communities in Kilombero Valley require additional or alternative interventions because the commercial enterprises may not cater for everybody in terms of poverty alleviation.

Sugarcane is grown in the 'sugarcane zone', which covers the two estates, K1 and K2 plus the outgrowers' area. This zone is located around the Msolwa and Ruembe Rivers. A number of important rivers and streams traverse this area and they flow in a west to east direction, from the Udzungwa Mountains. The sugarcane zone is bounded by the Mikumi National Park to the north, the Selous

Game Reserve and Kilombero Game Controlled Area to the South and East, and the Udzungwa-Gologolo and Migomberani Mountains to the West.

The cane is grown in generally flat lands with gradients rarely exceeding 1 per cent. However, in some of the outgrowers' land cane is grown on much sharper gradients. The climate of the area is generally described as 'tropical rainy', with annual rainfall ranging from 800 to 1,700 mm and a mean annual rainfall of 1,200 mm. The rainfall distribution shows a peak in March and April, floods, and water logging conditions are normal occurrences during this time of the year.

ILLOVO has two large estates, plus other external production areas belonging to outgrowers. The ILLOVO estates, K1 and K2 have 3,498.2ha and 3, 247.9ha of planted cane respectively, giving a total of 6,746.1ha of cane area. The total Estate Area is 7,658.1ha. The total area for irrigation is 5,002.3ha and the dryland production area covers some 1,600ha.

However, rainfall in the area is unreliable, and therefore risk for crop failure is high. The mean annual rainfall data for Msolwa and Luembe Estates show, for example, that annual rainfall precipitation was below 1,000 for Msolwa Estate in 1969, 1976, 1983 and 1985, and for Ruembe Estate in 1975, 1976 and 1988. Such low rainfall precipitation coupled with an evapotranspiration of around 1,900 mm increases risk of crop failures. In such a situation, irrigation is vital to supplement the water deficit. This however, is not possible for smallholders.

The critical period for irrigation is July, August and September when rainfall is the lowest. However, during this period, river water discharge is on the recession stage, but not the lowest. In this regard, water for irrigation could still be available. Water for irrigating the large-scale sugar plantations at K1 and K2 is drawn from the Ruaha and Msolwa Rivers by electric pumps. ILLOVO Kilombero also uses wastewater from sugar manufacturing. This water is collected in ponds and later directed to the sugar plantations for irrigation. Irrigation is carried out for about 8 and a half months between June and November and January and Mid-March. Since the privatisation of Kilombero Sugar in 1998, there has been an improvement in the irrigation system. Before the privatisation irrigation used to be 2 hours per line but by June 2000, the minimum time for the flow of water in one line is 10 hours. The amount of water used is 4,000 to 8,000 litres per 2 hectares per day. In the peak season some 6.3 m^3 of water per second is applied. ILLOVO has a water right for 6m^3 per second.

Irrigated land is presently about 3,000ha in Msolwa Estate and 1,400ha in Ruembe Estate. But even in rain-fed agricultural land mobile irrigation is applied particularly during the germination stage (about 2 months). This demonstrates the total dependence of irrigation for sugar cane farming in the estates.

Furthermore, sugar processing requires reliable supply of water from the rivers. It was, however, reported that the amount being used is less than the allocated water right.

The current plans for expansion are to increase production of cane from 450,000 tonnes to 600,000 tonnes, with most of the increase being in the local sector, i.e. the outgrowers' land. This also implies an expansion to produce 1 million tonnes of cane, which are about 100,000 tones of brown sugar per annum. To expand production capacity, the company also plans to increase cooperation with the outgrowers through the provision of training and farm implements in order to enable them to improve their yields. This is a step in the right direction.

ILLOVO also has reserved some land, into which they intend to expand. Much of this land is, however, currently being squatted on, and should the expansion programme be implemented into these areas, there may arise some problems if the squatters refuse to move. From the legal standpoint, however, the land is owned by the Company through a 99-year lease.

Currently, there are no serious land use conflicts, although there is a problem with squatters in the Nyange and Nyarabungu area. In these areas the squatters, many of whom also get casual employment on the estates, are growing rice and maize. There are signs that in the future there could arise serious land conflicts since the population in Kilombero valley is growing very fast while the land is limited.

Most of the incoming population is being squeezed in the limited public lands in the area, and this is where the initial land use conflicts are likely to arise. The situation is further complicated by the fact that the valley is surrounded by four protected areas, i.e. Mikumi National Park to the north, UMNP to the west, the Kilombero Game Controlled Area and the Selous Game Reserve to the south and east. Other limiting barriers are the Gologolo and Migomberani Mountains to the west.

There is another possible long-term problem of water pollution. With the large amounts of agro-chemicals currently in use and the fact that for irrigated farming water is eventually drained back into the river system, there is a possibility of downstream pollution that could affect the entire ecological system downstream. However, there are company management reports indicating that some sound management practices are in place that will reduce the possibility of large-scale pollution occurring.

It was reported by ILLOVO officials that it has not been established yet the extent to which water is polluted downstream through the application of agro-chemicals in their estates. Much worry is on the way local farmers are using these agrochemicals. The management thinks that the farmers are likely to use

more than the required applications and therefore cause more pollution. This fear may not be strongly founded because of the high prices of these agro-inputs. This problem can only be minimised through provision of extension services. It was encouraging to learn that such extension services are provided by ILLOVO, but it was not clear as to what extent environmental issues are covered in the extension package.

Inappropriate sewage disposal is also another threat. Such pollution can be hazardous to public health, marine life and the environment in general. Although not all the measures are being followed[3], the company has laid down some rules to control water pollution. The rules include the following:

- Water for the application of agrochemicals shall be distributed in special water tanks and direct water withdrawal from streams and rivers for herbicide application or washing/rinsing of containers shall be prohibited;
- All agrochemical containers/packaging not intended for any other official uses shall be destroyed appropriately, by burning in appropriate sites. Such sites are to be located so that smoke will not affect residential areas and inhabitants and rainfall will not carry burnt remains to water courses;
- Direct release of untreated factory effluent to streams and rivers shall be restricted by provision of effluent treatment plants. Likewise direct disposal of used oils and diesels to the drainage system shall be prohibited;
- The company shall also ensure that the existing sewage disposal systems are improved and always maintained to acceptable standards; and
- Periodic chemical analysis of water quality covering both domestic and major river/stream waters shall be carried out to identify any sources of water pollution, quantify their extent and propose remedial action in line with acceptable standards.

Other measures addressing environmental management include:

- An afforestation project at Kilombero, which has some 500ha. of trees planted for the provision of firewood for the factories. The project is aiming to plant both exotic and indigenous trees and is to eventually cover some 1,500ha;
- The use of biogases, which is one of the by-products of sugarcane processing, as a cheap source of energy for the production of steam, power generation, paper making, alcohol production and animal feeds;
- Maintaining the natural vegetation in and around the estates (including animal refugia in forests and wetlands) in order to conserve catchments and natural plants. There is also a large portion of Estate land at the southern tip that lies within the Kilombero Game Controlled Area/Selous

[3] The explanation offered was that the company had just been privatised and was in the process of reogranisation and would need some time and resources to be able to follow upon the Environmental Protection Plan.

Game Reserve. This land has been left to be utilized by wildlife and will not be used by the Company in future;

- There are limited lines for sugarcane cultivation along stream banks and rivers. For streams it is at least 3 metres and along rivers it is 6 metres. Also all banks shall be stabilised and if shaping is necessary, a gradient of 1:1 shall be established followed by planting of creeping or rhizomatous and suitable indigenous trees;
- Sound management practices are to be employed to control run-off and floods and avoid soil erosion. Outgrowers with cane land along steeper slopes shall be advised to plant sugarcane along contour lines; and
- Wildfires are common and to minimise these, firebreaks shall be constructed and maintained, also involve outgrowers and local government officials in the formation of a fire control policy and legislation aimed at fighting fires caused intentionally or carelessly.

Thus apart from providing employment opportunities, there seems to be encouragement on the small scale growing of cane sugar, which in turn addresses poverty in the communities around the area. It will be appreciated that this is not possible without the protection of the Udzungwa Mountain national Park.

4.4 The Sugarcane Outgrowers

ILLOVO has production arrangements with outgrowers, mostly around K1. The outgrowers' area covers some 1,909ha, out of which 1,788ha was to be harvested in the year 2000. Under this scheme small growers with an average of 2 acres of cane grow the bulk of the cane. There are only a few outgrowers with between 100-500 acres of cane. There are plans to expand the outgrowers output to 3,564ha to produce some 220,000 tons of cane, and also improve the ratio to 10:1 (10 tons of cane to 1 ton of sugar from the present 11:1.

The outgrowers' cane is grown as a dryland crop and is rain fed. There is also very little use of fertilizers and herbicides (see Box 1). There is also a programme to improve farming practices by applying some fertilizers, i.e. about 70 kgs of N/ha, and use herbicides to thwart weeds that compete with the cane for nutrients.

Box 1: Mr. Bakari Yusufu - A Large Scale Outgrower of Kidatu Village

Mr. Bakari has a 37 acre (or 15 ha) farm under sugarcane production. Of the 37 acres, 24 belong to him while he cultivates the remaining on rented basis. He employs modern farming technologies. He uses a tractor and applies fertilizers and other agro-chemical inputs. He says that if he does not apply fertilizers there is a reduction in yields of up to five or six tones per acre.

He says that the average price of sugar cane is Tshs. 7,000/= per tone. Therefore, if he can reach his peak production capacity of about a thousand tones, he can realise up to Tshs. 7,770,000. In the first year, production output was 15 tonnes per acre. In the second, third and fourth years, the output rose up to 30 tonnes per acre, that is, if good care of the crops is taken. However, production is not constant and therefore in the fifth year output dropped down to 15 tonnes per acre. His current challenges are high production costs and low profit margins.

Source: *Field Data, 2000*.

4.5 Ulanga Rice and Cotton Company (ULANGACO)

There is a fairly large-scale sugarcane producer best known by its acronym ULANGACO. Despite its name being related to rice and cotton, the company is currently involved in sugarcane growing. The company has two large-scale sugarcane plantations, one in Ichonde Village (500ha), and another in Kiberege Village (100ha.). The company has nine permanent workers and employs between 50-60 casual labourers on seasonal basis. The largest number of casual labourers is employed during the harvest season. Because of lack of capital and equipment, it has been impossible to put all the land into production. Currently, only 200ha of the Ichonde plantation are under production. The remaining 300ha have been loaned to local people to temporarily grow crops such as rice and maize. Similarly, in the plantation located in Kiberege only 50ha are currently under production and the remaining land is being used by local communities to grow food crops.

Production at this farm is estimated to be around 5,000 tonnes of cane. The sugarcane from both plantations are harvested and transported to the ILLOVO sugar factory. Despite the fact that both plantations are within close proximity to various streams and rivers, sugarcane production is still dependent on rainfall and some groundwater. Also because the plantations are located very close to the park boundary (hardly 200 metres at Ichonde farm) vermin is a major problem.

4.6 Benefits of Large Scale Sugarcane Production

The direct and indirect benefits accruing to the sugar industry in the Kilombero Valley is mainly in the form of production of some 45,000 tonnes of sugar annually and realising about Tshs. 17,120,000,000, or about US$ 21,400,000 annually. It also provides employment to about 3,000 people within ILLOVO and the outgrowers and an unknown number of other services that are linked to the township of Kidatu that largely exists because of the sugar industry. Part of this figure occurs in the form of important local livelihoods and resulting expenditures that form an integral part of the local and district/regional economies.

What is evidently clear is that the water coming from parts of the UMNP is of critical importance to the sugar industry as a whole. As a farm manager at ILLOVO put it: "The preservation of the evergreen forest on the Udzungwa Mountains is of the utmost importance so as not to cause adverse climatic changes and to prevent soil erosion". This answers the question on how the sugar industry contribute towards the conservation of the surrounding environment.

Another important function of the conserved vegetation cover is the flood and soil erosion control. For example, during the rain season serious soil erosion

and landslides occur on the unprotected mountainsides north of the Great Ruaha River where an increasing smallholder farming is practised on very steep slopes. The contrast with the protected side of the river, i.e. in the UMNP, is glaring. The resulting soil being carried downstream has caused some serious flooding and siltation between the Ruembe and Nyamvisi Rivers, between K1 and K2, threatening to waterlog and destroy the cane in the area. The costs for removing the silt has amounted to Tshs. 418,000,000. This can be taken as an indicative figure of how much the protected area of the UMNP is saving ILLOVO and other land users downstream.

4.7 The Rice Industry

Rice is the major cereal crop grown in Kilombero Valley both as a food and cash crop. Rice grown in this area is mainly dependent on rain and there is little irrigation being practised. Several small as well as large-scale rice growers were interviewed. It was observed that the responses were very similar so what is being presented here can be considered to be representative of the rice farmers in the area.

Most of the farmers are small-scale farmers. Very few farmers cultivate 50 acres and above. (see Box 2). The major characteristics of small-scale rice production in the Kilombero Valley include:

- Plots of between one and 20 acres;
- Most of them do not use fertilizers;
- The hand hoe is the main agricultural implement used by most small-scale farmers;
- Most small-scale farmers are producing mainly for subsistence;
- Small- scale rice farming is very much dependent on rain-fed agriculture.
- With the rapid population growth rate due to in-migration in search for good agricultural land together with relatively high fertility rates, it is very evident that there will be serious land pressure in the near future; and
- Marketing of their rice is a serious problem. Many farmers are poor and by the time of the harvest they are in great need of cash. The middlemen come in at this point and given the abundance of rice, most farmers are compelled to sell their rice at low prices to the middlemen, known as walanguzi. The walanguzi often buy the rice at very low prices of around Tshs. 150-250/= per kilogramme of dehusked rice (mchele uliokobolewa). The farmers need money to meet various demands but also lack safe storage facilities, thus most tend to sell their crops when the prices are still very low. They are unable to take advantage of the market and hold on to the rice until prices are on the high side.

Generally, the Kilombero Valley is producing a substantial amount of food, especially rice. In the year 2000 alone it produced about 40,000 metric tons of paddy whose value is around Tshs. 24,000,000,000/= (or US$ 30,000,000/=). This is a significant amount in the district and regional economy, but also very important in terms of household food security and local livelihoods.

Box 2: Case Studies of Four Farmers in the Kilombero Valley

Farmer 1

He owns and cultivates a small one-acre plot in which he grows only rice. His yields depend on whether he applies fertilizers or not. It also depends on the types of seed varieties (high v/s low yield), the method of sowing seeds used, fertility of the soils, and availability of water. These are the major determinants of high or low harvests.

If he applies fertilizers, he can get up to 25 bags while without fertilizer the yields drop to between 7 - 10 bags. The type of planting also affects production. For example, if the seeds are planted by throwing randomly on the farm, the yields range from 10 - 15 bags compared to the 20 - 25 bags when seeds are planted on lines. The farmer added that FAO shows that yields can be as much as 38 - 40 bags when improved seeds such as Line 88, Line 85 and A 54 are used. In his case, on average, his declared yields are around 20 bags for his one-acre plot.

Farmer 2

This farmer has about 10 acres. In the year 2000 he managed to plant only 6 acres with rice and succeeded to harvest 80 bags without applying any fertilizers. His average yield is around 13 bags per acre. He does not irrigate, that is, he practises rain fed agriculture.

Farmer 3

This farmer is a single mother with 2 children. She does not own any piece of land simply because she is a woman, and since she never got married, she does not have access to land from a husband. This is the tradition prevailing in the study area. Consequently, she rents farming land at the rate of Tshs. 1,000.00 per acre per season. She practises traditional rice farming. She never applies any fertilizers, neither does she apply any modern technologies. Because she cultivates only a small area, her yields are aslo low. She obtains about 25 bags of rice. [4] She produces both for food and a little surplus for sale.

Farmer 4: A large scale rice farmer

This farmer owns a rice farm of 420 acres. Like most other farmers in the area, he practises on rain fed agriculture. His farm is located in the Kilombero Valley where rain water from the UMNP brings plent of nutrients so that he does not need to use any fertilizers. He argues that when one uses fertilizers, though the output may be better, some of the rice husks are empty and others become too light, so that the overall output is not any better. To him, the UMNP is a very important source of natural nutrients and rain. He appreciates and values the microclimate that is influenced by the forests of the UMNP. The average output from his farms is between 10 to 15 bags per acre, and on the year of research he was expecting to yield up to 5,500 bags of rice.

Source: *Field Data, 2000.*

[4] During discussions with local farmers regarding the application of fertilizers, it was established that in some areas, there was low or no useat all because with the flooding of the valley, lots of silts rich in nutrients from the mountains is poured onto the valley raising the level of fertility in certain parts. So, in such areas, farmers rarely apply fertilizers. In other instances, poor farmers cannot simply afford to buy fertilizers. Therefore, there is variation of yields from farmer to farmer and from area to area.

4.8 IMPORTANCE OF IRRIGATION ON SMALLHOLDER AGRICULTURE

From the foregoing discussion it is clearly evident that socio-economic development for the communities surrounding the Udzungwa Mountains National Park centres on agriculture, of which water from the mountains is an important ingredient. The district per capita income is Tsh. 57,355/= which is just above the National Per Capita Average of Tsh. 55,200/=. The International Poverty Line is US$ 120 or Tshs. 72,000/=. One reason for it being above the national average is most likely the agricultural output from the Kilombero Valley, much of which stands to benefit from the waters flowing from the UMNP area. This presents an interesting case of a linkage between conservation and poverty alleviation.

The major food crops include maize, bananas, rice, beans and cassava. The main cash crops include: cotton, sugarcane and sunflower. Some crops such as maize, rice and beans are also sold as cash crops.

Irrigation is applied by a number of people who have started intensifying their production. There are some who are still relying on rain fed agriculture, thus producing less than what they could get if they could irrigate. For example, those who irrigate their farms are able to plant three times a year compared to the two times a year for those who depend on rain fed farming alone. Similarly, those who irrigate grow paddy twice a year compared to only once per year for those who depend on rain fed farming. This implies that those who are using rain fed agriculture are only producing two thirds and a half of what they could get for maize and paddy, respectively, under irrigation. Irrigation will be of importance in the near feature given the growing problem of shortage of agricultural land.

Land shortage does in most cases necessitate agricultural intensification for optimal production. Presently, the majority of the farmers acquire land through hiring on short-term basis. The current charge is Tshs. 10,000 per acre. Such investment is economical in that the harvest is in the range of 10-15 bags per acre, and one bag sells at Tshs. 14,000 - Tshs. 20,000.

Limited application of elaborate irrigation system in the area could be due to the inadequate irrigation technology that farmers have. Farmers in Msolwa A (Ujamaa) are seen to be on the frontier of irrigation technology. Irrigation canals being used in this village were constructed in 1978 by Chinese experts to support 500 households cannot currently support the 1,700 households in the village, thus requiring extension. It was also reported that even the existing canals need repair since floods associated with El Nino rains destroyed their banks.

Assurance of the supply of water from the Udzungwa Mountains is vital for sustainable development of communities living around the mountains. In this

regard, decline in water availability for irrigation will have socio-economic consequences in the communities around the Udzungwa Mountain National Park. There are other areas in the plains where soil moisture content is high and therefore crops can be grown in the absence of rainfall and irrigation. Again, such areas are fed by water from the mountains through underground channels. The change in the hydrological regimes upstream will also lead to the change in the groundwater regime, thus affecting the current farming system.

As already noted that, despite the immense potential for irrigated agriculture, much of the smallholder agriculture is rain fed. The very low use of agricultural inputs is also another reason for low levels of output. Yields for maize range between 7-12 bags (90 kg) per acre or between 630-1,080 kg of maize per acre. For rice, the yields without fertilizers are between 7-10 bags of paddy, whereas with fertilizers this can reach 25 bags of paddy. Nevertheless, a simple calculation of earnings from the smallholder production sector that takes into account the production of maize and rice shows that an annual earning of at least Tshs. 3,970,425,000/= is realised from agriculture alone.[5]

4.9 Problems of Smallholder Agriculture

4.9.1 Crop Marketing

There are some problems attendant to agriculture crop marketing. Poor roads infrastructure hinders easy and cost-effective marketing, especially in newly established and remote villages such as Mhelule, Mikoleko, Kanyenja and Msalise. The main traded crop is paddy but the poor roads and other factors hinder the poor farmers in transporting their crops to markets where they can fetch good prices. While a bag of paddy (50 kg) sells at between Tshs. 15,000 and 18,000 locally, in Morogoro town it can fetch over Tshs. 30,000.

The picture on problems of marketing of tree crops was not clearly demonstrated during the survey. Some tree growers can sell poles, firewood and timber fairly cheaply. Others claimed they did not even know where the markets were. One of the determining factors seems to be the location of the trees or woodlots and the species involved. Fruits, for instance, do not face serious marketing problems. Nonetheless, markets and low prices are real problems in the surveyed villages and need a more integrated approach. Any interventions should take infrastructure improved into account especially in the western side of the Udzungwa Mountains.

[5] In David Hoyle's (1997) WWF-TANAPA Socio-economic Survey, he estimates an income of 40,000/= per acre or 100,000/= per ha. Taking this figure and multiplying by the total area cultivated in 1998/99 season Tshs. 2,130,800,000 is generated from rice growing each year in the district. The figure does not differ very much from ours: 53,000 acres X 8 bags per acre = 424,000 bags X 6,000/= per bag = Tshs. 2,544,000,000/=. As for maize production: 33,925 acres X 7 bags per acre = 237,737.5 X 6,000/= per bag = 1,426,425,000/=. The combined income from both crops amounts to Tshs. 3,970,425,000/= per year. The figures for other crops are not included, therefore, the actual annual income must be higher than Tshs. 3.9 billion.

4.9.2 Land Shortage

Land is a scarce commodity in the surveyed villages. For example, Sanje, Mkula, Mang'ula A and B villages are enclosed by the Kilombero Sugarcane Plantation in the east and the UMNP in the west. Evidence shows that about 86 per cent of the households own below 5 acres of land each; mostly between 0.5 - 2 acres. This means that as population pressure on land increases people may be forced to cultivate in the UMNP. In Mang'ula A and B villages a by-law was passed in 1999 requiring each person to cultivate at least three acres of food crops. Up to now the implementation of this by-law has been difficult. Further, because of land shortage the Mwaya, Mang'ula A and B villages at the edge of the Udzungwa Mountain National Park complain that areas for building houses and even for burial are very limited, let alone areas for cultivation.

Land leases also fuel the problem of shortage of land. There are some private companies and individuals who are leasing big areas that are unfortunately not fully utilized. For example, it was reported that the Ulanga Rice and Cotton Mills Company have a lease of 160ha but only utilize 5 per cent of the area. It was claimed that the remainder of the land is rented by the owner at 25,000 shillings per hectare. Another example is the Mang'ula Mechanical and Machine Tools whose size of the area in question was not available during the study.

To try to curb the situation some farmers are trying to intensify their farming, but farming inputs are too expensive for them. For example, hiring a tractor (normally brought to Kilombero from other Regions) cost 20,000 shillings per acre. Another example is herbicides for rice farms. Fenemine and 2,4 D are among the commonly used. Each litre costs between 5,000 to 6,000 shillings, which is enough for a hectare. Thus, attempts to intensify agriculture are frustrated by the high costs of inputs. Only the few well-off farmers can afford to buy the required inputs.

Some farmers are turning to agro forestry as another possibility of solving land shortage although as noted earlier education on this subject it is very limited both among the communities and extension workers. Furthermore the villagers are urging the government to create buffer zones (3-5 km) into the park and wildlife reserves, with more "diluted" laws so that the land outside the conserved areas can be left for use by the communities, for example the procurement of firewood. At present the villagers are allowed to collect dry firewood from the Udzungwa National Park twice a week (Fridays and Sundays). "But we are not allowed to enter the park even with a razor blade". That was the cry from almost all the women, especially in Mwaya and Mang'ula A. The two days a week are not enough because, first, it is just a temporary measure which can be stopped any time the UMNP wishes to do so. Secondly, the availability of dead

wood is decreasing in nearby woods which forces women to walk long distances deep into the forest, which is very risky to their life safety.

This problem could be contained by increasing productivity per unit land and intensifying agricultural farming practices through input use and proper husbandry. Perhaps it will be of interest to undertake a comparative study on the agricultural productivity of the villages bordering the UMNP and others to find out whether there is any significant difference in terms of productivity per unit area. This is necessary to find out whether the advantages people are gaining from the UMNP are good enough to compensate for the loss they are incurring from losing accessibility to the park.

4.9.3 Unsuitable Land

Some land is unsuitable for farming and tree growing. This is partly because of the swampy nature of the Kilombero Valley. In some parts of Mang'ula A and B even rice growing is a problem. Other villagers also complained about soil infertility. However, the limited time of the survey did not allow the verification and assessment of the said problem.

4.10 Problems of Smallholder Producers: Education, Skills and Culture

4.10.1 Poor Primary Education

Education is one of the key tools for poverty alleviation and environmental conservation. In some surveyed villages this basic human right is not provided. As a result, the above innovations and activities are suffering. The Mhelule and Mikoleko village around Selous Game Reserve are a case in point. In both of these big villages there are no primary schools except one small nursery school and most of the pupils in the school should have started standard one several years ago.

Some have refused to join the nursery school because they are over-age and are physically out of place. In fact some 65 pupils attended (out of 106 villagers i.e. about 61 per cent) a village meeting organised to discuss the environment-poverty interventions. It is intriguing to see how the future environment-poverty programmes can be planned and implemented in such villages where even primary school education is non-existent.

4.10.2 Cultural Issues

The human population in the Mhelule, Mikoleko, Msalise and Kanyenja is steadily increasing (no accurate figures were available). The increase is partly attributed to migration from other areas, even outside the Kilombero Valley. This migration is causing not only land shortage but also cultural diversity that

is progressively causing disharmony, which has an influence on implementation of innovations. Culture and environment are basically and inextricably related. Normally the ways the communities conserve their environments, are influenced by their cultural values. But there is also the dimension of meeting the daily needs that is sometimes at the expense of the environment, an area that is more complex and requiring input from varied disciplines.

4.11 Women Economic Initiatives for Poverty Alleviation

Women have started income generating activities to respond to the economic problems ushered in by land shortage and poor marketing infrastructure. By and large the villagers have formed voluntary producer groups in the form of farming groups, fish buying and selling groups. There are several farming groups mainly dealing with the growing of paddy. These include the Community-Based Organisations such as Development and Environment Conservation, Efforts and Knowledge ("Juhudi na Maarifa"); Unity is Strength ("Umoja ni Nguvu"). Majority of the members are women.

On average the paddy plots range between 0.8 ha and 1.5 ha and the yields per season per ha is between 20-25 bags (1,000-1,250 kg). The price per bag is between Tsh. 15,000 and Tsh. 18,000. Thus a group (normally of 5-8 people) can earn an income of between Tsh. 300,000 and Tsh. 450,000. The estimated cost of production is between Tsh. 120,000-150,000, assuming that use is made of some fertilizer and herbicides. This gives a group minimum income of Tsh. 180,000 shillings. If the membership is five people, then each person gets Tsh. 36,000. In the village context this is a fairly good income, as the individual woman is also involved in other household or even other groups' income generating activities.

The major problems associated with these groups are marketing, lack of capital and credit facilities, education and skills to improve production. Almost all the people met during the survey regrettably admitted that their initiatives and WWF/ TANAPA interventions were not progressing well because of lack of education and skills. In many villages, farmers' training and capacity building are almost non-existent, especially so with regard to entrepreneurship.

It is encouraging to note that WWF has a short-term training programme for both local communities and extension workers. For example, in 1998 some women groups were sent to the Sokoine University of Agriculture to study micro-entrepreneurship for two weeks. Such training programmes covering other disciplines are badly needed. A well-phased training programme should be prepared, with emphasis on environmental education.

Women are key implementers of interventions whether internally initiated or introduced from outside the villages. From the survey it was vividly clear that

women's participation in decision-making and village leadership is very minimal. Even their attendance at meetings of leaders and villagers during the survey was proportionally low, as typified in Table 6.

Table 6: Women Attendance at Meetings Organised during This Study

Village	Total Attendance	Women	% Women
Mang'ula A and B	25	8	32
Mhelule and Mikoleko	106	19	18
Mwaya and Migudeni	51	12	23
Msalise and Kanyenja	55	9	16

Source: *Field Data, 2000*

It should also be noted that on average for the above six villages only 4 per cent of the women spoke during the meetings. Programmes to empower these rural women, with emphasis on illiteracy eradication, are imperative because there is unquestionable evidence that women are more linked with the environment; since their day-to-day activities are closely dependent on nature and natural resources, especially water.

4.12 The Fishmongers

Fish buying and selling groups are fewer than the farming groups and are mainly found in the Mwaya village and the Mhehe – Mdalangwila area and are owned by men. Most of the fishing is done in the Msolwa River, which originates from the UMNP and flows eastwards through the Selous Game Reserve before it enters into the Kilombero River.

Although according to the fishermen permission to fish in the reserve is hard to come by, they are often allowed to fish in the Kilombero River in the Mhehe – Mdalangwila area leased to a Zimbabwean farmer. From October to April, which is the fishing period, a fisherman can fish up to 500kg of fish worth about Tshs. 150,000.

Nevertheless, the fish vendors have little working capital for buying fish, fish preparation and transportation. Credit is also not readily available. Furthermore, it is claimed that the trading licences are expensive (about Tshs. 100,000 p.a.); and it was reported that the District Council demands at the market an additional fee of Tshs. 50 per fish sold.

4.13 Tree Growing

Tree growing is another land-based activity that addresses both environmental conservation and boosting households' incomes hence alleviating poverty. The World Wide Fund (WWF) mainly finances the intervention. Nurseries were started

in 1991. The 1991/92 and 1998/99 seedling production from 7 nurseries is shown in Table 7.

Table 7: Seedling Production: 1991/92 – 1998/99

Year	Seedling Production
1991/1992	48,000
1992/1993	60,000
1993/1994	130,000
1994/1995	142,000
1995/1996	156,172
1996/1997	180,014
1997/1998	160,300
1998/1999	142,000
TOTAL	1,018,628

Source: *WWF, February 2000*

The main species are *Cassia siamea, Khaya nyasica, Grevillae robusta,* and *Cedrela odorata. Tectona grandis* is slowly gaining popularity.

Table 8: Estimated Value (in Tshs) of the Seedling Production (1991/92 - 1998/99)

Year	Seedling Production	Estimated Value For Tshs 50 per Plant	Estimated Value For Tshs 500 per Plant
1991/1992	48,000	2,400,000	24,000,000
1992/1993	60,000	3,000,000	30,000,000
1993/1994	130,000	6,500,000	65,000,000
1994/1995	142,000	7,100,000	71,000,000
1995/1996	156,172	7,808,600	78,086,000
1996/1997	180,014	9,000,700	90,007,000
1997/1998	160,300	8,015,000	80,150,000
1998/1999	142,000	7,100,000	71,000,000
TOTAL	**1,018,628**	**50,931,400**	**509,314,000**

Source: *Field Data*

The figures in Table 7 show that the average annual planting is 127,328 trees for the whole Ward, which is on the low. However, the figures in Table 8 indicate

that there is a lot of potential in generating revenue from raising seedlings. The small figures are partly a reflection of land shortage, market problems for the woodlot products and the overall people's dissatisfaction of the environmental interventions which have tended to ignore their livelihood such as the national parks, wildlife and forest reserves.

There is some concern that choice of species is done by experts with little consultation with the people. It was reported that this situation is being rectified. Furthermore, emphasis should be put on fruit tree species such as mangoes and oranges and cash crop species like coconuts. For example, 46 villagers out of 51 (90 per cent) interviewed in Mwaya and Mgudeni villages expressed high preference for the fruit species because provide cash income.

Although tree growing is very much constrained by land shortage, some farmers are making some progress. Mr. Ndama in Mang'ula B is a good example. He owns 1.2 and 0.8 hectares of Tectona grandis and Grevillea robusta. In 1996/97 he earned 150,000 shillings from the sale of woodlot products. More and detailed data were not available. Similarly Mrs. Magdalena Kapinga in the Mgudeni Village has a two-hectare woodlot planted with Tectona grandis, Eucalyptus spp. Leucaena spp and mangoes (Mangifera indica) started in 1997. No further information was available. But unlike Mr. Ndama, she complained that she did not know where the markets for wood products were, this echoes the common problem that is prevalent even for other crops.

4.14 Environmental Waste Management

It was observed in several villages that the marketing of products such as paddy fetches more money, if it is de-husked into rice. The process results into heap of husks. Although rice husks are good for soil mulching none of the respondents interviewed was aware of this potential. Hence one way of reducing the heaps has been to burn them, which has occasionally caused forest fire; and the smoke pollutes the air immensely.

Some work has been initiated on the better means of husk disposal. Plan International (an NGO) is working towards this end and could be a useful partner in this endeavour. Some husks are, on a small scale, being used for brick burning which has enabled few people to sell small quantities. This locally initiated innovation may ultimately alleviate households' and individual's poverty. Further, efforts are also being made (e.g. at Kisawasawa and Mwaya villages) to make a stove, which uses husks. The major problems so far are that the husks produce a lot of smoke and the cooking pots wear out more quickly.

5.0 The Missing Links Between Environmental Conservation and Poverty Allevation Initiatives in the Kisongo Ward, Arusha

5.1 INTRODUCTION

The Kisongo area is ravaged by all kinds of land degradation processes. There are on going efforts that are aimed at responding to land degradation in the area including those that are community and individually initiated while others originate from outside. The latter include those by the Soil Conservation and Agro-forestry Project in Arusha (SCAPA), HELMA (an NGO based in Kenya), Heifer International, the Arumeru District Council and Radio Habari Maalum. These interventions are briefly outlined below and linked to poverty alleviation. It is, however, important to mention here that one of the most critical factors of any action in this area is the control and management of water (see Box 3).

5.2 AGRICULTURE

Soil erosion is the main problem and the major innovation used to ameliorate the problem is terracing and the making of bunds. Elephant grass (and others) and a variety of tree species are planted on the terraces. This intervention is mainly promoted by SCAPA, partly using some trained farmers as extension assistants. These conservation initiatives are paying dividends and some of the farmers are already capitalising on them to alleviate poverty.

Other conservation methods include the setting aside of plots for in-situ conservation by protecting grass and natural trees that grow in them. Such areas are also used for grazing, especially during the dry season; and obtaining building poles and firewood and grass[6] for sale. The focus of the researchers is to establish the economic gains of such double-pronged approach i.e. conservation and poverty alleviation through sale of outcomes of conservation activities.

Table 9 shows the income one family was generating from the sale of grass harvested from their own farm that had been protected from communal grazing.

Table 9: Sale of Grass from Mr Elisha Sheshe's Farm, Jan. – June 1995

Quantity	Tsh. Per Unit	Total Revenue (Tsh.)
20 bundles	300	6,000
12 bundles	300	3,600
16 bundles	300	4,800
35 bundles	300	10,500
12 bundles	300	3,600
60 bundles	300	18,000
100 bundles	300	30,000
3 pickups	3,500	10,500
Total		87,000

Source: *IRALAS, Arusha 1995*

[6]Some of the grass include: *Emurua, Oloigorong'o* and *Olveresi* (in Kimaasai language)

Theoretically, this could give this family an income of 120,000 to 180,000 shillings per annum. In addition at times the family can sell 60-100 bundles of thatching grass for the same period for 18,000-30,000 shillings. The total annual income is, therefore, between 138,000-210,000 shillings. This amount, though small shows the potential of such enterprises generating substantial incomes. Such environmentally based activities can give a family some good income to boost their household economy that is primarily, dependent on the sale of surplus agricultural crops such as maize and beans.

Box 3: Reaping from Sales of Grass

Before becoming a full time farmer, Mr. Elisha Sheshe of Engorora village worked with the Tengeru Institute of Natural Resources as a garden attendant. His work at Tengeru gave him vast experience in contour and ridge farming. When he retired in 1992, he transferred the knowledge he had so gained to his own 25 acres farm in the village. Mr. Sheshe applied contour and ridge farming to control soil erosion which was ripping his farm apart. On the contours and ridges, he planted thorny bushes and grass. The contours also conserve water.

By the time of this study the bushes had grown into sizable trees from which Mr. Sheshe's family were harvesting fuel wood and building poles for sale. They were also using the woodlot for a bee keeping project. Grass, on the other hand, was being sold to stall-feeders at a handsome profit.

Source:*IRALAS, Arusha, 1995.*

Vegetable gardening is also gaining momentum. The Uamsho Women Group, for instance, started in 1991 with 0.3 ha planted with a variety of vegetables such as cabbages, carrots etc. They also plant maize during the rainy season. Unfortunately there are no statistics regarding the production and marketing of the products.

Another cultivation aimed at conserving moisture in the soil and cutting down weeds is Zero Tillage. The farm is ripped across by an ox plough in narrow strips at specified intervals. The strips are then fertilized (using inorganic fertilizers) then planted with maize. The area between the strips is not cultivated but often covered with grass to suppress weeds. It was reported in the field that the yield per hectare is more than double compared with a field not ripped or fertilized. This technique is still on experimental stage and one of its limitations will probably be its labour intensiveness.

5.3 Tree Planting

This is the traditional and most common conservation measure that has unfortunately been over-dramatised and often seen as an end in itself. In the Kisongo area as with many other areas in the country, tree planting is mainly concentrated around homesteads. The principal species include Grevillea robusta, Acacia spp. Cassia siamea and Melea spp. It is encouraging that almost every homestead is planted with one or more of these species. In some places the

planting includes a few fruit trees such as pawpaws, guava, etc. However, the establishment of woodlots is still on a small scale, almost negligible because:

(i) There are no tree/fruit nurseries. SCAPA supplies seedlings free or at a subsidised price (about 50 shillings a piece). Otherwise the realistic price has been estimated at 300-500 shillings. For some families this may be unaffordable;

(ii) The establishment and operation of nurseries is too expensive for some households and individuals;

(iii) Water is very scarce;

(iv) Planted trees are often eaten and/or destroyed by free range livestock;

(v) Land is becoming scarce; and

(vi) Some farmers do not simply want "to be followed up".

There are many concerns in Kisongo that have worried development practitioners in Tanzania for as far back as the 1970s. An example of these concerns is the establishment of nurseries. It is more or less a government policy that central nurseries are discouraged in favour of local ones and that the communities should be involved in making decisions on the species they prefer. These and many other basic principles are not followed. Similarly, the new paradigm of jointly addressing environmental conservation and poverty alleviation appear to be far from being realized despite the big potential.

An integrated approach is advocated because so far most of the activities are not systematically integrated. Integration has several advantages, including: land saving, such as, intensive rather than extensive agriculture; complementarity of some activities in the package; effective labour deployment, since activities are often concentrated in a relatively small area; increased and well distributed (during the year) individual or household income. But one of the major limitations is that the individual or household tends to be a jack-of-all-trades, which may reduce productivity per activity.

However, some efforts have been initiated, some of which are already bearing fruit. The initiatives of Mr. Levi M. Ole Lamai are a good example. He has half a hectare along the Arusha – Dodoma road where he cultivates vegetables of various kinds, fruits (e.g. Pawpaw) and crops (e.g. Maize). Once in a while he operates a small tree nursery, producing up to 10,000 seedlings. He also practises aquaculture; there are currently four fish dams: D1- 20 x 8 metres, D2- 22 x 10 metres, D3- 10 x 2 metres and D4- 24 x 6 metres. Some of these dams are used for water harvesting and storage. There are also good efforts aimed at environmental conservation, which include the construction of bunds, planting of grass and some few trees.

Regarding income, Mr. Lamai claims that he sells, for example, a kilogramme of

fish for about a 1000 shillings. Unfortunately, accurate production statistics were not available. In 1999, D1 produced between 17 to 100kg each day; and on 15/2/2000, for instance, the production was 100kg. This, probably, earned him 100,000 shillings. The marketing of the produce is no problem, because Kisongo minor settlement is close to Arusha municipality.

Mr. Lamai's future plans are to expand the area and introduce limited livestock, chicken and beekeeping. This will ensure more complementarity of the various activities. For example, manure will be used for gardening, including food for ponds and the remains of vegetables will be fed to chicken and fish while some planted grass and crops will produce pollen for the bees. They will also be fed to livestock and the excess sold. This integrated approach is possible and can most likely address both conservation and poverty alleviation.

The main constraints he is facing, as well as other villagers, are lack of capital, labour shortage, free range livestock and water scarcity. Other problems include the shrinking, and degradation of land and lack of skills in implementing many of the interventions.

The other issue is the application of the carrot and stick principle. In the surveyed area a few incentive schemes were observed. For example, individuals and households who do well in land and environmental conservation are awarded a goat (goat parents originally came from Sweden). Similarly, there is the Heifer Project, which gives free dairy cattle, provided that the receiver would give to other villagers the third offspring. Further, to equip people with some skills a few villagers are taken to environmental conservation projects in other regions, such as the Soil Conservation Project in Dodoma (HADO) and the Soil Erosion Control and Agro forestry Project in Lushoto (Tanga). The tours may last up to three months on and off. However, the challenge is how the ideas gained are spread to other villagers. Experiences elsewhere have shown that with some innovations, study tours can be very useful. The involvement of people with possibility of making decisions is one such innovation.

We have not seen enough "sticks". Evidence from the field indicates that environmental – poverty alleviation initiatives are at times frustrated by passive farmers. Examples were seen in the field where a farmer on lower farm slopes had taken effective soil conservation measures while a neighbour at a higher slope had not done the same. During the rains the floods from higher ground eroded the lower farm and serious galleys appeared. By the time of this study nothing had been done to the farmer on the higher part of the slope!

Under these circumstances enforceable village by-laws should be formulated to take such farmers to task. This also applies to those who do not control their livestock. At present there are a few loose regulations, but they are not often adhered to.

There are also farms which have leaseholds in the Kisongo Ward with some parts of the land not managed at all and have, therefore, become vulnerable to environmental degradation. The leasehold conditions should constantly be reviewed to seal any loopholes encouraging such practices.

Furthermore, quite a number of Arusha Municipality residents are being offered land for building and small scale farming in the Kisongo Ward. A more comprehensive land use plan should be developed and the development of the allocated land must follow some basic environmental management principles.

6.0 An Overview on the Dualism of Environmental Conservation and Poverty Alleviation

This study was set out to explore how measures geared towards addressing environmental degradation could also be used as means of alleviating poverty. The premise of the study is that forest products provide a considerable part of the export and local revenue (see Tables 10 and 11). The forest products come from both woodlands (mainly miombo) and forests (particularly the non-timber products). This in itself provides an indication of the potential of poverty alleviation through activities that are geared towards conserving the natural resource base.

This study has demonstrated that peasants in the various ecological zones (from the coastal plains to the highlands/plains and even the arid and semi-arid areas of North) of Tanzania benefit differently from conservation of the natural resources with a lot of room for expansion.

The study demonstrates that the value of the benefits from land based and conservation related activities could be considerably high. However, in order for this to materialise, the stakeholders have to see the direct benefits. As it stands the stakeholders have yet to see the value of the intervention programmes. The argument here is that many village interventions are likely to contribute to poverty alleviation depending on how they are packaged and advocated. Projects or activities can be planned to focus on such a dualist approach.

One example is in the field of agriculture. A well-planned, gradual agricultural intensification scheme would go a long way to increase people's incomes as well as conserve the environment. Thus, agricultural packages should be sold in their broad context in order to have the desired outcome.

The study identifies a number of constraints for the dualistic approach as follows:

6.1 Water Shortage

Tree planting is a viable intervention linking environment conversation to poverty alleviation. At present some villagers in the case study area and elsewhere (See

Table 12) are supplied with seeds to establish their own nurseries. This is in accordance with the government's move towards discouraging central nurseries to minimise the problem of transportation. But the availability of water is a major constraint in some of the areas. In Mkange Village, for example, the women interviewed revealed that water shortage was a big problem. They have, for instance, to walk several hours to find water for washing their clothes, let alone water for other purposes.

6.2 Lack of Participatory and Communication Approaches

More stakeholders' involvement and constant communication between local communities and others, on the various interventions are needed. This is not only between experts and communities but also applies to the communication between experts and the village government leaders as well.

From the field survey, a substantial number of villagers are complaining about how the environmental interventions are planned and executed. Those interventions, which tend to take forestland from them, are particularly resented. Communities have developed the land grabbing perception that the government is all out to grab land away from them. This is the chorus heard in meetings and interviews conducted during the survey. It is in this context that local political and administrative support is desperately required.

Table 10: Export of Forestry and Bee Products for the Years: 1991/92 - 1994/95

	YEAR 1991/92		1992/93		1993/94		1994/95	
PRODUCT	**QUANTITY**	**VALUE US $**	**QUANTITY**	**VALUE US $**	**QUANTITY**	**VALUE US $**	**QUANTITY**	**VALUE US $**
Logs	3,991m^3	789,346	9,870m^3	1,459,407	8,831m^3	1,663,803	6,958.09m^3	1,544,441.95
Timber (Rough Sawn)	1649m^3	33,611	689m^3	597,271	210m^3	19,500	-	-
Floor Timber	2,125m^3	1,183,452	1,164m^3	728,014	770m^3	447,503	957.54m^3	2,829,66040
Timber (Mpingo)	55m^3	682,059	55m^3	584,997	61.20m^3	799,502	-	-
Handcraft (products)	-	-	20,914pcs	77,159	103,899pcs	689,848	-	-
Tree Seeds	-	-	1600kgs	18,560	1,003kg	15,240	-	-
Sandal Wood	72 Tons	61,200	68 Tons	62,512	38 Tons	37,012	-	-
Wax	696 Tons	2,088,000	569.5 Tons	1,522,739	123.8 Tons	237,882	-	-
Honey	123 Tons	221,400	31.9 Tons	31,216	78 Tons	71,540	-	-
Total		5,373,068		5,081,875		3,981,491		6,166,763.35

Source: *Ministry of Lands, Natural Resources and Tourism Budget Speech, 1995/96.*

Table 11: Export of Forestry and Bee Products for the Years: 1995/96 - 1997/98

PRODUCT	YEAR 1995/96		1997/98		1996/97		1998/99	
	QUANTITY	VALUE US $ (1000)	QUANTITY	VALUE US $ (1000)	QUANTITY	VALUE US $ (1000)	QUANTITY	VALUE US $ (1000)
Logs	5,m^3	908.3	2,178m^3	436	9525m^3	6,191.6	3,896.52m^3	717.95
Timber (rough-sawn)	74.2m^3	923.9	28.6m^3	355	107.5m^3	1,357.6	8,065.80m^3	684.46
Timber (Mpingo)	130m^3	14.5	51m^3	5.7	8,630.78m^3	1,035.7	122.26m^3	1,193.20
Floor Timber	803.7m^3	2613.5	329.7m^3	99.8	1,125.47m^3	3,405.6	67.76m^3	128.40
Hand-craft	165,493pcs	557.8	52,197 pcs	105	262,518pcs	891.5	253.124pcs	967.64
Tree Seeds	15.6 Tons	144.78	-	-	-	-	215.85kgs	11.65
Wax	202 Tons	077.9	202 Tons	678	316 Tons	1,044.4	332 Tons	1262.70
Honey	-	-	2.46 Tons	2.1	225 Tons	274.0	39 Tons	35.53
Others	-	-	-	-	-	-	3.645.34m^3	481.20
Total		15,840.68		2,578.96		14,180		5,422.72

Source: *Ministry of Lands, Natural Resource and Tourism Budget Speech, 1998/99; 1999/2000.*

Table 12: Production of Seedlings in Kilolo and Mazombe Divisions

Year	No. of Tree Nurseries				Percentages	
	Central	Kilolo	Mazombe	Total	Central	Village
1989/90	1,785,116	0	0	1,785,116	100.0	0.0
1990/91	2,142,825	140,401	41,200	2,324,426	92.2	7.8
1991/92	2,032,050	169,072	47,060	2,248,182	90.4	9.6
1992/93	973,958	261,656	79,436	1,315,050	74.1	25.9
1993/94	583,479	402,665	30,066	1,016,210	57.4	42.6
1994/95	0	1,028,572	135,017	1,163,589	0.0	100.0
1999/00	0	287,323	206,925	494,248	0.0	100.0

Source: *HIMA Files, 2000.*

6.3 Transfer of Technology

Communities lack education and skills to effectively implement the interventions being introduced to them. In many villages farmers' training and capacity building are non-existent, especially in regard to entrepreneurship. The WWF has some training activities but they involve very few people and those few who go out for study tours in other district/regions do not have the mechanisms to impart their newly acquired knowledge and skills on return. For the environment-poverty alleviation interventions to be successful, a comprehensive Farmers' Training Programme is required and for most of the interventions, training should precede implementation.

6.4 Poor Accessibility to Markets

Road infrastructure is still poor, especially to and from villages such as Matipwili-Wami. This situation constrains marketing of farm produce and forest products outside the villages. In fact, in most cases the farmers have to wait for buyers to visit them. For example, at the Gongo sub-village pineapples sometimes go bad because of the long waiting time. Marketing uncertainties discourage farmers, waste people's efforts and income, and intensify poverty.

6.5 Vermin Prevalence

Vermin prevalence is another major and widespread problem in farming, nursery production and tree planting. In some cases this is a result of the wildlife from the forest and game reserves. Among the destructive animals include elephants, buffaloes and monkeys. Since there are no reliable statistics available, it was not possible to quantify the extent of damage during this study. Nonetheless, this is a problem, which needs attention.

6.6 Links Between Environmental Health and Productivity not Fully Appreciated

There is no dispute that forests in reserves and/or national parks such as the Udzungwa Mountains have not only immense scientific and ecological value, but that they also have considerable economic importance to the local communities. It is, however, also true that in an area like ZFR economic production and consumption activities can lead to a downward spiral of environmental quality, and with this economic costs and loss of productive opportunities. A decline in environmental quality and resource supply impacts on economic activities by diminishing the amount of goods and services available for future production and consumption, and by progressively precluding economic activities, thus threatening economic sustainability. This is the perception that planners and environmentalists have.

Conservationists further believe that environmental conservation is likely to contribute more positively to an upward spiral of economic growth and benefits. It is argued that it is of critical importance to ensure that sound environmental management systems are in place which will enhance current opportunities for production and consumption at the same time as sustaining future economic growth (WWF, 2000).

Local communities are, however, at variance with this perception. A range of policy factors as well as socio-economic conditions such as poverty and land pressure often put communities in a situation that makes short term benefits more relevant to them than long term interests in environmental conservation. Oftentimes it is perceived by the local communities that there is little immediate or tangible economic gain to conserve the environment.

Data from this study indicates that there are two factors, which result into this perception. The first factor is that many smallholder farmers fail to relate directly the fertility and productivity of their arable land to the well being of the environment. In the case of the people of Kilombero Valley, for example, very few people could see any direct relationship between the productivity of the valley to the integrity of the Udzungwa Mountains.

Secondly, Tables 10 and 11 illustrate the range of products derived from forests and exported nationally. There is no doubt that exporting these products generates much revenue. Unfortunately, while the central and local governments get the lion's share of these proceeds the local communities get nothing, thus exacerbating the negative view of these communities.

6.7 Lack of Innovativeness

Data are very scarce in the village offices and those available are often inaccurate. For example, in one village two different leaders gave two different data sets on

the same issue: village population. Furthermore, not many people know what is going on in the villages. This points towards the need to establish simple data banks to facilitate monitoring of the development of the intervention and to avoid such data inaccuracies and data darkness.

From the field data it is clear that there have been ample opportunities for the various interventions to be used for poverty alleviation, yet the villagers and the innovators have not grabbed these opportunities. The challenge is to establish why these opportunities are missed and the attendant impact of missing such opportunities.

There are no simple answers to these questions but the lack of innovativeness both among the community members and the extension staff seem to be one of the main factors. Observations suggest that well over 50 per cent of the population is living below the poverty line. One would thus expect that the rural poor would have taken opportunities offered by environmental conservation interventions but on the whole there are many instances where poor households have not responded to such multipurpose interventions. In places like Zaraninge, poverty has instead outweighed their desire for intensive cultivation.

6.8 Poor Sectoral Integration

Several sectors are represented in the study villages. These include agriculture, wildlife, forestry, health, and education. If these sectors were properly linked the outcome would be a tremendous boost to environmental conservation and poverty alleviation. The lack of linkages clearly demonstrate missed opportunities.

6.9 Land Degradation

Most of the study areas are subject to land degradation of one form or another. Kisongo Ward, for example, is characterised by sheet and gully erosion because of overgrazing and other forms of land mismanagement. This situation is progressively causing land shortage. For instance, in the Olkaria and Orong'oswa villages some farms are literally being washed away. This is, in turn, reducing household incomes, since cultivation is the main activity. The poverty alleviation efforts are therefore being eroded fast. In the case of Kilombero valley some land is unsuitable for farming and tree growing. This is partly because of the swampy nature of the valley. In some parts of Mang'ula A and B even rice growing is a problem due to soil infertility.

The expectation is that such environmental conditions should have forced the people to rectify their actions and improve both the environment and their livelihood since the environment is a reflection and illustration of the integrity of the social relations at several levels of behavioural functioning. This is from a theoretical perspective that there is a basic material interdependence between society and the natural world in which its members are resident and that there is

a mutual and reciprocal relationship between the human being and the environment. Not only does the environment act upon the human being, but the human being also acts on the environment in a true ecological sense as an agent of environmental change (Mung'ong'o, 1995: 19). One factor though seems to have counteracted against this proposition that the incidence of poverty in much of the areas studied.

Furthermore, the various problems cited earlier may have suppressed the production drive. Some people, however, have shown commendable efforts in marrying environmental conservation and poverty alleviation. Tree growing is an important conservation measure, which has helped address the issue of poverty. This is mainly concentrated around homesteads. Almost every homestead is planted with one or other type of the species. There have also been attempts at systematic integration of economic activities, which serve both environmental conservation and poverty alleviation.

To try to curb the situation of land scarcity some farmers are trying to intensify their farming, even though farm inputs are too expensive for them. Another example of the environment-poverty link is nursery production. At present some villagers are supplied with seed to establish their own nurseries. Appendix 2 illustrates the declining importance of central nurseries vis-à-vis private and/or village nurseries in Kilolo and Mazombe Divisions in Iringa Rural District.

Whereas, central nurseries accounted for 100 per cent of production in the 1989/90 season, their importance declined to 57.4 per cent in 1993/94 before reaching 0.0 per cent in 1994/95. Although no concrete data could be found for the present study, indications are that this trend is likely to be taking place in the study areas as well.

6.10 Lack of Community Participation

From group discussions and interviews with the local communities it appears that there have been little community participation in the design and implementation of the key innovations. The establishment of Village or Community Forest/Game Reserves and buffer zones is a case in point. Most of the local communities have serious reservations about these innovations. Moreover, most environmental interventions, especially those involving creating reserves for fauna and flora conservation, do not take into account issues of poverty alleviation, or such more central issues to the villagers as land shortage, lack of essential products like firewood, local medicines, meat, etc. As a result local people are apathetic to environmental interventions because they tend to impoverish them rather than alleviating their poverty.

6.11 WOMEN UNDER-REPRESENTATION

Women are key implementers of interventions whether internally initiated or introduced from outside the villages. However, women's participation in decision-making and village leadership is very minimal. Even their attendance at meetings of leaders and villagers during the survey was proportionally low, are very disadvantaged and face illiteracy, cultural, religious, financial and psychological constraints.

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