A STUDY ON ENVIRONMENTAL CONCERN IN MKURANGA DISTRICT, TANZANIA

DRAFT REPORT

TITLE: THE STATE OF TREE CUTTING AND CHARCOAL BURNING IN MKURANGA DISTRICT

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Abstract

Mkuranga district is part of Coast region, located about 30-40km from the Dar es Salaam city. Deforestation in the district is caused mainly by uncontrolled tree cutting for charcoal burning and farming activities. The environmental study was implemented in the district to assess the status of environmental degradation and the extent of tree cutting for charcoal. It covered 5 villages of Mbezi-Msufini, Sotele, Kibamba, Bupu and Kitonga between October and November, 2006.

Primary data were collected through household questionnaires, Participatory Rural Appraisal (PRA) and market survey. The collected data were analyzed descriptively using Statistical Package for Social Science (SPSS) computer programme.

According to the findings, communities in the study area are peasantry agrarians, dependent on subsistence crop production and forest products; mainly charcoal and fuel wood. About 81.7% (85 respondents out of 104) mentioned agriculture as the leading source of income, 4.8% mentioned sale of forest produce and 11.5% mentioned others.

The findings further indicated that most of the households practicing in charcoal production are male-headed, 67.3%, and the majority of the respondents had attended primary education implying that the household heads had an adequate formal education to enable them to cope with technological changes in charcoal production. It was also revealed that most of the respondents depend on charcoal production as the major source of income Further, finding indicated that, 94% of

the respondents who produce charcoal use traditional method, where as 6% of the respondents use modern methods, due to the fact that the modern method is expensive and time consuming. The existence of huge difference between the price of charcoal at the production sites and the price at the end users' sites in Dar es Salaam city was also observed during the study. It was also indicated that people are now felling old cashew nut trees following overexploitation of natural species and disappearance of its mature species. Also the available natural species are of small dimension and therefore compelled charcoal adopt "Msonge" or cone-shape earth kiln which is not recommended b y Forest and Beekeeping Division.

In the study villages, 91.3% of the respondents acknowledged that there is degradation of Forest resource in the district. Today, only about 0.5% or 13.4 Km^2 of the district total area of 2746.8 Km^2 is covered by closed natural forest.The majority or 60.6% specifically mentioned tree cutting for charcoal production as the main source of environmental degradation in the area.

The findings also revealed that collection of charcoal revenue, cess and tax by district and village governments is poor, seriously insufficient and secretive. Village communities do not benefit from the revenues and information about it is not transparent. At district and village levels, records about charcoal production, revenues and money accrued from penalties are sketchy and untraceable. About 400 bags of charcoal are transported from Mkuranga district to Dar es Salaam daily by use of various equipments through formal and informal routes. It is estimated that, only about 20% of the charcoal produced in the district is adequately taxed. Charcoal dealers use large size charcoal bags which carry excessive weight against what is described by forest authority as standard

charcoal bag of 28 Kg. Through above methods, large quantities of charcoal reach end users before it is taxed.

On the other hand charcoal business in Mkuranga district is run by outsiders especially rich people from Dar es Salaam who appropriates a large share of the profit and therefore do not significantly benefit the local communities who will later suffers the consequence of its production. Prices offered to charcoal burners at kiln, village centre and road side are marginal. As a consequent, charcoal production will not assist in alleviating poverty in the district. On the other hand it is destroying the environment for example depletion of species and disturbing water catchments and consequently decreased agricultural production.

Little is done however to plant trees in the district and to raise awareness of people about environmental conservation. For example, tree seedlings planted by district in recent years were 23,000 and 45,000 for year 2003/04 and 2005/06 respectively at 78.3% survival rate. Locally and donor funded Environmental conservation programs are uncommon in the district. Further the district is seriously understaffed with forest workers and there is poor access to working logistics.

Further, the findings revealed that 66% of the respondents are in favour of the village government to take control of harvesting of forests for charcoal production. Mkuranga people sees the problem associated with charcoal production as distant created especially by Dar es salaam City. Results from the study shows that the main sources of energy in the city, as testified by the 31 interviewees are charcoal, gas and electricity. Charcoal is accounted by 71% of the respondents. Charcoal users in Dar es Salaam spends between 30,000 and

40,000TZS. Gas in Dar es Salaam is used by few respondents or 9.7% of the respondents.

Therefore, poor state of environment in Mkuranga district which is manifested by uncontrolled tree cutting for charcoal production is first attributed to poor socio-economic base particularly lack of alternative sources of income. Secondly, it is undoubtedly triggered by the growing demand in urban areas in particular the Dar es Salaam City, where population is high and growing rapidly amid lack of adequate alternatives. Therefore, availability of alternative sources of income in Mkuranga district, and affordable and better alternatives of energy in Dar es Salaam will slow the rate of tree cutting for charcoal production.

Basing on the findings from the study, the following are highly recommended as necessary interventions;

- ☞ Promotion of improved kilns – this has been successful in Ghana, Senegal, and other countries in West Africa
- ☞ The government should deploy trained and motivated staff to the district. Transport and allowance should be availed to make the staff mobile and effective
- ☞ The Forestry and Beekeeping Division, in collaboration with Mkuranga District Council should identify and set area blocks for controlled charcoal production. Importantly, the ministry should establish effective monitoring and follow up on districts regarding revenues collection from charcoal production and fines/penalties.
- ☞ It is importantly the government scaled up the Ruvu Forest Project activities for charcoal production especially for Dar es Salaam residents.

The government should also maximize the use of abundant wattle trees in Iringa and Njombe for charcoal production for Dar es Salaam City

- ☞ People in Mkuranga should be educated on better ways to improve agriculture especially by introducing diversity of marketable and agro-ecologically suitable crops. Crop husbandry should be key in enhancing better agricultural practices in Mkuranga district
- ☞ Enforcement of forest laws and by-laws, and strict control of the resource is crucially important
- ☞ Introduction of awareness raising program about forest conservation focusing on tree planting and conservation of natural forests and the consequences of uncontrolled charcoal burning in the district.
- ☞ Participatory forest resources management which will give the majority of people opportunity do decide on the use of common property like forests and woodlands is important. Therefore the Forest and Beekeeping Division should strengthen PFM programme in the district
- ☞ Make a participatory review of charcoal taxation to ensure that it benefits the stakeholders particularly governments and local community.
- ☞ There is a need to take concerted measures to substitute or compliment energy from charcoal
- ☞ Introduction and promotion of alternative energy sources and fuel efficient stoves in Dar es Salaam city is important. Further measures to reduce tax and tariffs on cooking gas should be sought from the Ministry of Finance.

Acknowledgement

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1.0 INTRODUCTION

1.1 Background

Tanzania covers an area of about 940,000,000 Ha of which the total land area is about 6,000,000Ha whereas the rest is inland water (URT, 2005). According to the population census of 2002 (URT, 2002) the country population is about 34.6 million people. There are 33.5 million Ha of forested land of which about 12.5 million Ha are protected as Forest Reserves. URT (2002) reports that about 66.6% of the forested land is under general land which is not adequately managed. FAO reported in 2001 that Tanzania loses approximately 92,000 Ha annually which is equivalent to 0.2% of its forest land because of deforestation. However, URT (2002) estimated deforestation at a rate of between 130,000 to 500,000 Ha per annum. According to URT (1998), deforestation is attributed to clearing for agriculture, overgrazing, wildfires, charcoal production and excessive cutting of trees. Due to the high rate of deforestation, low land productivity and poor land use (FAO 1985) have highly been experienced in most parts of the country.

According to BBC (2006) website data, an undated FAO report says forest covers 30% of the world's total land area with deforestation rate estimated to 13 million Ha per annum. It says Tanzania is among the world's countries that are loosing forest resource stock as shown in Figure 1.

Figure 1 Changes of wood volume in the world's most forest rich nations between 1990 and 2005

Mkuranga district is part of Coast region, located about 30-40km from the Dar es Salaam city. It has a population of 187,428 and an annual growth rate of 2.4%. Male and female population is 91,714 and 95,714 respectively, thus female: male ratio of 1.0436. Average household size is 4.4 (URT, 2002).

The natural forests in Mkuranga comprise of a large portion of coastal and mangrove forests that are renowned for their high biodiversity. The Coast region is apparently one of the regions in Tanzania with poor revenue base because of limited economic opportunities. Therefore, the district depends largely on subsistence agriculture because of poor soils and low rainfall.

Like in other districts in Tanzania, the rate of deforestation in the district is high and of serious concern. The country has deforestation rate of about 92,000Ha.pa. Deforestation in the district could be caused mainly by uncontrolled tree cutting for charcoal burning and farming activities. Uncontrolled charcoal burning is vivid and evidenced by

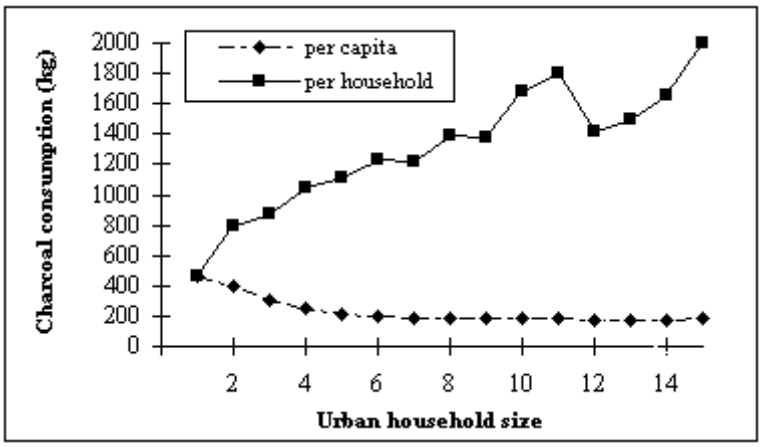
frequent truck loads of charcoal bags on route to Dar es Salaam city and Mkuranga Township. In Tanzania, 92% of energy requirement comes from forest resource. Thus, the district is an important source of charcoal for Dar es Salaam city which has about 2.5 million people and growth rate of 4.2%/yr as shown in Table 1. In addition, a portion is also thought to find its way to Zanzibar and Asian countries.

Table 1 Population of the Dar es Salaam City: growing demand for charcoal

Male Population	1,261,077
Female Population	1,236,863
Total Population	2,497,940
Total Household Number	596,264
Average Household Size	4.2
Inter-censal Growth Rate 1988 - 2002 (%)	4.3

In Zambia there is a positive correlation between household size and charcoal consumption), while correlation between per capita consumption and household size is negative. This means that although biomass energy consumption increases as household size increases, per capita consumption declines (Figure 2) according to Chidumayo, 1984. The average annual charcoal consumption in urban Zambia during 1983-1994 was 1046 Kg per household. Average charcoal consumption per household in rural Zambia was estimated at 1000kg per year, compared to Dar es Salaam City which is 1,012.8kg per annum (Malimbwi et al., 2001).

Figure 2 Correlation between household size and charcoal consumption



Most rural people rely on forest resource for income and livelihood. For instance, according to Minja (1997), people in Iringa region extract a range of wood and non

timber forest products (NTFPs) from the forests. Wood products include timber, poles, charcoal and fuel wood. The NTFPs are fruits, mushrooms, medicinal plants and dyes.

URT (2002) acknowledges that wood is an important source of energy for urban and rural population. Unreliable availability and limited access of alternative and cheaper sources of energy has significantly contributed to the destruction of natural forests in the country for supply of wood fuel. Because of the strong linkage between poverty and environment, Tanzania government approved the National Strategy for Growth and Reduction of Poverty (NGSRP) or MKUKUTA. It has categorically identified the role of natural resources in reducing poverty and vulnerability. Therefore, sustainable use of forests contribute to MKUKUTA goals. The target is to have increased access to subsistence and cash based income derived from the harvesting, processing, marketing and sale of forest products by 2010.

Charcoal has been the major source of income to the communities living around the forest resources, thus most of them are engaged in production and marketing of charcoal. However, marketing has been through middlemen, who often seem to form cartel implying that, they set their own price to buy charcoal from producers (farm gate price), resulting to producer discrimination due to the fact that the middlemen earn super profit compared to producers (farmers) who live around the forest resources (Rwelengera et al., 2004).

1.2 Problem statement and justification

Production of charcoal has remarkably become a factor of deforestation in most parts of the Coast region; it contributes about 75% of the deforestation according to Malimbwi *et al.*, 2001. The situation has led to the disappearance of some natural tree species such as bean mahogany (*Afzelia quanzensis*), iroko (*Milicia excelsa*), Mninga (*Pterocarpus*

angolensis), African mahogany (*Khaya anthotheca*) and many other miombo trees (Rwelengera *et al.,* 2004).

Deforestation disturbs forest ecology by destroying plant and animal habitats. It also destroys species biodiversity and destroys water catchments. Removal of forest vegetation disposes top soil materials and makes them vulnerable to soil erosion by rainfall. As a result soil fertility is decreased and consequently reduced agricultural productivity hence increased poverty. Uncontrolled tree felling and exploitation of charcoal in Mkuranga districts is therefore leading to unsustainable management of natural forests which are known for their livelihood support and good sources of income. In order to supplement income from agriculture and other practices the rural poor have been compelled to practice illegal wood carbonization as a quick alternative source of income and livelihood support.

Monela *et al* (2000) reported that charcoal extraction in the woodlands is one of the most essential economic undertakings which provide employment and income to majority of rural and urban households in Tanzania. It is also reported in URT (2004) that households involved in charcoal production in the coastal region can generate an average income of 630USD per year. Additionally, most of the people are poor, they earn less than 1.0USD per day and therefore regulation measures particularly increased taxation should be carefully worked out. FBD in 1999 also, appreciated that non timber forest products of charcoal and fuel wood are crucially potential for economic advancement in rural areas. They are particularly important in poverty alleviation in rural areas due to their cheap availability and management.

According to URT (2005) report on growth and poverty reduction, the contribution of natural resource sector to GDP is on average about 5.7%. However, this exclude provision of energy amongst important services. It is agreed that there is unsustainable

utilisation of natural resources as manifested by excessive cutting of trees for charcoal production and poor farming hence resulting to increased poverty.

Despite the alarming and increasing rate of charcoal production in Mkuranga district, qualitative data for timely and effective decision making for economic and political development by local and central governments is lacking. Monitoring and control of charcoal exploitation is also weak. Additionally, it is worried that charcoal is under taxed and sometimes revenues accrued from it are not ploughed back to the management of the forest resources. As a result its contribution to household, district and national economy is either underestimated or not captured. Lyimo (2001) reported that Government Notice No. 29 of 2001 required a bag of charcoal to be charged TZS 400.00 or about TZS 1,200.00m^{-3} of wood. By estimates 3 bags of charcoal were produced from about 1.0 m^3 of wood. Tree species mostly used for charcoal making are those in class V of the Forests Act No. 14 of 2002 and are charged TZS 10,000.00m^{-3} when sold as sawn logs. According to Lyimo (2001), the government loses TZS 8,800.00m^{-3} when charging TZS 400.00 per bag of charcoal. Charging on charcoal should be revisited for best revenue returns to the government, and hence avoid misuse.

1.3 Objective of the study

1.3.1 General objective

The forest resource in Mkuranga district is categorized into three types of management; open woodland, protected forests, and local (district) authority forest reserves. Table 2 show the forest resource in terms of forest reserves and forest type.

Table 2 Forest Reserves by areas, Mkuranga District

Name of Forest	Size (Ha)
Vikindu	1,599
Masangaya	**2,599**
Marenda	184

Mangroves	3,498
Total	***7,880***

In order to respond to the challenges facing management of the forest resources in Mkuranga district, an urgent need is required to generate such qualitative data through a special designed study. A study, therefore, to generate qualitative data on the status of wood carbonisation was carried out in Mkuranga district in October 2006.

The general objective of the study is ***"to generate data and evidence of the extent of environmental threat and assess on remedial measures".***

1.3.2 Specific Objectives

Main focus was put on assessing the problem and extent of charcoal production, revenue collection and expenditure, the impact of the business on rural poor communities and whether the production will have a positive consequence on alleviating rural poverty.

Focus was addressed on assessing the problem and extent of charcoal production, revenue collection and expenditure, the impact of the business on rural poor communities and whether the production will have a positive consequence on alleviating rural poverty.

The specific objectives of the study are the following;

- To find evidence on the environmental concern in Mkuranga district.
- To assess the magnitude of problem of tree cutting for charcoal production in Mkuranga districts.
- To assess the expenditure of revenue from charcoal taxes.
- To look for possible alternative sources of income (apart from charcoal) and measures to convince people disengage from charcoal business.
- To identify stakeholders that can reverse tree cutting and charcoal exploitation in Mkuranga district.

- To identify best practices applied elsewhere that could be practically implemented in Mkuranga district to remedy charcoal burning business.
- To find out practices of energy consumption in Dar es Salaam and alternatives to charcoal use by us of cost-benefit analysis between different options.
- To recommend a way forward particularly what can be done at different levels to remedy environmental destruction in Mkuranga district.

2.0 LITERATURE REVIEW

2.1 Deforestation as a negative impact of charcoal making

The forests in Tanzania were thought to cover about 44 million hectares in 1961, which has been reduced to 33.5 million ha in 1998 and it is forecasted to be reduced further to reach 28.4 million ha in 2020 (Mwandosya and Luhanga, 1993; MNRT, 2001). It is further estimated that between 130,000 and 500,000 hectares of forests are lost annually (MNRT, 1998). The major causes for deforestation in Tanzania are agricultural expansion, grazing, forest fire, charcoal making and harvesting for timber. Eleven to twenty percent of deforestation in developing countries including Tanzania is attributed to charcoal production (www.ipcc.ch/pub/tar/wg2/318.htm). Profuse evidence of the charcoal trade is visible throughout Tanzania: a visit to any forest reveals the presence of charcoal makers. Highways are lined with charcoal bags for sale in the production area and on the outskirts of towns. Thousands of markets throughout the country offer charcoal for sale.

Charcoal production contributes highly to the deforestation of Tanzania but it is difficult to quantify to what extent of its impact. As stated by Monela *et al, (*1999),"Little is known about the actual extent of deforestation due to urban charcoal use". Van Asperen, (2001) provides a useful formula which tries to relate charcoal production and deforestation: 50,000 tonnes of charcoal = 16,600 ha of forest =26.7 million trees. Moreover, total annual

wood fuel (charcoal and firewood) use in Tanzania is estimated at 32 million cubic meters (Monela *et al*., 1999). It is also estimated that about 200,000 hectares of forests are required to produce 10 million cubic meters of wood fuel (www.uccee.org/EconomicsGHG/Tanzania.pdf).

Direct environment impact of charcoal production is caused by the felling of trees to produce charcoal. Since the trend has been that more and more people use charcoal, the tendency to fell more trees has been and will continue to increase in the absence of any affordable alternative. The problems associated with felling trees that are not replaced by regeneration or afforestation activities are well known these include depletion of water sources and water catchments areas, reduction of carbon sinks; and loss of habitat and biodiversity. Deforestation takes two forms: clearance and degradation. Clearance of woody vegetation is conducted mainly for agricultural expansion and, to a lesser extent, logging, fuel wood production and urban expansion.

2.2 Harmlessness or Harmfulness of charcoal production

Ten years ago researchers defended charcoal production against accusations of a role in deforestation (Rwelengera *et al.,* 2003). At four sites in central Zambia it was found that charcoal production removed 50% of the total woody biomass but the woodland regenerated from a pool of stunted old seedling and stumps of cut trees (Chidumayo, 1993: cited by Rwelengera *et al.,* 2003). Productivity was correlated to tree density before felling. Clearing of successive regrowth of miombo did not appear to affect productivity (ibid., 2003).

Hosier and Kipondya, (1993) examining tree harvesting for charcoal production in Tanzania found that forests recovered relatively well following harvesting for charcoal production. Charcoal making, like cutting trees for firewood, tends to damage the forests

selectively. Certain species are preferred and, by natural selection, growth of disfavoured species is then favoured.

2.3 Sustainability of Charcoal Production

Sustainable charcoal production is non-harmful to the environment except in short-term (Rwelengera *et al.,* 2003). 'Sustainable' means that trees are cut to stumps (not to the ground) and they retain the ability to regenerate (ibid.,). Regeneration is however possible for those species which have ability to coppice such as *Pterocarpus angolensis* and *Ficus spp*. Tree felling for charcoal production should be limited and surrounded by woodlands or forests. The clearing is left fallow to recover naturally and not converted for other use such as cultivation. Kilns should be well managed such that they don't risk wild fires to the woodlands or forests around it (Rwelengera et al., 2004).

Most Tanzanian charcoal producers examined by the researchers ten years ago fulfilled those requirements (Hosier and Kipondya, 1993: cited by Rwelengera *et al*., 2003). Exception occurred in Shinyanga and Singida regions where it was noted that charcoal production often initiated further land use changes and was associated with environmental degradation (Hosier and Kipondya, 1993). These regions have poorer soils and lower mean annual rainfall than most parts of the country. The recovery rate of the harvested woodlands/ forests after disturbance is therefore slow.

3.0 3.0 THE STUDY MATERIALS AND METHODOLOGY

3.1 Data Collection

The study started by desk work whereby background or literature materials were perused and consulted. Documentation in the Forest and Beekeeping Division, Division of Environment, NGOs and other relevant environmental institutions were consulted. Field observation was done in five villages as well as assessment of forest and farm products sold at Mkuranga market.

The research team also consulted individual stakeholders, institutions and NGOs in Mkuranga district and Dar es Salaam. Also, statistics about charcoal production and movement were collected from charcoal dealers and check point manned by Ministry of Natural Resources and Tourism.

3.2 Study Tools

The researcher used pre- prepared data collection tools to facilitate data collection. They included structured and non-structured questionnaires for household surveys and check lists of questions for PRA meetings. A protocol was designed to guide the effecting of PRA meetings. The tools were approved by TAWLAE before the study took effect. Statistical Package for Social Sciences (SPSS), a software program was used to analyse field data. Geographical Information System (GIS) maps about land cover and vegetation types were prepared by use of archived data.

3.3 Approaches

Participatory approach in particular Participatory Rural Appraisal (PRA) was used to collect the opinion of local communities. Group focused discussions were organised in

all villages. To capture the views of women, special discussions were held and women field assistants collected their opinion and concern.

3.4 Scope of the Study

The study covered 5 villages in Mkuranga district namely; Mbezi-Msufini, Sotele, Kibamba, Bupu and Kitonga. In addition, a short survey was held in Dar es Salaam to gather views about alternative energy sources and information about energy practices. A total of 104 respondents were sampled from the five target villages (Table 3) for interview and discussion.

Table 3 Number and Percentage of Respondents by Villages, Mkuranga district

	Name of village	Frequency	Per cent	Valid Per cent
1	Mbezi-Msufini	15	14.4	14.4
2	Sotele	17	16.3	16.3
3	Kibamba	22	21.2	21.2
4	Bupu	28	26.9	26.9
5	Kitonga	22	21.2	21.2
	Total	104	100.0	100.0

For the purpose of gathering information on alternative sources of energy in the Dar es Salaam City, a total of 31 respondents were sampled and interviewed (Table 4).

Table 4 Respondents from the Dar es Salaam City by Districts

Name of District		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	1 Kinondoni	23	74.2	74.2	74.2
	2 Temeke	2	6.5	6.5	6.5
	3 Ilala	6	19.4	19.4	19.4
	Total	31	100.0	100.0	100

The PRA meetings were organized in all five target villages in the study area. A total of 161 people took part in PRA discussion sessions. Table **5** shows the number of respondents, gender disaggregated in each village meeting.

Table 5 Number of PRA participants b y villages

Name of Village	Participants in PRA meeting
Mbezi Msufini	14
Sotele	26
Kibamba	11
Bupu	63
Kitonga	47
Total	**161**

4.0 RESULTS AND DISCUSSION

4.1 Demographic and Economic Information of Respondents

Demographic characteristics give essential attributes to socio-economic status and farming enterprises practiced adopted by small-scale farmers around the forest resources in the district, and hence the productivity of charcoal production. Studying these characteristics is thus important in order to understand the general behaviour and attitude of the people who practice charcoal production that are of the interest to this study.

4.1.1 Gender aspect

Most of the households engaged in charcoal production are male-headed. The results indicated that male-headed household engaged in charcoal production activities, complemented with subsistence crop production constituted 67.3 percent, while 32.7 percent of the sampled households were female-headed (Table 6). These results closely compare with Rwelengera *et al.,* (2004) on a study on charcoal production and marketing in Kibaha district (i.e. 65.8% against 34.2% respectively), showing a typical case of most parts of the Coast region, and evident of most African culture in the context of production relations, ownership and access to household resources.

Table 6 Mkuranga District Respondents by Gender

Respondents by gender		Frequency	Per cent	Valid Per cent
1	Male	70	67.3	67.3
2	Female	34	32.7	32.7
	Total	104	100.0	100.0

4.1.2 Social Structure in the Study Area: Natives versus immigrants

According to field survey and data analysis (Table 7), about 70 per cent of the resident farmers in Mkuranga district are natives, whereas 30 per cent are immigrants from other Coastal districts, with a non-significant upcountry immigration. A characteristic difference was, however, noted was the origin of spouses, which account by about 62 per cent natives against 38 per cent immigrants (Table 8).

In both cases however, a notable feature of transitional migration to the Dar es Salaam City by "*Machinga* "(i.e. migrants from Southern part of Tanzania to Dar es Salaam) can be observed and possibly be associated with its vendor concentration in the City, as Kilwa commands a higher percentage (8.7 per cent against 10.6 per cent for household heads and their spouses respectively) of immigrants in the district (as it is close to the City), than it is with the other districts (Table 7 and Table 8). From the results, therefore, the socio-cultural structure of the communities in the study area is almost monoculture, a feature which bears some implications on the level of development of the communities.

Table 7 Respondents by districts of origin

District of birth		Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Mkuranga	73	70.2	73.7	73.7
2	Temeke	3	2.9	3.0	76.8
3	Magu	1	1.0	1.0	77.8
4	Ilala	2	1.9	2.0	79.8
5	Rufiji	2	1.9	2.0	81.8
6	Kunduchi	1	1.0	1.0	82.8
7	Ujiji-Kigoma	1	1.0	1.0	83.8
8	Morogoro	1	1.0	1.0	84.8
9	Kilwa	9	8.7	9.1	93.9
10	Muheza-Tanga	3	2.9	3.0	97.0
11	Bagamoyo	1	1.0	1.0	98.0
12	Kisarawe	1	1.0	1.0	99.0
13	Kibaha	1	1.0	1.0	100.0
	Total	99	95.2	100.0	
	Missing/ System	5	4.8		
Total		104	100.0		

Table 8 Spouses of Respondents by districts of origin

Spouses of Household Head by District of Birth					
District of birth		**Frequency**	**Per cent**	**Valid Per cent**	**Cumulative Per cent**
1	Mkuranga	65	62.5	71.4	71.4
2	Misungwi	1	1.0	1.1	72.5
3	Ilala	2	1.9	2.2	74.7
4	Temeke	2	1.9	2.2	76.9
5	Kilwa	11	10.6	12.1	89.0
6	Kibaha	3	2.9	3.3	92.3
7	Rufiji	2	1.9	2.2	94.5
8	Mpanda	1	1.0	1.1	95.6
9	Kisarawe	1	1.0	1.1	96.7
10	Tanga	1	1.0	1.1	97.8
11	Masasi	1	1.0	1.1	98.9
12	Morogoro	1	1.0	1.1	100.0
13	Total	91	87.5	100.0	
	Missing System	13	12.5		
Total		104	100.0		

4.1.3 Access to Information: Level of awareness in the study area

The respondents gave their various views regarding access to information and awareness on development issues, such as knowledge on the existence and role of forestry extension officers to the community, knowledge on improved technologies, market of charcoal products, and their obligation on meeting the legislation provisional requirements (Table 9). According to Table 10, hardly 9.0 per cent knew about the role of forestry extension officers, as well about 91 per cent had never seen extension officers visiting their village.

Illegal harvesting of trees leading to deforestation, and lack of knowledge on improved wood carbonization methods to mitigate excessive tree cutting are highly contributed by lack of knowledge in the study area. Hardly 4.8 per cent of respondents knew about harvesting permits, though they perceived to be aware of forest regulations (81.7 per cent). Only 5.8 per cent were aware of improved wood carbonization methods.

Table 9 Access to Information in the Study Area

Awareness		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	10	9.6	9.6	9.6
	No	94	90.4	90.4	100.0
	Total	104	100.0	100.0	

Table 10 Response on frequency of visits by Forest Extension officer to the village

Awareness		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Rarely	2	1.9	1.9	1.9
	Sometimes	6	5.8	5.8	7.7
	Never seen	95	91.3	91.3	99.0
	Don't know	1	1.0	1.0	100.0
	Total	104	100.0	100.0	

Although charcoal production is imminently growing as a quick lifeline in most of the rural poor, their charcoal monetary wellbeing seems to rest in the hands of the middlemen (Rwelengera et al., 2004). This is evident from the field survey, where about 64 per cent of the respondents are not informed of the destination of charcoal for marketing. About 63.5 per cent of the respondents testified of being aware of conservation radio programmes, owing to the wide coverage of the national radio namely Radio Tanzania Dar es Salaam (RTD).

Table 11 Response on where charcoal goes

Awareness on market destination		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Village market	20	19.2	19.2	19.2
	Mkuranga District centre	2	1.9	1.9	21.2
	Dar es Salaam Market	15	14.4	14.4	35.6
	Don’t know	67	64.4	64.4	100.0
	Total	104	100.0	100.0	

The study reveals that only 5.0% of the respondents have ever asked for tree felling permits. On the other hand only 18.3% agreed that they have knowledge of the existence of forest conservation laws.

Regarding the awareness about improved energy stoves, 5.8% acknowledged that they are aware of existence of improved charcoal burning methods in particular the improved charcoal kilns.

Of the respondents, 63.5% have access to radio programs on environmental conservation as shown in Table 12 .

Table 12 Access to Radio Programs on environmental conservation

Awareness		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	66	63.5	63.5	63.5
	No	38	36.5	36.5	100.0
	Total	104	100.0	100.0	

4.2 Livelihood Structure

Sources of livelihood in most of the rural poor in the country are characterised by subsistence crop production, forest products production and services (both timber and non-timber) and to a least extent petty trading and remittance. From the field survey and data analysis points of view, the communities in the study area are peasantry agrarians, dependent on subsistence crop production and forest products – mainly charcoal and fuel wood.

4.2.1 Crop production

The main crops grown by communities in the study area are cassava, accounting 33.7 per cent, and it stands as a ranking staple food in the area, as well as very essential during fasting in the month of Ramadan. Cashew nut growing (47.1 per cent) is a main cash undertaking. However, its market structure has been difficult, with quite falling prices in every year, hence compelling farmers to switch to wood fuel, mainly charcoal, as a quick cash earning source. Table 13 shows the analysis of crops grown in the study area as sources of livelihood, and the mode of indigenous farm management, based on

stratification of farm plots, and types of crops grown in plots at different times, depending on the bimodal rain regimes (i.e. short and long rains) in the area.

Table 13 Crop production in the Study Area

Crop		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Maize	2	1.9	2.0	2.0
	Cassava	35	33.7	35.4	37.4
	Sweet potatoes	2	1.9	2.0	39.4
	Banana	1	1.0	1.0	40.4
	Cashew nuts	49	47.1	49.5	89.9
	Rice	1	1.0	1.0	90.9
	Coconut	8	7.7	8.1	99.0
	Others	1	1.0	1.0	100.0
	Total	99	95.2	100.0	
	System	5	4.8		
Total		104	100.0		

From analysis, cassava being a staple food and cashew nut as a cash crop are given high priority during cultivation (41.3 and 51 per cent), and are grown in all farm plots. Coconut, however, receives priority in farm plot 3, twice as much as cashew nut (13.5 per cent), because it is a cash crop, and yet an important integral spice in meat, fish, vegetable, rice, and cassava dishes, and also a source of oil for various use.

4.2.2 Sources of income and expenditure pattern

The main sources of income identified by the respondents are: agriculture, forest products, salary and wages and others. About 85 respondents out of 104 (equivalent to 81.7 per cent) mentioned agriculture as the leading source of income (Table 14). About 4.8 per cent of respondents mentioned sale of forest produce and others (11.5 per cent) contributing to agriculture as sources of income in the study area. About 64 per cent of the respondents admit that the main crops produced are the source of domestic income. About 35.6 per cent of respondents admitted that they have been involved in charcoal production and trading (Table 17). Salaried or waged labour and remittance are lesser sources of income in rural settings, accounting by hardly 1 – 1.9 per cent of the 104

interviewed respondents. although in metropolitan centres as the case with the Dar es Salaam City they account significant by 73 per cent (Table 16 and Table 41).

Table 14 Main sources of household income

Source	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Agriculture	85	81.7	81.7	81.7
Pay salary	1	1.0	1.0	82.7
Sale forest products	5	4.8	4.8	87.5
Others	12	11.5	11.5	99.0
Nil	1	1.0	1.0	100.0
Total	104	100.0	100.0	

Table 15 Whether any household member ever traded or make charcoal business

Trading charcoal		Frequency	Per cent	Valid Per cent	Cumulative Per cent
Valid	Yes	37	35.6	35.6	35.6
	No	67	64.4	64.4	100.0
	Total	104	100.0	100.0	

Table 16 Members of Households with waged labour

Receiving wage	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	1	1.0	1.0	1.0
No	103	99.0	99.0	100.0
Total	104	100.0	100.0	

The percentage of households selling farm crops for income generation is 63.5% according to Table 17. Only about 2.0% of the households receive money support from outside. As for the main areas of income expenditure, majority spends money on food (57.7%) followed by energy for coking (4.8%), education (2.9%) and agriculture (3.8%). 1.0% said they spent on health and treatment.

Table 17 Sell of crops produced by households

Sell main crops		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	No	33	31.7	33.3	33.3
	Yes	66	63.5	66.7	100.0
	Total	99	95.2	100.0	
	System	5	4.8		

Total	104	100.0		

Table 18 Main areas of expenditure by household

Expenditure pattern	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Health/treatment	1	1.0	1.0	1.0
Food	60	57.7	57.7	58.7
Energy for cooking	5	4.8	4.8	63.5
Agriculture inputs	4	3.8	3.8	67.3
Education	3	2.9	2.9	70.2
Transport	2	1.9	1.9	72.1

The expenditure pattern is greatly skewed to purchase of food, accounting by 57.7 per cent, implying that food crop production is highly subsistence, with little likelihood of storage, thus need for monetary savings to supplement food supply. The far reaching implication is that the communities are characterised with relatively high food insecurity.

4.2.3 Food Security

Food security has received a multi-facet treatment. A food secured household is a household having assured sets of entitlements - from food production, cash income, reserves of food or assets and/or assistance from government programme, such that in times of need they will be able to maintain sufficient nutrient intake for physical well–being (Benson *et.al*., 1986). According to Maxwell and Frankenberger (1992), the above definition of HFS has four core concepts: (a) Sufficiency of food, which is defined as the calories needed for an active healthy life; (b) Access to food, defined by entitlement to produce, purchase or exchange food or receive it as gift; (c) Security, defined by the balance between vulnerability, risk and insurance; and (d) Time, where food insecurity can be chronic, transitory or cyclical.

From the study, therefore, food insecurity is an obvious phenomenon in about 50 per cent of the communities, because hardly 52.9 per cent (55 respondents out of 104) have access to three meals per day (Table 19).

Table 19 Number of meals households have per day

	Number of meals per day	Frequency	Per cent	Valid Per cent	Cumulative Per cent
	One meal	4	3.8	3.8	3.8
	Two meals	43	41.3	41.3	45.2
	Three meals	55	52.9	52.9	98.1
	No answer	2	1.9	1.9	100.0
	Total	104	100.0	100.0	

Table 20 Response to whether household ever slept without dinner any day last year (2005)

Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	60	57.7	57.7	57.7
No	44	42.3	42.3	100.0
Total	104	100.0	100.0	

Table 21 Households owning chicken

Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
1 Yes	59	56.7	56.7	56.7
2 No	45	43.3	43.3	100.0
Total	104	100.0	100.0	

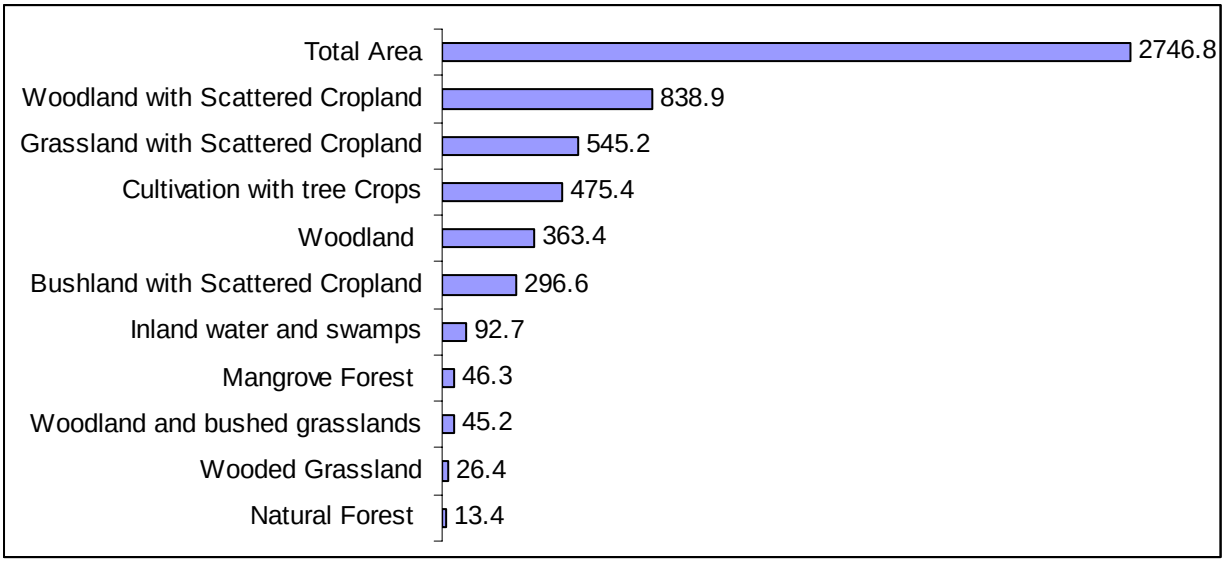
At most difficult times about 57.7 per cent (60 out 104 respondents) of the communities went without dinner particularly in year 2005 shown in Table 20. In most cases this happen during rain season because of lack of enough sunshine to dry cassava and lack of money to buy maize flour from shops. Others reported that it was attributed to acute food shortage that hit most parts of the area as. Most people in the study area do not own livestock but poultry (chicken). About 56.7 per cent (59 out of 104) respondents admitted of keeping chicken as source of nutrition and petty income as revealed in Table 21.

4.3 Environmental Degradation

Changes in vegetation cover and type, mostly negative have mainly been a result of uncontrolled tree cutting to meet livelihood needs in both rural and urban population, hence environmental degradation. There has been a growing linear relationship between increased urban population and increased deforestation for charcoal production for domestic energy. According to Malimbwi et al., (2001), about 69 – 70 per cent of the Dar es Salaam household depend on charcoal as first choice for domestic energy, and the Kilwa route (passing through Mkuranga district) contributes by 31 per cent of total charcoal entering the Dar es Salaam City (ibid.).

According to remote sensing data of 1995 the vegetation cover of Mkuranga district areawise was as shown in Figure 3.

Figure 3 Land use and vegetation types (in Km sq) in Mkuranga district



4.3.1 Deforestation

Deforestation has been expressed as a gradual loss, mainly by indiscriminate tree felling, of forest and woodland vegetation from a forested and woodlands locality over a period of time. Deforestation, and consequently environmental degradation is steadily taking place in Mkuranga district, and the communities show concern over the situation (table

4.7). About 91.3 per cent (95 out of 104 respondents) have knowledge on the state of forest resource degradation in the area. Charcoal production has been observed a main contributing factor, as 60.6 per cent (63 out of 104 respondents) of respondents admitted.

The vegetation cover and land use in Mkuranga district is as shown in Figure 4. According to 1995 spatial data, most natural forests including protected forest reserves such as Mtita, Masaganta, Vikindu and Marenda have been seriously encroached for charcoal production and agricultural activities. The Forest Officer for Mkuranga confessed that forest reserves (FR) have been seriously deforested. For example 80% of Marenda and 60% of Vikindu forest reserves are today affected by human encroachments. Mangroves are the only intact forests in the district. The area now occupied by natural forests in the district is 0.5% signifying that most forests have been converted to agricultural farms, woodlands, bushes and grasslands as shown in Table 22.

Figure 4 Land use and vegetation cover types for Mkuranga district

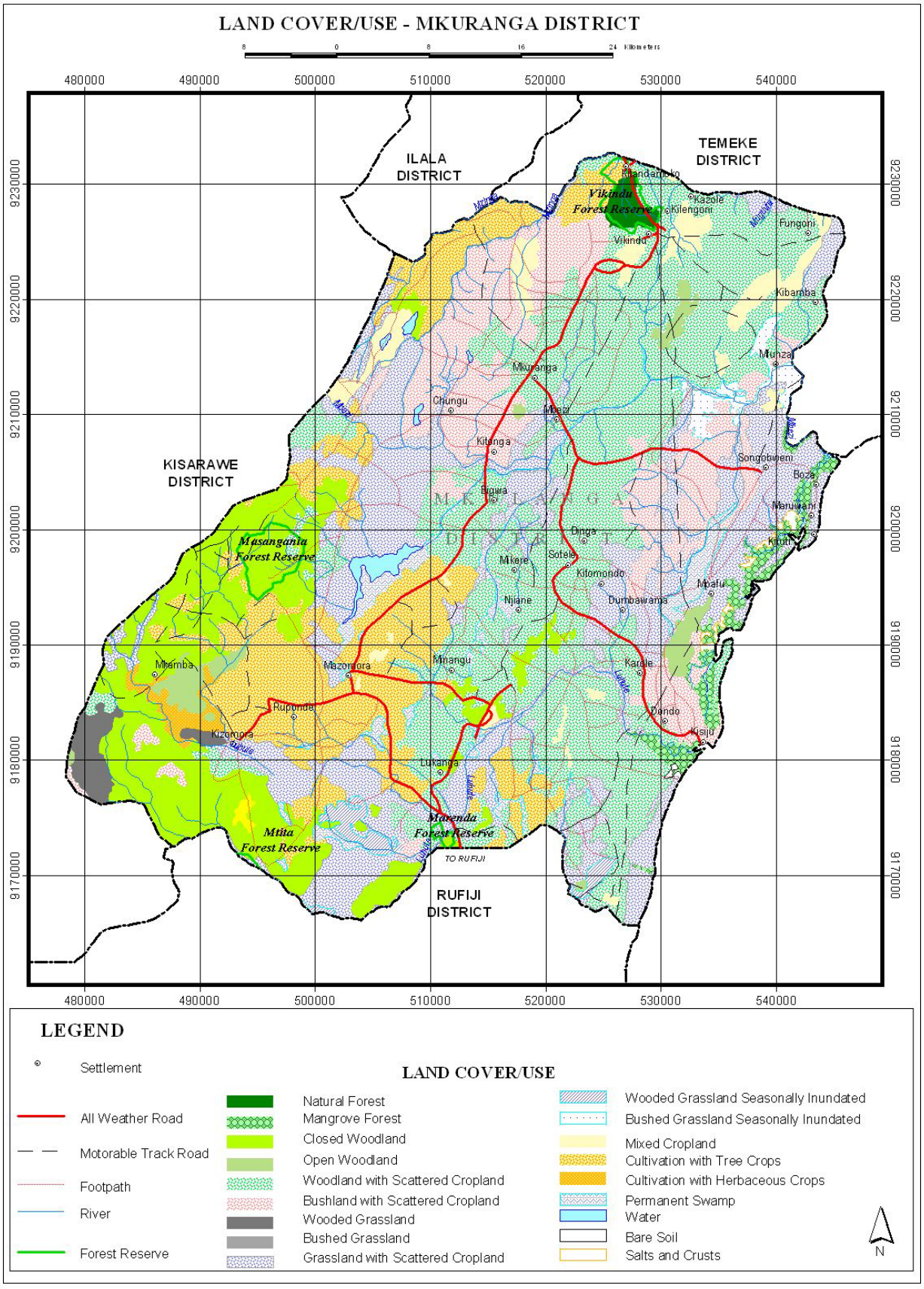


Table 22 Vegetation cover by percentage in Mkuranga District

Vegetation Type	%
Bushed Grassland	0.1
Natural Forest	0.5
Wooded Grassland	1.0
Woodland and bushed grasslands	1.6
Mangrove Forest	1.7
Inland water and swamps	3.4
Bushland with Scattered Cropland	10.8
Woodland	13.2
Cultivation with tree Crops	17.3
Grassland with Scattered Cropland	19.8
Woodland with Scattered Cropland	30.5
Total Area	100

In the study villages, 91.3% of the respondents acknowledge that there is degradation of Forest resource in the area as revealed in Table 23

Table 23 Notice of forest degradation problem in the village by respondents

Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	95	91.3	91.3	91.3
No	9	8.7	8.7	100.0
Total	104	100.0	100.0	

Majority of people in the study area or 60.6% mentioned tree cutting for charcoal production as the main source of environmental degradation in the area as shown in Table 24. Other causes were uncontrolled farming (28.8%), bush fires (1.0%). On the other hand 89.4% confessed to have vividly observed tree cutting for charcoal making as a problem in their areas. See Table 25 .

Table 24 Causes of environmental degradation in the village

Cause of environmental degradation	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Uncontrolled farming	30	28.8	28.8	28.8
Tree cutting for charcoal production	63	60.6	60.6	89.4
Bush fires	1	1.0	1.0	90.4
Other	1	1.0	1.0	91.3
Unknown	9	8.7	8.7	100.0
Total	104	100.0	100.0	

Table 25 Observation of tree cutting for charcoal production in the area as a problem

Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	93	89.4	89.4	89.4
No	7	6.7	6.7	96.2
No observation	3	2.9	2.9	99.0
Don't Know	1	1.0	1.0	100.0
Total	104	100.0	100.0	

4.3.2 Trading on forest and non-forest products

Information on trading on forest products shows that 8.7 per cent (9 out of 104 respondents) of the community is engaged in trade of firewood (table 4.8a). Trading on wood carvings and timber did not feature prominent with the communities. Hardly 5.8 per cent (6 out of 104 respondents) are involved in trade of poles.

Table 26 Household members trading on firewood

Household members trading on fire wood				
Response	**Frequency**	**Per cent**	**Valid Per cent**	**Cumulative Per cent**

1	Yes	9	8.7	8.7	8.7
2	No	94	90.4	90.4	99.0
3	Nil	1	1.0	1.0	100.0
	Total	104	100.0	100.0	

As for trading on tree poles or "Milunda", 8.7 % of the respondents admitted to have traded on it as shown in Table 27.

Table 27 Household members trading on poles (milunda) products

Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Yes	6	5.8	5.8	5.8
No	97	93.3	93.3	99.0
Nil	1	1.0	1.0	100.0
Total	104	100.0	100.0	

Trading on weaving products and wild fruits (Table 36) account by 19.2 (20 out of 104 respondents) and 15.4 (16 out of 104 respondents) per cent respectively. About 15.4 % agreed that they have traded on wild fruits. Table 29. Trading on thatching grass and coconut leaves obtained from natural forests is not a prominent activity, 7.7 per cent (8 out of 104 respondents) as shown in Table 30. The grass and coconut leaves are commonly transported to Dar es Salaam city for hotel construction and therefore an important source of household income.

Table 28 Members of household trading on weaving products

Response		Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Yes	20	19.2	19.2	19.2
2	No	83	79.8	79.8	99.0
3	Nil	1	1.0	1.0	100.0
	Total	104	100.0	100.0	

Table 29 Household members trading on wild fruits

Response		*Frequency*	*Per cent*	*Valid Per cent*	*Cumulative Per cent*
1	Yes	16	15.4	15.4	15.4
	No	87	83.7	83.7	99.0
2					
3	Nil	1	1.0	1.0	100.0
	Total	104	100.0	100.0	

Table 30 Response on household members trading in thatching grass

	Response	Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Yes	8	7.7	7.7	7.7
	No	95	91.3	91.3	99.0
2					
	Nil	1	1.0	1.0	100.0
3					

4.3.3 Conservation initiatives in the study area

There are no concerted conservation programs and awareness efforts in the area regarding proper forest resource use. 16.3% (17 out of 104 respondents) admitted to have enough knowledge on conservation activities as indicated in Table 31. Tree planting activities account by only 30.8 per cent (32 out of 104 respondents). The members of the community are not very much engaged in protection activities, accounting only by 10.6 per cent.

Table 31 Knowledge about forests conservation is enough

	Response	Frequency	Percent	Valid Per cent	Cumulative Per cent
2	No	87	83.7	83.7	83.7
	Yes	17	16.3	16.3	100.0
3					
	Total	104	100.0	100.0	

Of the respondents, 58.7% conceded to have not participated forest conservation activities in the past two years (Table 32). As mentioned above, this is due to lack of sufficient conservation programs in the district. Some people have participated in tree planting (30.8%), bush fire control (8.7%) and patrol inside forest reserves (1.9%).

Table 32 Involvement of households in forest conservation activities in the last two years

Conservation activities	Frequency	Percent	Valid Percent	Cumulative Per cent
Tree planting	32	30.8	30.8	30.8
Bush fire control	9	8.7	8.7	39.4
Patrol inside forest reserve	2	1.9	1.9	41.3

Nil	61	58.7	58.7	100.0
Total	104	100.0	100.0	

4.4 Charcoal production process

4.4.1 Charcoal production

In Mkuranga charcoal is processed using traditional earth kiln method. The steps involved are:

(i) Identification of suitable trees for charcoal productions

(ii) Cutting down and dismembering of trees

(iii) Hauling of woody to kiln sites

(iv) Clearing of ground for "Msonge" or cone-shaped kiln

(v) Piling and aligning to fit in Msonge charcoal kiln

(vi) Collection of sod and soils to cover the kiln construction

(vii) Burning and maintenance of carbonisation process of the kiln (vent control)

(viii) Unloading of the kiln

(ix) Packing charcoal into sacks

(x) Hauling of charcoal bags to road side and into the trucks.

In view of the above process of charcoal making, the task is highly labour intensive and therefore people are compelled to do so because of lack of alternative income sources..

4.4.2 Productivity

According to charcoal producers, the method is tedious and labour intensive. One kiln can produce between 2 to 20 bags in *shambas* and 10 to 30 in woodland. Evidence has shown that with the traditional, unimproved earth kilns, much wood is converted into ash instead of charcoal, the implication of which large amount of logs have to be felled to produce charcoal.

4.5 Problem Analysis

The study took time in assessing the charcoal demand especially by consumers in the Dar es Salaam City which is the main end user of charcoal from Mkuranga and elsewhere from upcountry. Despite being wasteful, poor methods for wood carbonization, especially the traditional earth kilns (tanuru) are widely being used in the district. The Ministry of Natural Resources through its guideline issued in September, 2006, requires the use of square underground trench. This is good for logs and efficient. However, most local practitioners argue the method is laborious and less efficient. It has low recovery rate for wood with low size for example poles as high percentage of charcoal is crashed during unloading. It is also of low safety as the users are likely to be burnt by hot charcoal during unloading from 1-2m deep trench. However, the latter is by far important in serving the forests as it would not accommodate less dimensional wood, for example sticks and young trees. The surface earth kiln which is commonly known as "Msonge" because of its cone shape is user friendly to people of all ages and gender but most destructive because it can burn small sized trees including sticks (Figure 5). Its recovery percentage is generally high as less charcoal is crashed during unloading and packing into sacks. It cools fast and therefore of less body burning risk to users.

Charcoal making in Mkuranga district is a traditional and well diffused practice in the society. During the PRA meeting, community at Kitonga village accepted that every person in the village both men and women except children and old ones is engaged in charcoal business. The attitude is also well known to children and most will practice the make of toy kilns as shown in **Error! Reference source not found.**.

Figure 5 *Msonge* charcoal kiln on preparation near homestead at Kibamba village

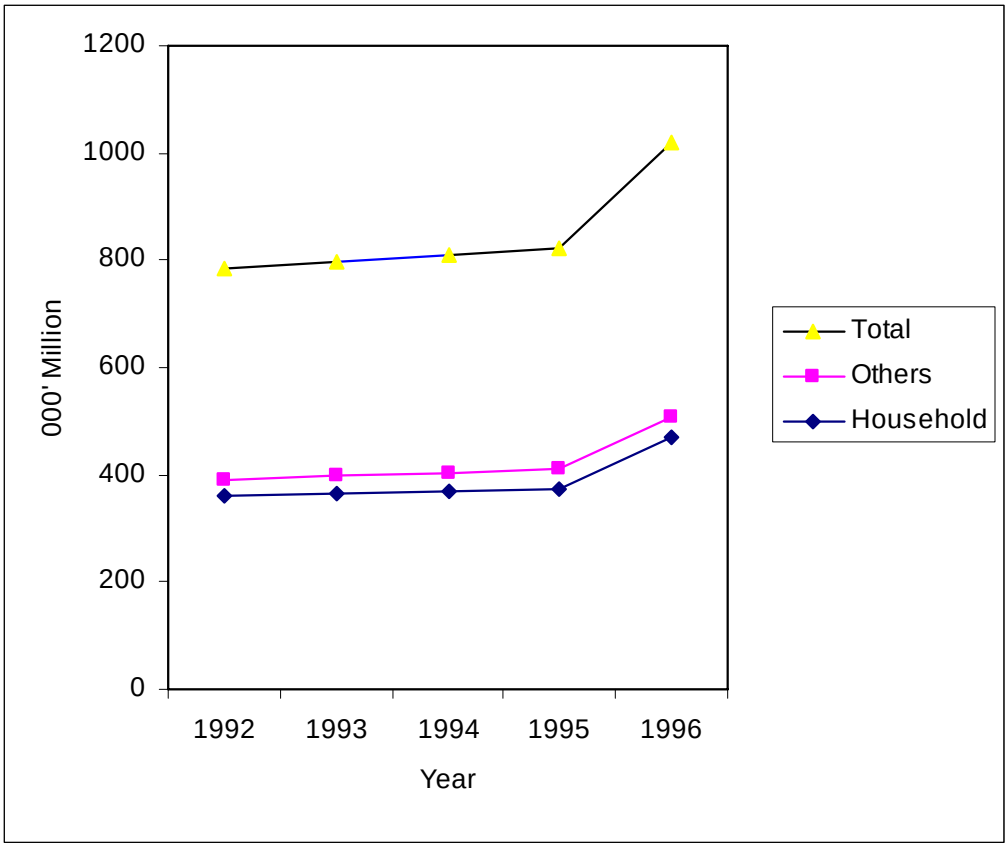
According to Malimbwi *et al.* (2001), Dar es Salaam city consumes about 416,688 tonnes of charcoal per annum.

Figure 6 A boy making a toy charcoal kiln at Kibamba village

Estimates on charcoal consumption in Tanzania, according to FAO (1999: cited in FBD 2005) are shown in

Figure 7.

Figure 7 Estimates of charcoal consumption in Tanzania in (000 mil. tonnes), 1992-1996



4.6 Charcoal Revenue, Expenditure and Taxes

Charcoal dealers interviewed acknowledged that they are paying charcoal tax to village government. However the village leaders do not keep records about charcoal revenue and therefore, the whole payment is secretive. As such the business at village level is not transparent because of apparent corrupt grass-root level leaders. Similarly, at district level, records about impoundment of charcoal bags and trucks are inadequate. For instance, in year 2005/5 28 trucks with about 2500 bags of charcoal were impounded by forest officers in the district for carrying illegal charcoal and fined 456,000TAS or 356 USD at a rate of about 5,100 TAS per bag. Patrol operation inside forest netted 4 defaulters in 2004, 6 in 2005 and 8 in 2006. In 2004/5 the district implemented 27 patrol operations which cost 8.0 million TAS. During the operations, 55 illegal charcoal kilns and 5 camps for charcoal makers were destroyed. However records about bags of

charcoal impounded during the particular operation were not reported. Generally, in most cases bags of charcoal impounded or confiscated are grossly underestimated or under reported. For example, 3 bags (2005) and 130 (2006) were impounded respectively according to district records. Therefore statistics about confiscated charcoal and fines are very sketchy or unavailable and they do not much the extent of charcoal production and trading in the district by far. Today, only about 20% of the charcoal produced in the district is taxed according to district forest officer.

Usually, charcoal and firewood are sold in bulky quantities. Charcoal dealers use large sizes of charcoal bags which carry excessive weight against what is described as standard charcoal bag by the Forest and Beekeeping Division. Observations at check points show that most charcoal bags on transit are above 60kg. Lyimo (2001) reported that, Forest and Beekeeping Divisions stipulates that fees for charcoal should be charged at the rate of TZS 400.00 per bag, and that the bag is required to weigh about 28kg. In this regard charcoal is obviously under levied or taxed.

The regulation requires the DFO to verify the number of bags or volume and if satisfied issues a Transit Pass (TP). A TP is valid for 2 to 21 days. Most people interviewed believe that permits are used longer than allowed and therefore a loop hole to transport excessive amount of charcoal without paying revenue to the government.

Charcoal business in the district is run by outsiders especially rich people from Dar es Salaam. As they reach the villages they are regarded as rich business people or literally "Matajiri", a phenomenon that makes village leaders fear them and therefore unable to control them.

Figure 8 show charcoal production by number of bags in Mkuranga district between 2003 and 2006, and the revenue accrued respectively, from charcoal and other forest products.

Figure 8 Recorded charcoal production by number of bags in Mkuranga district

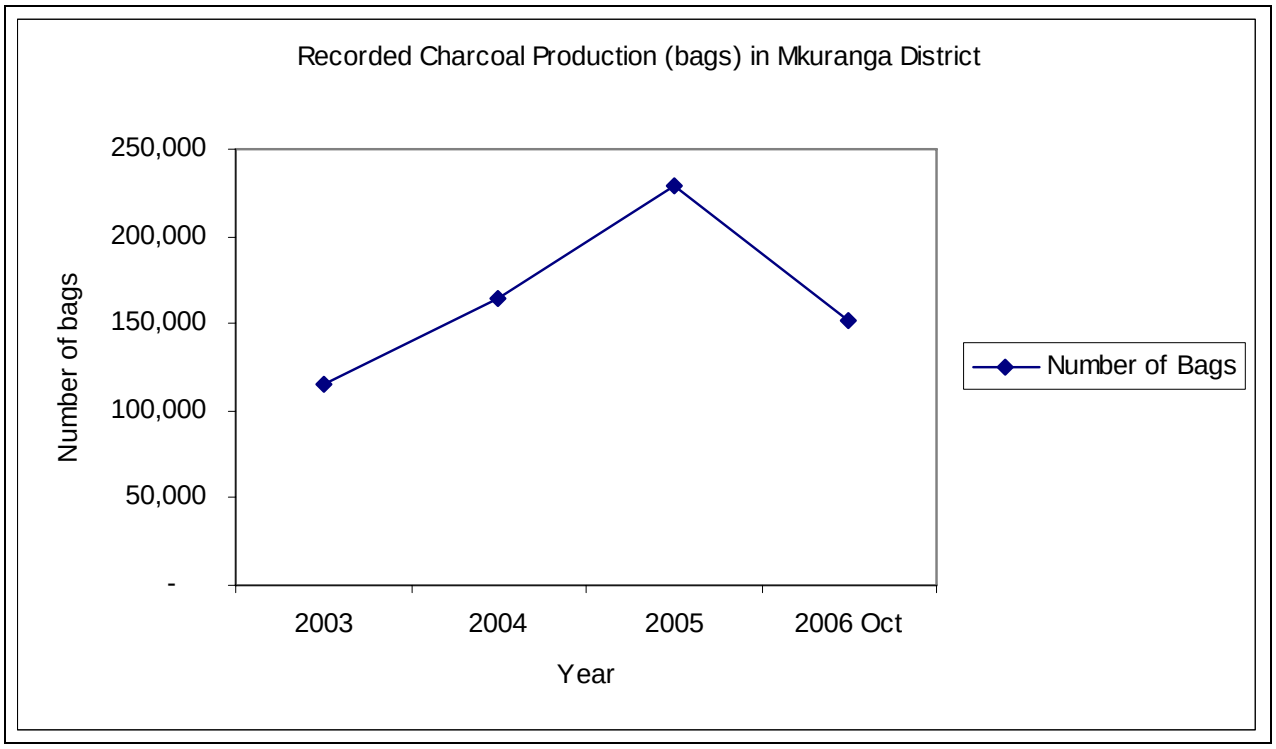
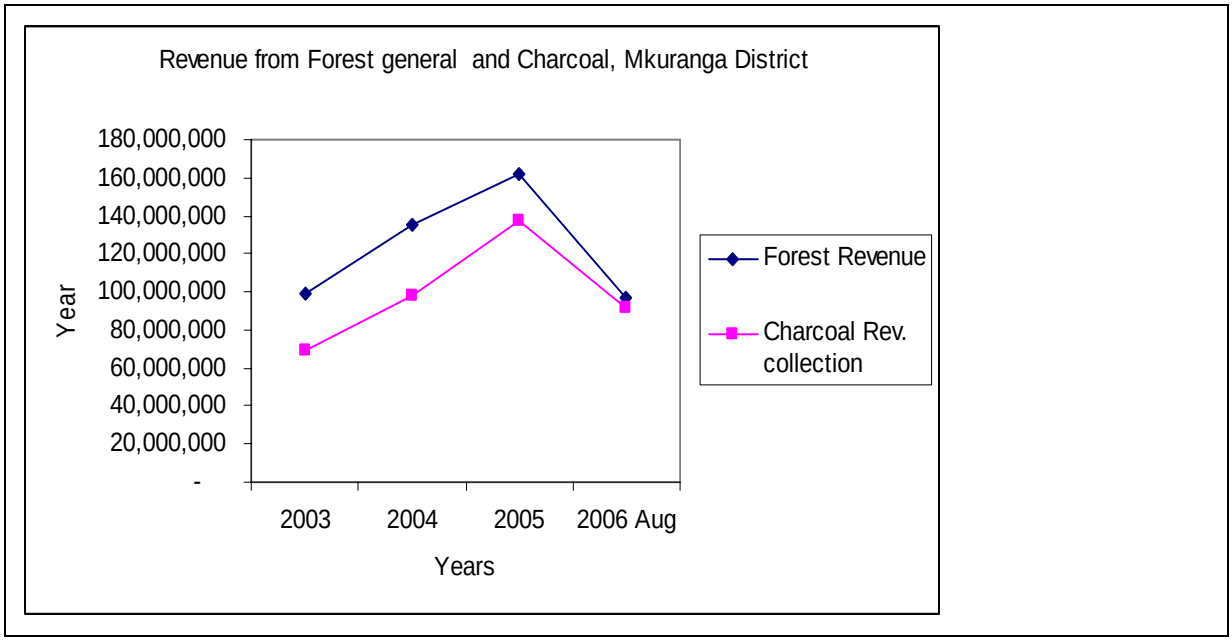


Figure 9 Revenue collection from charcoal and other forest products in general, Mkuranga District



Charcoal taxation is not effectively supervised and undertaken in the village. This is hindered by lack of sufficient manpower and logistics at district level. The district has a single vehicle which was sent by the Ministry of Natural Resources and Tourism in the recent years. However, its operation is hampered by insufficient funds.

Prices offered to charcoal burners by big dealers are marginal. The later enjoys lion share of the profit. Prices are as shown in Table 33.

Table 33 Charcoal prices at different sites

Location	Price (TZS)
Kiln site	4,000
Village centre	5000
Road site	7500
Mkuranga Township	12000
Dar es Salaam	17000- 23000

Source: Field survey, October 2006

According to Mkuranga District Forest Office, about 400 bags of charcoal are transported to Dar es Salaam daily by use of various equipments such bicycles, pickups, trucks and passenger vehicles. Figure 10 Truck loaded with charcoal on route to the City of Dar es Salaam. Majority of charcoal dealers hail from the Dar es Salaam city. Area of forest under protection is 7,880Ha, managed by the district council. There is no village government that owns a forest reserve in the district. Charcoal is not properly taxed because large quantities are transported outside the district illegally and unnoticed. Transporters use informal routes to avoid government check gates at Mbagala and Temeke districts. The district council charges a cess of TZS 300 per bag. Village authorities are allowed to collect a cess of TZS 100 per bag. Some villages have been established out of charcoal business thus making law enforcement and control difficult, as it becomes a political issue. Bupu and Mbezi beach villages are practical examples of such an establishment.

Figure 10 Truck loaded with charcoal on route to the City of Dar es Salaam

4.7 Alternative to charcoal business and income

Since charcoal business seems to be excessively growing in the area, alternatives to livelihood could be such as adopting beekeeping as a substitute, so as to reduce dependence on forest resources as source of income. The majority see improved agriculture and animal keeping especially chicken as good alternative to charcoal business and income. TAWLAE has introduced horticultural and poultry farming is Sotele village, which is seen as an important economic activity. In addition, the villagers are happy with the new variety of cassava which was introduced in the village by the same. Few people from the village have been trained at Mikocheni Research Institute under TAWLAE support. Beneficiaries acknowledge that the training impact has been positive as they are now raising and selling poultry products. The price of live chicken at Mkuranga township is about 7,500 TZS or 7 US$. Animal husbandry is another alternative, particularly dairy cattle and high breed goats.

The district agricultural office suggested the introduction and promotion of water melon, oil palms, simsim and vegetables in the rural for income generation (Figure 11). Sotele villagers reported that oil palms performs well in the village and people can locally

extract oil from the seeds. However, further agricultural knowledge about crop husbandry is required.

Figure 11 Oil Palm crop at Sotele village

Other crops suggested by respondents include good varieties of orange and mango trees, passion fruits and improved cashew nuts.

4.8 Stakeholders analysis for decision making

The communities gave their contribution on how harvesting should be regulated (Table 34). About 66 per cent (69 out of 104 respondents) suggested in favour of the village government to take control of harvesting forest resources.

Table 34 Response on who should be effectively control tree cutting for charcoal

Stakeholder	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Village Government	69	66.3	66.3	66.3
District Council	6	5.8	5.8	72.1
Forest and Beekeeping Division	8	7.7	7.7	79.8
Non Governmental Organisations	11	10.6	10.6	90.4
Don't know	10	9.6	9.6	100.0
Total	104	100.0	100.0	

4.9 Practices of energy consumption in Mkuranga district

Wood fuel in particular fire wood is a main source of domestic energy for cooking and heating (88.5 per cent of respondents) as indicated in Table 35.

Table 35 Main source of cooking energy in Mkuranga district

Source of cooking energy	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Paraffin	9	8.7	8.7	8.7
Wood	92	88.5	88.5	97.1
Charcoal	2	1.9	1.9	99.0
No response	1	1.0	1.0	100.0
Total	104	100.0	100.0	

Table 36 shows that paraffin is the main source of lighting energy, as testified by 92.3 per cent of respondents. However 4.8 % of the respondents lack access to lighting source.

Table 36 Source of house lighting energy in Mkuranga district

Source of lighting energy	Frequency	Per cent	Valid Per cent	Cumulative Per cent
Paraffin	96	92.3	92.3	92.3
Wood	2	1.9	1.9	94.2
Batteries	1	1.0	1.0	95.2
Nil	5	4.8	4.8	100.0
Total	104	100.0	100.0	

4.10 Practices of energy consumption in Dar es Salaam

The main sources of energy in the Dar es Salaam City, as testified by the 31 interviewees Table 37) are charcoal, gas and electricity. However, charcoal is the predominant source, accounting by 71 per cent (22 out of 31 respondents), and a result close to that of Malimbwa et al., (2001) of 69 – 70 per cent of Dar es Salaam households that use charcoal as first choice for domestic energy. Majority (29.0%) of charcoal users in Dar es Salaam spends between 30,000 and 40,000TZS as shown in Table 40.

According to Table 38, most of the respondents (16.1 per cent) with access to electricity have limited financial ability to pay bills, mostly pay less than TZS 20,000 per month. Quite few

respondents (9.7 per cent) use gas, above TZS 20,000 per month (Table 39). Most of respondents, 29 per cent (9 out of 31) proved to have a purchasing power of spending up to TZS 40,000 for charcoal for domestic energy.

Table 37 Main sources of energy and cost (TZS) for cooking in Dar es Salaam City

Energy source		Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Electricity	7	22.6	22.6	22.6
2	Gas	2	6.5	6.5	29.0
3	Charcoal	22	71.0	71.0	100.0
	Total	31	100.0	100.0	

Table 38 Average monthly cost for electricity for Dar es Salaam people

	Monthly cost	Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Less than 20,000	5	16.1	16.1	16.1
2	Above 20,000 but >=30,000	2	6.5	6.5	22.6
3	Above 30,000 but >=40,000	2	6.5	6.5	29.0
4	Above 40,000 but >=50,000	4	12.9	12.9	41.9
5	Above 50,000 but >=60,000	1	3.2	3.2	45.2
	Not used	17	54.8	54.8	100.0
	Total	31	100.0	100.0	

Table 39 Average Monthly Cost for Gas in Dar es Salaam

Monthly cost (TZS)		Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Less than 20,000	1	3.2	3.2	3.2
2	Above 20,000 but >=30,000	3	9.7	9.7	12.9
3	Not used	27	87.1	87.1	100.0
	Total	31	100.0	100.0	

Table 40 Average Monthly Cost of Charcoal for Cooking by Dar e s Salaam residents

		Frequency	*Per cent*	*Valid Per cent*	*Cumulative Per cent*
1	Less than 20,000	6	19.4	19.4	19.4
2	Above 20,000 but >=30,000	6	19.4	19.4	38.7
3	Above 30,000 but >=40,000	9	29.0	29.0	67.7
4	Above 40,000 but >=50,000	3	9.7	9.7	77.4
5	Above 50,000 but >=60,000	2	6.5	6.5	83.9
6	Above 60,000	1	3.2	3.2	87.1
7	Not used	4	12.9	12.9	100.0
	Total	31	100.0	100.0	

Of the people interviewed in Dar es Salaam, about 71% have salary employment while 25.8% are not employed (Table 41). This could be the main reason why the can afford a wide range of energy sources for cooking such as charcoal, electricity and gas.

Table 41 Dar es Salaam Households with members receiving wage salary

Response		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Yes	22	71.0	73.3	73.3
	No	8	25.8	26.7	100.0
	Total	30	96.8	100.0	
	System	1	3.2		
Total		31	100.0		

4.11 Choice of energy source and advice to the Government

None of the people interviewed in Dar es Salaam mention the use of solar energy for cooking. The respondents gave four parameters for choosing types of energy sources as revealed in

Table 42, namely efficiency, low price, ease to handle, and accessibility. The parameters that have high implication for choosing an energy source are price, 41.9 per cent (13 out of 31 respondents) and easiness to handle, 32.3 per cent (10 out of 31 respondents) respectively.

Table 42 Reasons for choosing the energy source used for cooking in Dar es Salaam City

Parameter		Frequency	Per cent	Valid Per cent	Cumulative Per cent
	Efficiency	5	16.1	16.1	16.1
	Low Price	13	41.9	41.9	58.1
	Easiness to handle	10	32.3	32.3	90.3
	Accessibility	2	6.5	6.5	96.8
	No answer	1	3.2	3.2	100.0
	Total	31	100.0	100.0	

Table 43 Recommendations by Dar es Salaam residents about household energy and charcoal problem

		Frequency	Per cent	Valid Per cent	Cumulative Per cent
1	Availability of and low price Electricity	16	51.6	51.6	51.6
2	Gas is an environmental friendly should be promoted	2	6.5	6.5	58.1
3	Initiate on tree planting	3	9.7	9.7	67.7
4	Training on awareness & usage of other energy source	8	25.8	25.8	93.5
5	Stop tree cutting permit	1	3.2	3.2	96.8
6	Laws be in place to restrict the use of forest products	1	3.2	3.2	100.0

Likewise, the residents proposed to the government to provide low price electricity, where 51.6 per cent (16 out of 31 respondents) made the advice. About 25.8 per cent (8 out of respondents) advised on having training on awareness and use of other energy sources, in order to meet the growing demand of the city population (**Error! Reference source not found.**).

4.12 Forest Management in Mkuranga District

The district forest office is apparently understaffed, with limited human resource (Table 44), financial and equipment resource capacity. The district has only one vehicle but no operational funds. Surveillance activities are difficult to achieve under such a resource scarcity situation.

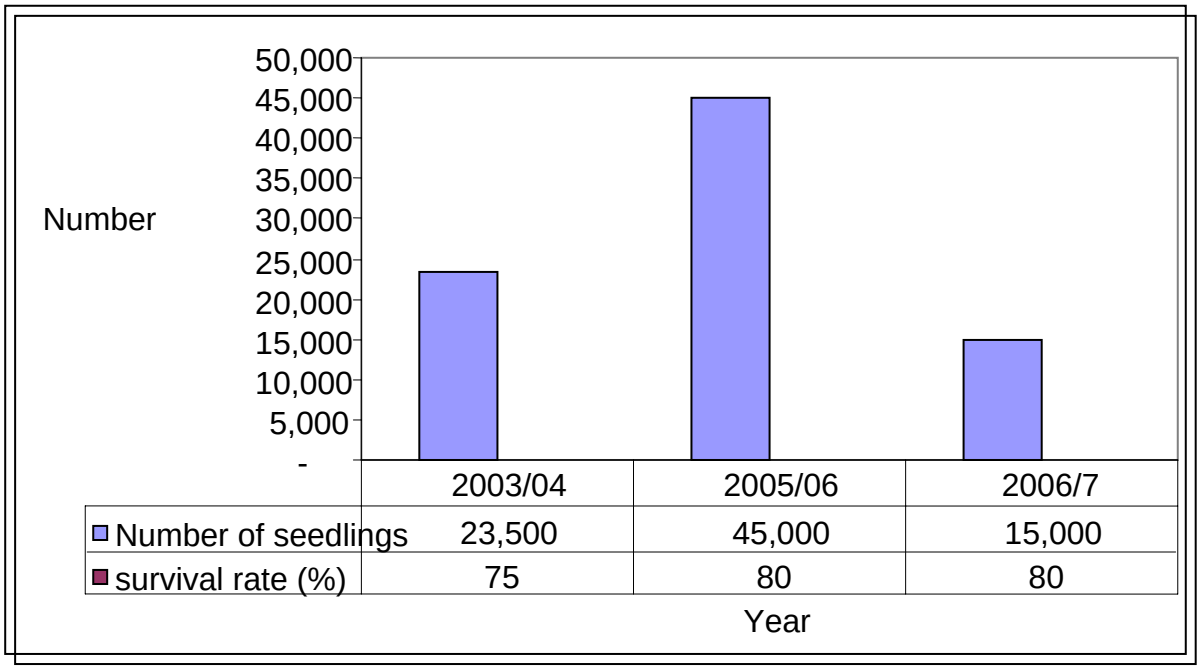
Table 44 Staffing positioning and number in Mkuranga district

Qualification	District	Wards	Villages
Degree and above	2	0	0
Diploma	1	1	0
Certificates	0	2	0
Below Certificate	0	5	0

Plans for improvement are difficult due to limited resource allocation most local authorities in the country experience.

Forest regeneration activities are as well limited (Figure 1Figure 12), with district planting targets of not more than 45,000 seedlings per annum, at survival rates of 75 – 80 per cent during planting seasons between year 2003/ 04 and 2006/ 07.

Figure 12 Tree planting in Mkuranga District between 2003/ 04 and 2006/ 07



However, with such a trend, annual planting targets are unstable, for instance year 2006/ 07 target has dropped to three-fold.

4.13 Results from Participatory Rural Appraisal Meetings

PRA results from the study area provide qualitative analysis, representing the local community perception on livelihood and environment issues. The results of PRA sessions are presented in boxes 1 and 2. Whereas box 1 presents the general views of the members of the community, box 2 presents views of women interviewed during the session **(Figure 13)**

Figure 13 Women consultative meeting at Bupu village

While most of respondents, especially men admit of switching to charcoal production as a socio-economic copping strategy, women, on the other hand, argued that they engage in charcoal production to meet household food needs, because money accrued by men from charcoal sales is not retired at home. In general, charcoal production is perceived an undertaking for local economic growth, but with environmental degradation consequences. The members of the community propose for alternative sources of income to safeguard the natural forest resource from depletion. Need for trading on

charcoal has also been associated with low crop yield and poor market of agricultural produce.

Box 1: General comments about solving problems related to environment			
Name of Village	**The present state of environment**	**Problems**	**Solutions**
Mbezi Msufini	• Forests resource is decreasing • Firewood is now collected far away from the village • Women are very much affected by firewood shortage	• Trees are their main sources of income to solve poverty • Lack of alternative income • It takes so much time for crops to mature, charcoal production takes little time to get money • Low yield from agricultural fields hence low income • Lack of agricultural facilities has contributed to environmental degradation • Poor access to agriculture extension services • They put all of their strength in tree cutting for charcoal production so as to improve their standards of living • Frequent bush fires • Lack of enough knowledge on	• Create alternative employment opportunities especially for youth • Improve agriculture for increased yield and market competitive quality • Formation of farmers associations /groups for better crop production and marketing • Access to knowledge on environmental conservation • Formation and support of natural resource committee • Knowledge on improved agricultural methods • Access to credit facility for small businesses • Access to knowledge on tree planting • Establishment of village bylaws • Involvement of community in decision making about environmental

		environmental conservation • Inadequate number of forest personnel • Lack of access to Energy saving/efficient stoves (EES) • Village not charging levy/ tax on charcoal	conservation, formation of groups to deal with environmental conservation • Better access to agricultural tools, seeds should be easily obtained • Improvement of agriculture extension services
Sotele	• Natural resources now have decreased a lot compared to the past ten years. • Over production of Charcoal • Scarcity of natural trees forcing people to use old cashew and mango trees to make charcoal.	• Lack of support in paddy cultivations • Poor access to agricultural tools. • lack of working force as most young persons are in schools • Natural resources are declining because of human activities particularly production of charcoal. • Today firewood, charcoal is collected far away from village centre. • Water sources have been much	1) Shifted from charcoal business to vegetable farming and fruits example vegetables, passion fruits and watermelon. 2) If they will be helped or given support in alternative income generation activities, they will stop cutting the trees. 1) Educate people on the consequences of tree cutting. 2) Facilitate formation of small groups for environmental conservation. 3) Promote agriculture especially food crops 3) Establish village forest reserves

		destroyed. • Decreased yield from Coconut trees • Population increase compared to the past years. • Peoples economic situation is so bad that opting for charcoal business • Increased use of costly pesticides for cashew nuts production • Rules on natural resources are not enforced • Poor awareness about energy efficient stoves (EES) • Lack of information on how to obtain tree felling permits • The village does not charge any levy/tax on charcoal. • High bureaucracy in obtaining harvesting permits. • Lack of forest extension officers • Lack of employment • Population increase	

Kibamba	• Today people are mainly relying on agriculture for survival as the trees have been finished. • There were sufficient trees in the past compared to now. • Improvements in transport compared to the past 20 years.	• Lack of village forest reserves • Increased sale of land to outsiders by old people is leading to land scarcity • Youth out-migrating to urban centres • Village doesn't charge levy/ tax on charcoal, whole revenue goes to the district council. • Coconut trees are declining. • Poor market for cashew nuts	• Control of natural resources is the responsibility of all villagers. • Access to tree seedlings.
Bupu	• Forest resource was abundant in the past but has decreased due to invasion of outsiders (example Wasukuma) for charcoal making and agricultural activities. • Local people also imitated them and started to make charcoal. • The competition over the resource use led to disappearance of forests. • Current development in the village	• Forest destroyed to give way to Agriculture farms and Charcoal making. • Excessive use of forest for charcoal making • The village doesn't charge levy/tax on charcoal • Lack of village forest	• Improved agriculture especially production of food and cash crops. • Allow natural forest to regenerate by stopping tree cutting for charcoal. • Creation of job opportunities • Support women groups on trade. • Access to education on business and agriculture to youth. • Guidelines about charcoal production •

	(improved housing and education) brought by charcoal production.		
Kitonga	• The name Kitonga originated from edible forest wild fruits "Matonga" which were abundant in the past • In the past days natural trees were abundant for example Mibula and Mitakila trees but now they have all been cut.	• Poverty has contributed to excessive tree cutting for charcoal • They cut trees because of poor economic situation. • Desertification as little grows in the village today • Disappearance of natural vegetation • Declining production of bananas and coconut trees • Written laws about the use and protection of natural resources are not found in the village. • Firewood is scarce and obtained far away from village centre • Lack of environmental institutions and NGOs at the village. • Environmental committee (EM) has been formed but not	- More education to people - Improvement on agriculture - Raise awareness on tree planting -

		operational. • All 13 members of EM committee are men. • The village has no reserved land/ forest. • Everybody is involved in charcoal business for income generation except old people and little children. • Lack of charcoal based entrepreneurship/Society in the village.	

Box 2: Views expressed by Mkuranga women about environment and tree cutting for charcoal production	
Sotele Village Women	1) There are so many fruits in the village hence they want construction of processing industries for juices and jams canning. 2) Better markets for mats, baskets, palm oil. Women who are involved in charcoal making knows how to make efficient charcoal stoves by use of clay but want more knowledge. 3) Need for agriculture improvement and support of tools. 4) They ask for support in tree planting in bare land in Sotele B and C. - They need more support to own women groups on horticulture and business
Bupu Village Women	1) Women who are doing charcoal production just like men they do so because their husbands don't give them money after selling charcoal. Instead they go in town to spend the whole of it. 2) Women don't have enough energy to do so but hire people. 3) They want support in their women groups mainly in agriculture e.g. green spinach, cucumber, cabbage, watermelon etc. 4) Markets for their goods should be available.

	1) There are 2) They also want support in their cassava farms 3) Women want the other women leaders from other areas to come and motivate them.
Kitonga Village Women	Need for support in chicken projects because they have capacity to manage it. 1) Frequent visit by their leaders and their motivation. 2) Better access for women produced goods.

5.0 THE WAY FORWARD TO MITIGATE ENVIRONMENTALDEGRADATION

The MNRT is now mainstreaming for wood fuel plantations, particularly peri-urban plantations and woodlots to meet the growing energy demand in the urban areas. Examples of such initiatives is the Ruvu fuel wood plantations in the Coastal region., for planting trees for charcoal production envisaged to supply Dar es Salaam City. Supply of energy from such alternatives as coal, LPG, solar and electricity need special thrust, with encouragement to private sector to invest in energy options, in order to protect natural forests from indiscriminate clear felling. People who can use electricity should be encouraged through awareness creation and price improvement. In the mid 2006, the Government of Tanzania, through its Annual Budget Speech announced measures to improve environment. They include the exemption from value added tax (VAT) on kerosene and LPG, also on LPG cylinders.

However, many stakeholders argue that five months after the announcement they are yet to see any relief on kerosene price as the fuel companies have not lowered the prices. According to Monela *et al.* (2004), the main types of earth kilns used are rectangular and circular in shape. Usually charcoal is produced in earth mould kilns made by covering a pile of logs with earth, igniting the kiln and allowing carbonization under limited air supply. About 95% of the respondents used rectangular kilns and the rest used either rectangular alone or the combination of both rectangular and circular. There is an average of 9 trees felled to produce about 29 bags (i.e. 1 tree to 3 bags of charcoal ratio). In Tanzania, coal reserves are abundant in Kiwira and Mchuchuma in the Southern Highlands, and could supplement charcoal in terms of energy for cooking. However there is fear that this can cause major pollution hazards to the environment and affect the health of users.

5.1 Conclusion

The poor state of environment in Mkuranga district which is manifested by uncontrolled tree cutting for charcoal production is attributed to poor socio-economic base. This state of affairs has largely been contributed by poor agricultural production and marketing, and lack of alternative sources of income. For example the findings showed 57.7 per cent of people went to sleep without dinner in year 2005 (Table 20), owing to acute food shortage, while 3.8 per cent can afford only one meal per day. It is only, therefore, 52.9 per cent can afford three meals per day. On the other hand 31.7 per cent of respondents (Table 17) did not sell any food surplus last year.

Charcoal production in Mkuranga district is undoubtedly triggered by the growing demand in urban areas in particular the Dar es Salaam City, where population is high and growing rapidly amid lack of adequate alternatives. For instance, the Dar es Salaam population in the 1998 population census was 1,360,850 people, while in the 2002 census the figure was 2,497,940, with 596,264 households, a variance of 54.5%. With 70 – 71 per cent of households depending on charcoal as first choice for domestic energy, therefore, availability of affordable and better alternatives of energy in Dar es Salaam will slow the rate of tree cutting for charcoal production in Mkuranga district. The demand of charcoal for Dar es Salaam residence is unquestionably so high that it is a threat to forests and woodlands from the supply districts.

The findings shows that charcoal is grossly under taxed and that there is lack of transparency especially at village level where by revenue accrued from the business does not benefit the village community. On the other hand, at district level there is poor record keeping on earnings from charcoal and the existing figures are thought lower by far. Fore example revenue from sale of confiscated charcoal and penalties are far lower compared to extent of tree cutting for charcoal in the district.

Nevertheless, measures to regulate taxation should be worked out carefully and by use of participatory methods. Notably most of the people involved in the business have poor financial background and they are doing it just for survival and not for profit. Most earn less than 1.0 USD per day hence increased may worsen their livelihood. Emphasis should be put on making the revenue collection exercise wholly transparent from grass-root to national level. Villages should get their due share of the revenue for their own development. Statistics or records about tree cutting for charcoal production and revenue earned should be available at all levels. More importantly, in order to make charcoal production sustainable in the district. Measures to replenish the resource by tree planting and protection of forested areas as fuel reserves should be put in place. According to Figure 12, tree planting in Mkuranga district is insufficient and therefore required significant improvement.

People in Mkuranga especially women should be facilitated to open and improve trading by use of no charcoal alternatives such as basket and mats weaving as shown in Figure 14.

Figure 14 Women weaving mats at Sotele village

FBD in 1999 also, appreciated that non timber forest products of charcoal and fuel wood are crucially potential for economic advancement in rural areas. They are particularly

important in poverty alleviation in rural areas due to their cheap availability and management

The findings also showed that the district has inadequate staff and equipment as shown in Table 44. Therefore measures should be taken to ensure that the district is adequately staffed with well equipped personnel.

Figure 15 Tree cutting in the catchment area of Mbezi River, Mkuranga district

The current charcoal production trend in Mkuranga district is not sustainable and therefore will not meet the millennium goals on poverty alleviation. Little is done in the district to replant or re-afforestate the harvested areas. The district office is ill equipped, seriously understaffed, and unmotivated. Haphazard tree cutting for charcoal exacerbates the danger of poverty because of destruction of water sources and increases the dangers of soil erosion and consequently decreased soil fertility and productivity (Figure 15). The net result is poor agricultural production and consequently increased poverty. Ongoing disturbance in the catchment areas for example in the upper areas of Mbezi stream has negatively impact on water flow and quality in terms of decreased yield and riverbed siltation. This is likely to create water shortage downstream.

5.2 Recommendations

Basing on the findings from the study, the following are highly recommended:

- ☞ Promotion of improved kilns – this has been successful in Ghana, Senegal, and other countries in West Africa
- ☞ The government should deploy trained and motivated staff to the district. Transport and allowance should be availed to make the staff mobile and effective
- ☞ The Forestry and Beekeeping Division, in collaboration with Mkuranga District Council should identify and set area blocks for controlled charcoal production. Importantly, the ministry should establish effective monitoring and follow up on districts regarding revenues collection from charcoal production and fines/penalties.
- ☞ It is importantly the government scaled up the Ruvu Forest Project activities for charcoal production especially for Dar es Salaam residents. The government should also maximize the use of abundant wattle trees in Iringa and Njombe for charcoal production for the Dar es Salaam City
- ☞ People in Mkuranga should be educated on better ways to improve agriculture especially by introducing diversity of marketable and agro-ecologically suitable crops. Crop husbandry should be key in enhancing better agricultural practices in Mkuranga district
- ☞ Enforcement of forest laws and by-laws, and strict control of the resource is crucially important
- ☞ Introduction of awareness raising program about forest conservation focusing on tree planting and conservation of natural forests and the consequences of uncontrolled charcoal burning in the district.
- ☞ Participatory forest resources management which will give the majority of people opportunity do decide on the use of common property like forests and woodlands

is important. Therefore the Forest and Beekeeping Division should strengthen PFM programme in the district

- ☞ Make a participatory review of charcoal taxation to ensure that it benefits the stakeholders particularly governments and local community.
- ☞ There is a need to take concerted measures to substitute or compliment energy from charcoal
- ☞ Introduction and promotion of alternative energy sources and fuel efficient stoves in Dar es Salaam city is important. Further measures to reduce tax and tariffs on cooking gas should be sought from the Ministry of Finance.

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7.0 LIST OF PERSONS CONSULTED

Name	Title	Institution
R. M. Shao	District Forest Officer	Mkuranga District
Hasia Omari Machimbuzi	District Executive Director	
Eli Mlaki	Ag. District Lands and Natural Resources Officer	
Juma Kigonile	Assistant Forest Officer	Mkuranga District
Sudi Omari Tanda	Chaiman of District Council	
Selemani Kiumbo	Secretary District Council	
Sande Ringo	Health Officer	Shungubweni, Mkuranga
Octavian Mushi	TRACE	Dar es Salaam
Abel Mkumba	Secretary General,	JEMA, Univerrsity of Dar es Salaam
Loyce Lema	Executive Director	ENVIROCARE, DSM
Hosea Mwamkusye TASF		
Constantin Mboya Ag. DALDO		