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ISBN 9987-686-64-8

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Natural Resources Use Patterns and Poverty Alleviation Strategies in the Highlands and Lowlands of Karatu and Monduli Districts:

A Study on Linkages and Environmental Implications

Pius Zebbe Yanda
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Research Report No. 03.3

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MKUKI NA NYOTA PUBLISHERS LTD
P. O. BOX 4246, DAR ES SALAAM, TANZANIA

Published for: Research on Poverty Alleviation (REPOA)
P. O. Box 33223, Dar es Salaam, Tanzania
www.repoa.or.tz

By: Mkuki na Nyota Publishers
P. O. Box 4246, Dar es Salaam, Tanzania
www.mkukinanyota.com

ISBN 9987-686-64-8

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ABBREVIATIONS

ADR	Age Dependency Ratio
NCA	Ngorongoro Conservation Area
PRA	Participartory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
UNFPA	United Nations Fund for Population Activities
URT	United Republic of Tanzania
WMA	Wildlife Management Areas

ACKNOWLEDGEMENTS

Many people and institutions facilitated the successful completion of this study. Since it is not easy to thank each person individually, we wish to thank them all for their mutual support and contributions. In a special way, we would like to thank REPOA for providing funds that enabled us to cover the expenses of undertaking this study, without which the study would have been impossible. We thank the village governments and district authorities under the study for their invaluable support during and after the study period.

ABSTRACT

People in lowland and highland areas interact through sharing of agricultural and grazing land, social services, trading and employment opportunities. There is a significant population growth in the highland areas leading to land use conflicts, natural resource depletion, and serious environmental implications that can be linked to increase of poverty level (e.g. lack of employment to the young generation).

The immediate responses to such a situation have been, among others, change in livelihood strategies and change of life style among the people in both the highland and lowland areas. For example, all pastoralists in the lowland areas have turned into agro-pastoralists, and farmers from the highland areas are opening up farms in the lowlands.

About 90% of the people interviewed in the lowland areas own an agricultural land between 1 - 10 ha, while about 10% own above 10 ha. People in the study areas are also involved in trading of produce, often between the lowland and the highland areas. The observed livelihood changes are accelerated by the changing biophysical and socio-economic environments, including human population increase coupled with the decline in livestock population and grazing areas.

Notable coping mechanisms among agriculturalists in the highland areas include cultivation of cash crops, hiring of land, out-migration, and employment in the informal sectors (short-term employment, especially in the lowland areas). However, prevailing conflicts between the communities in the highland and lowland areas have limited in-migration into the nearby sparsely populated lowland areas.

1. INTRODUCTION

In most of the countries in sub-Saharan countries, competition for land resources such as arable land for crop production and rangelands for grazing, forests, water and others, have been increasing since the beginning of the 20th century. This has largely been due to population pressure leading to agricultural expansion and consequently land degradation processes such as overgrazing and deforestation (Hoffmann and Jackson, 2000; Cleaver and Schreiber, 1994; Badiane and Delegado, 1995 cited in Dejene et al., 1997).

Land resources are in most cases unevenly distributed in a landscape. Highlands are characterised by favourable climatic conditions and productive soils. Such areas are rich in natural resources, hence, have high carrying capacity, and attract more migrants than the surrounding lowlands. For the purpose of this study, such areas are referred to as the *"High Potential Areas"*. Gichuki, et al. (1998) gave an example of the Mount Kenya region, which is characterised by the highland-lowland system with a small percentage of resource-rich highland area surrounded by a vast area of resource-poor lowlands. The resource-poor areas often have limited economic potentials, and are in most cases characterised by poor soils and low rainfall. For the purpose of this study, such areas are referred to as *"Low Potential Areas"*. The Mt. Kenya highland-lowland system presents an opportunity to illustrate the interaction of man with the diverse ecosystems, due to steep ecological gradients, diverse land uses and management practices, different settlement and population densities, and different ethnic communities. It should, however, be pointed out that such ecological gradient and natural resources endowment is unique to some areas as there are areas where lowlands have higher potential for crop production and other uses such as livestock keeping than highlands. An example is Usangu Plains in southern Tanzania.

2. STATEMENT OF THE PROBLEM

The purpose of this study was to establish the dynamic interrelationships that exist between communities living in the resource rich areas (high potential) in the highlands, and resource poor (low potential) areas in the lowlands of Karatu and Monduli districts, respectively. Highland areas are characterised by favourable climatic conditions such as high and reliable rainfall. As a result, such areas are densely populated and extensively cultivated. The Mbulumbulu highlands in Karatu district demonstrate the characteristics of the high potential areas. The low potential areas are mostly characterised by low and unreliable rainfall; thus limiting the diversity of economic activities in those areas. The

study also looked into the coping mechanisms that local communities in the two localities use to overcome the prevailing environmental and socio-economic changes such as human population increase coupled with the dwindling natural resources base. Furthermore, the study examined the extent to which people in the highland and lowland areas interact and depend on each other for their livelihood strategies through sharing of resources.

Monduli and Karatu districts have experienced various land use conflicts of varying nature and intensity. These include conflicts for grazing land versus agricultural expansion, and conflicts on water resources. However, the extent and nature of conflicts and resource exploitation strategies are different from one area to another (i.e. highland and lowland areas). Highland areas are densely populated with intensified crop production system. Due to high population pressure in the highland areas, arable land is getting scarce, thus necessitating fragmentation, and expansion of cultivation into marginal areas that were originally used for grazing. For many years, pastoralism was the dominant farming system, especially in the lowland areas. However, present experiences show an increase of flows from highland areas into the lowland areas mainly due to increasing land pressure in the highlands and search for agricultural land. Land shortage in the highland has not led to innovation on agriculture because people have other livelihood options such as non-farming activities and migration into lowlands to search for new land. The expansion of agriculture into marginal land is also reported in other areas like the lower slopes of Mt. Kenya (Wiesmann, 1998), the Lower Kondoa Irangi plains (Mung'ong'o, 1995), and the Mbuga plains in Kwimba District (Madulu, 1998).

Increasing agricultural practices in the lowland areas are likely to have reduced the size of the grazing areas for the pastoralists. The implication of this change is that pastoralists can no longer subsist on pastoralism due to pasture scarcity, and competition for land and water. This is reported to have been the case on the lower slopes of Mount Kenya where such areas have experienced very rapid human population growth, basically due to in-migrants from highland areas (Gichuki et al., 1998). For this particular case, people from high rainfall areas introduced land use practices that are not suitable for the dry areas of their new settlements. The area has undergone a dramatic change in land use such as conversion of grazing land, natural forest and bushlands into small-scale farming areas. This has resulted into increased demands on natural resources such as forest resources, agricultural land and pastures, among others, and thus led to resources use conflicts (Gichuki et al., 1998).

Although the experience from Mt. Kenya and Kondoa Irangi highland-lowland systems illustrates how human being can depend on the diverse ecosystems for

livelihood, the nature of the interactions and environmental implications are based on the local biophysical as well as the socio-economic situation in the respective areas. Interactions established in one area may not necessarily be replicated elsewhere (Lininger et al., 1998). This study, therefore, aimed at establishing the specific dynamic interrelationships that exist between high-altitude resource rich areas, and lowland resource-poor areas of Karatu and Monduli districts, respectively. Similarly, the study intended to establish coping mechanisms that are adopted by the marginalised groups both in the highland and lowland areas in their efforts to earn a living and alleviate poverty. This study also attempts to underscore the extent to which the people in the lowland and highland areas are dependent on each other for their livelihoods.

So far, mechanisms on how people in both the highland (which are densely populated and intensively cultivated), and lowland (which are sparsely populated and overgrazed) areas share land resources is not clear yet. The question here is to what extent do people in the highland and lowland areas share the benefits of existing natural resources in the two areas? Are there any coping mechanisms that enable communities to adapt their lifestyle with diminishing resources in the two areas? To what extent does the adopted coping mechanisms contribute to poverty reduction efforts in the two localities? Answers to these questions might give an understanding of the resources distribution and use patterns between the highlands and lowlands ecosystems in the two districts.

Following from the above discussion, the objectives of the study were as follows:

a) To document the existing resource use patterns and establish the interactions between human activities and resource use patterns in the highland and lowland areas.

b) To examine and assess the relationships between population growth trends and changes in settlement patterns on the one hand, and resource use patterns and poverty levels on the other.

c) To identify coping strategies adapted by communities as a result of resource depletion in the highland and lowland areas.

d) To assess the demographic, socio-economic and environmental impact of migration in the affected villages and to document lessons occurring in the lowland areas in response to changes in land use and natural resource exploitation patterns.

In order to examine the nature of interactions in natural resources use patterns and their impacts on poverty reduction efforts, three hypotheses were put

forward. First, land fragmentation and agricultural practices in the highland areas accelerate poverty levels to the extent that the size of some farms can no longer sustain household social and economic needs. Second, expansion of agricultural activities in the lowland areas limits transhumance practices by interfering the seasonal grazing areas for the pastoralists, hence, stimulating non-sustainable resource use practices such as overstocking and thus leading to overgrazing. This situation will consequently lead to the decline in livestock population due to shortage of pastures, and therefore contribute to the increase in poverty levels among pastoralists. Third, there exist different coping mechanisms and strategies emanating from different resource use patterns in the lowland and highland areas due to ecological and social differences between these areas. These variations lead to different poverty alleviation strategies between the two areas.

3. LITERATURE REVIEW

Although Ka ratu and Monduli districts are apparently endowed with a wide range of land resources, a number of studies have shown various forms of deterioration of such resources, for example, deforestation and soil degradation due to poor land husbandry just to mention a few (Mwalyosi, 1991; Kahurananga, 1992 and Meindertsma and Kessler, 1997a&b). A number of factors are reported to have contributed to the present state of environmental deterioration such as deforestation of natural forests including forest reserves, land degradation leading to soil erosion and decline in soil fertility. For example, human population has been increasing in all the districts, as it is the case for the whole of Tanzania. The 1988 population census data indicate that the growth rates were 4.5% and 3.3% for Monduli and Karatu, respectively (URT, 1994). These growth rates are extremely high when compared to the national growth rate of 2.8% (URT, 1994). It is however, clear that Karatu is densely populated as compared to Monduli district. The 1988 census data show that the population density ranges between 5 and 150 persons per km^2 in Karatu district. The densely populated areas are on the eastern parts of the districts. The population density for Monduli district ranges between 4 and 15 persons per km^2, while the national average is 26 (Meindertsma and Kessler, 1997a&b; URT, 1994).

The rapid population increase has resulted in the marked increase in population pressure on land, necessitating expansion of agriculture into marginal areas. The increase has been due to natural and in-migration particularly in the highland areas. Some of the migrants came as labourers to work in the estates, and others were government employees who eventually settled permanently.

Similarly, tourism industry has contributed substantially to the rapid population increase in the area as some migrants came for business but eventually settled and engaged themselves in agriculture. In addition, the phosphate mining activities at Minjingu also attracted a number of people as labourers who eventually settled permanently, practicing cultivation in the area, which forms part of the wildlife corridor linking Tarangire and Lake Manyara National parks. Likewise, the Mto wa Mbu Irrigation Project enhanced rapid growth of human population in the area. While the population of Mto wa Mbu ward was 10,999 in 1978 and 12,339 in 1988, it rose to 16,068 in 2002 (URT, 2003). These population figures give a growth rate of 1.2% and 1.9% in 1978/88 and 1988/02, respectively. However, the 2002 population figure for Mto wa Mbu ward does not reflect the reality due to boundary changes and introduction of new wards. If we include Selela and Esilalei wards which were part of Mto wa Mbu ward in 1978 and 1988, then the total population for the area in 2002 would be 28,994 people, suggesting a growth rate of 6.3%. This high growth rate is a reflection of immigration, because people moved into the area searching for agricultural land and business opportunities, especially in the expanding tourism sector. This area is now among the most densely populated parts of the basin as it goes up to 200 persons per km^2 (URT, 1994).

Crop production and livestock keeping are the major economic activities in Monduli and Karatu districts. Both small scale and large-scale farming are practised in both districts. However, livestock keeping is dominant in Monduli District, while crop production is dominant in Karatu district. About 85% of Monduli district's total land area is used mainly for pastoralism activities and the remaining land is used for subsistence farming.

Large-scale rainfed crop production, which is concentrated in the highland areas started in the early 1930s when settlers established coffee farms in Oldeani and wheat farms in the Mbulumbulu area. Development of large scale farms coupled with strongly expanded smallholder agriculture which took place from the 1960s (Meindertsma and Kessler, 1997) resulted in extensive clearing of natural vegetation, thus exposing large areas of land surface to agents of erosion and sedimentation. Large scale clearing of natural vegetation to give way to irrigated agriculture in wetlands (both in the lowlands and the highlands) has also taken place, particularly around Mto wa Mbu and numerous depressions on the Mbulumbulu Highlands, respectively. Considering that wetlands serve as sediment filters, groundwater reservoirs, and are particularly notable for their high biodiveristy, their destruction have naturally led to the accelerated siltation of Lake Manyara, lowering of the quantity and quality of the groundwater, and loss of biodiversity (Mwalyosi et al., 1999 and Shishira et al., 1999). In addition, intensification of crop production as a whole has resulted

into soil and water pollution through the application of agrochemicals (Brawn, 1990; Meindertsma and Kessler, 1997b).

Evidence from the literature (e.g. Mwalyosi, 1990; Mwalyosi and Mohamed, 1992; Kahurananga, 1992; Sandstrom, 1995; Lindberg, 1996; and Meindertsma and Kessler, 1997a&b) shows an increase of human activities in the areas bordering the national parks and forest reserves from well protected areas with a diversity of wildlife species to a more degraded area. In particular, use of surrounding lands for agriculture, settlements, and livestock grazing has increased. One of the potential effects of increased human activities around the national parks is the blocking of wildlife migratory corridors/routes. Also, increased human pressure in areas surrounding forest reserves facilitates encroachment into the forest reserves, hence accelerating the rate of resource depletion (Meindertsma and Kessler, 1997b).

Implementation of various macro-policies notably villagization, *Kilimo cha Kufa na Kupona* (cultivate or perish), soil and water conservation policies, and free market economy have had negative effect on the environment. For example, villagization policy of the 1970's, which compelled the rural population to be resettled in planned village settlements had negative impacts on the environment, including establishment of settlements in potential arable land and in marginal areas. Generally, the process of villagization which involved moving and resettling people, had a negative impact on agricultural production especially in areas where people were resettled in farmlands or far from their farms. In some cases, the access to virgin land led to change in the farming system from intensive to extensive farming system because of increased access to virgin land. Also, in some cases it was not possible to directly transfer the former intensive farming skills because they appeared inappropriate due to changed environmental set up such as climate, soils, terrain, access to water, access to manure, and others (Mung'ong'o, 1995; Loiske, 1995; Yanda and Mung'ong'o, 1997).

Kilimo cha Kufa na Kupona (cultivate or perish) policy which was implemented as a way of increasing food production following the acute food shortage of 1974 had the impact of expanding cultivated land into marginal areas. The policy set a lower limit of three acres per household to be opened up for agriculture. Areas were allocated in blocks and cleared without provision for proper soil and water conservation measures. Consequently, large areas and continuous tracks of land were exposed to land degradation.

Land tenure in the two districts has been changing over time in response to the population increase in the highlands and occupation of pastoral lands by agriculturists. In many areas, agriculture is practiced in the key resource areas for pastoralists like the dry season grazing lands and around water sources.

Although land rights of pastoralists grazing land are still widely recognised, no protection against claims by agriculturists is guaranteed (Meindertsma and Kessler, 1997a).

The main sources of land use conflicts in Monduli district, for example, is the established legal precedent that granted right of occupancy to individuals obtainable under the Land Ordinance. The granted right of occupancy has a priority over the customary land tenure system (Meindertsma and Kessler, 1997a). This alienation of villagers' grazing lands has precipitated land use conflicts between villagers on the one side, and the government and large-scale farmers on the other. In Kondoa district, agricultural expansion into pastoral areas has been a common practice especially in the Lower Irangi areas leading to serious land use conflicts and tribal warfare (Madulu, 1996; Mung'ong'o, 1995).

In many areas, the traditional land tenure systems changed significantly under the Villagization and Ujamaa Villages Act of 1975 (URT, 1975). Land was redistributed in equal parcels regardless of former land ownership. Land was given to individuals including immigrants. However, former owners claimed back and recaptured their land especially after the relaxation of the Ujamaa Villages Regulations in the late 1980s. This situation has created a struggle for land between the majority of youths who mostly acquired land through the villagization programme and the elders who want to reclaim their former lands obtained through the customary land tenure systems (Meindertsma and Kessler, 1997b).

In Monduli district, the authority to allocate land was put under the Village Council's Planning and Economic Affairs Committee that allocates land to individuals. Grazing land and water sources remained under the village communal ownership and control (Meindertsma and Kessler, 1997a). According to the traditional grazing cycles, a communal land has to be earmarked for dry and/or wet season grazing. However, constant shifts from one village to another, conflicts over boundaries, dual residence in different villages and trespassing village boundaries during different seasons are some of the land tenure problems noticed that violets the traditional grazing cycles especially in villages belonging to pastoral communities.

Many studies have indicated that traditional land tenure and land use systems are ecologically stable and adapted to the environment. However, the observed increase in large scale mechanized farming and the state owned or private ranches, undermine the traditional social organisations of the indigenous pastoral people and aggravate the ecological impacts of overstocking and population pressure (Mwalyosi, 1990). For example, within the Lake Manyara Basin, several private owned ranches such as the Essimingori, Ardai Ranches

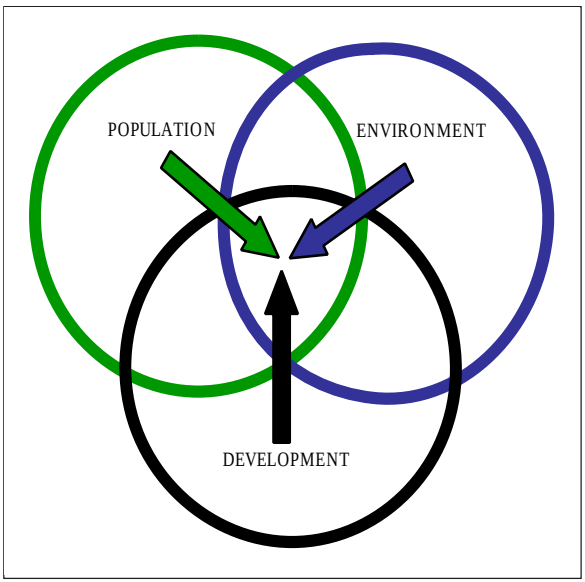
and the Mdori cattle holding ground exist. Similarly, a state owned ranch occupies about 1800 hectares within the Mto wa Mbu Game Controlled area (Gamassa, 1989). Under such circumstances, land use conflicts are deemed inevitable between wildlife conservation, livestock keeping, agricultural expansion, and to a lesser extent mining activities. The consequence of such conflicts is the increase in land degradation as manifested by severe soil erosion (which is dominant in Karatu district), and flooding and siltation (which are dominant characteristics in Monduli district, particularly in Mto wa Mbu). Another consequence is the increase of poverty levels especially among pastoral communities due to scarcity of pasture and competition for water.

4. THEORETICAL FRAMEWORK

This study is based on the logic of the Population, Development and Environment (PDE) Model (UNFPA, 1991) that examine the linkages between population change (P), socio-economic development (D) and environmental factors (E). The model illustrates that there are strong linkages between population, development and the environment, and any change in one of these factors may necessarily influence changes in the other two factors. Figure 4.1 demonstrates these linkages.

The PDE model aims at enhancing scientific understanding and demonstrating the long-term consequences of alternative policies on demographic,

Figure 4.1: The Population, Development and Environment Model



developmental and environmental spheres. It also gives a broad accounting framework that specifies the most important and immediate effects of one sector to another, hence to poverty eradication efforts (UNFPA, 1991).

Generally, (P)opulation change can be taken as the point of departure and considered to be the basic driving force that, together with other factors, influence socio-economic (D)evelopment and the (E)nvironment. In this case, the population pressures on the land resources in the highland and lowland areas reflect the P factor. The (D)evelopment factor is reflected by the various socio-economic activities that are taking place in the study area like crop cultivation, mining, tourism, business and livestock keeping, among others. These activities are geared to transforming people's lives, their socio-economic status, and hence, may have significant implications to the poverty status and to the environment. For example, tourism industry offers opportunities for employment, market for the produce and other items of tourist attraction. In recent years, eco-tourism has become popular in the region, thus becoming a good source of income to the inhabitants of the area. All these should be seen as non-farm income generating activities contributing to poverty reduction. The (E)nvironment factor reflects all environmental related impacts in the Monduli and Karatu districts. These include deforestation, overgrazing, water pollution, siltation, and loss of soil fertility. The linkages between these variables influences the people's socio-economic status and poverty levels of the communities concerned due to their influence on the level of access and distribution of land resources. They also form the ground for analysing the interdependencies between communities living in highland and lowland areas in terms of resource use and conservation.

5. THE STUDY AREA

5.1. Location

This study was conducted in Monduli and Karatu districts in Arusha region, Northern Tanzania (Figure 5.1). It was based on the assumption that there are dynamic interlinkages between communities in highland areas and lowland areas. Such interactions are likely to either exacerbate or alleviate poverty levels in the two ecological zones. For the purpose of this study, Karatu and Monduli districts were chosen to represent the highland and lowland area, respectively as these represent different ecological settings. Karatu district is situated on the western part of Lake Manyara. Its elevation varies from 1000 meters above sea level in the Lake Eyasi basin to about 2400 meters above sea level in the south-eastern parts of Mbulu plateau. Two villages were selected from each zone.

These villages are Upper Kitete and Kambi ya Simba in the highland areas, and Selela and Engaruka in the lowland areas.

Monduli and Karatu districts are within the Lake Manyara Basin in Arusha Region. The two districts lie within the Eastern Rift Valley zone. They are drained by seasonal and perennial rivers. Major part of Monduli district is drained by the Makuyuni river system of seasonal streams, which enter the northern end of Lake Manyara. There is also the Tarangire River, which drains part of Monduli district, particularly on the plains. Karatu district is drained by permanent and seasonal streams like the Mto wa Mbu, Simba and Kirurumo. These streams originate from the highlands to the north-west of the basin and enter the lake on the northern part.

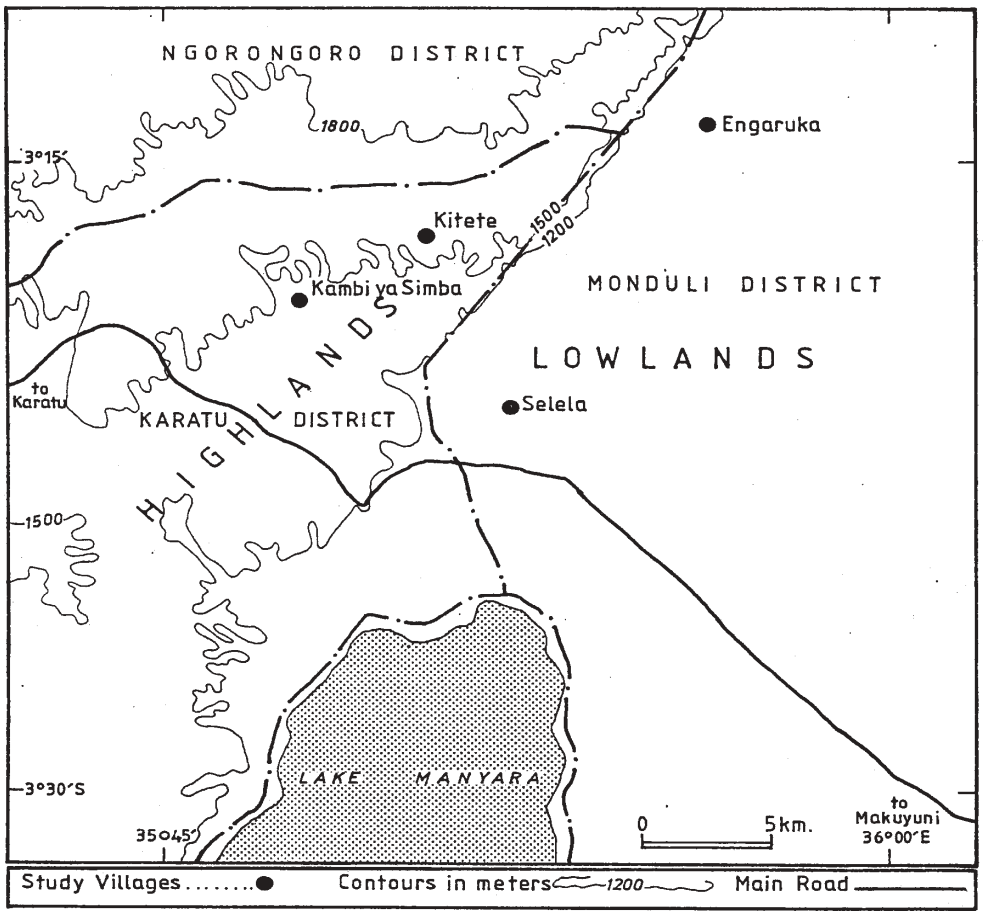
Karatu district has a total land area of 3,300 km^2 and Monduli district has 14,201 km^2. These districts occupy about 4% and 17% of the regional total area, respectively (URT, 1998). Administratively, Karatu district on the one hand is divided into 4 divisions, 13 wards and 42 villages. On the other hand, Monduli district has 3 divisions, 14 ward and 49 villages.

5.2. Rainfall

The study area receives a minimum rainfall of 500 and a maximum of over 1,000 mm per year. While a larger part of Karatu district receives much rainfall, most of Monduli district receives less rainfall.

In Monduli district both rainfed and irrigated agriculture are practised (Meindertsma and Kessler, 1997a). Large-scale farming is practised in Lolkisale area. Kisongo and Manyara divisions are mainly agro-pastoral. Longido division, which covers about 53% of the district area, is almost exclusively a pastoral zone due to low rainfall to support rainfed agriculture. The district also possesses rich wildlife resources that give a potential for tourism activities. About 95% of the district area is categorised as game controlled area (Meindertsma and Kessler, 1997a). Some of these areas will soon be categorised as wildlife management areas (WMA).

Figure 5.1: Location of the Study Area



5.3. Population Characteristics

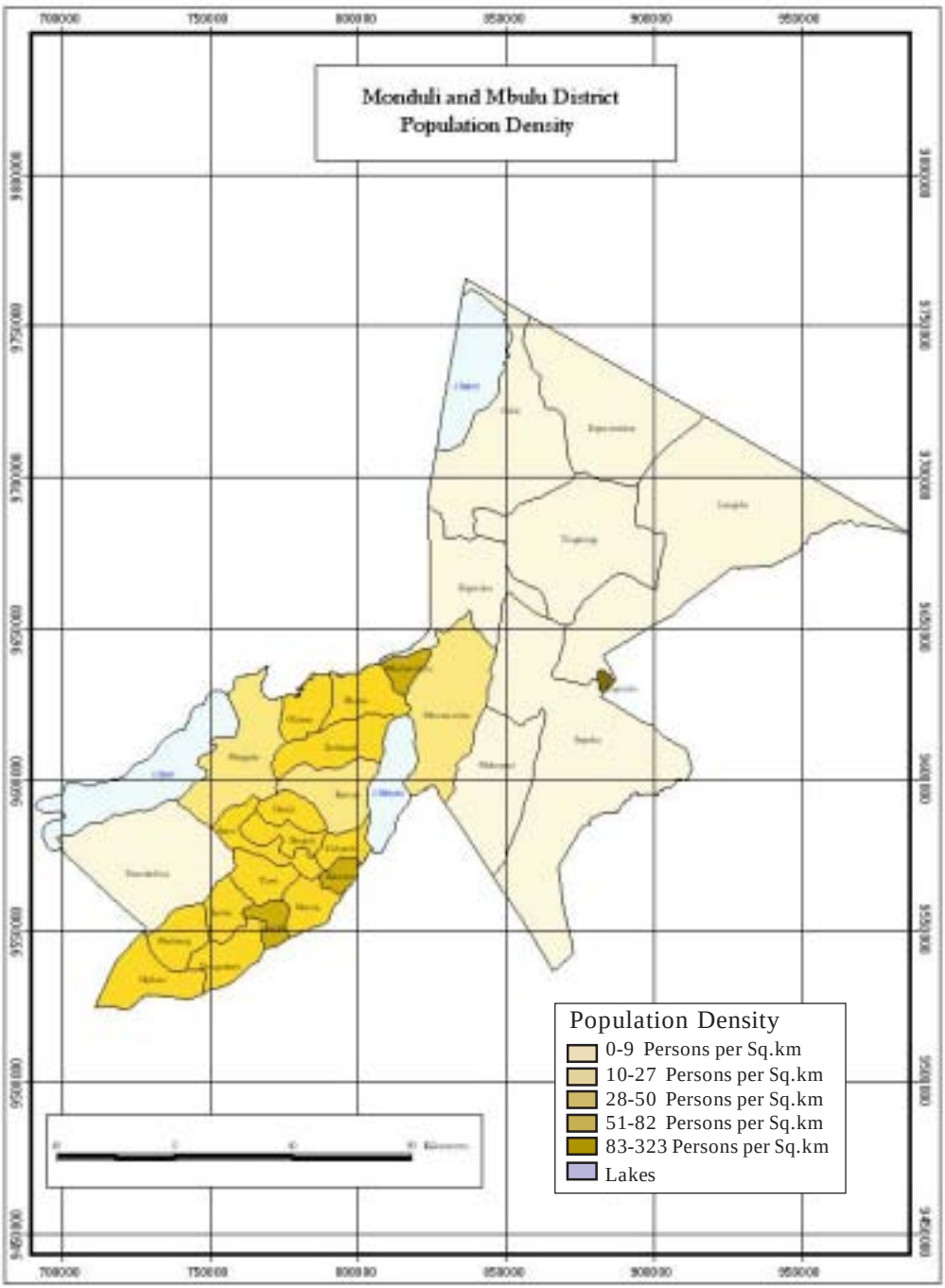
Monduli district had a population of 71,756 people in 1978 which increased to 109,006 in 1988. The growth rate of the district declined from 4.7% in 1967/78 to 4.1% in 1978/88 (Madulu, 1994). The current growth rate in this district is 3.8% (Meindertsma and Kessler, 1997a). The main cause of rapid population growth in Monduli district is migration. A large proportion of the in-migrants come from the densely populated highland areas. Migration occurs due to agricultural, mining and tourism related reasons (Meindertsma and Kessler, 1997a). The district population density increased from 4.4 in 1978 to 6.7 persons per km^2 in 1988. These density levels seem to suggest that Monduli district is sparsely populated.

The population in Mbulu district[1] has also been increasing rapidly. This district had a total population of 93,767 and 267,613 in 1978 and 1988, respectively (URT, 1981, 1991). For Karatu district alone, the total population was 110,000 in 1988. Given the growth rate of 3.8%, the district population was projected to be 160,000 people in 1997. The population density in the district also varies widely, with a very high concentration in the northern and southern uplands that receive high rainfall, and low concentration in the dry areas around Lake Eyasi (Meindertsma and Kessler, 1997b) (see Figure 5.2).

The major economic activities in Karatu district include agriculture (coffee, wheat, maize, onions and beans) and livestock keeping. These two activities employ almost 90% of the total labour force. The district is famous for both small and large-scale crop production. Livestock population is estimated to be 160,542 livestock units (Meindertsma and Kessler, 1997b).

[1] During the 1978 and 1988 population censuses, Karatu district was still under Mbulu district. So the population data given reflects the greater Mbulu district before Karatu was formed.

Figure 5.2: Population Density in Monduli and Mbulu Districts



6. METHODOLOGY

The study covered four villages namely: Engaruka and Selela in Monduli district (lowland areas) and Kambi ya Simba and Upper Kitete in Karatu district (highland areas). The selection of the study villages was based on the discussions with the district authorities and on the assessment of the population pressures in the affected areas. The four villages selected are situated in areas closer to the rift escarpment and people living in these villages seem to have direct interactions. All the four villages are located far from major roads so external influence such as markets is at the minimum. The idea was to establish spatial variation in the degree of interactions.

The data collection process involved physical observation on the state of the environment by documenting land degradation features and the associated factors. Attempts were made to establish changes in land cover/land use types in the study sites based on aerial photos for the different years. Aerial photos were preferred than LandSat Images because of their higher resolution.

Socio-economic data were gathered through focus group interviews, and household interviews by using structured questionnaires. A checklist was prepared in advance and used to guide the focus group discussions. Structured questionnaires were administered to individual respondents from sampled households. A total of 200 household interviews were made representing about 10% of the total households for the four villages. Additional quantitative and qualitative data were gathered through reviews of existing reports both at the district and village levels.

6.1. Physical Aspects

Hard copies of aerial photos were purchased at the Survey and Mapping Division. The aerial photos acquired were for February 1983 (1:68,000 scale), January 1972 (1:68,000 scale) and July 1996 (1:25,000 scale). The idea was to employ these aerial photos to detect changes in land cover/use types in the study area. It was, however, revealed that only a small part of the study area was covered by both 1972 and 1996 aerial photos, though at different scales. This source of information was complemented by field observations and existing literature on the study area.

Field investigation involved the assessment of extent of land degradation. This was undertaken through documentation of land degradation indicators such as sheet, rill and gullies.

6.2. Socio-Economic Aspects

Two different approaches were employed in the socio-economic study: the Participatory Rural Appraisal (PRA) method and application of semi-structured and structured questionnaires.

The first method was the Participatory Rural Appraisal (PRA). This method enabled villagers to present, share and analyse their knowledge on the natural resources sharing between people in the highland and lowland areas and implications on poverty levels. The PRA method was used to facilitate entry in a community, using villagers as expert of their own environment and establishing context of priorities. The method allowed for the collection of preliminary information for further investigation. It was used to describe the past and present farming systems through use of a multi-disciplinary team working with farmers and community leaders in a quick systematic manner in assessing a development need(s), identifying problems and priorities; assessing socio-economic and environmental changes in the village. Socio-economic data were also gathered through structured interviews, from which questionnaires were analysed.

7. NATURAL RESOURCES USE PATTERNS

7.1. Changing Population Characteristics

Rapid population growth is one of the major factors that facilitate non-sustainable resource use and land use conflicts in many areas. Evidence from this study shows that large families are common both in the highland and lowland areas. The average household size in the villages ranged between 6.9 persons per household in Kambi ya Simba and 7.9 persons in Engaruka. The total population reported from the 200 households visited was 1441 people, giving an average household size of 7.2 persons per family as compared to the regional and national averages of 5.4 and 5.2 persons per household, respectively, in 1988 (URT, 1989). At the district level, the average household sizes in 1988 were 5.3 for Monduli and 6.2 persons for Mbulu which then included Karatu district. Table 1 shows the age distribution of the population by clusters.

Table 1: Percent Distribution of Population by 5 Year Age-Groups

Age Groups	Clusters		All Respondents	
	Highland	*Lowland*	*Percent*	*Number*
0-4	11.6	14.5	12.8	185
5-9	18.3	17.6	18.0	260
10-14	16.1	12.2	14.1	203
15-19	12.1	8.5	10.3	149
20-24	9.3	12.2	10.5	152
25-29	4.3	10.0	7.1	103
30-34	4.9	6.7	5.8	83
35-39	4.5	6.4	5.6	80
40-44	6.7	2.4	4.6	67
45-49	4.1	2.6	3.4	49
50-54	3.3	2.3	2.8	40
55-59	1.5	0.7	1.1	16
60-64	1.1	1.1	1.1	16
65+	2.3	3.0	2.6	38
Total %	100.0	100.0	100.0	
Total No.	731	710		1441
HH Size	7.3	7.1		7.2

Source: Survey Data, December 1999

The age structure demonstrates the dominance of the young ages in the population. About 45% of the total population is under age 15, and at the village level, the proportion under age 15 ranged between 43% in Engaruka and 47% in Kambi ya Simba. These observations suggest a high dependence ratio and a big poverty eradication burden on the adult population as over a third of the total population is covered by dependants who do not contribute or whose contribution is at the minimum to the poverty eradication efforts.

Often the presence of high proportion of young people in the population is accompanied by high dependence age ratios[2]. However, this was not the case in

[2] The Age Dependency Ratio (ADR) is the ratio of persons in the dependent ages (under 15 years and over 64 years) to those in the economically productive ages (15-64 years) in the population. This measure is often used as an indicator of economic burden the productive portion of the population must carry (PRB, 1998). An age dependecy ratio of less than 100 suggests that the active population have less dependants to care in populations with ADR higher than 100.

the study area. The observed age dependency ratios in the study villages ranged between 84 in Engaruka and 96 in Kambi ya Simba. The dependence ratios were even lower in the lowland areas suggesting fewer burdens to the active population than expected. This low dependency ratio may be contributed by high in-migration that is age selective in nature. Only people in the active working ages migrate into the villages, hence, minimizing the impact of children on the overall dependence ratios. This situation is further supported by the fact that a comparatively large proportion of people were in the 20-24 and 25-29 age groups. The proportion was higher in the lowland areas (22%) as compared to the highland areas (14%). This might be a reflection of age selective in and out migration in the low and highland areas, respectively.

These observations are supported by the fact that almost all villages observed significant increases in population, which is basically influenced by migration and natural increase. Whereas natural increase refers to the difference between births and deaths in a population, migration is defined as a permanent change of residence across defined boundaries or territory. With the exception of Upper Kitete where in-migration is not a serious issue, migration influences population increase by almost 40% in the study area. About 56% of the respondents in Kambi ya Simba, 46% in Selela, and 54% in Engaruka identified migration as the main factor influencing population change.

On the one hand, availability of better social services, good nutrition, and low contraceptive use are factors that influence natural population growth. Better social services include health services, education, reliable transport, and water services. On the other hand, better nutrition is very dependent on the level of understanding of nutritional value/issues in the community. This may lead to low infant and child mortality as well as maternal deaths. Changes in the level of these mortality measures may have an impact on the natural increase of the population. A similar impact may be expected from the level of contraceptive prevalence in the community, which may or may not lower the fertility levels. Migration has a dual effect to population increase. It may increase or decrease the population depending on the nature of the net migration available (whether positive or negative). Availability of land resources has acted as a pull or push factor to migrants in the lowland and highland areas, respectively.

However, variations also exist between villages with regards to the main causes of population increase. Results from the study show that, whereas availability of social services, low contraceptive prevalence, and good nutrition are the most important causes of population increase in the highland areas (Upper Kitete and Kambi ya Simba). Availability of land and water are dominant pull factors contributing to in-migration into the lowland areas (Selela and Engaruka).

The dominance of in-migration as a factor influencing rapid population increase may be linked to poverty levels in many ways. First, in-migration into areas, which have resource scarcity like the highland, and lowland areas leads to population pressure on the existing resources. The study has, for example, witnessed expansion of agricultural activities into marginal areas, increasing incidences of land disputes and overgrazing, thus leading to a decline in the household economic potentials and capability. Second, in-migration may lead to land scarcity and land fragmentation. In the absence of agricultural intensification[3], the reduction of farmland per household leads to decline in agricultural production, hence, less opportunities for household income generation. Third, since in-migration influences population pressure and expansion of settlements and agricultural activities in the pastureland, it might lead to reduction of pasturelands and concentration of livestock in limited grazing areas. The implications of such situations include rapid land degradation, overgrazing, and high mortality of the livestock.

Intensification in the highlands would seem to have been an alternative in areas where there is land shortage leading to land fragmentation. However, this is not the case for the Karatu Highlands (including Mbulumbulu) partly because of the investment involved in intensification. They therefore find out-migration searching for land in the lowlands as the immediate alternative. Opening up of the lowland areas for agriculture leads to the reduction of grazing areas and compete with pastoralists for other resources like water. This is contrary to the popular thesis that population growth and agricultural intensification has been accompanied by improved environmental condition (Tiffen et al., 1994). A paper by Charlotte and Tom (2000) concludes that such a thesis is not replicable for other areas. Even in areas like Ukara island where population pressure has stimulated changes in farming systems, the limits of the observed improvement have not stopped out-migration to other areas like Sengerema and Geita districts where the Kara people were resettled by the government in the 1970s.

This study confirmed the presence of rapid population change particularly during the past 10 years. The rapid change in the population is reflected by the presence of many young parents which reflects early marriage, expanded settlements, large population of migrants, land scarcity, land grabbing practices, and water shortages. These changes in population characteristics are largely influenced by the increase and direction of migration flows mainly searching for land.

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[3] Agricultural intensification could increase agricultural productivity even without necessitating expansion of the cultivated areas. This could help to ease the pressure on the land as influenced by population pressure.

7.1.1. Impacts of Rapid Population Increase

The observed population increase in the study area has had various serious environmental, social and economic consequences. These include land scarcity, unemployment, food insecurity, water shortage, scarcity of pastures, poor social services, community insecurity including thefts, and environmental degradation. Table 2 summarizes these impacts at the cluster level.

These data demonstrate that land scarcity is the most common and major problem for both the highland and lowland areas. Whereas 54% of the respondents in the highland areas mentioned land scarcity and unemployment as the major problems, 42% in the lowlands mentioned land scarcity followed by the problem of food security.

Table 2: Problems Influenced by Rapid Population Increase

Problems	% ofRespondents Mentioning Specific Problems Caused by Population Pressure		
	Highland Areas	*Lowland Areas*	*Total*
Land scarcity	31.9	42.4	37.3
Unemployment	22.3	3.0	12.4
Water shortage	7.4	7.1	7.3
Poor social services	7.4	10.2	8.8
Shortage of pasture	5.3	3.0	4.1
Food insecurity	2.1	17.2	9.8
Community insecurity	4.3	6.1	5.2
Environmental Degradation	-	5.1	2.6
Others	19.1	6.1	12.4
Total Percentage	100.0	100.0	100.0
Number	94	99	193

Source: Survey Data, December 1999.

From these observations we can see some linkages or dependencies between the two areas emerging. If we leave land scarcity which is common to all clusters,

there is severe food shortages in the lowland areas on the one hand, hence, creating a market for foodstuff produced in the highland areas. On the other hand, unemployment is high in the highland areas, necessitating out-migration to the lowland areas in search for land and employment opportunities especially in the agricultural sector. It can therefore be generalised from these observations that communities in the highland and lowland areas in Karatu and Monduli district are so dependent and complementary to each other in terms of resource utilization and poverty eradication measures.

7.1.2. Migration Patterns

Migration is an important population growth component which in addition to natural population growth, influence population change either positively or negatively depending on the direction of the migration flows. In the study area, over 60% of the respondents consider migration as a feature of concern in their villages. Only 39% of the respondents did not see migration as a problem. However, significant variations exist between the highland and lowland areas. In the highland areas, migration is reflected in the form of out-migration whereby youths migrate to other areas, especially in the lowland areas and towns in search for better economic opportunities, land and employment. This aspect has significant repercussions on the labour force especially in the highland areas because of the disappearance of the young energetic people who are expected to contribute significantly to the agricultural labour force. In-migration is a serious issue in the lowland areas. In Selela and Engaruka villages, more than 95% of the respondents were concerned with the in-migration problem.

The main causes of the observed migration trends in the lowland areas include search for arable land for agricultural purposes, and pasture and water for the livestock. These observations suggest that migration is largely location selective and there are different patterns of migration between the highland and lowland areas. To demonstrate the influence of migration on population change, the data on place of birth were collected and analysed at the village level. Table 3 gives a summary of the distribution of population in the study villages by place of birth.

Table 3: Percent Distribution of Population by Place of Birth

Clusters and Villages	Place of Birth of Respondents				Total	
	Within village%	*Number*	*Outside village%*	*Number*	*Percent*	*Population*
Highland Areas						
Upper Kitete	73.2	284	26.8	104	100.0	388
K/Simba	74.3	255	25.7	88	100.0	343
Total	73.7	539	26.3	192	100.0	731
Lowland Areas						
Selela	61.7	195	38.3	121	100.0	316
Engaruka	66.7	263	33.3	131	100.0	394
Total	64.5	458	35.5	252	100.0	710
Total Sample	69.2	997	30.8	444	100.0	1441

Source: Survey Data, December 1999.

About 28.5% of the total population in both areas was born outside their present residences. The observations show that over a quarter of the present population in the highland areas and almost a third in the lowland areas were born outside their present residences. These observations are also true at the village level. Implicitly, these observations suggest that over a quarter of the population in the study area are migrants and the situation is higher in the lowland areas as compared to the highland areas. This situation has been contributed by the flow of migrants form the highland areas to the lowland areas due to reasons already mentioned in the preceding sections. The observed migration features in the study villages tally very well with the general migration features for Arusha region which is categorized as a net-migration earning region (URT, 1998).

While most of the migrants entering the highland originate from South Mbulu and to a lesser extent, from Monduli district, those entering the lowland areas originate from Ngorongoro, Karatu, Arusha, Monduli, and even from Moshi district. It is clear from these observations that the lowland areas attract more migrants from wider catchments than the highland areas. It is also clear that while there are more intra-district migrations in the lowland areas, migration patterns in the highland areas are dominated by inter-district migration patterns. In most cases, the decision to migrate is mainly centred on the land issue and availability of essential resources like pasture and water.

The preceding discussion has demonstrated that, migration is an important feature of the demographic characteristics of the study area. The migration pattern and the causes of migration in the two clusters reflect the existing interdependence between communities in the highland and lowland areas. While the lowland areas offer opportunities for arable land, pasture and water to migrants from the highland area, the highlands accommodate migrants from the lowland areas by providing employment in the agricultural sector, and provide essential commodities like foodstuffs and market for livestock products. This dependence suggests that communities in the two areas are complementary in terms of livelihood and coping strategies in response to population and environmental change. Such dependence is also essential in the poverty eradication strategies that are put in place by the communities in these areas.

The main pull factors that encourage people to migrate into particular villages include availability of land (25%), availability of pasture and grazing areas (19%), social services (14%), business (12%), and availability of water (10%). Table 4 summarizes the observations regarding the major pull factors to various areas.

Evidence gathered from the respondents indicate that the main pull factors that influence people to move into the highland areas include availability of fertile land, social services, water, and employment opportunities especially in the agricultural sector. These observations suggest that agricultural related factors are prominent in the highland areas and tend to provide essential opportunities for employment even to the migrant population from the lowland areas. In the lowland areas, availability of pastures is the prime pull factor. Other factors include availability of arable land, business, availability of water, good social services, and good administration.

Table 4: Factors Influencing In-migration by Zones

Pull Factors	% of Respondents Mentioning Various Pull Factors		
	High Potential Areas	*Low Potential Areas*	*Total*
Fertile land available	51.0	21.0	25.8
Grazing land available	3.0	26.0	18.6
Social services	16.0	11.0	13.6
Business	2.0	17.0	11.5
Water availability	7.0	15.0	10.3
Agricultural labourers	9.0	1.0	6.4
Good administration	3.0	4.0	4.5
Irrigation	-	3.0	1.9
NA	9.0	2.0	7.4
TOTAL	100.0	100.0	100.0

Source: Survey Data, December 1999.

There are many factors that instigate people to move out of particular residences (i.e. push factors). In many cases push factors tend to be the opposite of the pull factors. Table 5 summarizes the main push factors for the village and cluster level analysis.

Table 5: Factors Influencing Out-migration by Clusters

Push Factors	% of Respondents Mentioning Various Push Factors		
	Highland	*Lowland*	*Total*
Land degradation	20.0	17.0	18.5
Drought	1.0	16.0	30.0
Pasture shortage	43.0	8.0	4.4
Poor Social services	-	12.0	6.0
Food insecurity	-	10.0	5.0
Lack of employment	8.0	1.0	4.5
Others	7.0	4.0	5.5
NA	21.0	32.0	26.5
TOTAL	100.0	100.0	100.0

Source: Survey Data, December 1999.

7.2 Land Use Conflicts

Given the fact that migration is a main feature of the population in the study area, and given that population pressure and mixed economic activities, especially crop cultivation and livestock keeping are practised, land use conflicts is eminent. One of the major conflict areas is related to land distribution and allocation for different uses. It was evident in some villages, especially in the highland areas, that communal lands that were formerly used for grazing purposes have been allocated to migrants to establish farms.

This is the case for Upper Kitete and Kambi ya Simba Villages. Consequently, there has been a rapid reduction of grazing areas to the extent of instigating land degradation processes due to over-grazing, and out-migration of the livestock keeping households. This problem has also been responsible for the shortage of pasture in many villages in the lowland and highland areas. Experiences from Selela and Engaruka Villages can be used to substantiate this observation. Conflicts over farm boundaries between neighbours and individual households are more evident in the highland areas where land scarcity is severe. In Kambi ya Simba, for example, about 34% of the respondents reported boundary conflicts in the village.

In many cases these problems are instigated by increasing household sizes resulting into expansion of agricultural activities into the traditional grazing areas, especially in the lowland areas where migration flows are directed. The boundary conflicts often stimulate land use conflicts in the communities, especially between livestock keeping and crop cultivation. Deforestation, soil erosion, overgrazing, and water pollution are some of the environmental implications of the observed land use conflicts in the study area.

Another serious land use conflict is related to wildlife conservation. According to Mwalyosi (1991), large parts of the lowland areas especially around Lake Manyara are Game Controlled Areas. However, current observations indicate an increase of settlements and agricultural activities in these areas. For example, movement of wildlife from Tarangire National Park into Manyara National Park and Ngorongoro Conservation Area has been blocked by the emergence of new settlements and new farms in the buffer zone areas and wildlife migration routes. Around Mto wa Mbu area, irrigation farming has been opened, putting even marginal grazing areas into irrigation farming.

Mwalyosi (1991) reports that mechanized large-scale farming has been opened in the area and that there are plans to increase acreage, hence, undermining the traditional social organizations of the indigenous people and aggravated ecological impacts of overstocking and population pressure. This is a negative

development and may lead to serious ecological and biodiversity consequences if no intervention measures are put in place. Such circumstances stimulate land use conflicts especially between wildlife conservation, livestock grazing and cultivation. This can also lead to unsustainable consumption patterns of natural resources, threatening the long-term survival of wildlife.

7.3 Access and ownership of land

Land tenure may influence the type of land management practices. Insecure land ownership may lead to consideration of short-term gains in the land management practices. Such a process may lead to land degradation, hence, accelerating poverty. There are various strategies that are used to access land. While inheritance has been the main strategy for acquiring land in many communities, this study suggests that the importance of inheritance as a strategy for accessing land has been eroded or is on a decline. Table 6 summarises the different strategies used to access land in the study area.

Table 6: Strategies Used to Access Land by Clusters

Means of accessing land	Cluster/ Areas)		
	Highland	*Lowland*	*Total*
Inheritance	2.0	33.0	17.5
Purchase	4.0	20.0	12.0
Village allocation	88.0	42.0	65.0
Given by relatives	1.0	3.0	2.0
Clear forests	5.0	2.9	3.5
TOTAL	100.0	100.0	100.0

Source: Survey Data, December 1999.

The data illustrate clearly that the most common method of acquiring land is through village allocation (65%) followed by inheritance (17%) and purchase (12%). Acquiring land through village allocation was observed to dominate in almost all villages except Engaruka where inheritance is still prominent. Forest clearance as a method of accessing land is not widely practiced in all clusters probably due to non-availability of forests and virgin land to clear at the moment.

Purchase of land is very significant, especially in the lowland areas. This practice is probably stimulated by the influx of migrant populations who are desperately

in need of land at any cost in those areas. However, the expansion of this strategy may have an impact of increasing poverty levels especially to those who cannot afford to buy land and to those who are forced to sell their land in order to acquire some basic needs like food and clothing. Large proportions of the grazing areas in the lowland have been sold under this system. In some cases, relatives and friends give land.

Given the high population pressure on the land in the various villages, the amount of land owned by households is very limited. Table 7 shows the distribution of the households according to the amount of land owned.

Table 7: Distribution of Land Owned by Village

Land owned (ha.)	Highland			Lowland			Total
	U/Kitete	*K/Simba*	*Highland Total*	*Selela*	*Engaruka Total*	*Lowlands*	
1-5 ha.	20.0	40.5	30.0	69.6	79.6	75.0	52.4
6-10 ha.	80.0	57.1	69.0	5.2	14.3	15.0	41.7
11-15 ha.	-	2.4	1.0	8.7	6.1	7.0	4.3
16+ha.	-	-	-	6.5	-	3.0	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean	5.8	5.2	5.5	5.2	4.0	4.6	

Source: Survey Data, December 1999.

The data illustrate that over 50% of the total households interviewed own only 1-5 hectares of land, and about 42% owned 6-10 hectares. The situation is even worse in the lowland areas where 75% of the households own 1-5 hectares as compared to 30% in the highland areas. The proportion owning more than 10 hectare is 15% and 10% in the highland and lowland areas, respectively. At the village level there are variations in ownership of land depending on the land resources available and population pressure. Again the villages in the lowland areas have less land available to them as compared to those villages found in the highland areas as observed in the table above. While the average farm size in the highland areas is around six hectares, it is less than five hectares in the lowland areas.

About 48% of the respondents in the study area have observed a decrease in the amount of land owned especially during the past 10 years. Since land is the main capital for the rural population, the observed decline might be another

indicator of increasing poverty levels in the areas. However, about 41% of the respondents have seen no change in the amount of land owned. Only one-tenth of all respondents observed an increase in the amount of land owned, especially in Engaruka Village (30%). The decline and lack of change in the amount of land owned in the highland areas is justified by the lack of new lands for expansion. This finding is further confirmed by the 1973 and 1996 aerial photographs for the area, which show that the area was already intensively cultivated by 1973 (see Figures 7.1 and 7.2 on the following page).

Changes in the amount of land owned is largely a function of population pressure and type of agricultural activities practised. The introduction of coffee and wheat/barley farming in the highland areas of Karatu district necessitated the use of mechanised agriculture, hence, large scale farming. This feature is demonstrated by having about 69% of the households in this cluster having 6-10 hectares as compared to only 15% in the lowland areas.

7.4. Livestock ownership

Livestock keeping is another major economic activity in the study area. Generally, there are more livestock in the lowland areas than in the highland areas. However, the observed expansion of agricultural activities in the rangelands poses a threat to pastoralism as a mode of life. This new change can also be expected to increase poverty levels among the pastoralists as more and more livestock will die due to scarcity of pasture and water. This raises concerns over the sustainability of the pastoral mode of life, especially in the lowland areas. There is enough evidence to demonstrate that pastoralists are engaged in farming activities around their own villages. This is in response to the increasing pressure from the agriculturalists, especially the large-scale farmers and those from the highland areas in Karatu and other districts. Table 8 shows the type and number of livestock owned in the study village.

Figure 7.1: Aerial Photographs of 1972: Left hand side being the Ngorongoro Conservation Area (protected) and right hand side being the intensively cultivated Mbulumbulu Area.

Figure 7.2: Aerial Photographs of 1996: Left hand side being the Ngorongoro Conservation Area (protected) and right hand side being the intensively cultivated Mbulumbulu Area.

Table 8: Number of Livestock Owned in Households by Village and Cluster

Livestock	Cluster/ Areas		
	Highland	*Lowland*	*Total*
Cattle	296	670	966
Donkey	44	81	125
Goats	407	1597	2004
Sheep	123	759	984
Mean number of livestock owned			
Cattle	4.4	10.6	7.4
Donkey	1.6	2.5	2.1
Goats	5.8	20.5	13.5
Sheep	3.3	12.0	8.8

Source: Survey Data, 1999.

The data demonstrate more livestock concentration in the lowland areas where the average number of cattle and goats were 11 and 21, respectively. In Selela village for example, about 16% of the households had reported 1-10 cattle and 36% of the respondents had reported 11 cattle or more. In Engaruka 66% had 1-10 cows while only 8% had more than 10 cattle. In Upper Kitete, about 70% of the respondents owned 1-10 cattle, and only 2% had more than 10 cattle. In Kambi ya Simba, 52% had 1-10. Although these figures on livestock numbers cannot be taken for granted to reflect the actual situation of the livestock population, they give a rough indication of the distribution of livestock between the highland and lowland areas. There is often a tendency among livestock keepers to conceal the actual herd size of their livestock to avoid taxation, especially in areas where District Councils charge a livestock levy.

The assessment of the livestock herd size indicate clearly that the number of livestock have declined over time. Over 70% of the households reported a decline in the number of livestock and only 22% observed an increase. The decline is more pronounced in the highland than in the lowland areas. The causes of declines in livestock in the highland areas include, among others, tsetse flies, lack of drugs and vaccines, cattle rustling, and food scarcity which necessitates sell of livestock to buy foodstuffs. In the lowland areas, the main causes of the declines here are largely drought and lack of livestock extension services rather than lack of grazing areas. This observation is mainly due to the shortage of pasture in the highland areas largely caused by agricultural expansion.

To demonstrate the shortage of grazing areas in the study area, it has been reported that the mean distance to grazing areas is 2.7 km and 2.3 km during the dry and wet seasons, respectively. Variance, however, exists between villages depending on the intensity of agricultural activities in the village. In many cases, the distance to grazing areas is much longer in the highland areas than in the lowland areas.

Taking livestock as a family investment or some sort of capital, the decline in livestock numbers reflect an increase in the level of poverty in those households unless other alternative forms of profitable investments are made. However, the observed trend of opening farms in the grazing areas will probably lead to serious problems in the livestock sector in the near future.

In some exceptional cases, there are places where livestock population was reported to have increased. The increase was instigated by improved veterinary services, availability of pastures, and introduction of improved breeds. Comparing the highland and lowland areas, improved veterinary services and availability of pasture were the most important factors influencing an increase in livestock population in the two clusters. However, use of crossbreeding is another important component influencing changes, especially in the lowland areas.

The presence of conflicts between the pastoral and agro-pastoral communities is immense. These can be explained by the many reasons that influence livestock keepers to graze far from home. They include, among others, presence of cultivated areas in areas surrounding the homesteads (51%), lack of pastures nearby (15%), sparing nearby pasture for calves (young animals) (9%), and avoiding destruction of crops (7%). While expansion of cultivation into grazing areas (76%) and lack of zero grazing practices (12%) were dominant in the highland areas, scarcity of pasture nearby (31%), agricultural expansion (25%), and sparing areas for young animals (16%) are the most common reasons in the lowland areas. Almost all these reasons are related to agricultural expansion in the traditional grazing areas. The observations suggest that grazing areas have continued to be transformed into farms, thus, threatening the existence of pastoralism as a sustainable mode of life.

Generally, changes in the availability of grazing areas have largely been affected by such factors as agricultural expansion, expansion of settlements, and drought. The introduction of irrigation agriculture in Mto wa Mbu and Selela, for example, has transformed the areas that were considered unsuitable for crop cultivation into good agricultural areas, hence, reducing grazing and watering areas during the dry season. This situation is even worse in areas where the livestock and human populations have also been increasing. Table 9 summarizes

the reasons that have influenced changes in the availability of grazing areas in the highland and lowland areas.

Table 9: Reasons for Changes in Grazing Areas by Location

Causes of change in grazing areas	Zone		
	Highland	*Lowland*	*Total*
Settlement expansion	67.2	11.5	36.0
Grazing areas cultivated	6.6	42.3	26.6
Land allocated to migrants	8.2	7.7	7.9
Drought	-	10.3	5.8
Livestock increase	-	8.9	5.1
Irrigation agriculture	-	3.8	2.2
Other reasons	-	5.1	2.9
No change	9.8	7.7	8.6
Not stated	8.2	1.3	4.3
Total	100.0	100.0	100.0

Source: Survey Data, 1999.

In the highland areas, expansion of farming into grazing areas is more pronounced in Upper Kitete village than in Kambi ya Simba where it was almost non-existent. In the lowland areas, agricultural expansion was more evident in Engaruka village and less practised in Selela.

It was generally observed that the majority of people who open up farms in the former grazing areas are the local people themselves. This is true in villages like Upper Kitete, Selela and Engaruka. However, there is also a significant proportion of farms that are opened up by in-migrants especially in the lowland areas where in-migrants contribute about 20% of the farms in the grazing areas. The presence of local people as a factor suggest that some local pastoralists have started to engage themselves into farming activities.

The environmental implications of extending farms into the grazing areas include: destruction of natural vegetation and deforestation; land degradation, especially, soil erosion; water source destruction; environmental pollution; pasture shortage; and resource use conflicts especially water and land. In the highland areas, destruction of natural vegetation (62%); shortage of rainfall

(14%); deforestation (10%) and land degradation (8%) are the most prominent environmental implications. In the lowland areas, deforestation (29%); land degradation (27%); water source destruction (24%) and environmental pollution (11%) are the most common impacts.

The economic implications resulting from agricultural expansion into grazing areas include scarcity of livestock products, destruction of crops by livestock, lack of oxen, decreased crop production due to lack of manure, land degradation and theft of crops. In the highland areas, scarcity of livestock products like milk, butter, meat and manure has been reported to be the most pressing economic implication. In the lowland areas, the destruction of crops done by livestock is very common. This impact has in many cases resulted into serious social conflicts between livestock keepers and the crop cultivators.

The social implications of expanding farms in grazing areas include: failure to pay dowry due to decline in livestock population (44%); involvement of pastoralists in farming (23%); shortage of pasture (11%); out-migration of pastoralists (7%) and lack of freedom of the livestock keepers to practise a free range grazing system (15%). At the cluster level, failure to pay dowry is actually increasing in the highland areas, and the involvement of pastoralists into farming and out-migration are the main coping strategies used by pastoralists in the lowland areas.

7.5 Resource Use Dependencies between Highland and Lowland Areas

Almost all respondents are aware of the existing resource use interdependencies between the communities in the highland and lowland areas. However, only 50% of those in the highland areas and 97% in the lowland areas respondd to the question and all of them indicated existence of such interdependencies. The main interdependencies observed include: water resource use; food sources; land resources; pasture; wood fuel and other resources. Dependency on water resources is common to all clusters. All respondents in the highland and lowland areas observed dependencies in water resource use. The water source for both the highland and lowland areas are in the Ngorongoro Conservation Area (NCA). Although this source is located in the highland areas (highlands), it provides water for human, livestock and agricultural use to the lowland villages. Water from Losleli area is also used by people in Selela Village in the lowland area as about 41% of the residents obtain water from the source.

With regards to sources of food, only 10% of the respondents in the highland area depend on lowland areas for the supply of foodstuffs. In this case, foodstuffs are obtained from Mto-wa-Mbu and in villages located in the Ngorongoro Conservation Area. The proportion indicating food dependencies was

significantly high (73%) in the lowland areas suggesting that a large flow of foodstuffs from the highlands to the lowland. The main sources of foodstuffs for lowland areas are Melili in the NCA, Losleli, and Kapenchiro. Other areas are Mto-wa-Mbu, Upper Kitete, Naiyobi, and Ketumbeine.

8. POVERTY ALLEVIATION STRATEGIES AND IMPLICATIONS ON NATURAL RESOURCES BASE

Given the various environmental, economic and social implications, local communities in the highland and lowland areas have devised coping strategies to counter the expected effects. Evidence from the survey indicated that the most prominent coping strategies include involvement in business, embarking on afforestation programmes, investing in children's education, and working as labourers especially in large farms. Other strategies include use of mechanised agriculture, and application of proper land use management. In the highland areas, many youths are either involved in business or working as agricultural labourers. In the lowland areas, involvement in afforestation programmes, provision of education to children, and business are the most pronounced strategies.

One more observation especially in the lowland areas is the involvement of the pastoral communities into farming activities. This change or coping strategy has basically been a function of two factors. First, due to harsh climatic conditions which have affected the livestock business in terms of recurrent droughts and shortage of pasture and water, the pastoralists have lost large numbers of livestock due to high mortality rates. This suggests that pastoralism as a mode of life is not sustainable under such harsh conditions. Second, the influx of agriculturalists and the opening up of large scale farms in the rangelands have significantly reduced the areas where free range pastoralism can be practised. Similarly, expansion of agricultural activities have stimulated more and serious conflicts especially in relation to water and land use. More often, the pastoralists are the losers.

As it has been explained in the previous chapters, population growth has led to resource depletion in both the low and highland areas. However, other factors such as climatic variability and changing land use patterns have also influenced the deterioration of the quality of the environment, hence decreasing its carrying capacity for both human and livestock populations. Table 10 shows the major drought years as observed in Monduli district.

Table 10: Major Droughts Observed in Monduli District

Period	Duration (Year)	Interval (Years)
1933-35	3	-
1948-50	3	1
1953-56	4	2
1964-67	4	7
1973-76	4	5
1983-87	5	6
1990-94	4	3

Source: Meinderstsma and Kessjer (1997) in Shishira et al 1998.

In the highland areas, land scarcity is a big problem. The scope of the problem is even larger among the young generation that has been affected by the current changes in the land tenure systems. Consequently, there are several activities that youths do as coping mechanisms for income generation to sustain life. The first coping strategy used is to sell labour in the farms within and outside the villages, especially in the lowland areas. The remuneration obtained from the labour selling is either in the form of cash payment or in kind. However, this arrangement is often temporal and/or seasonal. Some youth accumulate the money obtained from selling labour to the extent of being able to purchase land. These strategies are very common, especially in the lowland areas. In many cases, youths purchase land from the same households they have been working for as farm labourers. This is due to the close relationships and trust that is generated throughout the years he/she has been a farm labourer. Negotiations to sell land are done privately. Village government is called in at the final stages of transaction so as to mediate in case conflicts arise. Such actions have their own implications like making it difficult for the village government to manage its natural resources such as land and water.

Current trends demonstrate that it is becoming difficult to buy land in the lowland areas without having a close friend or linkages with the local people who can sell portions of their land. Pastoralists are increasingly becoming reluctant to sell land, especially to agriculturists or migrants from the highland areas. This situation is facilitated by the increasing awareness of the consequences of population increase on land availability and over the increasing need for more arable and pasturelands in future.

The second coping strategy used is to change from growing food crops to cash

crops like wheat and barley. This strategy is common in the highland areas, especially among youths coming from rich families that own big pieces of land. The system of allocating land to youths through inheritance is on a rapid collapse. A new system is emerging whereby parents give land to their sons on temporary terms. This system is being practised by many parents in the highland areas, and has instigated the youth to develop coping mechanisms that ensure them profit maximization of the borrowed land. One way of maximizing profit that has been adopted by the young generation is to invest much in growing cash crops like wheat and barley. These have a reliable market and secures high prices than most of food crops like maize and beans. For example, the price for a 100kg bag of wheat/barley is about Tsh. 16,000 while that of maize is hardly Tsh. 10,000. In addition the market for maize is unreliable and unpredictable.

Another reason for opting into cash crop growing is the fact that barley and wheat cultivation is based on mechanised farming, and therefore the use of human labour is minimum. Contrary to this, maize cultivation largely depends on human labour for planting, weeding and harvesting. Given these changes, more barley and wheat are being produced especially in the highland areas while the production of maize and other food crops has rapidly declined. This trend necessitates importation of foodstuffs from other areas, and most likely from villages in the lowland areas. Recent observations have indicated that Karatu district is now the second largest wheat producer in the country (Meinderstma and Kessler, 1997). The proceed from sells of cash crops are most often used to purchase land from other farmers or to invest in other income generating activities like shops, commuter transport, and milling machines.

The third coping strategy is the one used by the tractor owners residing in the highland areas who go to work for the landlords (pastoralists) in the lowland areas. Remunerations for the type of work are given in the form of a piece of land to cultivate on a temporary basis. For example, if a person with a tractor assists to cultivate 5 acres for the landlord, he/she might be given 10 acres to cultivate for himself. Other tractor owners are paid in cash. Similar arrangements are applied even in the highland areas for people who own big land but have no tractors. Tractor owners usually assist in cultivating the land for the landlords and are in turn given land to cultivate for themselves. Generally, trade and agriculture are used to supplement the incomes obtained from pastoralism in the lowland areas.

Trade is another important coping strategy employed. The number of youths involved in trade is rapidly increasing. Some of them are involved in livestock

trade whereby they buy cattle from Loliondo and sell them to other areas. However, it is important to note here that despite the fact that there is a big change in the coping strategies especially among the youth, the traditional investment patterns that centred around livestock still prevails. Although some youths do investment in trade, they also use the profit to buy more livestock that are still considered to be a symbol of wealth and prestige. In most pastoral societies, the herd size symbolises the socio-economic status of the household in the society.

Generally, the recent developments in the study area show that most pastoral households practise both livestock keeping and crop cultivation. In the lowland areas, many villages have allocated areas for pastures and for agriculture. One of the reasons for the adoption of agriculture among the pastoral communities is the recurrent drought periods, which have been very unfavourable to the livestock population. During the drought years, the prices for foodstuffs often rise while the price of cattle goes down. As a result, pastoralists are forced to sell many cattle in order to purchase enough food to sustain their families.

Moreover, evidence gathered from the respondents indicate that their herd sizes have declined mainly due to drought and diseases. The decline in livestock numbers has made it difficult for the pastoral communities to sustain their livelihood. This has resulted into adoption of agriculture and increased rural-urban migration of the pastoral youths. With regards to agriculture, the use of irrigation to grow food crops like maize, banana, and vegetables has become inevitable. Although agriculture used to be mainly a women dominated activity, current observations from Selela village, for example, illustrate the involvement of pastoral men and women in agriculture. Vegetables produced in the lowland areas are often sold at Mto wa Mbu, and to villages located in the highland areas like Kambi ya Simba and Upper Kitete. While agricultural activities are used to provide the necessary food requirements for family subsistence, they are also used as a means for generating income to supplement incomes from livestock. Other income generating activities done in the lowland areas include petty business like tea-rooms (mamalishe) and selling of milk to people from the highland areas.

The realization of sustainable development with improvement of livelihoods of Tanzanians as the center point is the focus of the Tanzanian Government as reflected by various policy statements. For example, the Tanzania vision 2025 aims at achieving a high quality livelihood for the people. However, given the circumstances observed in the study area, there are emerging obstacles that may hinder the attainment of the vision. These obstacles include things like scarcity of land in the highlands of Karatu district leading to fragmentation,

over-cultivation without nutrient replenishment, hence, low per capita income; and unsustainable land use practices and natural resource utilisation in the lowland areas of Monduli district leading to land use competition and conflicts, and resources depletion and/or degradation. Such conditions limit the pace towards poverty reduction in the highland and lowland areas, respectively.

Similarly, Poverty Reduction Strategy Paper (PRSP) sets strategies for poverty reduction by the year 2010 and provides indicators for measuring progress (URT, 2001). The PRSP recognizes the need for sustainable management of natural resources in order to sustain the desired pattern of growth and consumption. Natural resources are the major livelihood options for the rural communities (URT, 2001).

The Wildlife and Forestry Policy insists on conservation and rural development by promoting sustainable utilization without jeopardizing the environment (URT, 1998). Involvement of rural communities and other stakeholders in taking joint responsibilities for sustainable management of natural resources is one of the strategies identified to ensure that conservation takes on board community development. However, the experiences observed in Monduli district whereby agricultural expansion is being practiced even in the wildlife corridors or encroachment of forest reserves defeat the purpose of sustainable development. There is a need, therefore, to harmonise between the existing socio-economic activities in the area with natural resources conservation such as wildlife and forest available in that area.

9. CONCLUSIONS AND POLICY IMPLICATIONS

9.1 Conclusions

This study has examined interactions between communities in the highlands and lowlands in terms of natural resources sharing and other socio-economic interdependences in the two areas. Various linkages have been observed which serve as catalysts for increasing poverty levels among the local communities. For example, the migration pattern and the causes of migration in the two clusters reflect the existing interdependence between the highland and lowland areas. While the lowland areas offer opportunities for arable land, pasture and water to migrants from the highland area, the highlands accommodate migrants from the lowland areas by providing them with employment in the agricultural sector, essential commodities like foodstuffs and a market for livestock products. These interdependencies suggest that the two areas are complementary in terms of livelihood and coping strategies in response to population and environmental change. They are also essential is the poverty eradication strategies that are put in place by communities living in these areas.

There exist different coping mechanisms and strategies emanating from different resource use patterns in the low and highland areas due to ecological and social differences between the two areas. These variations lead to different poverty alleviation strategies between the two areas. For example, the observed coping strategy for the high unemployment in the highland areas is out-migration, in most cases, to the lowland areas in search for land and employment opportunities in the agricultural sector.

It is evident in this study that land fragmentation and agricultural practices in the highland areas has reached a level that exacerbates poverty level. Similarly, the expansion of agricultural activities in the lowland areas stimulates non-sustainable resource use practices that increase poverty levels, particularly among the pastoralists communities due to scarcity of pasture land and water. In the most unusual situations, some pastoralists have even opted to engage themselves in cultivation, increasing the risk to their own very means of survival. Some have opted to migrate to other areas, which have new environmental risks; hence, they and their livestock find it difficult to cope with the new situations.

The main push factors in the study areas include land degradation, drought, pasture shortage, food insecurity, unreliable social services, and search for employment especially in the agricultural sector. While pasture shortage and land degradation are the main push factors in highland areas, land degradation, drought, poor social services and food scarcity are very effective in the lowland areas. In a way, the push factors identified in lowland areas are related in the sense that land degradation and drought may influence poor agricultural production, hence, food insecurity. These factors may influence population pressures in the areas of destination and are also very significant in increasing the poverty levels of the population in those areas.

Land tenure determines the type of land management practices. Insecure land ownership may lead to consideration of short-term gains in the land management practices. Such a process may lead to land degradation, hence, accelerating poverty.

Purchase of land is very significant, especially in the lowland areas. This practice is probably stimulated by the influx of migrant populations who are desperately in need for land in those areas. However, the process may cause increased poverty levels especially to those who cannot afford to buy land and to those who are forced to sell their land in order to acquire some basic needs like food and clothing. Large portions of the grazing areas in the lowland areas have been sold under this system. Furthermore, since land is the main capital for the rural population, the observed decline of land ownership might be another indicator of increased poverty levels in the areas. But also, the observed

expansion of agricultural activities in the rangelands poses a threat to pastoralism as a mode of life. This new change also can be expected to increase poverty levels among the pastolalists as more and more livestock will die due to scarcity of pasture and water. Likewise, since livestock is seen as a family investment or some sort of capital, the decline in livestock numbers reflect an increase in the level of poverty in those households unless other alternative forms of profitable investments are made.

This study has established mutual interdependences between the highland and lowland areas. These observations support findings made by similar studies in other areas (Mung'ong'o, 1995; Gichuku et al., 1998; Mascharenhas, 2000). It is also clear from these findings that societies cope differently with their environments and device different livelihood strategies to cope with the diminishing natural resources. What is also evident is that resources rich areas are densely populated while resources poor areas are sparsely populated. However, movement of people from the densely populated areas to the sparsely populated areas is seen as a way of coping with land shortage in the resources rich areas.

To deal with such trends it is important that village land use plans are established in collaboration with all stakeholders in communities. Establishment of community level land use plans is one step forward towards ensuring community involvement in the development of district land use plans, thus aiming at sustainability management of natural resources.

9.2 Policy Implications

One policy and practical recommendation for addressing the poverty situation in areas where there is high competition for land is to facilitate the establishment of alternative sources of income. This can be in the form of credit facilities, strengthening cooperatives, provision of reliable livestock marketing systems, crop diversification, and employment in non-farm activities. Currently, it is not easy for ordinary rural farmers to get loans from the financial institutions simply because they cannot meet the requirements. To make things worse, the government has withdrawn subsidies on agricultural inputs. This situation has created a vacuum that needs to be filled.

Since land degradation is one of the main push factors in both highland and lowland areas, there is need to tackle the problem on an integrated fashion. Both agricultural and livestock sectors should be involved in instituting measures to ensure sustainable management of the land resources. Programmes need to be established as measures to reduce soil erosion, deforestation and overgrazing.

With regards to land tenure issues, there is need to institute mechanisms for ensuring security on land ownership. The new Tanzania's Land Act and the Village Land Act 1999 (URT, 1999) provide the basic law in relation to the management and administration of land, settlement of disputes and related matters. It recognizes the importance of secure land tenure in improving the standards of life of the people. It also creates opportunities for collective land ownership at community level, especially for the pastoralists. There is therefore a need to increase awareness on issues related to the Land Act in order to ensure that local communities are aware of their rights as stipulated in the Act and be ready to defend those rights and effectively participate in the implementation of the Land Act and other useful policies. These efforts aim at increasing security on issues related to land tenure. The understanding of community land rights can minimize many of the land disputes and land use conflicts especially in the lowland areas.

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