GERFFA PROJECT

Community Forestry Component

Nhmatanda Community Project Report (July 1998)

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List of Contents

List of Tables

List of Figures

List of Boxes

List of Maps

Definition of Acronyms

ADB	African Development Bank
ADPP	Apoio de Desenvolvimento de Povo para Povo
CFM	Caminhos de Ferro de Mozambique National Railway Services
DDA	Director Distrital de Agricultura District Director of Agriculture
DDAP	Direccao Distrital de Agricultura e Pescas District Directorate of Agriculture and Fisheries
DNFFB	Direccao Nacional de Florestas e Fauna Bravia
FHI/M	Food for the Hungry International
FRELIMO	Frente de Libertacao de Mocambique
GERFFA	Gestao dos Recursos Florestais e Faunisticos
INDER	Instituto Nacional de Desenvolvimento Rural
PAPIR	Projecto de Apoio as Pequenos Industrial Rural
PRA	Participatory Rural Appraisal
RENAMO	Resistancia Nacional Mocambicana
RRA	Rapid Rural Appraisal
SDER	Servico Distrital de Extensao Rural
SDFFB	Serico Distrital de Floresta e Fauna Bravia
SEMOC	Sementes de Mocambique (the national seed company of Mozambique)

Glossary of Terms

Bairros	Smallest political sub-division of area
Circulo	Political sub-division of area
Coutada	Defined hunting and forestry exploitation area
Credencial	Permit needed to collect resources or produce charcoal for local sale
Ganho-Ganho	Part-time or 'piecemeal' employment
Localidade	Largest political sub-division of area
Machamba	Farming area
M'fumo	Traditional Leader (below Regulo)
Regulado	Traditional land division area
Regulo	Traditional Leader
Secretario de Bairros	Political Leader of bairros
Secretario de Circulo	Political Leader of circulo
Secretario de Localidade	Political Leader of localidade

Currency

At the time of writing $1.00 was equivalent to MT 11,700.00 (meticais).

1.0 EXECUTIVE SUMMARY

During the civil war Sofala Province suffered environmental degradation in terms of both forestry and wildlife resources. One area which was particularly affected was the Beira Corridor and the environment directly surrounding it. Large numbers of refugees concentrated along corridor due to the relative safety of the area, which was a consequence of the presence of Zimbabwean Troops. Increased population numbers and uncontrolled exploitation of natural resources (for both subsistence and commercial purposes) led to localised deforestation and severely affected the wildlife population.

In March 1997 the African Development Bank provided funding to the National Directorate of Forestry and Wildlife (DNFFB) of the Mozambican Ministry of Agriculture and Fisheries, for a five year resource use and management project (GERFFA), which it was hoped would address natural resource problems, initially in Sofala Province. The main objective of the project is the formulation of a national sustainable forestry and wildlife resources management plan. Project implementation activities are also carried out in certain areas. The GERFFA project consists of four main components: Managed Forestry, Social Forestry, Wildlife Management and Institutional Support. The Socio-Economic section is situated within the Social Forestry Component, though works with each component in order to establish links with the community and provide information that is vital to the success of any management or implementation plan.

Nhamatanda District, situated along the Beira Corridor received a large number of refugees, both during and after the war and consequently suffered localised natural resource degradation. It was therefore identified as one of the areas where the Social Forestry Component would implement programmes. Prior to commencing activities it was requested that a socio-economic study be carried out in the area. The socio-economic study was implemented in collaboration with the Social Forestry Component with inputs from the various other GERFFA components and the District Directorate of Agriculture and Fisheries (DDAP) in Nhamatanda. The study was carried out within five communities in Nhamatanda District which were identified by the District Director of Agriculture (DDA) in Nhamatanda as suffering resource degradation, particularly in relation to forestry resources. These communities include: Chicuacha, Ndeja, Mudu-Mufo, Lamego and Siluvo, all of which are in close proximity to the Beira Corridor.

In order that this report can be used effectively and efficiently, the main finding of the study are presented briefly below. Detailed accounts of each issue and an in depth description of Nhamatanda District can be found within the main body of the report.

Demography

The majority of people living in Nhamatanda have lived in the area for over ten years, therefore prior to 1988 (during the war). These people include both permanent residents and those who moved to the area as refugees during the war and decided to make Nhamatanda their permanent home. The most popular areas where new people continue to settle include Lamego and Chicuacha. These areas are popular as they have a higher level of economic activity and employment opportunity.

Systems of Control

Two systems of control operate in each area: these are the Traditional Leader system (*'Regulos/M'fumos'*) and the Political Leader system (Administrators/*Secretarios*). The Traditional and Political Leaders are responsible for conflict resolution, land allocation and general community management. The Traditional Leader is additionally responsible for carrying out ceremonies and other traditional activities. The Political Leaders is elected while the Traditional Leader inherits his position. Land is not 'owned', usually a lease is agreed upon which either party can end at any time. '*Regulos'* may charge a certain amount of rent to the tenant, however, this practice is in fact illegal.

Use of Trees: Fuelwood, Charcoal and Construction Material

Fuelwood

Fuelwood was used by 100% of the population and was either collected, or collected and purchased. Only 4% of families purchased all their fuelwood – these were all located in Lamego and all had one member of the family in full-time employment. This indicates a relationship between income and natural resource use.

Women are the main group responsible for collecting fuelwood. Dead material is used if it is found, otherwise a living tree is cut down. Collection occurs from the nearest forest area and includes areas such as Macumba, Halumbwa, Metochira and Magoe. Favoured species include Mussequesse (*Pilostigma thonningii*), Xhiposa (*Combretum frangrans*) and Mpingue/Pau Preto (*Dalbergia melonaxylon*).

Firewood was generally collected on a weekly basis with the exception of Chicuacha where it was collected twice weekly. The most common distance walked was 5-8 km in each direction, though the distance in Chicuacha was 3-5 km. None of respondents reported walking further than 10 km.

An examination of the time taken to collect fuelwood at present, five years ago and five and ten years ago showed that there has been a significant increase in fuelwood collection time (from as low as fifteen minutes to more than half a day in some cases). This is due to receding forest margins which have increased the distance women must walk to collect the fuelwood and therefore the time taken in this activity.

Other energy sources used include, crop residue (such as maize cobs and stalks), shrubs and bushes, charcoal, kerosene and electricity. 27% of families were found to use charcoal, mainly in Lamego and Siluvo. (Lamego is the area with highest full-time employment level therefore again suggesting a relationship between resource use and income. Siluvo is one of the main areas of charcoal production).

Charcoal

Producers and transporters require official licences or *credencials* in order to produce specific amounts of charcoal. There are numerous checkpoints along the Beira Corridor that ensure transporters purchase licenses. It is however, is difficult to control production of charcoal as the DDA has insufficient resources to police production areas. Production licenses are therefore not regularly purchased and illegal production occurs without redress.

Charcoal was produced by 16% of the population, mainly from Chicuacha and Siluvo. Production was the responsibility of men in all cases and men were also responsible for sale in the majority of families. Sale usually took place in the local community, though a large percentage of those in Siluvo sold to wholesalers in Beira. In some cases charcoal was purchased and resold rather than produced and sold.

40% of producers only produced charcoal in the dry season due to difficulty accessing sites in the wet season. In addition, more charcoal was produced in the dry season (50-100 sacks) than in the wet season (less than 50 sacks). Production, however, remained high in Siluvo throughout the year. Seasonality also affected the price of charcoal with prices being high in the wet season (due to increased demand and reduced supply) and lower in the dry season (due to reduced demand and increased supply). Charcoal was also sold for slightly lower prices to wholesalers than when sold privately both in the wet and dry season.

Charcoal production takes place in distant forest areas such as Metuchira Ermoque Forest, Kudibi, Cunsito, Fenso and Mucombeze. Favoured species include Messassa (*Brachystegia spiciformis*) and Mfuti (*Brachystegia boehmii*).

Construction Wood

Construction wood was used by 93% of the population; only a small percentage of those with higher disposable incomes able to afford locally made bricks for construction. Collection of wood for construction was in the vast majority of cases the responsibility of men.

Favoured species included: eucalyptus (*Eucalyptus spp.*), Panga Panga (*Millettia stuhlmanni*), Mussangarassa and Munhashambi (scientific names unknown).

Perceptions of Deforestation

It was clear that forest resources had markedly reduced in areas surrounding Nhamatanda during the last ten years. The main reason for this was perceived to be charcoal production, followed by clearance of forest for machamba and collection of resources by local people. People from local communities and local areas were held to be responsible for deforestation. However, outsiders were blamed for charcoal production on several occasions. Forest resources were also affected by uncontrolled charcoal production and timber extraction during the war period.

Tree Planting Activities

37% of the survey were found to plant trees. These were virtually all fruit trees that were planted around the homestead. A number of people planted around the field margins and fewer still in the machamba fields, as trees in this area led to shading which was thought to reduce machamba productivity. Agroforestry methods and benefits were relatively unknown practices.

Planting fruit trees was reported to be a traditional activity, whereas planting trees for fuelwood was virtually unknown. All trees requested from the project were fruit trees, including tangerine and orange (*Citrus spp.*) and advocado (*Persea americana*) trees. Coconut (*Coco nucifera*), Mango (*Mangifera indica*), Banana (*Musa spp.*) and cashew (*Anacardium occidentale*) were also requested. Improved varieties of seeds that produced quality fruit for commercial purposes were requested.

Tree planting was mainly the responsibility of men and was mostly carried out using young wildlings that were transplanted onto the homestead or machamba. The wildlings were found growing on common land or given by a neighbour rather than purchased. Various methods were used to care for wildlings including clearing the area, giving water and in some cases giving manure and using fencing. 37% of people did not give any care to wildlings. A paradox was identified in that men are responsible for planting trees and requested fruit trees, whilst women are responsible for fuelwood collection and must endure the difficulties associated with this activity. As men are responsible for tree planting, women are limited in their ability to address any problems of fuelwood shortage.

Other Forest/River Resources

Bamboo was used by 60% of families, mainly in house construction activities. It was purchased in the majority of cases, as bamboo is no longer widely available in the forest environment. Collection, when it did take place, was mainly the responsibility of men. Bamboo was available for purchase in the local market area. Communities of Lamego and Chicuacha requested that bamboo be grown in as part of the nursery programme. Green bamboo was the preferred species.

Grass was used by 93% of families, mainly in roofing construction. The grass was collected from the forest in the majority of cases. Collection was mainly the responsibility of men.

Medicinal Plants were used by a small number families and were in most cases collected from the forest. Collection was the responsibility of men and women. Medicinal resources could be purchased within local communities.

Fish 62% of the community either purchased fish or fished themselves from the nearby rivers, although the majority of people purchased fish rather than collected themselves. More fishing activities occur in Ndeja and Mudu-Mufo where rivers were easily accessible. Fishing activities tended to be seasonal, taking place in the wet season when rivers are full. Lines, nets, fences and baskets were used to catch fish. Fishing was the mainly the responsibility of men, though women and children were also involved in this activity. Fish was mainly purchased at the local market.

Hunting Activities/Meat Consumption Only 15% of families reported eating meat. The majority of this was purchased from the local market, however, three families were involved in hunting activities (from Chicuacha and Lamego). Hunting took place in forest areas, such as Kudibe (Mangoma) and was the responsibility of men. Bow and arrows, dogs and traps were used. Small animals such as hares, rats and in some cases gazelles are hunted. In Chicuacha and Mudu-Mufo it was reported that fire was used to clear areas in order to catch rats. Hunting was practised widely in the past when more animals were available.

Honey was used by 18% of families. In the majority of cases it was purchased from the local market, however, 17% of families collected honey from the forest or machamba area. Collection was the responsibility of men.

Wild Fruit was collected by 11% of families, mainly from the forest but also from the machamba. Collection was the responsibility of men, women and children.

Mushrooms were used by 11% of the population. The majority of people collected mushrooms either from the forest or the machamba area. Women were mainly responsible for collection.

Coconuts were used by 53% of families. They were mainly purchased from the local market area. Coconut trees are also useful for the production of rope, baskets and ‘surra’ (palm wine). Coconut trees were requested from the GERFFA Project.

Roots and Tubers were used by 80% of people though in the majority of cases were planted as a machamba crop or purchased from the local market. Only 2% collected roots and tubers from the forest area. This practice takes place mainly in time of food scarcity.

Alcohol is sold by 10% of families. Types of alcohol include ‘*surra*’ (palm wine) and ‘*neepa*’ which is produced from maize husks or sugar cane. Liquor was mainly sold in the local community and was the responsibility of women.

Crafts were sold by 11% of families, usually at the local market. Men were mainly responsible for sale. Products included clay-cooking pots, sweeping brushes and mats made from reeds.

Economic Activities

96% of families received some form of income. Economic income was derived from several areas including formal activities such as full-time employment, part-time employment, *ganho-ganho* (which could also be informal), or in informal activities such as the sale of natural resources and machamba produce or through receiving remittances from other family members. The majority of people (75%) gained economic income from informal activities such as the sale of produce rather than formal activities. Full-time employment accounted for 17% of income and *ganho-ganho* for 24%. In some cases families were involved in more than one activity. Informal activities however, have the disadvantage of being seasonal and providing fluctuating levels of income. Many people complained of lack of employment opportunities. The main area in which people were employed full-time was Lamego. Chicuacha had the highest rate of *ganho-ganho* and also the highest rate of informal sale of produce.

Economic income from each activity varied widely, though the only permanent source of income was from full time employment. Income from this was on average MT 323,000.00 per month. Income from *ganho-ganho* was on average MT 288,750.00 per month, however there was a large difference between the minimum and maximum values. Income from informal activities ranged from MT 50,000.00 to MT 3,000.000.00 (for brick production and sale). The average amount received in remittance was MT 106,000.00 per month.

The highest level of expenditure was on food and beverages, where most people spent between MT 100-200,00.00 per month. Most people spent between MT 20-50,000.00 per month on items such as fuel, household products and personal items.

Machamba Activities

98% of families have access to a machamba area, which in the majority of cases is between one and two hectares in size. Many people have access to two or three machamba areas, however, movement from one machamba to another appeared to be rare. Those that do move, do so at approximately five-year intervals.

Only 21% of families use fallow systems of rotation, with the majority of those using fallow working the field for less than three years then leaving it to fallow for one year. Intercropping and mixed cropping are used by approximately half of families, while compost production, water retention techniques and use of natural pesticides were found to be virtually unknown practices. The majority of families continue to clear fields by burning, though waste is collected into piles and burned rather than allowing the entire field to burn. The main constraints to farming include pests, drought and flood and lack of seeds.

Sale of Machamba Produce/Livestock/Fruit

Machamba produce is sold by 50% of families, usually within the local community or the local market, though a small percentage sold to wholesalers. Sale of produce was mainly the responsibility of women.

Chickens and ducks are sold by 21% of the population, usually within the local community with men responsible for sales. Livestock however, is usually retained as an insurance measure and sold only in times of need.

Fruit from the machamba/homestead is sold by only 6% of families, usually after subsistence needs have been met. Women are mainly responsible for the sale of fruit. Many people reported that the seed varieties available produced poor fruit and requested better varieties be made available that could be sold easier. A further problem was that certain fruit, such as mango, ripen at the same time therefore flooding the market and providing very little return when sold.

Main Problems in each Community

Lack of employment was perceived to be the main problem in each community. Resource degradation was, in many cases blamed on lack of employment, thus lack of income which caused people to depend to a large extent on natural resources to meet their basic needs. Problems with the machamba and lack of trees were considered the next most serious problem, with access to water also reported from most communities.

Attitudes to GERFFA Project

Generally, attitudes to the GERFFA Project were positive and individuals were willing to join further discussions to organise and implement the projects. In many cases however, resource degradation was not perceived to be the main problem within the community. It was argued that other problems, such as lack of water, food and poverty, should be resolved before people could utilise time planting trees.

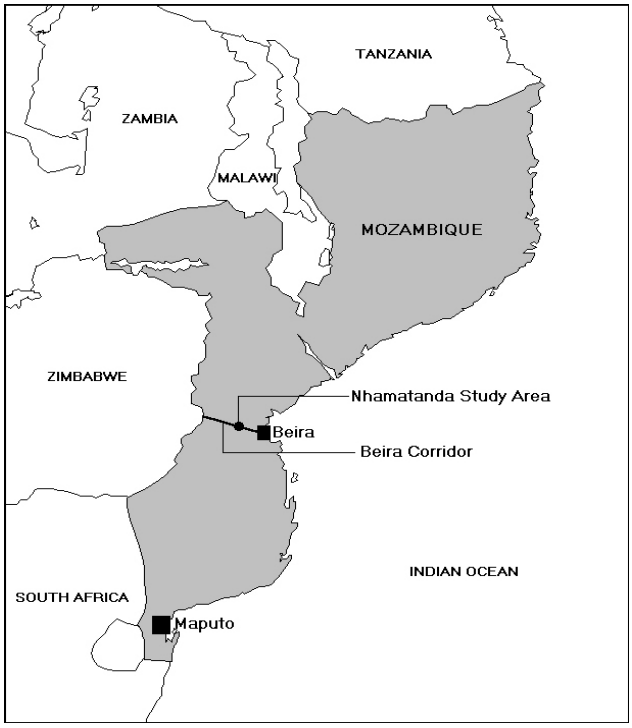
Fruit trees were requested above all other species as excesses could be sold to provide a source of economic income for the family. Generally, individuals stated that they were willing to pay a small amount to purchase seedlings from nurseries.

2.0 INTRODUCTION

2.1 History and Orientation

As can be seen from Map 2.1, the Beira Corridor crosses through central Mozambique, extending from Beira, the second largest city in Mozambique, to Zimbabwe. Beira, the provincial capital, has traditionally been a strategically important city, with a large port facility and an oil pipeline running alongside the Beira Corridor road link to Zimbabwe. A railway line also runs the length of the corridor from Beira to Zimbabwe. The corridor itself therefore provides an important commercial link between the port facilities of Beira and other landlocked countries within Southern Africa.

Map 2.1 The Beira Corridor and Nhamatanda



Sofala Province covers an area of approximately 68,000 Km^2. The eastern section of the Beira Corridor traverses the province, ending at the coastal city of Beira. Nhamatanda is approximately 110 Km west of the city of Beira itself.

During the conflict period, population movement particularly affected the corridor environment, as the protection afforded by the presence of Zimbabwean troops meant that it was a relatively safe area to live. Accordingly, large concentrations of refugees settled in and around Nhamatanda, as well as Dondo and Beira. It was estimated that in 1988-89 alone, approximately 83,000 refugees concentrated along the Sofala section of the corridor. Nhamatanda was also a major temporary resettlement area for Mozambican refugees returning from neighbouring countries after the civil war. Although many returnees have now moved back to their areas of origin, many are

making Nhamatanda their permanent home. The population of the district thus continues to grow rapidly, with great demands being put on local natural resources and social services. Pressure on the natural resource base has led to localised environmental degradation and deforestation. This is a result of charcoal and timber production, land clearance for subsistence agriculture and wood gathering for fuel and construction.

The Social Forestry Component of the GERFFA project intends to introduce community nurseries and school tree programmes into this area in order to raise awareness of the importance of trees, and attempt to tackle the problem of resource degradation in the area. The first step of this process was the implementation of a socio-economic study in order to understand livelihood systems and the use and management of natural resources to a greater extent.

2.2 Study Objectives

Main Objective: Collection of community information in order to facilitate GERFFA management plans and project implementation.

Specific Objectives:

i) Descriptions of traditional and political systems of control
ii) Analysis of natural resource use (local and outsider)
iii) Analysis of natural resource management and constraints
iv) Examination of perceptions of deforestation and tree planting activities
v) Gender analysis of natural resource use and management
vi) Analysis of livelihood systems and income generating activities
vii) Examination of machamba activities
viii) Identification of specific community problems
ix) Examination of attitudes to Community Forest project

2.3 Methodology of Study

The methodology involved a combination of quantitative and qualitative techniques in order that data could be effectively cross checked, thereby ensuring quality and reliability of information. The methodology consisted of the following:

- Review of existing data and previous studies performed in Nhamatanda District by various organisations.
- Various PRA and RRA techniques focused around community meetings in each of the five selected areas. This involved open-ended, though directed, discussions. Efforts were made to contact the most vulnerable groups.
- Questionnaire survey with randomly selected members of the local community in each of the five selected areas.
- Structured and informal interviews with governmental and non-governmental organisations working in the area, including extension staff.

The questionnaire survey was restricted to the five areas where the project was to be implemented. The number of questionnaires completed in each area is as follows:

Table 2.1 Number of Questionnaires Carried Out in each Area

	Area	No. Questionnaires
	Siluvo	25
	Lamego	28
	Mudu-Mufo	20
	Ndeja	8
	Chicuacha	19
Total	**5 Areas**	**100**

The number of completed questionnaires represents an approximate 2% sample size in each community. Attempts were made to ensure that women were represented in the questionnaire survey. Women were therefore invited to fill in the questionnaire either together with male respondents or alone. Overall, 56% of the questionnaires were completed by men alone, 35% by women alone and 9% by both men and women. Data inputting and analysis was carried out using EXCEL. Analytical techniques involved calculations of frequencies, percentages and averages of the entire data set and each individual community.

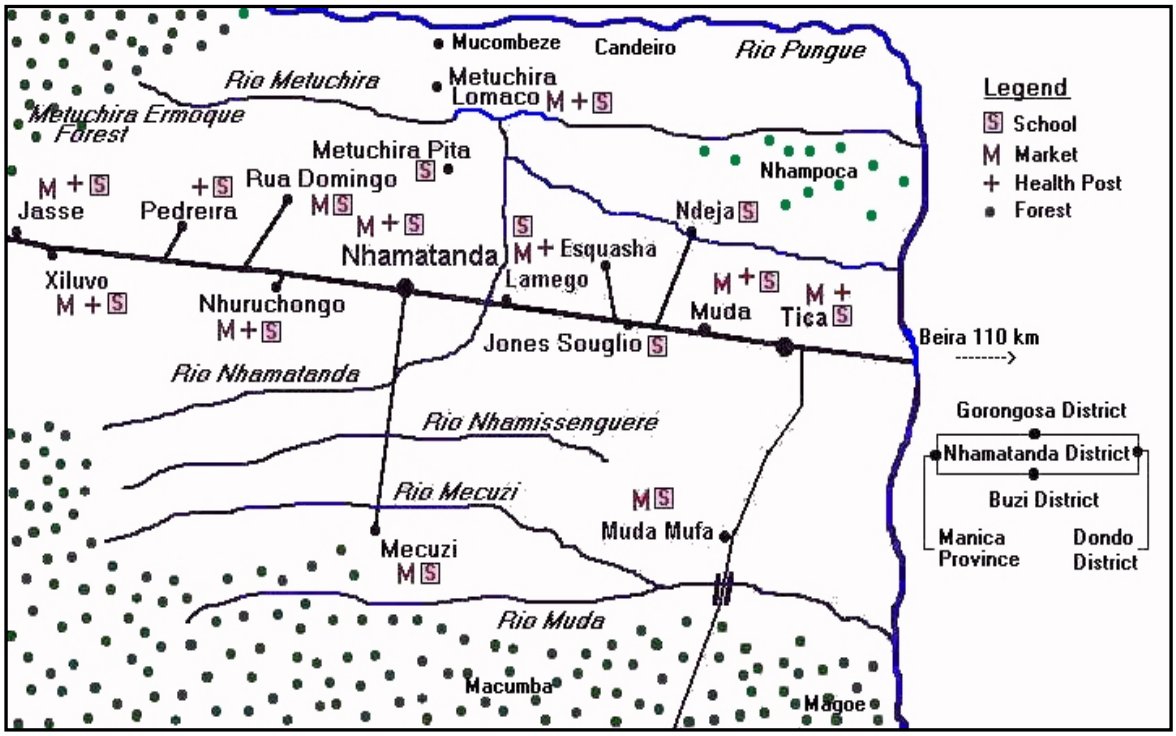
A detailed description of the field methodology and questionnaire can be found in Appendix 1 and 2.

2.4 Description of Nhamatanda District and Communities Studies

2.4.1 General Information

Nhamatanda became an independent district on the 10th June 1980. Prior to this time Nhamatanda was a part of Dondo District. The sketch map below shows the boundaries, forest resources, rivers, main areas of habitation and services of the District. As can be seen in Map 2.2 below, the boundaries of Nhamatanda District are formed by the Pungue River to the east and north, beyond which are Dondo and Gorongosa District (respectively); the provincial border between Sofala and Manica in the West and a band of forest in the south after which Buzi District commences. There are two administrative areas in the district. The main administrative centre is situated in Nhamatanda *Sede*, the central area, with a second in Tica, which is situated 27km east of Nhamatanda. Nhamatanda is linked to the electricity grid, though few houses, especially outside the *Sede* and Metuchira Lomaco, have access to electricity. Post office and public telecommunication facilities are available in Nhamatanda *Sede* and a public telephone is also available in Tica. The majority of housing in all areas is constructed with natural materials, including wood, grass, mud, bamboo and stones rather than bricks and cement. Plumbing and sewage facilities are limited and in most cases water is collected from rivers, boreholes or traditional wells. The vast majority of families are involved in subsistence agriculture with sale of excess produce or natural resources.

Sketch Map 2.2 Nhamatanda District: Boundaries, Resources and Services



From the map it can be seen that the five communities studied are all situated relatively close to the Beira Corridor with only Muda-Mufo and Ndeja not actually adjacent to or traversing the corridor. Muda-Mufo is situated 9km to the south of the corridor and Ndeja approximately 5km to the north.

2.4.2 DDA Activities

The District Directorate of Agriculture and Fisheries (DDAP) has been operational in the area since 1985, though at this time it operated in relation to agricultural activities only, with no involvement in fishery related activities until 1995. During the conflict period, the DDAP maintained some level of activities, though these were concentrated along the protected areas directly around the Beira Corridor. Activities in interior areas were severely restricted due to conflict activities. The DDAP are currently implementing a rural extension programme concentrated around improvement of agricultural techniques, with involvement in cattle raising and fishery activities. In addition, controllers are involved in fiscalisation activities and carry out routine control of poaching throughout the area. The extensionists are under the supervision of SDER while the controllers are supervised by SDFFB. The District Director of Agriculture (DDA) heads this hierarchy. There are no social forestry activities currently carried out in the district. The 1997 FHI/M survey showed that of the total number of people in the district receiving extension support, only a very small percentage were reached by the DDA extensionists. This was reportedly due to lack of logistical necessities, such as transport needed to access communities which are situated in widely spread areas.

2.4.3 Geography and Resource Base

Nhamatanda District covers an area of 3,975 Km^2. The population of Nhamatanda relies heavily on the natural resources within the area which fulfil many basic needs such as the basic needs for fuel, construction material, food, medicines and economic income.

The forest of Nhamatanda is mainly comprised of Miombo woodland, with a transitional area to the east of Mopane woodland. Miombo woodland is composed mainly of deciduous woody vegetation, and is dominated by *Brachystegia spiciformis* and *Julbernadia globiflora.* In wetter areas, *Brachstegia spiciformis* may be replaced by *B. utilis.* On thin soils or rocky slopes *B. boehmii* may become the dominant species. In the transition zone from Miomba to Mopane woodland in the east of the district, species of the following genera may be found: *Acacia, Colophospermum, Combretum* and *Kirkia*.

As can be seen from Map 2.2, the main forestry resources are situated towards in the western section of the district on both the north and south sides of the Beira Corridor, with a band of forest running across the south forming the boundary with Buzi District. Forest resources can be seen to be very scarce in the east of the district. This area is also prone to flooding. Of the communities studied, Mudu-Mufo and Siluvo are situated in the south of the district and the remaining areas are in the north. Siluvo, situated in the west of the district has the easiest access to forest resources, while the remaining districts are situated in the east where forest resources are minimal. Forest resources are collected from areas such as Macumba, Halumbwa, Magoe in the east and Metochira Ermoque Forest in the west. In many cases resources are collected in these areas and sold within local communities.

In terms the present natural resource base in Nhamatanda, the DDA in Nhamatanda reported that the resource base is currently severely degraded. This is for several reasons. Initially, natural resources suffered greatly as a consequence of the war, during which time forest resources were devastated and poaching brought the number of some of the most important wildlife species close to extinction. During the war charcoal production and timber extraction continued and in Nhamatanda was concentrated in areas close by the Beira Corridor due to the protection afforded to the area by the presence of the Zimbabwean army. Lack of controls at this time resulted in and unsustainable cutting of high-grade trees and subsequent degradation of the forest, most notably in the northern areas of the district. At the present time, lack of control of charcoal producing activities, especially in the south of the district (due to limited means of DDA staff to police production areas) is continuing to contribute to the problem of degradation. The DDA also reported that population increases (of refugees during the war and to a lesser extent the current population growth) and the practice of shifting cultivation has also caused forest to be removed by local people in order to create new machamba areas.

The entire district of Nhamatanda is traditionally an agricultural area. FHI/M (1997) report that the soils are fertile and there is little erosion due to the flat terrain. The River Pungue and it's tributaries are the main water sources. The main tributaries running through Nhamatanda are the River Metuchira in the north and rivers Nhamatanda, Mecuzi and Muda in the south. Rivers Muda, Metuchira and Mecuzi are

permanent rivers, while River Nhamatanda becomes dry in some parts during the dry season.

2.4.4 Legalities of Resource Exploitation

Forest areas are communally accessible for the exploitation of everyday subsistence resources such as fuelwood by members of the local community. A *'credencial'*, or temporary license must, however, be obtained from the DDAP if a large amount of any resource is to be extracted. For example, if a large building such as a church is to be constructed, a *'credencial'* must be obtained in order to legally cut the bamboo (or other resource) necessary to construct the building. *'Credencials'* must also be obtained by large institutions such as schools, hospitals and jails, in order that they can collect fuelwood. In terms of charcoal and timber production, *'credencials'* or licenses must be obtained which legalise small and large-scale production consecutively. This issue is examined in detail in Section 5.2.

2.4.5 Population/Area of Study

Prior to the war the population of Nhamatanda, according to the DDA, was 100,000 people. During the war the number of people increased to 260,000, though by 1997, this figure had reduced to 135,000 people. The present population figure gives a population density of around 34 people per Km^2, which is higher than the national figure of 21 people per km^2. The population is however, concentrated mainly in areas in close proximity to the Beira Corridor for economic and employment reasons.

The population of each of the study areas is shown in the table below:

Table 2.2 Population Data in Study Areas

Area	Population
Chicuacha	500
Ndeja	620
Mudu-Mufo	600
Lamego	650
Siluvo	3,014

2.4.6 Language

Languages spoken include Sena and N'dau. The N'dau are an ethnic group accounting for less than 2% of the total Mozambican population. They are a sub-group of the Shona, the majority ethnic group in Zimbabwe and their homeland spreads from the south-eastern Zimbabwe highlands across an area just south of the Beira Corridor to the coastal region. N'dau speakers dominated RENAMO military leadership. Portuguese is also spoken by a large number of people.

2.4.7 Zones and Regualdos

Within Nhamatanda land areas are administered according to Political and Traditional Systems. In the Political System the area is divided into Administrative Zones of which an Administrator or Administrator de Poste is the head. There are two Administrative Localities in Nhamatanda which are Tica and Nhamatanda *Sede*. Each locality is then broken down further into 'circulos' and 'bairros'. In the Traditional Systems, the area is broken down into '*Regulados*' of which a '*Regulo*' or a *M'fumo* is the head. Certain areas may have both a political and traditional leaders. (This is examined in more detail in section 4.0). There are three '*Regulados*' within Nhamatanda: two in the north – '*Regulado'* Candiero and '*Regulado'* Nhampoka, – and one in the south – '*Regulado'* Tica. The DDA work within both the political and traditional systems.

2.4.8 Market Areas

The main market is situated in Nhamatanda *'Sede'*, however, other relatively large markets exist in Lamego and Tica. Smaller markets exist in the majority of areas as can be seen from Map 2.2. In many areas produce is also sold at small stalls along the roadside. Markets are held on a daily basis and typically sell an assortment of fresh produce, second hand clothing and basic commodities.

2.4.9 Transport Network

The main road running through Nhamatanda is the Beira Corridor, this road dissects the district into northern and southern areas. In this area the road has a tar surface. Several sections in the western area of the district, near Siluvo zone are presently undergoing rehabilitation. The remaining roads running off the Beira Corridor are gravel or dirt-roads that are mostly impassable without high clearance or four-wheel-drive vehicles. For local people, the most common method of transportation is via *'chappa'* which is a privately owned minibus/small lorry operating as a taxi. A *'chappa'* from Nhamatanda to Beira or Siluvo costs MT 10,000.00 or MT 3,000.00 respectively in each direction. The railway running alongside the corridor road also passes through and stops in Nhamatanda.

2.4.10 Health and Educational Facilities

At least one school facility is available in the majority of areas as can be seen from Map 2.2. Schools are available in each of the study areas with the exception of Chicuacha. The main concentration of schools is however in Nhamatanda *Sede,* where eight schools exist. School fees cost between MT 35,000.00 - 40,000.00 per year depending on the educational level.

The main health post is situated Nhamatanda *Sede,* which is the only area where a medical doctor is available for consultation. Other smaller health posts also exist in Tica, Muda,, Lamego, Metuchira Lomaco, Nharuchonga, Pedreira, Siluvo and Jasse and are staffed by health technicians or nurses. Of the study sites, Muda-Mufo, Ndeja

and Chicuacha do not have health posts. Prices range from MT 1,000.00 - 10,000.00 for consultation which excludes any necessary medication.

2.4.11 Organisations Working in District and Existing Activities

FHI/M – The FHI/M agricultural programme has attempted to provide assistance through the establishment of an extension network which works together with the DDA to provide extension support to target communities. In the 1997 survey carried out by FHI/M it was found that only 29% of the population in Nhamatanda District receive extension support. Of this total 97% received support from FHI/M and only 2% received support from the DDA. The remaining 1% received support from an unknown source.

PAPIR – an organisation providing agricultural assistance. Activities in this programme are planned to end in December 1998.

VSO – working to establish and provide technical assistance for farmer associations

ORAM – involved in land rights, forming farmer associations and rural land registration.

RESULTS AND DISCUSSION SECTION

3.0 POPULATION DATA

The majority of people in the studied areas of Nhamatanda had lived in the area for over 10 years (as can be seen from the table below).

Table 3.1 Length of Habitation in Nhamatanda (% survey sample)

Length of Time	% of Sample
Less than one year	8
One to two years	10
Three to five years	14
Five to ten years	13
More than ten years	55

Most of the people have therefore lived in the area prior to 1988, when the civil war was still occurring. This figure therefore included the permanent population and those who may have moved into the area as refugees and decided to make Nhamatanda their permanent home.

Examining this data on a community basis (as shown in the table below) gives a clearer picture of areas to which new settlers moved after the end of the war.

Table 3.2 Years Length of Habitation in Nhamatanda (% of each community)

			Peace Accord		
	1997-8	1996-7	1993-5	1988-93	1988 onwards
	Below 1Year (% per area)	1 – 2 Years (% per area)	3 – 5 Years (% per area)	5 – 10 Years (% per area)	Over 10 Years (% per area)
Chicuacha	16	10.5	10.5	5	58
Ndeja	0	25	12	0	63
Mudu-Mufo	0	5	20	15	60
Lamego	11	14	18	7	50
Siluvo	8	4	8	28	52

The civil war between FRELIMO and RENAMO officially ended with the signing of the Rome Peace Accord in 1994. It can be seen from the table above that the majority of people have lived in the same area for over 10 years in each community. However, movement of populations into various areas has occurred both before and after the war ended. New families appear to be have been continually arriving in Siluvo, possibly because it is near to the forest areas and natural resources are more widely available than in other areas. Lamego and Chicuacha also have new families arriving, especially in recent years. This is possibly due to employment opportunities and economic activities occurring in this area. Mudu-Mufo and Ndeja have not seen newcomers moving into the area recently, but did in the years proceeding the end of the war.

3.1 Family Size

Family size was calculated from the number of people living on a single homestead. The overall number of people contained in the 100 families sampled was 613. The average family size of the entire sample was therefore found to be 6 people per family. This however ranges from a minimum number of 1 person to a maximum of 17 people.

Approximately half the population are adult (51%) and the remainder below 16 years of age. Juveniles (12-16 years old) represent 12% of the population, children (5-12 years old) represent 18% and babies (0-5 years) represent 18%.

4.0 SYSTEMS OF CONTROL

4.1 Political and Traditional Leaders

There are two systems of control or authorities within the area, namely Political Leaders and Traditional Leaders. The political leaders are typically FRELIMO officials while the Traditional Leaders were RENAMO sympathisers. These two groups are currently attempting to work together to resolve community conflicts.

Both leaders are responsible for orientation and direction of people within their areas. They are also responsible for land allocation and resolving conflicts in terms of natural resources and social problems. Both operate a procedure of reporting to larger political and departmental organisations, such as the Provincial Governor and the Provincial Director of Agriculture.

One of the main differences between the two types of leader is that the political leader is elected, whereas the traditional leader inherits the position. The Traditional Leader is also responsible for performing traditional activities within the community. For example, lions have symbolic, cultural importance in various areas throughout Sofala Province. If a symbolic lion is thought to be present in the community the Traditional Leader will perform ceremonies in order to pacify the lion. Also, in times of drought and famine the Traditional Leader will perform ceremonies to bring an end to these conditions. Thanksgiving and celebration ceremonies are also performed by the Traditional Leader.

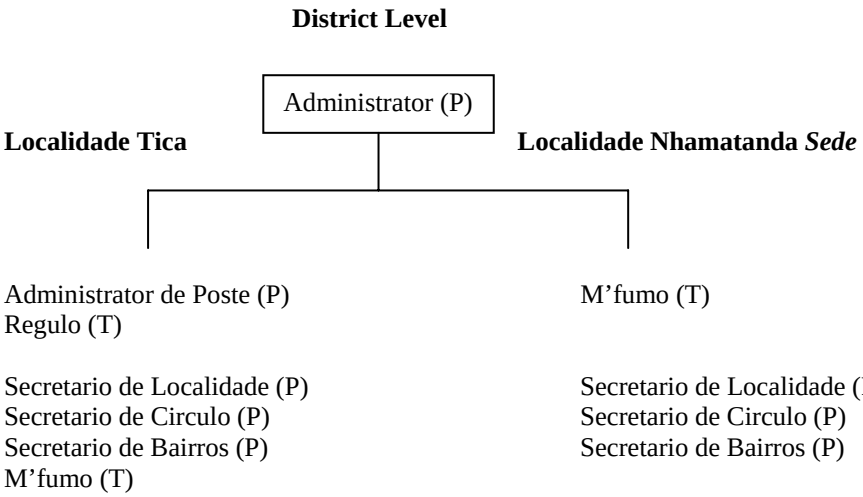
The hierarchy within each system is as follows:

Figure 4.1 Traditional and Political Hierarchy

Political Leaders	**Traditional Leaders**
Administrator	Regulo
Administrator de Poste	M'fumo
Secretario de Localidade	Sapanda
Secretario de Circulo	
Secretario de Bairros	

Within Nhamatanda the hierarchy is as shown in Figure 4.2 overleaf:

Figure 4.2 Traditional and Political System in Nhamatanda



One political Administrator therefore heads the hierarchy for the entire district. An *Administrator de Poste* and *Regulo* work under this Administrator in Tica, with other political and traditional leaders supporting them at a community level. In Nhamatanda *Sede* the Administrator is supported by a *M'fumo* and lower ranking political leaders.

Typically, small community areas, such as those in the study, would have a local leadership comprised of a *Secretario de Circulo, Secretario de Bairros* and a *M'fumo.* Political leaders are however, concentrated around the administrative centres along the Beira Corridor. In more distant areas of the district the Traditional Leader System is increasingly responsible for community management.

4.2 Land Allocation and Tenure

Local farmers do not legally need to own the 'title' to their land, but organise a lease through customary law and must be compensated by the state if they are forced to move. In practices this is not always the case. External groups may exploit land without permission from the landowner and with no benefit to the community. Peasants may also be pushed from their land illegally. Land is normally accessible free of charge, however, some *Regulos* are known to charge rental fees, though this practice is illegal. The *Regulo* or *Secretario* is at liberty to ask a family to leave the *Regulado* in the need arises. Organisations such as ORAM are however, working to establish land tenure for farmer associations in order that titles can be obtained for blocks of land, after which each member is given a title to own their plot. External groups wanting access to land would then be forced to negotiate with the landowners to gain access to resources.

When land is inhabited by a family, that family control all the resources, including trees, on the land and those resources are no longer freely accessible to other people. Complaints were made in some cases that "*all the trees in the area belong to someone*". This was a reference to the fact that all trees were situated on machambas

to which access was restricted. Trees with communal access were situated only in distant forest areas.

4.3 Conflict Resolution

In terms of conflicts arising due to natural resources, the Traditional Leaders within the communities are generally approached first. If the problem is of too great a magnitude for the Traditional Leaders to deal with, the matter is taken to the political leaders or the police. Punishment in this case is decided by the police.

In terms of other conflicts a person may first visit the Political Leader, but this depends where the individual lives. As Political Leaders are concentrated along the Beira Corridor area, they are only accessible to communities living alongside the corridor. For communities living away from the corridor, where Political Leaders are inaccessible, conflicts are taken to the Traditional Leader.

5.0 TREES: USE, PERCEPTION OF FOREST DEGRADATION, AND TREE PLANTING ACTIVITIES

The forest contains many resources that are used by people to meet their basic needs. One of the most important resources within the forest is trees. Trees are used for a variety of purposes, with the main uses being fuelwood, production of charcoal and construction material. From these resources people are able to meet their basic needs for energy and shelter. Each of these tree uses will be examined individually. This will be followed by an examination of local perceptions of forest resources, both at the present and in terms of changes seen over recent years and information of current tree planting activities carried out in each community.

5.1 FUELWOOD

As in many African countries forest areas are traditionally important due to the role they play in providing energy in terms of fuelwood for local people. Fuelwood is one of the main resources collected from the forest and is widely used as can be seen in Table 5.1. In this section the number of families using fuelwood; collection, purchase and sale of the resource; responsibilities for collection; rate of collection; distance walked to collect and time taken to collect will be examined. The time taken to collect fuelwood will be compared to the amount of time taken in this activity 5 years ago and 10 years ago.

Table 5.1 Fuelwood Data: Use, Collection/Purchasing/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Fuelwood (of community)	100
No. Collecting Fuelwood Only (of users)	85
No. Purchasing Fuelwood Only (of users)	4
No. Purchasing and Collecting (of users)	11
No. Collected from Machamba (of collectors)	27
No. Collected from Forest (of collectors)	63
No. Collected from Forest and Machamba (of collectors)	10
No. where Women Responsible for Collection (of collectors)	79
No. where Men Responsible for Collection (of collectors)	5
No. where Men and Women Responsible (of collectors)	10
No. where Children Responsible for Collection (of collectors)	6
No. of Families Selling Fuelwood	2
Main Area of Purchase	Local Market

Fuelwood was used by 100% of the sample population. 85% of the population collected fuelwood from the forest or machamba areas, while 4% never collected fuelwood but purchased it instead. An additional 11% of families purchased additional fuelwood to that which was collected.

Of the fuelwood that was collected 27% was collected from the machamba and 63% from the nearby forest, with an additional 10% collected from both areas. In the majority of areas fuelwood was collected from the forest with the exception of Siluvo where approximately 50% was collected from the forest and 50% from the machamba. Fuelwood was purchased either from the local community (40%) or the local market (53%) or both areas (7%).

In the majority of cases (79%) women were responsible for the collection of fuelwood though men and women were responsible in 10% of cases and children in 6%. Men alone were only responsible for collecting fuelwood in only 5% of cases. (In community meetings it was reported that this only occurred when the man was single, when his wife was ill or when he was involved in income generating activities). In Siluvo it was reported that men are involved in fuelwood collection to a larger extent nowadays because of the large distances involved in collecting the wood. However, generally women collect fuelwood for family use, whereas men collect fuelwood for sale or for charcoal production.

Only 2% of families reported selling fuelwood. This was sold in the local market on a daily to periodic basis and was the responsibility of both men and women. Firewood is sold for approximately MT 2,000.00 per bundle. Each bundle contains 10-15 sticks or about one metre length and 10cm width.

Table 5.2 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% of users purchasing and collecting	% selling
Chicuacha	100	100	0	11	5
Ndeja	100	100	0	0	0
Mudu-Mufo	100	100	0	0	0
Lamego	100	72	14	14	0
Siluvo	100	100	0	20	4

The main area where fuelwood was purchased was Lamego where a total of 28% of the community purchased fuelwood. Half of this number purchased fuelwood and the remaining half both purchased and collected. Lamego is the only area where members of the community purchased without having additional collecting activities. This 14% purchasing all had one family member in employment. Three were employed full-time within Lamego and one worked as a street vendor. In all cases except one charcoal was used in addition to fuelwood. Fuelwood was purchased and collected to some degree in Siluvo (20% of families) and Chicuacha (11% of families) Fuelwood was not found to be purchased in Ndeja or Mudu-Mufo. Fuelwood was sold by members of the community in Chicuacha and Siluvo.

5.1.1 Favoured Trees for Fuelwood

Numerous tree species were used for fuelwood. In Siluvo and Mudu-Mufo all trees were claimed to be important for fuelwood. In Ndeja, M'baua (*Khaya nyasica)* is a favoured fuelwood tree, however there is reportedly only one M'baua tree growing in Ndeja and two in Mudu-Mufo. Messassa (*Brachystegia spiciformis*) is also used. In Chicuacha favoured trees include Mussequessa (*Piliostigma thonningii)*, Fite/Xhiposa (*Combretum fragrans),* and Mudzeredzere (*Cleome monophylla*). All these trees are available in the nearby areas. Favoured trees in Lamego include Musolola (*Albezia harveyi)*, Mussequessa, Xhiposa, Mpingue/Pau Preto (*Dalbergia melonaxylon*) and Munangale (*Combretum imberber*).

The most popular trees used for fuelwood therefore include: Mussequesse, Xhiposa and Mpingue/Pau Preto.

5.1.2 Fuelwood Collection Activities

When collecting fuelwood, the community of Ndeja reported that wood would be taken from a dead tree if one could be found, or one which had been cut down by another person for fuelwood. If neither of these two options existed they would cut down a living tree themselves. In some cases, fruit trees are cut down for fuelwood use. One elderly woman in Chicuacha said that she had had to cut down a cashew tree for fuelwood the day prior to the community meeting. In Siluvo one man said that *"we cut down fruit trees that are old and tired. Such trees do not produce good fruit anymore and so are used as firewood."*

5.1.3 Frequency of Fuelwood Collection

For the overall data sample, fuelwood was collected most frequently (modal value) on a weekly basis. The following table shows the breakdown of fuel collection on a community basis.

Table 5.3 Frequency of Fuelwood Collection (% of families in each area)

	Daily (%)	Every 1-2 days (%)	Every 2-3 days (%)	Every 3-5 days (%)	Weekly (%)
Chicuacha	5	0	26	**42**	26
Ndeja	0	0	0	0	**100**
Mudu-Mufo	0	0	15	15	**70**
Lamego	0	7	15	15	**70**
Siluvo	0	4	17	17	**61**

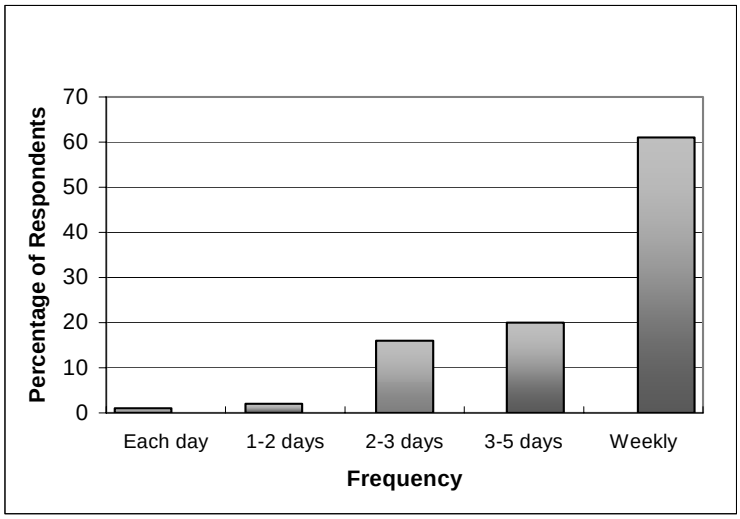
*the most common rate of collection in each area is highlighted in black

Fuelwood is collected on a weekly basis in all communities except Chicuacha, where fuelwood was collected every 3-5 days or approximately twice per week. However, in examining the tables below it can be seen that the distance walked to collect fuelwood in Chicuacha is generally shorter than that of other communities and time taken for collection is consequently less. This suggests the community of Chicuacha has easier access to forest resources than other community areas. As both the collection distance and the time involved in collection is less than in other communities it may be feasible to collect smaller quantities, which are easier to carry, on a more frequent basis. The overall sample results are presented in Table 5.4 and Figure 5.1.

Table 5.4 Frequency of Fuelwood Collection (% of survey sample)

	Frequency of Fuelwood Collection (% of Survey Sample)
Each day	1
1-2 days	2
2-3 days	16
3-5 days	20
Weekly	61

Figure 5.1 Frequency of Fuelwood Collection



5.1.4 Distance walked to Collect Fuelwood

The distance walked to collect fuelwood (each way) can be seen to vary slightly both within and between each community as is shown in the table below:

Table 5.5 Distance Walked to Collect Fuelwood (% of each community)

	1 – 3 km (%)	3 – 5 km (%)	5 – 8 km (%)	8 – 10 km (%)
Chicuacha	39	**44**	11	6
Ndeja	0	38	**62**	0
Mudu-Mufo	0	5	**70**	25
Lamego	6	29	**53**	12
Siluvo	5	16	**47**	21

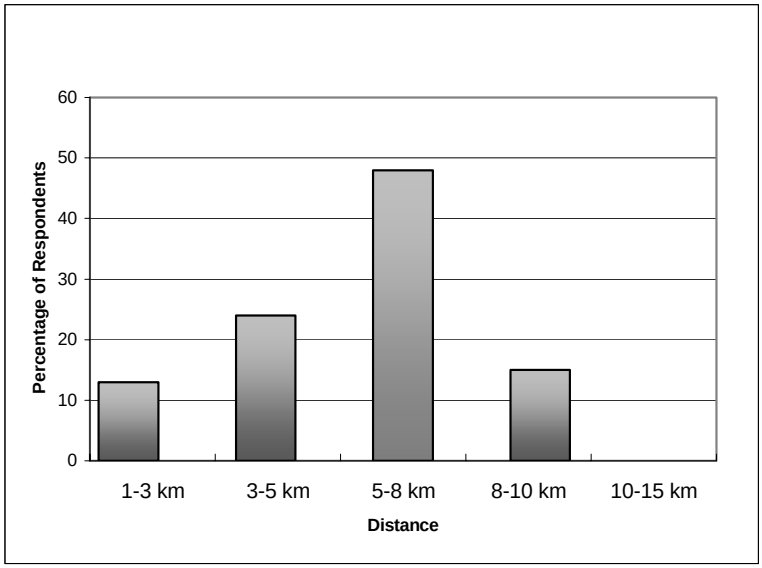
*most common distance walked in each area is highlighted in black

In all communities (with the exception of Chicuacha) the majority of families walk 5-8km in order to collect fuelwood. It can be seen that quite a large percentage of families in Mudu-Mufo, Siluvo and to a lesser extent Lamego, walk between 8 and 10km. No one was found to walk further than 10km. This information is presented graphically below.

Table 5.6 Distance Walked to Collect Fuelwood (% of sample survey)

	Distance Walked to Collect Fuelwood (% of Survey Sample)
1-3 km	13
3-5 km	24
5-8 km	48
8-10 km	15
10-15 km	0

Figure 5.2 Distance Walked to Collect Fuelwood



5.1.5 Time Taken to Collect Fuelwood (Present, Five and Ten Years Ago)

An analysis was made of the approximate time taken to collect fuelwood at the present time, five years ago (1993) and ten years ago (1988). The table below shows time taken to collect fuelwood at present.

Table 5.7 Time Taken to Collect Fuelwood at Present Time (% of each community)

	1 – 2 Hr (%)	2 – 3 Hr (%)	Half Day (%)	Whole Day (%)
Chicuacha	**63**	26	10	0
Ndeja	0	**62**	38	0
Mudu-Mufo	0	40	**55**	5
Lamego	10	37	**47**	5
Siluvo	17	39	**58**	11

* most common time taken to collect fuelwood in each area is highlighted in black

With the exception of Chicuacha and Ndeja, the majority of families spend half a day in the collection of fuelwood. Families in Ndeja tend to spend slightly less time in fuelwood collection. This is probably due to the fact that the farthest distance walked is 8km whereas members of other communities may walk as far as 10km as is shown in the table above. In Chicuacha the most common collection time is one to two hours which is the least of all communities. One person in Mudu-Mufo used a bicycle to collect fuelwood.

The following two tables show the approximate time taken to collect fuelwood five years (1993) and ten years ago (1988) respectively. These can be compared to the table above showing time taken at present. (Families not living in the area five or ten years ago have been omitted from the calculations in these tables).

Table 5.8 Time Taken to Collect Fuelwood Five Years Ago (% of each community)

	15 mins (%)	30 mins (%)	1-2 Hr. (%)	2 - 3 Hr. (%)	Half Day (%)	Whole Day (%)
Chicuacha	0	38	**46**	8	8	0
Ndeja	0	0	**80**	20	0	0
Mudu-Mufo	0	6	**72**	22	0	0
Lamego	0	0	**57**	29	7	7
Siluvo	0	16	**68**	16	0	0

* most common time taken to collect fuelwood in each area is highlighted in black

Table 5.9 Time Taken to Collect Fuelwood Ten Years Ago (% of each community)

	15 mins (%)	30 mins (%)	1-2 Hr. (%)	2 - 3 Hr. (%)	Half Day (%)	Whole Day (%)
Chicuacha	**42**	25	25	0	8	0
Ndeja	0	40	**60**	0	0	0
Mudu-Mufo	0	19	**63**	18	0	0
Lamego	14	29	**57**	0	0	0
Siluvo	25	10	**65**	0	0	0

* most common time taken to collect fuelwood in each area is highlighted in black

It can be seen that five years ago the most common time taken to collect fuelwood is one to two hours in all cases. A relatively high number also said two to three hours. Very few took a half or whole day. In Lamego and Siluvo some families reported that fuel collection took only half an hour at this time.

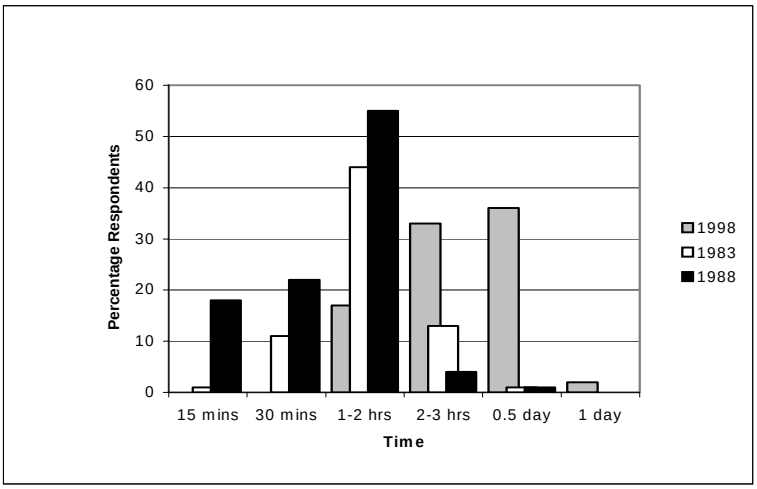
Ten years ago the modal value can again be seen to be one to two hours for each community with the exception of Chicuacha, where the most common time for fuelwood collection was only 15 minutes. The distribution at this time though tends to favour the lower side of one to two hours, with many families taking half an hour or 15 minutes. Very few families took more than two hours to collect fuelwood.

Clearly seen the time taken to collect fuelwood has increased considerably over the ten-year period from an initial 15 minutes to two hours, to one to three hours and then to half a day in most cases at the present time. This is indicated in Table 5.10 and Figure 5.3 below.

Table 5.10 Fuelwood Collection Time (% of survey sample)

	Fuelwood Collection Time (% of Survey Sample)		
CLASS	**1998**	**1993 (5 years)**	**1988 (10 years)**
15 mins	0	1	18
30 mins	0	16	22
1-2 hours	19	63	55
2-3 hours	38	19	4
0.5 day	41	1	1
1 day	2	0	0

Figure 5.3 Time Taken to Collect Fuelwood



5.1.6 Variety of Fuel Use

Of the overall sample, 100% of people used fuelwood. In addition, however, 64% used crop residue such as maize cobs, stalks and leaves of maize and sorghum or small bushes and shrubs. 27% used charcoal and one family used kerosene for lighting purposes. In addition, one family used electricity. The table below shows a breakdown of fuel use in each area.

Table 5.11 Types of Fuel Used (% of each community)

	Fuelwood (%)	Crop Waste/ Small bushes/ Shrubs (%)	Charcoal (%)	Kerosene (%)	Electricity (%)
Chicuacha	100	84	11	0	5
Ndeja	100	88	0	0	0
Mudu-Mufo	100	75	5	0	0
Lamego	100	34	46	0	0
Siluvo	100	68	45	4	0

*N.B. Some families used more than one fuel product

It can be seen that from the Table 5.11 that maize-cobs, stalks and leaves are used by many people in all areas (though less is used in Lamego). Kerosene was used in Siluvo. Electricity was used in Chicuacha by one family, of which one person was in full-time employment.

Charcoal was popular in Lamego and Siluvo with almost half of each community utilising this resource. Lamego has the highest level of full-time employment, therefore more families with a greater disposable income, which can be spent on alternative energy sources. This indicates a relationship between fuel use and economic income where the type of fuel used changes as income increases. Charcoal was also used to some extent in Chicuacha. Charcoal use is probably higher in Siluvo and Chicuacha as these were the major production areas identified in the study. Charcoal is generally purchased within the local community. In most cases it is purchased rather than produced by the family solely for consumption. One bag of charcoal, usually weighing between 35-50kg lasts a family between two and four weeks depending on family size. The cost of a bag varies depending on the season (as

can be seen from section 5.2.6), but on average costs approximately MT 15,000.00. Several people mentioned that charcoal was not used because families did not have enough money to purchase the stoves needed to burn charcoal. These stoves cost approximately MT 50,000.00.

5.2 CHARCOAL

In Beira, as in many African cities where wood resources are scarce or located far from urban centres, charcoal is fast becoming the dominant fuel. One advantage in using charcoal is that it is easier for the consumer to carry from the market due to its greater energy density. It is also easier to handle and store, gives a more even cooking temperature than wood, and typically has a higher end-use efficiency. Also, charcoal is smokeless and can thus be used indoors. For many consumers these advantages outweigh the fact that charcoal typically costs more per kilogram than fuelwood.

Much of the charcoal produced in Nhamatanda is transported to Beira in order to meet the urban demand for energy. This provides a valuable source of income to members of the local community involved in this activity. However, uncontrolled charcoal production is blamed in many cases for destruction of the forest surrounding Nhamatanda. Many people however produce charcoal as it is one of the few income generating activities available. One man in Chicuacha reported that *"we do this job because we do not have any other job. To get another job we must pay someone to get the job for us. Why bother when we can get money from making charcoal?"*

5.2.1 Legal Procedures

Both producers and transporters of charcoal require official consent in order to carry out their activities legally. Large-scale producers and transporters, for example, those selling their charcoal wholesale for transportation to Beira, must first purchase a license. The license limits the producer to producing charcoal in a specific area, for a specific length of time and must be obtained from the Provincial Director of Agriculture (DPA). It specifies the diameter of trees that can be used and the amount of charcoal that can be produced. Checkpoints are situated along the Beira Corridor at Inchoppe, Nhamatanda and Dondo in which licenses of transporters are checked.

Those producing charcoal at a small-scale for sale within the local community or subsistence purposes do not need a license, but must purchase a *'credencial'*. This is a temporary production permit that is obtained from the local DDAP. The cost of the *credencial* depends on the quantity of charcoal which is to be produced. For example, a *credencial* to produce ten bags of charcoal presently costs MT50,000.00. A certain percentage of the cost of a license or *credencial* is taken as a government tax.

However, according to the DDA, there are many problems associated with controlling charcoal activities. Most of the problems were reported to lie with the producers rather than the transporters. Transporters were more likely to purchase licenses as the license had to be produced at the various checkpoints. As road access to Beira is limited, avoidance of the checkpoints is difficult. In addition, those found without a license are refused future licenses as a form of punishment. In terms of charcoal production however, the DDA and members of local communities reported that the license and *credencial* system is often ignored. The DDAP is limited in its ability to police and control production activities due to lack of and transportation facilities, therefore producers can continue illegal production of charcoal in the knowledge that they will be unchallenged. Members of Siluvo community reported that people from Beira, Chimoio, Gorongosa, Mefambise and other areas of Nhamatanda are involved

in illegal charcoal production in the area. The community said that *"as soon as a person gets into the forest he claims an area and uses all the trees for charcoal"*.

5.2.2 Production Process

Charcoal production involves several processes as described below:

- Selecting and cutting the wood
- Preparing and clearing the kiln area
- Moving the wood to the kiln site
- Building the wood into a suitable mound shape
- Covering to wood with grass and leaves, then soil
- Igniting the kiln
- Removing and cooling the charcoal when a specific amount of combustion has occurred.
- Packing the charcoal into sacks ready for transportation and sale.

A kiln can measure up to 3-4 metres in length, 2 metres in width and 1.5 metres in height. Air holes are left in the side of the kiln in order to promote combustion. The kiln is ignited at one end and combustion gradually occurs through the entire kiln. When combustion is complete in the first section the charcoal is removed in order that it is not completely burned. The entire process, including preparation and burning, usually takes approximately three to four weeks.

5.2.3 Level of Activity

The following table shows the number of people involved in charcoal production, selling activities and main group responsibilities.

Table 5.12 Charcoal Production Data: Production, Sale, Responsibilities

Activities	% of Sample Population/ Producers/Sellers
No. Producing Charcoal (of sample)	16
No. Producers Selling (of producers)	100
No. Selling but not Producing (of sample)	4
No. where Men Responsible for Sale (of sellers)	86
No. where Men and Women Responsible for Sale (of Sellers)	14
Main Area of Sale (of Sellers)	Local Market
Frequency of Sale (of Sellers)	Seasonal

A total of 16% of the sample population produced charcoal. Of these producers, 100% sold the charcoal rather than use it for household consumption. In no cases was charcoal found to be produced only for household consumption. An additional 4% purchased charcoal rather than produced it themselves, then resold the charcoal either in the local community or in other areas. 57% of those selling charcoal sold it in the local area, either within the community or at the market. An additional 34% sold to

wholesalers and the remaining 8% sold in other areas, such as Beira, on a private basis.

Charcoal was mainly sold on a seasonal (43%) or monthly (29%) basis. 14% sold on a daily and 14% on a weekly basis. Sale of charcoal was the responsibility of men in 86% of cases and men and women in 14% of cases. Charcoal production and sale however, varied from community to community as can be seen from the table below.

Table 5.13 Breakdown by Community of Producers and Sellers

Area	% of Community Producing and Selling	% of Community Selling Only
Chicuacha	37	11
Ndeja	13	0
Mudu-Mufo	0	5
Lamego	4	0
Siluvo	28	4

Charcoal was mainly produced and sold within Chicuacha and Siluvo, and to a lesser extent in Ndeja and Lamego. Charcoal was sold by non-producers in Chicuacha, Mudu-Mufo and Siluvo. In Chicuacha 86% of producers sold locally and 14% sold to wholesalers. All the charcoal produced in Lamego was sold within the local area. In Siluvo, 17% was sold outside local areas and 83% of charcoal was sold to wholesalers.

5.2.4 Seasonal Changes in Charcoal Production

Charcoal production tends to vary on a seasonal basis. In the wet season many areas may be flooded causing difficulty accessing forest sites where charcoal is produced. If sites can still be accessed, difficulties arise in constructing the kiln when the ground is wet. Achieving ignition and effective combustion within the kiln may also be problematic. As a result some people only tend to produce charcoal in the dry season rather than all year round. In Nhamatanda 40% of producers are active only in the dry season, while 60% produce all year round. The following table shows the breakdown of production on a seasonal basis for each community.

Table 5.14 Seasonal Charcoal Production (% of each community)

	Produce in Dry Season (% of Producers)	Produce All Year (% of Producers)
Chicuacha	33	67
Ndeja	100	0
Mudu-Mufo	0	0
Lamego	100	0
Siluvo	29	71

It can be seen that in Chicuacha and Siluvo, the main charcoal producing areas, charcoal is produced by the majority of people all year round. As can be seen from Table 5.11 (variety of fuel use) these areas also have some degree of demand from the local community. In Ndeja and Lamego, where charcoal is produced by a smaller number of people, charcoal is only produced in the dry season. In Lamego, charcoal is not produced during the wet season as it is impossible to cross the flooded rivers to

reach the forest. Charcoal was not found to be produced in Mudu-Mufo, but was sold in this area.

5.2.5 Level of Production

The amount of charcoal produced by each producer were found to vary slightly, again according to the season as is shown in the table below.

Table 5.15 Monthly Charcoal Production on Seasonal Basis (% of those producers)

	Below 50 Sacks (% of Producers)	50-100 Sacks (% of Producers)	100-200 Sacks (% of Producers)
Wet Season	64	27	9
Dry Season	57	34	9

It can be seen that the majority of charcoal producers produce less than 50 sacks of charcoal per month in both the wet and dry seasons. However, in the dry season producers increase output to 50 - 100 sacks. On examining this information on a community basis the amount of charcoal produced varies as indicated in Table 5.16.

Table 5.16 Charcoal Production Per Community (% of producers)

	Charcoal Production		
	Less than 50 Sacks/ Month (% of Producers)	**50-100 Sacks/ Month (% of Producers)**	**100-200 Sacks/Month (% of Producers)**
Chicuacha			
Wet Season	100	0	0
Dry Season	83	17	0
Lamego			
Wet Season	0	0	0
Dry Season	100	0	0
Siluvo			
Wet Season	33	50	17
Dry Season	17	60	20

It can be seen from Table 5.16 that 100% of producers in Chicuacha produced less than 50 sacks per month in the wet season with 17% increasing to 50-100 sacks in the dry season. The majority of charcoal producers in Chicuacha therefore produce relatively small amounts of charcoal. In Lamego, the producers again all produce less than 50 sacks per month and only in the dry season. The major charcoal-producing group of the communities studied, in terms of quantity was Siluvo. The majority of producers in this area produced between 50-100 sacks per month throughout the year. Producers with an output of 100-200 sacks per month were all situated in Siluvo and maintained this output during the wet and dry season.

5.2.6 Sale of Charcoal

Prices of charcoal tend to vary, again depending on the season. In the wet season the price tends to be elevated because not as much charcoal can be produced and there are difficulties associated with transporting charcoal to the point of sale. At the same time, demand for charcoal within urban areas increases due to the difficulties associated with burning wood. During the dry season production and transportation

are easier and at the same time demand from urban areas decreases as dry wood can easily be burned. Prices are therefore lower.

Generally, charcoal sold privately is sold for a higher price than that sold to wholesalers as wholesalers have the advantage of buying in bulk and so can negotiate for lower prices. The data from the sample confirms these usual trends as is shown in Table 5.17 below.

Table 5.17 Price Scales According to Season and Method of Sale (modal value)

	Local, Private Sale (MT)	Wholesale (MT)
Dry Season	15,000.00	10-14,000.00
Wet Season	20,000.00	15-20,000.00

Charcoal sold locally, on a private basis during the dry season, is sold for approximately MT 15,000.00 per sack in all cases. During the wet season, it is sold at a higher price of MT 15 - 20,000.00 per sack. Charcoal sold to wholesalers during the dry season is sold for between MT 10 - 14,000.00 per sack. During the wet season this increases to MT 15 - 20,000.00 in the majority of cases. Wholesale prices can be seen to be slightly lower than local sale prices.

5.2.7 Collection of Wood for Charcoal Production

77% of those producing charcoal use wood collected from the distant forests. 13% collect the wood from the nearby forests. These people are all situated in Chicuacha. Those using wood from the distant forest of Chicuacha work in Kudibi and Cunsito areas. Those in Lamego use wood from Fenso and those in Siluvo use wood from Metuchira, on the road to Gorongosa, in the majority of cases or Mucombeze in one case.

5.2.8 Favoured Tree Species for Charcoal Production

In Chicuacha favoured trees used for charcoal production include M'Futi (*Brachystegia boehmii*), M'Goe (*Acacia goetzei*) and Ndjerendjere (*Cloeme monophylla*). Both Mugoe and Ndjerendjere are used for production, however, M'Futi is no longer available in the forest nearby Chicuacha.

In Lamego Fiti (*Combretum fragrans*) Ndjerendjere (*Cleome monophyll*) and Messassa (*Brachystegia spiciformis*) are favoured and all are used.

The favoured tree species for charcoal production in Siluvo area are Messassa (*Brachystegia spiciformis*) and M'futi (Brachystegia boehmii). The Messassa tree is used by 83% of people for the production of charcoal, indicating that it is still available in the area and M'Futi is also used to some extent.

5.3 CONSTRUCTION WOOD

The majority of buildings in Nhamatanda District are constructed from wood. The number of people engaged in various activities related to construction wood are indicated in Table 5.18.

Table 5.18 Construction Wood Data: Use, Collection/Purchase, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Construction Wood (of community)	93
No. Collecting Construction Wood (of users)	69
No. Purchasing Construction Wood (of users)	20
No. Purchasing and Collecting (of users)	11
No. Collected from Machamba (of collectors)	1
No. Collected from Forest (of collectors)	99
No. where Men Responsible for Collection (of collectors)	95
No. where Women and Children Responsible (of collectors)	5
No. of Families Selling Construction Wood	2
Main Area of Purchase	Local Community

Wood for construction was used by 93% of the sample population. 69% of those using construction wood collected the material from the forest while 20% purchased the material. In 11% of cases those that purchased material also collected from the forest or machamba. The 7% not using wood for construction used other materials such as locally made bricks.

99% of those collecting construction wood collected it from the forest with only one person collecting from the machamba area. One person in Mudu-Mufo whose livelihood was building houses collected wood from Mosca de Sono area. Collection of material for construction was in 95% of cases the responsibility of men. Women and children were responsible for the remaining 5%.

Where construction material was purchased, it was purchased from within the local community (58%), the local market (39%) or both (3%). Construction material was sold by 2% of the population. It was sold either within the local community or within the local market with sale being the responsibility of men.The following table shows the construction data for individual communities.

Table 5.19 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% of users purchasing and collecting	% selling
Chicuacha	100	84	5	11	10
Ndeja	100	87	0	13	0
Mudu-Mufo	100	85	10	5	0
Lamego	96	41	52	7	0
Siluvo	76	68	11	21	0

Construction wood was used to a slightly lesser extent in Lamego (96%) and Siluvo (76%) but was used by 100% of communities in the other areas. Construction wood was collected in the majority of cases in Chicuacha, Ndeja, Mudu-Mufo and Siluvo. In Lamego purchase of construction material occurred much more often than

collecting with over 50% of the community purchased construction material. Construction wood was sold by members of the community in Chicuacha.

5.3.1 Favoured Construction Species

Favoured construction species in Lamego include Mukungo* (which splits easily into pieces), Eucalyptus (*Eucalyputs Sp*.), Mussangarassa, Munhashambi and Chivera. These species area available in and around Busi. Umbila (*Pterocarpus angolensis*) is the preferred species in Ndeja, however there are very few trees around. Other species include Messassa (*Brachystegis spiciformis*), Panga-Panga (*Millettia stuhlmanni*), Pau Preto (*Dalbergia melanoxylon*) and Mussequessa (*Piliostigma thonningi*). Favoured tree species in Chicuacha include Mukungo, Mussanga and Panga-Panga, which can be obtained nearby, and Raswi and Munhashambi which can be obtained in Busi. In Mudu-Mufo favoured species include Mussangoraswa, Munhashambi, Mutanda and Muningale. In Siluvo, favoured trees include Guhu, Mukuniti and Eucalyptus.

*Scientific names unknown for certain trees.

5.4 DEFORESTATION

5.4.1 Perceptions of Forest Change

According to members of the local communities, the forest has changed significantly over recent years. The DDA in Nhamatanda reported that uncontrolled charcoal production and timber extraction during the civil war was the main cause of deforestation in the past. The following box cites quotations which were collected from the various community meetings in order to highlight the changing forest over recent years, the effects of these changes and causes as perceived by the local communities.

Box 5.1 Forest Perceptions (10-20 Years Ago, Compared to Present Day)

"*The forest was dense when I was young, it formed a canopy over the road. Now there is no more forest"*. Lamego

"During the colonial regime there was a lot of forest because of the strict controls from the government. Trees could not be cut without permission". Lamego

"People used to consider the size of the tree (diameter of trunk) and not cut small ones, now this is not so". Lamego, re: charcoal production as a cause of deforestation.

"Local people join outsiders in deforestation but on a smaller scale". Lamego, re: use of forest for charcoal and timber.

"During the war many trees were destroyed by timber poachers. The government was too busy with the war and didn't do anything about it." Lamego

"The forest was so dense, it was frightening to walk into it. There were lions and other dangerous animals. Now those places are just open. You can walk with no fear". Chicuacha

"After the trees have been used to make charcoal the land is used for machambas, the forest does not regenerate". Chicuacha

"In the past people used to come and take trees for timber. Now it has all been taken. People go to Gorongosa and Buzi instead". Chicuacha

"There is a big difference between the forest now and ten years ago. Ten years ago there was a lot of forest in this area". Ndeja

"Charcoal makers have destroyed the forest. Now women use maize stalks, otherwise they must walk ten kilometres to the forest to collect fuelwood". FRELIMO Secretary, Siluvo

"It was forest in the past. Now there are no trees. It is like looking at a desert". Elder, Siluvo

As can be seen, different people had differing perceptions causes of deforestation. This information was quantified in the questionnaire survey, the results of which are shown in the table below.

Table 5.20 Local Perceptions of Forest Loss (% of sample)

Reason For Forest Loss	% of Sample*
Clearance for Machamba	29
Charcoal Production	71
Collection of Resources (Firewood and Construction Material) by Local People	20
Commercial Timber Production	5
Other	2

*in some cases more than one reason was given

Other reasons given for deforestation include population pressure and lack of employment.

In all communities except Mudu-Mufo, charcoal making was perceived as the main reason that deforestation occurred. This problem was thought to be exacerbated when the forest, which has been cleared for charcoal production, is then turned into machamba area rather than being allowed to regenerate. However, studies by Santos (1997) (into charcoal production) and Saket (1996) (into available forest resources) show that the level of charcoal produced at a provincial level is insignificant in terms of standing forest resources, however, at a local level degradation of the natural resource base can be significant, as is the case in Nhamatanda. This is due in part to the fact that large areas of forest in Sofala Province are inaccessible, therefore producers are confined to working around local settlement areas where roads exist and forest areas are accessible.

Clearance for machamba was reported to cause deforestation in all areas except Siluvo. In Mudu-Mufo, clearance of forest for machamba was reported to be the main problem. Reports of commercial timber production came from Siluvo. However, it appeared that timber from the surrounding areas was no longer exploited as the timber had all been taken in the past.

5.4.2 Responsibility for Forest Loss

The following table indicates the perceptions of the sample regarding the groups of people responsible for deforestation in their area.

Table 5.21 Responsibility for Forest Loss (% of sample)

Responsible Group	% of Sample
Local Communities	88
People from other Local Communities	40
People from Outside Areas (e.g.Beira)	5
Commercial Producers	4

* in some cases more than one group was given

Overall the majority of people blamed those living in local communities for destruction of the forest and those in other local areas. However, an additional level of

blame was given to outsiders during the community meetings. The DDA in Nhamatanda reported that outsiders were to blame to a large extent during the conflict period when control over forest resources was impossible.

In Chicuacha land clearance for machamba was blamed on the local community and people from nearby communities. This was also the case or charcoal production. Outsiders as well as the local community were blamed for causing deforestation through overuse of forest resources and charcoal production.

In Ndeja people from the local community and nearby local communities were blamed for deforestation caused by charcoal production and clearance for machamba areas.

In Mudu-Mufo charcoal production was attributed mainly to the local community but also by people in other local communities. Clearance for machamba was attributed to the local community, though in one case was attributed to outsiders.

In Lamego charcoal production was attributed in the majority of cases to members of the local community and to some extent to members of other local communities. Community meetings however, suggested that outsiders were also responsible for charcoal production. Some of the affected areas, according to one resident include: Metuchira, Halumwa, Mangoma and Makumba.

In Siluvo 35% of the population attributed deforestation to outsiders using the forest to make charcoal. Local people were also reported to cause deforestation through charcoal production. Timber extraction in this area was blamed on commercial producers.

5.5 TREE PLANTING ACTIVITIES

Tree planting activities were examined in order to ascertain how communities were managing the problem of localised deforestation and lack of resources. It was found that overall, 37% of the sample population planted trees, the majority of which were planted on the homestead and were fruit trees. The most common fruit trees which were planted include mango (*Mangifera indica*), papaya (*Carica papaya*), banana (*Mussa spp.*), and cashew nut trees (*Anacardium occidentale*). Massanigueira trees (*Ziziphus mauritiana*) producing small apple-like fruits were planted in Siluvo. The number of people planting trees in each area varied as shown in the table below.

Table 5.22 Number of Families Planting Trees (% of families in each area)

Area	% Planting Trees (per community)
Chicuacha	68
Ndeja	25
Mudu-Mufo	20
Lamego	43
Siluvo	24

The majority of trees are planted in Chicuacha and Lamego communities. In the remaining communities tree planting is carried out by a maximum of one quarter of the community with only 20% planting in Mudu-Mufo.

5.5.1 Areas Where Trees are Planted

Trees were found to be planted in a variety of areas. However, the majority of people planted trees around the homestead or on both the edge of the machamba and the homestead, as can be seen in the table below:

Table 5.23 Areas Where Trees are Planted (% of those planting trees)

Area Trees Planted	% of Tree Planters
Edge of Machamba	3
In Machamba Field	13
In/Around Homestead	51
Edge of Machamba/Homestead	22
In Machamba Fields/Homestead	3
Edge of Machamba/In Machamba field/Homestead	5
In Machamba Field/Homestead	3

In all areas the homestead was the most popular place to plant trees. A large number overall also planted on the edges of the machamba. A smaller number planted within the machamba fields. One person in Chicuacha reported that if trees are found on the machamba field, this was because they had been there a long time rather than that they had been specifically planted.

5.5.2 Type of Trees Planted

In all areas the favoured type of trees planted are fruit trees. In the vast majority of cases these were the only trees which were planted. 100% of those planting trees on and around the machamba planted fruit trees. On the homestead 88% of trees planted were fruit trees, 3% were for fuel and 9% were planted for other reasons such as to provide shade or medicine. (Trees planted to provide shade and fuel were reported to be acacia species). Fruit trees were the main trees planted because of the benefits they provided in terms of dietary intake and economic income from sale of surplus fruit. The farmer leader in Chicuacha reported that *"some people have no fruit trees and no shade, they don't know the value of fruit trees for starvation and getting money by selling the fruit."* This man also said that trees were not generally planted for fuel, *"if someone is seen planting a tree it is for fruit, shade or medicine, no other purpose"*.

It was reported that planting fruit trees was a traditional practice taught to people by their ancestors, whereas planting trees for fuelwood was not a traditional practice and so was unknown. In Chicuacha it was said that *"we were never told by our fathers and forefathers to plant trees for fuelwood. It is not traditional practice"*. When asked about planting fruit and medicinal trees it was claimed that this was a traditional practice as *"we were told by our fathers and forefathers 'this is life'"*. The concept of planting trees for fuelwood was therefore an unfamiliar practice to many people. One person in Ndeja reported that "*planting fruit trees is a traditional activity. We have never seen anyone planting trees for fuelwood before*".

In Ndeja it was also reported that people do not know how to identify fuelwood trees when they are wildlings, so do not transplant them onto their homesteads or machambas.

5.5.3 Planting Methods

Methods of planting trees include planting from seeds and planting from wildlings as is shown in the table below.

Table 5.24 Planting Methods Used (% of those planting trees)

Method	% of Tree Planters
From Seeds	32
Collecting Wildlings	59
Purchasing Wildlings	0
From Seeds and Collecting Wildlings	8

In all areas the most popular method of planting was to collect wildlings growing spontaneously in the area and replant the wildlings on the machamba or homestead area. Trees were however planted from seed frequently in Chicuacha and in many cases in Ndeja. According to the community in Lamego trees were not planted from seeds because people do not have the knowledge to grow trees from seeds. This was a common complaint in many areas. Wildlings that were collected and replanted on homesteads had usually grown as result of someone throwing seeds down after eating fruit the previous year and was therefore accidental.

Wildlings were not purchased by any of those planting trees. If wildlings could not be found growing in communal areas they were usually requested from neighbouring families rather than purchased.

5.5.4 Caring for Trees

63% of people planting trees used a number of different methods to care for trees once they had been planted. The various methods used are shown in the table below. 37% of people planting trees did not give the trees any additional care.

Table 5.25 Methods Used to Care for Trees (of those providing care)

Method	% of those Caring for Trees
Give Water	80
Give Manure (goat)	4
Fence (usually grass)	8
Water/Manure	4
Water/Manure/Fence (ox manure)	4

In Siluvo it was reported that when planting banana trees a hole was initially made which was filled with grass and sand. The wildling was planted, watered and left alone. In the case of mango and other trees the wildling was planted in the hole, watered and left. Six out of ten trees were reported to survive using this method. The trees are usually planted in the rainy season. Some people reported clearing the area around the tree until the tree had become established.

5.5.5 Responsibility for Tree Planting

In 63% of cases tree planting was found to be the responsibility of men alone, in 30% of cases it was the responsibility of men and women and in only 7% of cases was it the responsibility of women alone. This therefore raises an important issue. Women are responsible for the collection of fuelwood in most cases and therefore the problems associated with walking long distances and the amount of time spent in this activity. However, it is men rather than women who are responsible for tree planting activities. In all cases men requested more fruit trees in order to increase excesses available for sale, rather than fuelwood trees which would reduce problems experienced by women in fuelwood collection. In this present scenario, where women are essentially excluded from tree planting, women are limited in their ability to address the problems associated with fuelwood.

5.5.6 Agroforestry

Agroforestry refers to the inclusion of trees in the farming system. Research has indicated that agroforestry increases the sustainability of the farming system by improving soil fertility which leads to increased yields. However, within the areas examined agroforestry was a relatively unknown technique. Indeed planting trees within the farming system was perceived as detrimental for various reasons as shown

in the table below. For these reasons very few people planted trees in the machamba area (as is shown in Table 5.23 above).

Table 5.26 Reasons for Not Planting Trees within the Machamba Area (% non-planters)

Reason	% of Non-Planters
Causes Shade on Fields	48
Takes all the Water from Crops	0
Takes all Nutrients from Soil	0
Reduces Space for Crops	14
Other	38

Other reasons for not planting trees (either in the machamba or in other areas) include *"lack of knowledge about the necessity of trees"* (Siluvo); death of trees due to floods, fires, pests or unsuitability of soil; trees taken by thieves.

Shade was perceived as the main problem in terms of agroforestry. One person from Chicuacha reported that people would not plant trees on the machamba area because *"if there are too many trees they will create shade for the crops and so we will not have as much produce"*.

In Mudu-Mufo people reported that *"we are afraid that planting trees will take all the water and cause the crops to die"*. It was thought that planting trees would exacerbate the problem that they already experienced in providing enough water for their crops.

6.0 USES AND ACTIVITIES ASSOCIATED WITH OTHER FOREST RESOURCES

Within the forest it is not only trees that are important to the local community. The forest provides many other natural resources that are of importance and are collected, used and/or sold. The following section of the report examines the availability and use of these other resources. Some of the resources which were traditionally collected in the area were no longer found to be widely available and were therefore purchased from individuals who had previously collected the resource from more distant areas.

6.1 BAMBOO

Bamboo is used in the construction of buildings. There are two types of bamboo: yellow and green. Green bamboo is considered to be the best species. Collection of bamboo from the forest is a traditional activity which is still practised in rural areas. However, scarcity has resulted in bamboo now being purchased in Nhamatanda more often than it is collected. The overall number of people using bamboo, purchasing, collecting, selling activities and responsibilities are shown in the table below.

Table 6.1 Bamboo Data: Use, Collection/Purchase/Sale, Responsibilities

Activity	% of Sample Population/ Users/Collectors
No. Using Bamboo (of community)	60
No. Purchasing Bamboo (of users)	78
No. Collecting Bamboo (of users)	20
No. Purchasing and Collecting (of users)	2
No. Collecting from Machamba (of collectors)	9
No. Collecting from Forest (of collectors)	82
No. Collecting from Roadside (of collectors)	9
No. where Men Responsible for Collection (of collectors)	93
No. where Women and Children Responsible (of collectors)	7
No. of Families Selling Bamboo	2
Main area of purchase	Local Market

60% of the sample population used bamboo. The majority of families (78%) purchased the bamboo while 20% of families collected it. The remaining 2% of families collected and purchased additional bamboo. Collection of bamboo was the responsibility of men in 93% of cases.

Bamboo was collected from the forest in 82% of cases, the machamba in 9% of cases and from the roadside in the remaining 9% of families. The majority of bamboo which was purchased was acquired within the local market (49%) or the local community (26%). However, bamboo was also purchased in Tica (9%) and Nhamatanda (5%). 2% of the local communities sold bamboo within local community. This activity was generally the responsibility of men. Bamboo costs approximately MT20,000.00 for 10 sticks measuring 1.5-2 metres. The following table shows the breakdown of use by each community.

Table 6.2 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% of users purchasing and collecting	% selling
Chicuacha	68	0	100	0	0
Ndeja	50	0	100	0	0
Mudu-Mufo	50	0	100	0	0
Lamego	71	5	95	0	0
Siluvo	52	75	17	8	4

Bamboo is used widely within each community, especially in Chicuacha and Lamego. However, in the majority of cases it is purchased rather than collected. Siluvo is the only exception to this. In this area the majority is collected with only a small amount purchased. Bamboo is also sold by people from within Siluvo community.

Many people expressed regret that bamboo was now very scarce and had to be purchased rather than collected, as was traditional practice. Requests for bamboo plantation or nursery schemes were made in Chicuacha and Lamego

6.2 GRASS

Grass is mainly used in local communities for roof thatching and is traditionally collected rather than purchased. The overall number of people using grass, purchasing, collecting, selling activities and responsibilities are shown in the table below.

Table 6.3 Grass Data

Activity	% of Sample Population/ Users/Collectors
No. Using Grass (of community)	93
No. Collecting Grass (of users)	79
No. Purchasing Grass (of users)	13
No. Purchasing and Collecting (of users)	8
No. Collected from Machamba (of collectors)	19
No. Collected from Forest (of collectors)	80
No. Collected from Forest and Machamba (of collectors)	1
No. where Men Responsible for Collection (of collectors)	91
No. where Men and Women Responsible (of collectors)	6
No. where Women Responsible for Collection (of collectors)	3
No. of Families Selling Grass	2
Main area of purchase	Local community

95% of the sample population used grass. 79% of those using grass collected it from the machamba and forest area only. 13% purchased grass and 8% both collected grass and also purchased additional grass. Grass was collected mainly from the forest (80%) and in some cases from the machamba (19%) and the remainder from both areas (1%). Collecting was the mainly the responsibility of men (91% of families) with 6% reporting that it was the responsibility of both men and women. It was the responsibility of women alone in only 3% of households.

Of the grass that was purchased, 53% was from the local community and 47% from the local market. Grass was sold by 2% of the population. It was sold on a seasonal basis within the local community or local market and sale was the responsibility of men. The table below shows the breakdown of grass use by community.

Table 6.4 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% of users purchasing and collecting	% selling
Chicuacha	100	100	0	11	10
Ndeja	100	100	0	0	0
Mudu-Mufo	100	95	5	0	0
Lamego	93	58	38	4	0
Siluvo	88	77	5	18	0

Grass was used by a smaller proportion of the Lamego and Siluvo communities and the entire community of Chicuacha, Ndeja and Mudu-Mufo. In the latter two cases larger amounts of grass were collected rather than purchased. Grass was sold by members of the local community in Chicuacha. One person in Ndeja reported that it was difficult to cut grass from the forest as "*there is not grass left. All the land is used for agriculture"*.

6.3 MEDICINAL PLANTS

Medicinal plants are used to treat and prevent illness both by the traditional healers and members of local communities. Examples of medicinal plants include "*Mukina*" which is used to treat stomach problems and "*Mukiniti*" which is burned in the house to keep snakes away. The overall number of people using medicinal plants, purchasing, collecting, selling activities and responsibilities are shown in the table below.

Table 6.5 Medicinal Plant Data: Use, Collection/Purchase/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Medicinal Plants (of community)	9
No. Collecting Medicinal Plants (of users)	89
No. Purchasing Medicinal Plants (of users)	11
No. Collecting from Machamba (of collectors)	25
No. Collecting from Forest (of collectors)	75
No. where Men and Women Responsible for Collection (of collectors)	57
No. where Women Responsible for Collection (of collectors)	43
No. of Families Selling Medicinal Plants	1
Main area of purchase	Local Community

9% of the survey population used medicinal plants. 89% of the people using medicinal plants collected them while 11% purchased them. 75% of medicinal resources were collected from the forest while 25% were collected from machambas. Collection was the responsibility of men and women in 57% of families and of women alone in 43% of cases. Medicinal plants were purchased from within the local community. 1% of the population was involved in the sale of medicinal plants. This

family collected medicinal plants from the forest and sold them within the local community. The following table shows use of medicinal plants in each community.

Table 6.6 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% selling
Chicuacha	16	100	0	0
Ndeja	0	0	0	0
Mudu-Mufo	5	100	0	0
Lamego	7	100	0	0
Siluvo	16	75	25	4

Medicinal plants are used mainly in Siluvo and Chicuacha. They are collected in most cases with resources only being purchased in Siluvo. Siluvo is the only area selling medicinal resources.

6.4 FISH

Fish is a very important resource to local people both as a source of protein in the diet and as a source of economic income when sold. The overall number of people purchasing, catching and selling fish and responsibilities of these activities are shown in the table below.

Table 6.7 Fish Data: Use, Collection/Purchase/Sale, Responsibilities

Activities	% of Sample Population/ Users/Fishers
No. Using Fish (of community)	62
No. Catching Fish (of users)	21
No. Purchasing Fish (of users)	61
No. Catching and Purchasing Fish (of users)	18
No. where Men Responsible for Fishing (of fishers)	68
No. where Men and Women Responsible for Fishing (of fishers)	16
No. where Men and Children Responsible for Fishing (of fishers)	11
No. where Women Responsible for Fishing (of fishers)	5
No.% of Families Selling Fish	11
Main area of purchase	Local Market

62% of the sample population reported that they either caught or purchased fish. Of the people acquiring fish, 61% purchased the fish, 21% caught the fish themselves and 18% both caught the fish themselves and purchased additional fish. The fish that was caught was usually caught from the nearest river. Fishing activities occur at different rates with some people fishing daily and others monthly or seasonally. The modal, or most common rate of fishing was once or twice per week. Seasonal fishing occurred during the wet season when the rivers and surrounding areas were flooded. Fishing was mainly the responsibility of men (68% of families). However, men and women together were responsible for fishing in 16% of cases and men and children in 11% of cases. Women alone were only responsible in 5% of families.

Fish was mainly purchased from the local market (72%) or in the local community in 12% of cases. 16% of families purchased from both these areas.

Fish was sold by 11% of the sample in either the local market (54%) or the local community (46%). 75% of people sold fish on a seasonal basis, usually during the wet season when there was greater opportunity for fishing locally. 12.5% of people reported selling fish on a daily basis and 12.5% on a weekly basis. Sale of fish was the responsibility of men in 88% of cases and men and women in 12% of cases.

Table 6.8 Breakdown by Community

	% using resource	% of users who catch fish only	% of users purchasing	% of users purchasing and catch fish	% selling
Chicuacha	79	7	60	33	10
Ndeja	88	57	43	0	12
Mudu-Mufo	65	46	23	31	30
Lamego	68	11	84	5	4
Siluvo	32	12	88	0	0

Fish is an important resource in all communities, though to a lesser extent in Siluvo, probably as there is no river nearby this community. The majority of fish is caught in Mudu-Mufo where a large percentage fish or fish and purchase. This is probably because of the easy accessibility of the river which runs directly through the community. A large proportion of the community also fish in Ndeja, where there is also a nearby river (as can be seen from Map 2.2). In other communities fish is purchased rather than collected personally. As expected, more people are involved in the sale of fish in Mudu-Mufo than in other communities. Fish is sold fresh in Mudu-Mufo as well as sun-dried and smoked prior to sale or storage.

6.4.1 Fishing Techniques

A variety of techniques were used to catch fish, including the use of baskets (known as '*ngizhi*s'), lines, fences or nets. The table below shows the most common methods overall.

Table 6.9 Fishing Methods (as % of those Fishing)

Method	% of those that Fished
Net	19
Fence	19
Line	37
Basket	7
Line and Basket	4
Net and basket	4

It can be seen that the line was the most popular method, however, nets and fences were also popular. The basket tended to be used in conjunction with other techniques. Fences and baskets were used more often in Mudu-Mufo. Lines and nets were both popular in Lamego and lines were commonly used in Chicuacha. Generally, men tend to catch fish using lines whereas women tend to use baskets. Fencing was generally used after the wet season when temporary rivers had flooded. The fence, usually constructed from reeds, spans the width of the river. Fish are trapped as they move downstream or as the water level subsides.

6.5 HUNTING ACTIVITIES/MEAT CONSUMPTION

Hunting activities were more prolific in the past, though this is no longer the case according to one person from Lamego. He stated that *"there are few animals around now, much less than before. Ten years ago we would meet a baboon or gazelle on the road to Nhamatanda. Now there are none. If you are very fortunate though you may meet animals when you are in the forest"*. The DDA of Nhamatanda reported that *"the animal population is now devastated and areas such as Coutadas 8 and 12 which used to be the main game areas around Beira now have no animals"*. Nevertheless, hunting activities do still take place to some extent though only a small percentage of the population are involved. Overall, only a small percentage eat meat at all, either reared or hunted. The overall number of people purchasing, hunting and selling meat and responsibilities of these activities are shown in the table below.

Table 6.10 Hunting/Meat Consumption Data: Use, Hunting/Purchasing, Responsibilities

Activities	% of Sample Population/Users
No. Hunting/Consuming Game (of community)	15
No. Hunting (of users)	13
No. Purchasing Game (of users)	81
No. Hunting and Purchasing Game (of users)	6
No. where Men Responsible Hunting	100
Main Hunting Area	Nearby Forest
Main area of purchase	Local Market

15% of the sample reported eating meat. Of those eating meat, 81% purchased the meat, while 13% hunted themselves and 6% both hunted and purchased. 67% were purchased from the local market and 27% from the local community. 6% purchased meat from Beira. The following table shows the breakdown by community.

Table 6.11 Breakdown by Community

	% using resource	% of users hunting	% of users purchasing	% of users hunting and purchasing	% selling
Chicuacha	32	0	71	29	0
Ndeja	0	0	100	0	0
Mudu-Mufo	5	0	100	0	0
Lamego	21	17	83	0	0
Siluvo	8	0	100	0	0

Meat is eaten in Chicuacha and Lamego to a greater extent than other areas. These are both the areas in which hunting also takes place to some extent. In Ndeja it was reported that *"the only meat which is eaten comes from ducks, chicken and fish"*. Hunting did not take place at all as due to the lack of animals. The activities of three of the families involved in hunting are examined individually as case studies in Box 6.1 below.

Box 6.1 Case Studies: Hunting Activities

Family 1 – Chicuacha

This family hunt in the local, nearby forest. A bow and arrow and dogs are used for hunting. Small animals are hunted including gazelle, hares, and rats. Hunting takes places every one to three months, the last time being April (1998) when several of the above species were caught.

Family 2 – Chicuacha

This family hunt in the distant forest of Kudibe (Mangoma). (This is the same area where the family also produce charcoal). A bow and arrow, dogs and snares are used to catch small animals such as hares and rats. Hunting occurs on a weekly basis, though nothing was caught during the last hunting trip. The family reported that gazelles, hares, monkeys, baboons and rats are all commonly seen around Chicuacha.

Family 3 – Lamego

This family hunt in the nearby forest. A bow and arrow and dogs are used for hunting during the day and traps are set during the night. Small animals such as hares and rats are usually hunted. Hunting takes place twice per week. On the last hunting trip nothing was caught. The family reported that gazelles, hares, monkeys, baboons and rats are commonly seen around Lamego.

In Chicuacha and Mudu-Mufo it was reported that fires were used to catch small animals such as hares or '*bush-rats*'. However, such fires are not always contained and extinguished and can lead to larger bush-fires. One person said that "*they find a rat hole and use fire to clear around the edge of the hole. But they don't stop the fire and the fire carries on.*" People involved in these activities are reported to be both from inside and outside the local community.

6.6 HONEY

Honey is traditionally an important resource in Sofala Province. It is useful in dietary terms and as a source of income if sold. In traditional apiculture hives are made from a hollow section, usually the bark, of host trees such as Messassa (*Brachystegia spiciformis*). This practice can however damage or kill the host tree as the bark is removed therefore depriving the tree of nutrients. Alternatively honey is collected from the forest. The overall number of people purchasing, collecting and selling honey and responsibilities of these activities are shown in the table below.

Table 6.12 Honey Data: Use, Collection/Purchase/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Honey (of community)	18
No. Collecting Honey (of users)	17
No. Purchasing Honey (of users)	83
No. Collecting from Machamba (of collectors)	33
No. Collecting from Forest (of collectors)	67
No. where Men Responsible for Collection (of collectors)	100
No. of Families Selling Honey	0
Main area of purchase	Local Market

18% of the sample reported utilising honey. 17% of people collected honey while 83% purchased the honey. 33% reported that they collected honey from their own machambas while 67% collected honey from the forest. This activity was the responsibility of men. Where honey was purchased, it was purchased in the local community in 29% of cases and in the local market in 71% or cases. Honey was not found to be sold by any of the families questioned. The following table shows the breakdown of honey use in each community.

Table 6.13 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% selling
Chicuacha	5	100	0	0
Ndeja	13	100	0	0
Mudu-Mufo	10	0	100	0
Lamego	18	0	100	0
Siluvo	32	13	87	0

Honey was found to be a more important resource in Siluvo and Lamego than in the other areas. In Chicuacha and Ndeja the honey was collected whereas in Mudu-Mufo and Lamego it was purchased. In Siluvo it was both purchased and collected. (The community meetings indicated that honey was sold to some extent within the local community. However, this was not apparent from the questionnaire survey).

6.7 WILD FRUIT

Wild fruit is important in terms of dietary intake and economic income if sold. Collecting of wild fruit is known to be a valuable activity in times of food scarcity or during economic hardships. Types of wild fruit collected include '*Murimbi*', '*Matenuguende*' and '*Maghiru*', all of which are found in the forest. The overall number of people collecting and selling wild fruit and the responsibilities associated with these activities is shown Table 6.14 below.

Table 6.14 Wild Fruit Data: Use, Collection/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Wild Fruit (of community)	11
No. Collecting Wild Fruit (of users)	100
No. Collecting from Machamba (of collectors)	20
No. Collecting from Forest (of collectors)	80
No. where Men/Women/Children Responsible for Collection (of collectors)	100
No. of Families Selling Wild Fruit	1
Main area of Sale	Local Community

11% of the sample collected wild fruit. It was collected either from the forest (80%) or from machambas (20%). This was equally the responsibility of men, women and children. Wild fruit was not purchased by any of the sample population and was only sold by 1% of the population, on a seasonal basis. This was the responsibility of men. The following table shows the breakdown of these activities in each community.

Table 6.15 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% selling
Chicuacha	16	100	0	0
Ndeja	25	100	0	13
Mudu-Mufo	5	100	0	0
Lamego	4	100	0	0
Siluvo	16	100	0	0

Wild fruit collection was more important in Chicuacha, Ndeja and Siluvo than in Mudu-Mufo and Lamego and was found to be sold in Ndeja.

6.8 MUSHROOMS

Table 6.16 Mushroom Data: Use, Collection/Purchase/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Mushrooms (of community)	11
No. Collecting Mushrooms (of users)	91
No. Purchasing and Collecting Mushrooms (of users)	9
No. Collecting from Machamba (of users)	46
No. Collecting from Forest (of collectors)	27
No. Collecting from Forest and Machamba (of collectors)	27
No. where Women Responsible for Collection (of collectors)	70
No. where Men and Women Responsible (of collectors)	20
No. where Men Responsible for Collection (of collectors)	10
No. of Families Selling Mushrooms	1
Main area of purchase	Local Market

11% of the sample population utilised mushrooms. 100% of those utilising mushrooms collected them from either their own machambas (46%) or from the forest (27%). An additional 27% collected from both their own machamba and the forest areas. Collection of mushrooms was the responsibility of women in 70% of cases, men and women in 20% of cases and men alone in 10% of cases. In addition to

collecting, one family also reported purchasing mushrooms at the local market. 1% of the survey reported selling mushrooms at the local market. This was carried out seasonally and was the responsibility of men. The following table shows breakdown of these activities in each community.

Table 6.17 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing and collecting	% selling
Chicuacha	26	80	20	5
Ndeja	0	0	0	0
Mudu-Mufo	0	0	0	0
Lamego	4	100	0	0
Siluvo	20	100	0	0

Mushrooms were a popular resource in Chicuacha and Siluvo communities. In Chicuacha mushrooms were mainly collected though one family collected, purchased and sold mushrooms. In all other areas mushrooms were collected.

6.9 COCONUTS

Coconuts (*Coco nucifera*) provide a good source of protein and fat to the diet, make a refreshing drink and are a useful source of economic income if sold. In addition, coconut palms are also useful for production of palm wine (known as *'surra'*). The overall number of people purchasing, collecting and selling coconuts and responsibilities of these activities are shown in the table below.

Table 6.18 Coconut Data: Uses, Collection/Purchasing/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Coconuts (of community)	53
No. Purchasing Coconuts (of users)	96
No. Collecting Coconuts (of users)	2
No. Purchasing and Collecting Coconuts (of users)	2
No. Collecting from Machamba (of collectors)	100
No. where Men, Women and Children Responsible for Collection (of collectors)	100
No. of Families Selling Coconuts	2
Main area of purchase	Local Market

Coconuts were utilised by 53% of the population. 96% of those utilising coconuts purchased them while 2% collected coconuts from their machamba and 2% both purchased and collected. Collecting coconuts was the responsibility of men, women and children. The majority of coconuts purchased were purchased in the local market (68%). Coconuts were also purchased in Tica, Nhamatanda *Sede*, and Beira. Coconuts were sold by 2% of the sample on a seasonal basis. Sale was the responsibility of men, women and children. The following table shows the breakdown of activities in each community.

Table 6.19 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% of users purchasing and collecting	% selling
Chicuacha	84	0	94	6	11
Ndeja	63	0	100	0	0
Mudu-Mufo	45	11	89	0	0
Lamego	61	0	100	0	0
Siluvo	24	0	100	0	0

Coconuts are a popular resource in most communities. In the majority of cases the coconuts are purchased, with the exception of Chicuacha and Mudu-Mufo where coconuts are also collected, or purchased and collected. One person in Chicuacha collects, purchases and sells coconuts.

In addition to coconuts, other nuts are eaten. These include cashew nuts (*Anacardium occidentale*), which are first roasted, the soft 'apple' fruit from cashew tree is also eaten.

6.10 ROOTS AND TUBERS

Roots and tubers are important both in terms or cultivated crops grown on the machamba and wild resources growing in forest areas. The wild resources are important in times of food scarcity or economic hardship when food cannot be purchased. The overall number of people purchasing, collecting, cultivating, selling roots and tubers and responsibilities of these activities are shown in the table below.

Table 6.20 Roots and Tubers Data: Use, Collection/Purchase/Sale, Responsibilities

Activities	% of Sample Population/ Users/Collectors
No. Using Roots and Tubers (of community)	67
No. Collecting Roots and Tubers (of users)	80
No. Purchasing Roots and Tubers (of users)	14
No. Purchasing and Collecting Roots and Tubers (of users)	6
No. Collecting from Machamba (of collectors)	93
No. Collecting from Forest (of collectors)	2
No. % Collecting from Forest andMachamba (of collectors)	5
No. where Women Responsible for Collection (of collectors)	58
No. where Men Responsible for Collection (of collectors)	2
No. where Men and Women Responsible (of collectors)	32
No. where Women and Children Responsible (of collectors)	2
No. where Men, Women and Children Responsible (of collectors)	6
No. of Families Selling Roots and Tubers	2
Main area of purchase	Local Market

Roots and tubers were utilised by 67% of the sample population. Of those using roots and tubers 80% collected them, 14% purchased them and 6% both collected and purchased the resource. However, of those using roots and tubers only 2% of the sample reported collecting wild roots and tubers from the forest area, and 5% from both the forest and machamba. In the remaining 93% of cases the roots and tubers were grown on the machamba as a crop. Collection was the responsibility of women. Roots and tubers were purchased from the local market (92%) or the local community

8%. 2% sold roots and tubers in the local market on a seasonal basis. This was mainly the responsibility of women but men and children were also involved. The following table shows these activities in each community.

Table 6.21 Breakdown by Community

	% using resource	% of users collecting	% of users purchasing	% of users purchasing and collecting	% selling
Chicuacha	89	87	13	0	11
Ndeja	63	100	0	0	0
Mudu-Mufo	50	100	0	0	0
Lamego	75	57	33	10	0
Siluvo	56	86	14	0	0

Roots and tubers are popular in all areas and collected in the majority of cases. In Lamego a larger number of roots and tubers were purchased, or purchased and collected by the community than in other areas.

6.11 ALCOHOL

Forest resources may also be used in the production of alcohol, which is then consumed or sold. '*Surra*' is one type of alcohol that is produced within local communities. This is made from the sap of palm trees which is collected from an incision made in the tree trunk or roots. The drink must be consumed rapidly before complete fermentation takes place and the liquor loses its taste. Another form of alcohol is called *'neepa'*. This is produced from soaking maize husks in water, then distilling the mixture. *Neepa* can also be produced by distilling sugar cane. The overall number of people selling alcohol and responsibilities of these activities are shown in the table below.

Table 6.22 Alcohol Data: Sale, Responsibilities

Activity	% of Sample Population/Sellers
No. Selling Alcohol (of Community)	10
Main Area of Sale (of Sellers)	Local Community
Main Person Responsible for Sale (of Sellers)	Women
Frequency of Sale (of Sellers)	Daily to Seasonal

10% of the sample sold alcohol. In all cases this was sold within the local community. Alcohol was sold on a daily, weekly, monthly and seasonal basis and sale was the responsibility of men in 30% of cases, women in 60% of cases and men and women in 10% of cases. Alcohol was mainly sold in Chicuacha and Lamego, with sale occurring to some extent in Mudu-Mufo. The following table shows the breakdown of activities in each community.

Table 6.23 Breakdown by Community

Area	% of each community selling resource
Chicuacha	16
Ndeja	0
Mudu-Mufo	5
Lamego	22
Siluvo	0

6.12 CRAFTS

Crafts can also be produced using natural resources. The production of crafts and artefacts for sale provides a valuable source of income to members of communities involved in these activities. The overall number of people selling crafts and responsibilities of these activities are shown in the table below.

Table 6.24 Craft Data: Sale, Responsibilities

Activity	% of Sample Population/Sellers
No. Selling Crafts (of Community)	11
Main Area of Sale (of Sellers)	Local Market
Main Person Responsible for Sale (of Sellers)	Men
Frequency of Sale (of Sellers)	Daily to Seasonal

Crafts were sold by 11% of the population. 64% sold these products in the local market and 36% within the local community. Products, included such things as sweeping brushes, clay cooking pots, basketes or mats made with reeds collected from the riverside. The mats were sold in Ndeja for MT20,000.00 each. Such products were sold on a daily, weekly, monthly and seasonal basis according to the nature of the product and the resources needed to produce it. Products were sold by men in 64% of cases and women in 36% of cases. The table below shows the breakdown of activities in each community.

Table 6.25 Breakdown by Community

Area	% of each community selling resource
Chicuacha	32
Ndeja	38
Mudu-Mufo	0
Lamego	4
Siluvo	4

Crafts were mainly sold in Chicuacha and Ndeja, with a small number of families also selling in Lamego and Siluvo.

7.0 ECONOMIC ACTIVITIES

Of the total sample population, 96% of families received income from various places. The types of economic activities in which people are involved are discussed below.

7.1 Types of Economic Activity

- **Full-time employment** – this is the only method of employment in which income is continual and guaranteed on a weekly/monthly basis. Examples of the type of full-time work available in the area include: C.F.M. (the railway company in Lamego); INDER (a rural development project in Lamego); ADPP (an organisation selling second hand clothes in Lamego). Other people were employed as extensionists, teachers, electricians, and several people were street vendors in Lamego; Others worked outside Nhamatanda, for example at Acucarieria (a sugar factory in Mefambisse) and Textil de Pungue (a textile producing factory in Beira).

- **Ganho-ganho** - this includes various activities – part-time or 'piecemeal' – either on other peoples machambas or at places such as the 'Lomaco' cotton production factory. Pickers at the cotton factory are employed on a daily basis and paid according to the amount of cotton picked. This tends to be seasonal work and income is not therefore guaranteed and fluctuates through out the year.

- **Other activities, for example the small-scale sale of resources and products**. 98% of the entire sample population have access to machamba area and are subsistence farmers. In addition to meeting subsistence needs, excesses of some machamba products, including cereals such as maize and vegetables such as tomatoes, may be sold. Other products may also be sold, including: natural resources (such as firewood, bamboo, construction material, honey), charcoal, liquor, fruit, home-fired bricks, artefacts and livestock (chickens, ducks, goats, pigs). Again certain products tend to only be available seasonal, therefore income is not guaranteed and fluctuates throughout the year. The majority of products are sold either within the local community or at the nearest local market.

- **Remittance** – this includes money that is earned by someone within the family, a portion of which is returned to relatives.

7.2 Number of People Involved in Economic Activity

The following table shows the overall results of the sample population. In some cases families were involved in more than one income generating activity.

Table 7.1 Income Generating Activity of Sample Population

		Formal	Formal/Informal	Informal	
	Total % Receiving Income	**% Employed (Full-Time)**	**% Employed (Ganho-Ganho)**	**% Selling Produce**	**% Receiving Remittance**
Total Sample Population	96	17	24	75	5

* for the purpose of this analysis the percentage applies to the percentage of families with at least one family member involved in the activity, rather than percentages of the entire community.

Although 96% of families receive income, it can be seen that overall, only 17% of the sample were employed in full time employment, thus only 17% receive a guaranteed income each week/month. 88% of those in full-time employment are male and 12% female. All the women employed full-time were from Lamego where they worked within the local community. In all other areas only men were employed. Women therefore account for a small proportion of the full-time formal workforce. The income from full-time employment ranged from MT 100,00.00 per month to MT 600,000.00 with an average of MT 323,000.00 per month.

24% of the overall sample population were employed in *ganho-ganho*. 82% of those employed are male and 18% female. There are therefore, more women employed in *ganho-ganho* than full-time employment, however, men still dominate the workforce. Employment of women was however more widespread, with women being employed in each area with the exception of Mudu-Mufo. The income from *ganho-ganho* varied widely and was not stable on a monthly basis due to the seasonal nature of the work. However, figures given ranged from MT 10,000.00 per month to MT 1,800,000.00 (for cotton picking) with an average of MT 288,750.00 per month.

75% of the overall sample population were involved in other income generating activities, namely the sale of produce, natural resources and home-made products. Income from sale of produce varied greatly again due to the seasonal nature of production. One family reported earning MT 3,000,000.00 per month from producing and selling home-fired bricks. Others earned MT 50,000 from the sale of vegetables. Responsibility for sale of products rested in most cases with men. However, women had a larger role in the sale of some products such as machamba produce, livestock, crafts, fruit and sale of liquor. In 28% of cases families in full-time or *ganho-ganho* employment also sold produce.

A total of 5% of the overall community received remittances. In all but one of these cases the family member sending the money worked and lived in Beira. In 2% of these cases the remittance was the only form of income for the family. Remittance level ranged from MT 30,000.00 per month to MT 200,000 with the average being MT 106,000.00 per month.

Overall, only 4% of the sample population neither worked nor received income from sale of produce. It is likely that these were the older members of the community who were supported by younger family members living in the area.

A division can therefore be made between income generating activities that are formal (such as full-time employment) and those which are informal (such as sale of produce and remittances). *Ganho-ganho* could be either formal or informal depending on the person/organisation employing the labourer. It can be seen that the majority of income generation comes from informal rather than formal activities.

A further level of analysis can be gained by examining the level of employment within each area. Data is presented in the table below.

Table 7.2 Percentage of Each Community Involved in Employment Activities

	Formal	Formal/Informal	
	% of Full-Time Work in each Community	% of Ganho-Ganho in each Community	Total % Employed in each Community
Chicuacha	16	37	53
Ndeja	13	25	38
Mudu-Mufo	15	5	20
Lamego	25	25	50
Siluvo	12	28	40

Table 7.3 Percentage of each Community Involved in Other Income Generating Activities

	Informal
	% Selling Products or other Activities in each Community
Chicuacha	95
Ndeja	75
Mudu-Mufo	80
Lamego	68
Siluvo	56

* for the purpose of this analysis the percentage applies to the percentage of families with at least one family member involved in the activity, rather than percentages of the entire community.

The highest overall levels of employment are within Chicuacha and Lamego communities, with the highest level of full-time employment found within Lamego. This area (and Chicuacha with the second highest level) are situated beside the main road and therefore have access to the transport system along the Beira Corridor which facilitates mobility and therefore employment opportunities. In addition, Lamego has a relatively large market area, therefore increasing employment opportunities for street vendors, all of which worked in Lamego. As mentioned previously, organisations such as C.F.M, INDER and ADPP also operate in this area and therefore provide local employment. The percentage of *ganho-ganho* in Lamego and more notably Chicuacha is also high. Sale of products is very high in Chicuacha but relatively low in Lamego.

Mudu-Mufo and Ndeja have the lowest overall rates of employment of the five areas. Mudu-Mufo can be seen to have both a low rate of full-time and *ganho-ganho* employment. However, this could be a result of Mudu-Mufo being situated to the south of the Beira Corridor along a difficult road (approximately 9km long). Access to other communities for employment purposes is therefore more difficult than in Lamego or Chicuacha. Sale of products within the community is however relatively high. Ndeja can be seen to have a low rate of full-time employment but a relatively high rate of *ganho-ganho*. Ndeja is situated to the north of the Beira Corridor, again along a difficult road of approximately 5km length. This may affect full-time employment opportunities. *Ganho-ganho* may however, be available within the local community. A large proportion of families can be seen to sell products.

Siluvo has an average level of employment, mostly made up from *ganho-ganho* rather than full-time employment. Siluvo community is situated beside the Beira Corridor, but is one of the most distant areas from the administrative and commercial centres of Nhamatanda and Tica. It is therefore relatively isolated which could be responsible for the lowest full-time employment rate and the lowest rate of sale of products.

7.3 Income Expenditure

Income expenditure was examined in relation to four categories of needs, namely: food and beverages, fuel, household items, personal items. A further category was added to account for income spent on other needs not accounted for in the first four categories. The following table shows the modal value, or the most common amount spent in each category per month. (The range given shows the minimum and maximum amounts spent in each category per month).

Table 7.4 Monthly Expenditure

Product	**Most Frequent (Modal) Amount Spent (MT) Per Month**
Food and Beverages	100-200,000.00 (Range 0 – 200,000.00)
Fuel	20-50,000.00 (Range 0 – 100,000.00)
Household Products	20-50,000.00 (Range 0 – above 200,000.00)
Personal Items	20-50,000.00 (Range 0 – above 200,000.00)
Other*	20-50,000.00 (Range 0 – above 200,000.00)

*The 'other' category tended to include expenditure on milling grain, school fees, hospital fees or money for medication.

It can be seen from the table that the largest amount of income is most frequently spent on food and beverages. However, in no case did any family spend in excess of MT 200,000.00 on this category. The amount spent on fuel is relatively low in comparison and never exceeded MT 100,000.00. Household, personal items and other expenditures ranged between MT 20-50,000.00, but in some cases expenditure in each of these categories exceeded MT 200,000.00.

8.0 MACHAMBA ACTIVITIES

98% of the population have machambas and are subsistence farmers. Of the 2% who do not have machambas, one family has recently arrived in the area and the other was a political leader.

8.1 Machamba Size

Of those with access to a machamba, 59% reported their machambas to be 1-2 hectares in size. Others varied from less than one to seven hectares. The following table shows the range of machamba sizes in the sample population.

Table 8.1 Size of Machamba (as % of those with access to machamba)

Machamba Size	% of those with Access to Machamba
Less than 1 Hectare	9
1 – 2 Hectares	59
2 – 3 Hectares	20
3 – 5 Hectares	9
Above 5 Hectares	3

In all areas the modal machamba size was 1 – 2 hectares. Larger machambas were found more often in Mudu-Mufo or Siluvo than the other areas.

8.2 Machamba Extension

Of the people with machambas 72% plan to expand their machamba area during the next year, while the remainder do not plan to extend. On a community basis between 71-78% of people plan to expand in Chicuacha, Mudu-Mufo, Lamego and Siluvo, while 50% plan to expand within Ndeja. Families in Lamego, Chicuacha and Mudu-Mufo reported that they would like to expand their machambas, however there was no more space left in which to expand.

8.3 Number of Machambas

The number of machambas to which each family had access varied from between one and four as shown in the table below:

Table 8.2 Number of Machambas Per Family (as % of those with access to machamba)

No. of Machambas	% of Sample Population
One Machamba	28
Two Machambas	39
Three Machambas	25
Four Machambas	8

Of people with machambas, 28% have access to only one machamba while 39% had access to two, 25% had access to three machambas and 8% had access to four.

In Chicuacha the majority of families (42%) have access to one machamba, though a large number (37%) have access to two. Ndeja, Mudu-Mufo, Lamego and Siluvo the majority have access to two machambas. In Mudu-Mufo 35% have access to three machambas and in Siluvo 20% have access to three.

Not all families with access to more than one machamba actually move from one machamba area to another. However, of those that move, 85% move at one to five year intervals. Access to machambas is however controlled by ancestral inheritance. Thus, even if a machamba has been unused for a long period, it can still be reclaimed by members of the family at any time.

8.4 Shifting Cultivation and Fallow Systems

The traditional farming system in Nhamatanda is shifting cultivation. This is a form of agriculture in which agricultural productivity is maintained by rotating cropping areas. An area of land is typically cropped until the soil shows signs of exhaustion. The land is then left uncultivated (fallow) in order that it can regenerate naturally while cultivation is carried out elsewhere. Appropriate fallow periods vary according to local environmental conditions, but may be between 10 – 20 years. New machamba areas are cleared by cutting down vegetation and burning the site (slash and burn). Under optimum population densities slash and burn agriculture is a sustainable form of agriculture as it employs few, if any, external inputs and allows for natural land regeneration. However, the problem of increased population pressure, with resulting pressure on land resources can lead to reduced fallow periods and thus reduced yields, soil erosion and ultimately environmental degradation.

Of the sample population only 21% of families used a fallow system of rotation whereas 79% of families did not use any fallow system. The following table shows the results on a community basis.

Table 8.3 Number of People using Fallow (as % of each community)

Area	% of Community using Fallow Practices
Chicuacha	31
Ndeja	13
Mudu-Mufo	5
Lamego	11
Siluvo	20

It can be seen that on a community basis, the largest number of people use fallow in Chicuacha (31%), followed by Siluvo (20%). Fallow systems are used in Ndeja by 13%, Lamego by 11% and Mudu-Mufo by only 5% of the community. In Mudu-Mufo it was reported that use of fallow techniques was uncommon. The ground was reported to be very dry and in order to improve fertility the soil was "*ploughed deeper each year*". One person said that *"if a man has enough money he hires a tractor to plough the soil deeper, if not a hoe is used"*. Several people mentioned that there was not enough space on their machamba to leave areas to fallow.

The table below shows the length of time in which farmers using the fallow system work in a field before leaving in to fallow.

Table 8.4 Fallow Practice (as % of those using fallow systems)

Fallow Practice	% of those Using Fallow Systems
Less than 3 Years	70
3 – 5 Years	25
5 – 8 Years	5

Of those that rotate, 70% cultivate a machamba area for less than three years before leaving it to fallow, 25% work the field three to five years before fallow and 5% work the field for five to eight years before leaving to fallow.

The length of time a field is left to fallow varies from one to five years. The majority of those that use fallow leave the field for one year (52%), while 39% leave the field for one to three years and 9% leave the field to recover for between three and five years.

8.5 Improved Cropping Techniques

41% of the overall sample population used intercropping techniques and 49% used mixed cropping. Intercropping was more popular in Lamego and Siluvo while mixed cropping was more popular in the other areas.

No evidence was found throughout any area of compost production, use of water retention techniques or use of natural pesticides, with the exception of one farmer in Chicuacha who produced compost and used water retention techniques. In Mudu-Mufo it was reported that ploughing is carried out vertical to the contours of the field, which in fact increases water loss from the area. In this area however, advice on cropping techniques and general farming practices was sought from elder members of the community. However, such information had to be paid for by the person seeking the advice.

8.6 Field Clearing

Land clearance using fires is relatively quick and not labour intensive. Nutrients are released into the soil in a single burst rather than the sustained release of nutrients that can be obtained from mulching or compost applications. In addition fires have the potential to become uncontrolled, causing damage to forest resources and housing. Various NGO organisations and DDA extensionists working in the area attempt to persuade farmers to use other techniques rather than burning to clear vegetation from the soil. One farmer in Chicuacha said that *"if people are found burning on their machamba they are ignorant, they are told not to do this"*. The field clearing techniques used by the survey population are shown in Table 8.5 below.

Table 8.5 Field Clearing Techniques Used (as % of survey sample)

Clearing Technique	% of Survey Sample
Burning Entire Area	15
Collecting Waste to Piles and Burning	60
Re-incorporate Waste into Soil as Mulch	20
Use of Tractor	9

*in 4% of cases different practices were used in different areas, therefore more than one answer was given

It can be seen that the main practices used for clearing fields continues to be burning. However, only 15% of the overall sample reported burning the entire area. The largest, 60% of people collected waste (using hoes) from fields into small piles and burnt the piles rather than the whole area. Only 20% of the sample re-incorporated the waste into the field as a form of mulch. Another 9% used tractors to clear the land. In all cases those using tractors were employed and received income which was used to hire out the tractor.

In each of the study areas the main method of clearing was to burn waste in small piles. In Ndeja one person reported that *"in the past there were many bushfires caused by burning machambas. Now we are told not to burn machambas. If burning does still happen the waste from clearing fields is put into piles and burnt in one place"*. Mulching was most common in Siluvo where it was practised by 38% of families in the community. Mulching was not practised by any families in Chicuacha. The majority of families using tractors were found in Lamego where 14% of the community used tractors to clear their fields.

8.7 Sale of Machamba Produce

Sale of machamba produce provides an important source of income to local farmers. Selling activities range from people selling vegetables, such as tomatoes, along the Beira Corridor, to others selling excesses of maize to families within the same community to families who have smaller machamba areas and do not produce enough maize to meet their needs. The table below shows the number of people involved in this activity, area of sale and main person responsible for sale.

Table 8.6 Machamba Produce Data: Sale, Responsibilities

Activity	% of Sample Population/Sellers
No. Selling Machamba Produce (of Community)	50
Main Area of Sale (of Sellers)	Local Community/Local Market
Main Person Responsible for Sale (of Sellers)	Women
Frequency of Sale (of Sellers)	Seasonal

50% of the sample sold machamba produce. 45% sold within the local community and 45% at the local market. 2% sold in Tica and Nhamatanda and 2% in Beira. 5% sold to wholesalers. 94% of those selling sold on a seasonal basis. Selling was the responsibility of women in 47% of cases, men and women in 27% of cases and men alone in 22% of cases. Men, women and children were responsible for the sale in 4% of cases. The following table shows the number of people selling products in each community.

Table 8.7 Breakdown by Community

Area	% of each community selling resource
Chicuacha	42
Ndeja	50
Mudu-Mufo	75
Lamego	43
Siluvo	44

Approximately half of the people in each community sold agricultural products. The exception to this was Mudu-Mufo where 75% of the sample population sold products. The two families selling agricultural products to wholesalers were both also situated in Mudu-Mufo. One family in Lamego sold produce in Beira. In addition to those actually involved in selling products, other people stated that they wished to become involved in this activity but, according to one man in Siluvo, many people were unable to grow enough agricultural produce, resulting in lack of excesses that could be sold. He stated that *"output does not equal input as all work is performed manually without tools"*. When questioned he stated that *"tools such as tractors are needed to increase output"*. Chicuacha community also mentioned problems in producing enough food to last throughout the year.

8.8 Sale of Livestock

The most popular livestock held by members of local communities tended to be chickens and ducks, though a small number of people also held goats and pigs. The overall number of people selling livestock and responsibilities of these activities are shown in the table below.

Table 8.8 Livestock Data: Sale, Responsibilities

Activities	% of Sample Population/Sellers
No. Selling Chickens/Ducks (of Community)	21
Main Area of Sale (of Sellers)	Local Community
Main Person Responsible for Sale (of Sellers)	Men
Frequency of Sale (of Sellers)	Periodic

Chickens and ducks were sold by 21% of the population. 63% sold ducks and chickens in the local community and 21% at the local market. 11% sold in both the local community and local market. 5% sold in Tica or Nhamatanda. In 5% of cases chickens and ducks were sold on a monthly basis, while the remaining 95% sold on a periodic basis. Sale was mainly the responsibility of men (63%), with women responsible in 26% of families. Men and women and men, women and children were responsible in 11% of cases. 2% of the survey population also sold goats and pigs. These families were from Mudu-Mufo. The following table shows the breakdown of activities in each community.

Table 8.9 Breakdown by Community

Area	% of each community selling resource
Chicuacha	32
Ndeja	25
Mudu-Mufo	20
Lamego	11
Siluvo	24

It can be seen that sale of ducks and chickens occurs in all communities to some extent, with the majority sold in Chicuacha. Ducks and chickens do however, appear to be retained as an insurance measure and sold in times of need. Families in Mudu-Mufo reported selling chickens and ducks in order to purchase clothing for the family and in order to pay school fees when no other money was available.

8.9 Fruit from Machamba/Homestead

Fruit from around the machamba and homestead provides a valuable resource in terms of dietary and economic needs. Fruit trees can be found on many machambas and homesteads and usually include mango (*Mangifera indica*), banana (*Musa spp.*), papaya (*Carica papaya*) and cashew nut trees (*Anacardium occidentale*). In some cases fruit from the trees is consumed and in others it is sold. Initially subsistence needs of the family are met, then excess fruit is sold. Sale of fruit is reported as being difficult as the market tends to be overwhelmed with one particular fruit as it comes into season, causing prices to be low. This probably explains the low percentage of people selling fruit as shown in the table below. However, fruit trees continue to be virtually the only trees planted by the population of Nhamatanda and it was requested that more be made available through the GERFFA project. The overall number of people selling fruit from the machamba and responsibilities of these activities are shown in the table below.

Table 8.10 Machamba/Homestead Fruit Data: Sale, Responsibilities

Activities	% of Sample Population/Sellers
No. Selling Fruit (of Community)	6
Main Area of Sale (of Sellers)	Local Community
Main Person Responsible for Sale (of Sellers)	Women
Frequency of Sale (of Sellers)	Seasonal

6% of the sample sold fruit from their machamba. 60% sold fruit within the local community and 20% in the local market. 20% sold in the local market and in Beira. Fruit was sold on a seasonal basis in the majority of cases and was the responsibility of women in 80% of families. The following table shows the number of people selling fruit in each community.

Table 8.11 Breakdown by Community

Area	% of each community selling resource
Chicuacha	16
Ndeja	13
Mudu-Mufo	0
Lamego	4
Siluvo	4

Fruit from the machamba was sold in Chicuacha and Ndeja with a small amount also being sold from Lamego and Siluvo.

8.10 Main Constraints to Farming

In the overall sample, the main constraint to farming was found to be problems with pests, which was reported by 77% of families. 33% reported drought and floods to be the most serious problem and 11% said lack of seeds was the main constraint. In 4% of families weeds were a problem. The table below shows the breakdown of problems per community.

Table 8.12 Main Constraints to Crop Production (as % of each community)

	Pests (%)	Weeds (%)	Drought/Floods (%)	Lack of Seeds (%)
Chicuacha	53	5	26	26
Ndeja	75	0	25	38
Mudu-Mufo	65	5	25	10
Lamego	64	7	39	0
Siluvo	84	0	16	4

*in some cases more than one answer was given

It can clearly be seen that pests are the main problem in all communities. In Siluvo, individuals mentioned that red locusts were problematic on sorghum crops. Rats, termites and guinea fowl also caused problems. Those in Lamego had problems with locusts and grasshoppers which had destroyed half of one family's tomato crops through eating the stem and leaves of the young plants and causing the plant to die. Chemicals were requested to solve this problem. In Mudu-Mufo stalkborers affected the maize. According to one man in Lamego *"people become disillusioned when they lose all their crops to pests. They become lazy and don't work the soil anymore. They don't see the point"*.

Droughts and floods are also apparent in all areas, though to a lesser extent in Siluvo. Absence of a river in this area probably reduces the level of flooding that is experienced. Dry season vegetable production was reported to be especially problematic in Siluvo, however lack of water during the dry season was reported to affect crop production in all areas.

Lack of seeds was particularly problematic in Chicuacha and Ndeja with some degree of problem in Mudu-Mufo. Problems with acquiring seeds were also mentioned in community meetings at Lamego. In some cases seeds (from cereals and vegetables) are stored from the previous season, but these were reported to often be destroyed due to rains. Seeds were usually therefore purchased from SEMOC (the national seed

company) in Beira. One suggestion from Chicuacha was that a seed vendor should be identified who would sell seeds within the community at a reasonable price, therefore saving people money travelling to Beira to purchase seeds individually. Maize seeds and tomato, cabbage and onion seeds were particularly lacking in Chicuacha. Variety of seeds available was also mentioned as being a problem and improved varieties were requested.

9.0 MAIN PROBLEMS AS PERCEIVED BY COMMUNITY

The main problems as perceived by the overall sample varied as is shown in the Table 9.1 below.

Table 9.1 Main Problems (as % of survey sample)

Problem	% of Sample
Machamba	37
Employment	53
Lack of Trees	36
Access to Water	18
Other	16

*****43% of families stated more than one problem

Overall, it can be seen that lack of employment was considered the main problem, this was followed by lack of trees, machamba problems and access to water. The results however varied from community to community.

Table 9.2 Main Problems (as % of each community)

	Machamba (%)	Employment (%)	Lack of Trees (%)	Access to Water (%)	Other (%)
Chicuacha	37	**47**	37	32	26
Ndeja	**50**	**50**	**50**	0	0
Mudu-Mufo	**45**	**45**	20	10	20
Lamego	29	**46**	43	7	4
Siluvo	20	**60**	24	28	16

***** 43% of families stated more than one problem

** most frequent problem stated in each community is highlighted in black

From the table it can be seen that lack of employment is regarded as a serious problem in each community. In many cases degradation of resources was blamed directly on lack of employment. This was because lack of financial income, due to unemployment, resulted in people relying completely on natural resources to meet their basic needs for products such as fuelwood and construction material. In addition, sale of natural resources, such as fuelwood, charcoal or other products, formed the only source of income available.

Machamba problems are however equally prevalent in Mudu-Mufo and Ndeja. Lack of machinery was often stated as a problem. In Ndeja it was suggested that a tractor should be purchased for the community, after which the community would work to repay the loan. Requests were also made for watering cans in Lamego.

Ndeja also has the highest percentage of families complaining about the lack of trees in the area, with Chicuacha and Lamego also having high percentages with this problem. Lack of bamboo was also mentioned in Chicuacha and Lamego, where it was requested that bamboo could be produced in a nursery in the area.

Access to water was reported in all communities with the exception of Ndeja where boreholes function and the community have access to a river. The problem with water applied to both drinking water (i.e. lack of wells or boreholes) and also irrigation pumps for agricultural use. In Siluvo only two out of eleven boreholes were reported to be functioning. People were therefore forced to walk long distances into other

‘bairros’ within the area in order to collect water. This problem was more severe in the dry season. In Chicuacha boreholes did not exist at all and hand-dug traditional wells were used. The river was reported to be far away and the water dirtier than in the traditional wells. In Mudu-Mufo the community complained bitterly about the absence of irrigation pumps for crops. This was due to the fact an aid organisation had previously promised to install irrigation pumps in the area but had not fulfilled this promise. No boreholes existed at all in Mudu-Mufo though a river ran through the community which was used for drinking water. In Lamego it was reported that the boreholes no longer functioned. Water is collected from the River Mudu-Mufo but was reported to be unclean and cause health problems such as cholera.

The ‘other’ category contains problems which include the following: distance to the health centre, floods, thieves and social problems in Chicuacha; Floods and social problems in Mudu-Mufo; floods in Lamego; financial problems, high prices, obtaining credit, thieves and lack of a hospital (though one is being built) in Siluvo.

10.0 PERCEPTIONS OF GERFFA PROJECT

A general discussion was held at the end of each community meeting in order to ascertain views regarding the establishment of a central tree nursery area in Nhamatanda with satellite nurseries in each community and a school tree programme in each community. All communities met favourably with these suggestions and were willing to join in further discussions in order to organise the planning, implementation and management of such projects.

Several communities felt that though there was a need for trees in the area, other problems were more pressing and needed to be dealt with at the same time. For example, in Mudu-Mufo it was stated that *"we need trees, but they only give long-term benefits. We need short term benefits. We want to solve poverty and food problems"*. In addition, promises made to communities by other organisations that were unfulfilled led to suspicion regarding the actual implementation of the planned nursery and school projects.

It was requested in every community that fruit trees were planted rather than trees specifically for fuelwood. It was argued that fruit trees could also be used as fuelwood in the longer term. In Lamego it was reported that fruit was generally purchased from Chimoio where the quality and varieties were good. However, it was requested that seeds be given to the community in order that they could grow these improved variety fruits themselves rather than purchase them from Chimoio. Requests for improved varieties of seeds that produce higher quality fruits, which are easier to sell were made in many cases.

Requests were also made for bamboo to be grown within the nurseries as this was not widely available in the local environment and had to be purchased. Green bamboo was the preferred species.

10.1 Types of Fruit Trees Preferred

Various types of fruit trees were requested by each community. In Siluvo all type of fruit trees were reported to be important. Of the remaining four communities, avocado (*Persea americana*), tangerine and orange trees (*Citrus spp.*) were requested in all areas. Coconut (*Coco nucifera*), mango (*Mangifera indica*), cashew (*Anacardium occidentale*), and banana (*Musa spp.*) were requested in three of the four communities. '*Ata*' or sweetsop (*Annona squamosa*), '*coracao de boi*' or soursop (*Annona muricata*), lychee (*Litchi chinensis*), pineapple (*Ananas comosus*), papaya (*Carica papaya)* and lemon (*Citrus spp.*) were requested by two of the four of communities and 'massanica' (*Ziziphus mauritiana)* by one community.

Tangerine and Oranges are reported to grow in the area and have been grown in the past. Coconut trees (and other palms) are important as they produce fruit but in addition the leaves are also used to make rope and baskets. The trunk can be split to make poles and palm wine can be produced from the sap. In Ndeja it was reported that *"papaya are fairly easy to sell at the side of the road: it comes continuously, mangos all arrive at once, then there is too much"*.

10.2 Payment for Seedlings

Members of communities would be willing to pay a small amount for each seedling, ranging from MT 500.00-1,000.00. Purchasing other types of seedlings, such as cassava stems was reported to be normal practice.

11.0 CONCLUSIONS

The forest provides many resources including: fuelwood which is either used dry or in the production of charcoal; construction material, including wood, grass and bamboo; food, such as fruit, mushrooms, honey and meat; material for craft production; medicinal plants. These, and many other resources, are used by local people in order to meet basic needs, which may include the need for energy, shelter, food, health and economic activity.

However, local forest resources are experiencing increasing pressure, which, according to the local community is caused by: expansion of machamba areas - by those already living in the area and to accommodate new people; charcoal production - by local people and outsiders; resource collection by the local community. (Though the amount of forest resources used to produce charcoal is small in terms of Provincial forestry resources, the effects of charcoal production in concentrated areas, such as those around Nhamatanda District, can have devastating effects).

The results of activities associated with deforestation are clearly evident locally and adversely affect the local communities. For example, the distance walked to collect fuelwood has grown over the past ten years from 15 minutes to two hours ten years ago to half a day or longer at the present date. This is a clear indication of receding forest margins. In addition, resources such as bamboo, which was traditionally collected from the forest, is no longer abundantly available and in the majority of cases is now purchased from those collecting bamboo in distant areas.

The importance of forest management and regeneration practices were recognised by local communities – particularly due to the time taken and distance walked to collect fuelwood. However, the issue appeared to be given very low priority. In the majority of cases deforestation was not perceived by the communities to represent the most serious problem. Forest areas are accessible by all people and though licenses or *credencials* must be obtained for charcoal production and larger scale exploitation of other resources, this system of legalisation of exploitation is often ignored. In practice, therefore, there is little control over the amount of each particular resource that can be taken by an individual. Conservation actions by one person therefore may immediately be undermined by another person, which may prevent individual conservation efforts. However, individual activities on machamba and homestead to address the fuelwood problem were also not practised.

Trees were planted by individual families, however, these were usually planted on the homestead and were, in the vast majority of cases, fruit trees. Agroforestry was not practices by many families, in fact trees were, for the most part, regarded as a threat to machamba productivity rather than a benefit.

Planting fruit trees was regarded as a traditional activity – knowledge of which was passed on through generations. Planting trees for fuelwood was an unknown practice – no doubt because such an activity was not needed in the past as forest resources were abundant and perceived and infinite. The introduction of tree planting for fuelwood may therefore be met with resistance from the local communities. However, planting fruit trees would undoubtedly be welcomed and would additionally lead to an increase in standing biomass in each area. Planting fruit trees initially may, through

further discussion and activities, lead to increased interest in planting trees for fuelwood.

A problem was identified in the fact that men are traditionally responsible for planting trees and prefer fruit trees due to the economic benefits that can be made through sale of excess produce. However, women are responsible for collecting fuelwood and therefore are the group that must tolerate walking long distances to collect the resource. As women have no control over planting trees, they are limited in their ability to address this problem. Working with both women and men on the issue of planting trees may promote the acceptance of planting fuelwood trees in addition to fruit trees. Providing fuelwood wildlings free of charge with every fruit tree purchased may present one method in which fuelwood trees could be introduced.

Specific requests were made for additional information in terms of the importance of trees, identification of fuelwood wildings and methods of planting and caring for trees. Activities of this nature will be useful in raising awareness, particularly among the younger generation of the importance and need for trees. The school nursery programme is an ideal opportunity to carry out such activities. In the longer term, planting trees for fuelwood may be perceived as a normal activity rather than an unknown activity.

The main fruit trees preferred include avocado (*Persea americana*), tangerine and orange trees (*Citrus spp.*), coconut (*Coco nucifera*) mango (*Mangifera indica*), cashew (*Anacardium occidentale*) and banana (*Musa spp.*). The feasibility of planting citrus species (in terms of water and pesticide requirement) should be studied further. In many cases improved varieties of seeds were requested in order that fruit would be of better quality and therefore easier to sell. Species preferred for fuelwood and construction varied greatly. However, Mussequesse (*Piliostigma thonningii*), Xhiposa (*Combretum fragrans*) and Mpingue/Pau Preto (*Dalbergia melonaxylon*) were mentioned on several occasions for fuelwood. Favoured trees for construction include: Eucalyptus (*Eucalyptus spp.*), Panga-Panga (*Millettia Stuhlmanni*), Mussangorassa and Munhashambi (scientific names unknown). Planting preferred species will obviously increase the success of the project due to increased demand and interest.

It is widely perceived that economic income reduces pressure on the natural resource base as other resources replace natural forest resources in meeting basic needs. This was the case in Nhamatanda as resource use of those with full-time employment (and therefore stable income) appeared to change, with resources being purchased rather than collected and use of charcoal, paraffin lamps and electricity replacing fuelwood to some extent. In addition, economic income led to the use of bricks for house construction rather than wood. Income generating activities were found to be either formal – full-time employment or *ganho-ganho* (though the latter could also be informal). However, the majority of employment was informal, usually involving the sale of machamba produce or natural resources. Informal employment produced an unstable income that varied according to the season. Many people complained of lack of employment and stated that this was the main cause of resource degradation.

Numerous problems with machamba activities were identified, such as pests, lack of seeds and tools and dry soil. Many people sought methods to increase production in

order to produce excesses that could be sold. Output could, however, be increased through the adoption of simple techniques of for example, pest control and water retention. These methods have yet to be introduced by extensionists working in the area. Increasing machamba productivity is important, as sale of produce would result in a higher level of disposable income and reduced reliance on natural resources.

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Though outside the remit of the project, problems with employment and machamba activities (and access to water) were regarded as more important than resource degradation. Awareness and sensitivity to these problems, in addition to networking with other organisations, in order that they may provide solutions or assistance in dealing with these problems, is an important factor in the accomplishment of an holistic development programme, of which natural resource use and management only forms a part of the whole.

12.0 RECOMMENDATIONS

- That fruit trees are planted initially, with ongoing discussions in order to introduce fuelwood trees, perhaps by giving fuelwood trees to women free of charge when a fruit tree is purchased.

- That the feasibility of growing citrus species, coconut trees and bamboo in nurseries be explored.

- That investigation of the feasibility of using improved varieties of seeds for fruit trees, in order that the fruit is of better quality and easier to sell, takes place.

- That other fruit species which may be unknown to local communities are grown in the nurseries in order to introduce new species that may have a higher market value.

- That both men and especially women are involved in the nursery and school tree programmes.

- That efforts are made to establish a woman's tree programme/group once initial activities are organised and the project is accepted.

- That a fuelwood tree demonstration site forms part of the nursery and school programme.

- That teaching of tree planting techniques and tree care is carried out in both the nurseries and at local schools. Carrying this activity out in local schools will ensure that the next generation is aware of the importance of trees and that tree planting for fuelwood becomes a common, rather than an unknown activity.

- That local people are employed (when necessary) in operating the nursery and school tree programmes in order to create an additional level of employment in the area.

- That trees are sold to members of the local community for a small fee rather than donated.

- That the social forestry technicians work with DDA extensionists in order to train them in nursery techniques, therefore ensuring capacity building and promoting a sustainable programme where tree planting activities will continue after the social forestry technicians cease activities in this area.

12.1 Suggested Micro-Projects

- Allocation of a seed-vendor within each local community in order to create employment and save money in transport costs of families travelling to Beira to purchase seeds.
- Fruit drying programme in order that fruit such as mango, which all become ripe at the same time and flood the market can be sold at a later date and for a higher price.
- Establishing dry season gardens for subsistence and sale of excess produce.

APPENDIX 1: METHODOLOGY

Team: Socio-Economist x 1; Extensionists x 4

Initially, contact was made with the DDA in Nhamatanda who selected areas in the district where local deforestation problems were acute and therefore a social forestry programme was most needed. The socio-economic study was therefore carried out in each of these areas prior to the implementation of the social forestry programme.

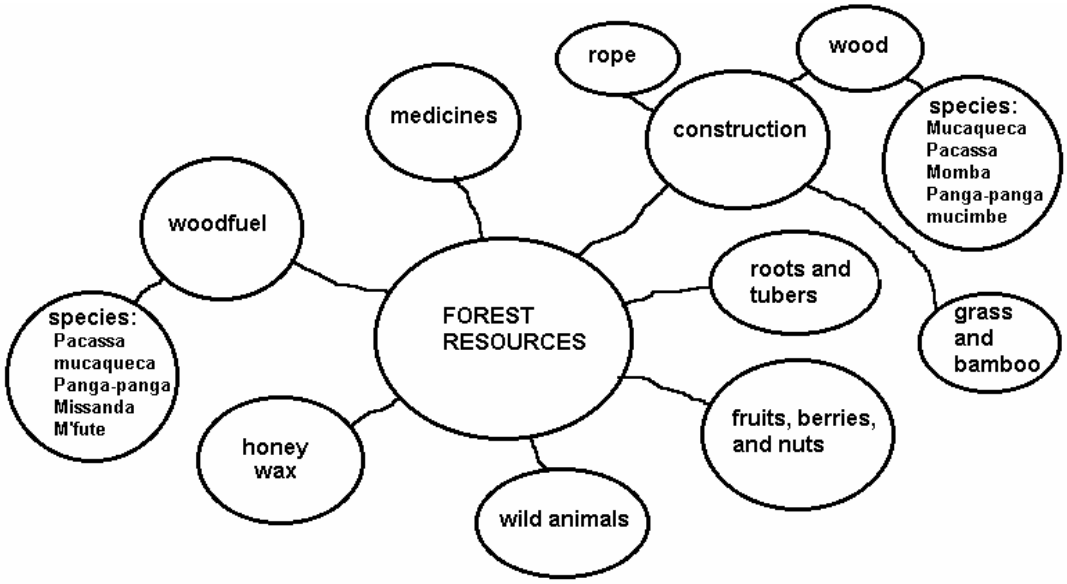
Visits were made to each of the selected communities with DDA extensionists, in order to introduce the survey team to the political and traditional leaders in each area in order to explain the survey and social forestry programme. Appointments were then made for community meetings to take place.

Initial community meetings were carried out by the socio-economist, two GERFFA forestry extensionists and the DDA extensionist working in the area who already had established links with the community. The meetings were informal and attended by various members of the community from traditional and political leaders to farmer leaders and ordinary members of the community. Women were encouraged to attend and become involved in meetings. Spidergrams were used as with the aim of providing a focus point and direction for the discussions. The local community were encouraged to become involved and contribute to the creation of the spidergram. Initially, the main problems within the community were identified, each was then discussed individually with special focus of problems pertaining to natural resource use and managament. An example of a spidergram is presented overleaf in Figure 2A.1.

Questionnaires were then devised on the basis of the information which was provided during the community meetings. The questionnaires were completed by the team of five extensionists who were employed to work on the social forestry programme. It was envisaged that this would provide the opportunity for the extensionists to become known to the local community and establish important links. Training was given to the extensionists prior to the study in questionnaire techniques and the questionnaire was discussed in detail in order that there were no ambiguities. The survey was carried out over 5 days with one day in each of the selected areas in the district. Arrangements were made with the community in advance in order that they were aware that the survey team would be in the area. An attempt was made to randomise household selection for the survey by instructing the survey team to work in different areas of the community and carry out a survey at every 5 households.

Additional information was collected from interviews with the DDA in Nhamatanda, DDA agricultural extensionist and Chief of Provincial Forestry.

Figure 2A.1 Example of Spidergram



APPENDIX 2: NHAMATANDA QUESTIONNAIRE

SECTION I. GENERAL INFORMATION

Area					
Bairro					
1. How long have you lived in this area	1. Less than 1 year	2. One to two years	3. Three to five years	4. Five to ten years	5. Longer than 10 years
2. How many people are in your family	a. Total	b. Adults (over 16 years)	c. Juveniles (12-16 years)	d. Children (5-12 years)	e. Babies (0-5 years)
3. Who filled in questionnaire	1. Man	2. Woman	3. Both		

SECTION II. USE OF RESOURCES

4) Do you collect or purchase any of the following Resources (Circle the number of each one used and fill in additional information)	**a.** **1. Yes** **2. No**	**b.** **Where do you collect these resources** **1.** Machamba **2.** Forest River **3.** Roadside **4.** Other (specify)	**c.** **Who is responsible for collection** **1.** Male **2.** Female **3.** Children **4.** Other	**d.** **If the resource is purchased, where is it purchased from** **1.** Local community **2.** Local Market **3.** Tica; **4.** Nhamatanda **5.** Beira	**e.** **If the resource is sold, where is it sold** **1.** Local community **2.** Local market **3.** Tica/Nhamata **4.** Beira **5.** To wholesaler **6.** Other (specify)	**f.** **How often is the product sold** **1.** Daily **2.** Weekly **3.** Monthly **4.** Seasonally	**g.** **Who is responsible for the sale** **1.** Men **2.** Women **3.** Children
1. Firewood							
2. Construction wood							
3. Grass							
4. Bamboo							
5. Medicinal plants							
6. Fish							
7. Wild Animals							
8. Honey							
9. Wild fruit							
10. Mushrooms							
11. Nuts							
12. Roots and tubers							
12. Other							
13. Machamba produce*							
14. Charcoal*							
15. Chickens/ducks*							
16. Crafts*							
17. Alcohol (surra/neepa)*							
18. Fruit from machamba*							
19. Other (specify)							

SECTION III. ECONOMIC ACTIVITIES

5. Does anyone receive income from the following activities	**a. 1. Yes 2. No**	**b. Which Family member? 1. Male 2. Female 3. Male and female**	**c. State Monthly income**	**d. Which Area 1. Local community 2. Tica/Nhamatanda 3. Beira** 4. **Other**
1. Full time employment				
2. Part-time or seasonal				
3. Remittance				
4. Sales				

6. What is your average monthly expenditure on the following items					
1. Food/beverage	1. None	2. MT20-50,000	3. MT50-100,000	4. MT100-200,000	5. Above MT200,000
2. Fuel	1. None	2. MT20-50,000	3. MT50-100,000	4. MT100-200,000	5. Above MT200,000
3. Household Items	1. None	2. MT20-50,000	3. MT50-100,000	4. MT100-200,000	5. Above MT200,000
4. Personal items	1. None	2. MT20-50,000	3. MT50-100,000	4. MT100-200,000	5. Above MT200,000
5. Other (specify)	1. None	2. MT20-50,000	3. MT50-100,000	4. MT100-200,000	5. Above MT200,000

SECTION IV. FUEL USE AND COLLECTION

7. How often do you collect woodfuel	1. Each day		2. Every 1-2 days		3. Every 2-3 days	4. Every 3-5 days	5. Once per week
8. How far do you walk to collect fuel	1. 1-3 km		2. 3-5 Km		3. 5-8 km	4. 8-10 km	5. 10-15 km
9. How long does it take	1. 15 mins	2. 30 mins	3. 1-2 hrs	4. 2-3 hrs	5. Half day (morning or afternoon)	6. Whole day	7. Don't know
10. How long did it take 5 years ago	1. 15 mins	2. 30 mins	3. 1-2 hrs	4. 2-3 hrs	5. Half day (morning or afternoon)	6. Whole day	7. Don't know
11. How long did it take 10 years ago	1. 15 mins	2. 30 mins	3. 1-2 hrs	4. 2-3 hrs	5. Half day (morning or afternoon)	6. Whole day	7. Don't know
12. Do you use any other type of fuel	1. Maize stalks		2. Charcoal		3. Kerosene	4. Other (specify)	
13. If you use charcoal, where do you purchase it from	1. Local community		2. Tica		3. Nhamatanda	4. Beira	5. Other (specify)
14. How long does one sack of charcoal last your family	1. One week		2. Two weeks		3. Three weeks	4. Four weeks	5. More than four weeks

SECTION V. TREE PLANTING ACTIVITIES

15. Has your family planted any trees this year	1. No	2. Yes, on edges of machamba:	3. Yes, within machamba fields	4. Yes, around homestead	5. Other area (specify)
16. What type of trees were planted on edge of machamba	1. Fruit trees	2. Fuelwood trees	3. Other (specify)		

17. What type of trees were planted within the machamba field	1. Fruit trees	2. Fuelwood trees	3. Other (specify)		
18. What type of trees were plated around the homestead	1. Fruit trees	2. Fuelwood trees	3. Other (specify)		
19. If trees are not planted within the machamba, why not	1. Causes shade	2. Takes all water	3. Takes all nutrients from soil	4. Reduces amount of crops	5. Other (specify)
20. In what form are trees planted	1. From seeds grown self	2. From seedlings collected around area	3. From seedling purchased (specify area)	4. Other (specify)	
21. In what way do you look after new trees	1. Give them water	2. Give them compost	3. Put a fence around them	4. Other (specify)	
22. In your family who is responsible for planting trees	1. Men	2. Women	3. Children	4. Women and men	5. Other (specify)
23. What do you consider the main reason for forest loss in your area	1. Clearance for machamba	2. Charcoal production	3. Collecting firewood and construction material by local people	4.Timber production (commercial)	5. Other (specify)
24. Who is responsible for these activities	1. People from the local community	2. People from other local communities	3. Individuals from outside areas such as Beira	4. Commercial producers	5. Other (specify)

SECTION VII. MACHAMBA ACTIVITIES

25. What size is your machamba	1. Less than One hectare	2. One to two hectares	3. Two to three hectares	4. Three to five hectares	5. Other (specify)
26. Will you extend your machamba in the next year	1. No	2. Yes			
27. How many other machambas do you have	1. None	2. One	3. Two	4. Three	5. Other (specify)
28. How often do you change machamba	1. One to five years	2. Five to ten years	3. Ten to fifteen years	4. Fifteen to twenty years	5. Other (specify)
29. How long do you work in a field before leaving it to fallow	1. Never leave fallow	2. Less than 3 years	3. Three to five years	4. Five to eight years	5. Other (specify)
30. How long do you leave the field to fallow	1. One year	2. One to three years	3. Three to five years	4. Five to eight years	5. Other (specify)
31. Do you do any of the following	1. Inter-cropping	2. Mixed cropping	3. Compost production	4. Water retention techniques	5. Use natural pesticides
32. How do you clear your fields	1. Burn the whole area	2. Collect waste in piles and burn	3. Collects the waste and produce compost	4. Other (specify)	
33. What are the main problems on your machamba	1. Pests	2. Weeds	3. Drought/Floods	4. Lack of seeds	5. Other (specify

SECTION VII. CHARCOAL PRODUCTION AND SALE

34. Does anyone in your family produce charcoal	1. No	2. Yes, only in the dry season	3. Yes, all year round	4. Other	
35. Where do you cut the wood for charcoal	1. In the local community	2. In the nearby forest	3. In the distant forest (specify area)	4. Other	
36. How many sacks of charcoal do you produce per month in the wet season	1. Less than 50 (specify amount)	2. 50-100	3. 100-200	4. 200-300	5. Other (specify)
37. How many sacks of charcoal do you produce per month in the dry season	1. Less than 50 (specify amount)	2. 50-100	3. 100-200	4. 200-300	5. Other (specify)
38. How is the majority of your charcoal used	Used by household	Sold locally	Sold in other area	Sold to wholesaler	Other (specify)
39. How much does one sack cost during the wet season when sold privately	1. MT15,000 or below (specify amount)	2. MT20,000	3. MT20-30,000	4. MT30-50,000	5. Above MT50,000
40. How much does one sack cost during the wet season when sold to wholesaler	1. MT 10,000 or below	2. MT 10-14,000	3. MT 15-20,000	4. Above 20,000	5. Other (specify)
41. How much does one sack cost during the dry season when sold privately	1. MT15,000 or below (specify amount)	2. MT20,000	3. MT25,000	4. MT30,000	5. Other (specify)
42. How much does one sack cost during the dry season when sold to wholesaler	1. MT 10,000 or below	2. MT 10-14,000	3. MT 15-20,000	4. Above 20,000	5. Other (specify)
43. Which trees are the best for producing charcoal	1.	2.	3.		
44. Which trees do you use	1.	2.	3.		

SECTION VIII. HUNTING AND FISHING ACTIVITIES

45. Do you fish	1. Yes	2. No			
46. How often do you fish	1. Every day	2. 2-3 times per week	3. Once per week	4. Once per month	5. Other (specify)
47. How do you catch fish	1. Net	2. Fencing	3. Line	4. Basket	5. Other (specify)
48. Do you hunt	1. Yes	2. No			
49. In which area do you hunt	1. Local area	2. Local forest	3. Distant forest (specify)	4. Other (specify)	
50. What type of animals do you hunt	1. Gazelle	2. Hare	3. Other (specify)		

51. What hunting equipment do you use	1. Bow and arrow	2. Snare	3. Fire	4. Other (specify)	
52. How often do you hunt	1. Every day	2. Once per week	3. Once per month	4.Every 1-3 months	5. Other (specify)
53. When was the last time you caught an animal	1.				
54. What was the animal	1.				
55. What are the most common animals seen in the area	1. Gazelle	2. Hare	3. Baboon	4. Other (specify)	

SECTION IX. MAIN PROBLEMS IN COMMUNITY

56. What are the main problems in your community in general	1.Machamba/Cultivation	2. Employment	3. Lack of trees	4. Access to Water:	5. Other specify)