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**Florian Sanya Chisawani Silangwa**

**Migration and demographic changes**

Its implications on land transformation and changing socio-economic development in the Lake Eyasi Basin in Karatu District, Tanzania

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## Preface

This PhD thesis was written within the context of the interdisciplinary project *Human Mobility, Networks and Institutions in the Management of Natural Resources in Contemporary Africa*, funded by the VW Foundation. Within the project seven PhD projects by young African scholars were commenced. The overall project focused on a detailed examination of the relationship between new forms of mobility and the management of natural resources in sub Saharan Africa. Of course, mobility is not a new phenomenon in Africa but has been part and parcel of adaptive strategies since centuries. Indeed, labor migration and various forms of long distance trade in the past as well as in the present within and beyond Africa have shaped our understanding of social, cultural and economic dynamics on the African continent. However, there is ample evidence that mobility patterns are undergoing a process of thorough and groundbreaking changes due to on-going processes of globalization. These very processes call for revisiting mobility and rethinking what constitutes mobility. In the application for project funding it was argued that *'processes of globalization, commoditization but also of rural impoverishment lead to an increasing flow of people, ideas and capital that influence the regulation of social-ecological systems'*. It was detailed that mobility could be operationalized (according to various contexts and different research questions) as a structured flow of people, money, energy, water, soils, seed, fertilizer, a variety of natural resources, food and fiber products, manufactured goods, waste and vehicles but also ideas, cultural repertoires, modes of business decision making, property rights and related institutional models. Identifying and analyzing these composite flows from an interdisciplinary, but 'place or region-based' perspective allows us to better understand the connections and dependences between different places and types of place, in terms of their overall sustainability, resilience, vulnerability and adaptive capacity.

Florian Silangwa's PhD research project focused on the causes of mobility, its manifold forms and its implications for land use change in the Lake Eyasi Basin in the northern part of Tanzania. Silangwa's research combined qualitative and quantitative approaches with political ecology as a guiding framework. The land tenure and management in and around Lake Eyasi basin has been changing in recent decades in response to the processes of occupation of pastoral lands by agriculturalists. In many areas agriculture is practiced in key resource areas of pastoralists and pastoralism has been replaced by agricultural strategies. A review of population records within and around Lake Eyasi division in Karatu District indicates

that the population has been increasing rapidly over time. Available data based on population censuses from the National Bureau of Statistics in Tanzania shows that the population of two selected villages in the Lake Eyasi basin has increased from 2090 in 1978 to 14,624 in 2002. The main cause of rapid population growth is in-migration, mainly, coming from the densely populated highland areas in Karatu and Mbulu Districts. The main objective of Silangwa's study is to investigate the extent to which population mobility has influenced the current land tenure systems and management and its implications on the socio-economic conditions of the people in Lake Eyasi Basin.

Key research questions that are answered in the course of the study are: What are the dynamics of demographic changes given the demographic history of the area? How is land currently owned, allocated, and managed by different socio-economic groups? What are the socio-economic strategies used by migrants to access land in Lake Eyasi Basin? To what extent has population mobility influenced changes of land tenure systems and land management strategies in the area of study? Are there clear and equitable arrangements for secure land tenure?

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## List of Acronyms

CAN	–	Calcium Ammonium Nitrates
DALDO	–	District Agricultural and Livestock Development Officer
DNA	–	Deoxyribo Nucleic Acid
ERP	–	Economic Recovery Programme
FAO	–	Food and Agricultural Organisation
GDP	–	Gross Domestic Product
HCL	–	Household Life Cycle
IMF	–	International Monetary Fund
NAP	–	National Agricultural Policy
NLP	–	National Land Policy
NSS	–	National Soil Science
SACCOS	–	Savings and Credit Cooperative Societies
SAP	–	Structural Adjustment Programme
SMUWC	–	Sustainable Management of Usangu Wetland and its Catchment
UN	–	United Nations
UNEP	–	United Nations Environmental Programme
URT	–	United Republic of Tanzania
USD	–	American Dollar
USGSLOVIS	–	United States Geological Survey Global Visualisation
WUA	–	Water User Association
TANU	–	Tanganyika African Nation Union
TFA	–	Tanzania Farmers Association

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## **1. Background to the research problem**

### **1.1 Introduction**

It is estimated that over 70 percent of the people in Tanzania live in rural areas and depend upon secure access to, and productive use of, land for their livelihood. Land tenure rights play a fundamental role in governing the patterns of natural resource management, as well as the welfare of individuals and communities dependent on those resources. Secure access to land is an essential catalyst force for economic growth and sustainable livelihood and it encourages investment which can lead to higher productivity and efficiency. Tenure insecurity often implies destitution and discourages farmers from making investment to increase productivity and for the reorientation of farm production for the market (Ghezze, 2009). The systems under which people get access to, and own, land is crucial to the understanding of the way land is used. Traditionally, ownership of rights of land in the Lake Eyasi Basin, as in other parts of Tanzania, have hinged on various forms of communal land tenure, whether of an extended family lineage or held in trust for the community by local chiefs who allocated it to families for their use.

The land tenure and management in and around Lake Eyasi Basin has been changing in recent decades in response to the processes of occupation of pastoral lands by agriculturists. This process, which was started by the colonialist settlers, continues today. In many areas, agriculture is practised in many key resource areas for pastoralists like dry season grazing lands. Although the land rights of pastoralists are still widely recognised, no protection against settlements by agriculturists is guaranteed. This situation has led to many land tenure conflicts between the pastoralists and agriculturists (Meindertma & Kessler, 1997). Pastoral nomads and indigenous people have been affected by the changes that are modernising resource tenure for land without claiming exclusive rights to any one location. These groups rarely own their land, although they do own their livestock. Changes in land use and tenure administration have led to increased exclusion and marginalisation of these pastoral communities (Ghezze, 2009).

A review of population records within and around Lake Eyasi Division in Karatu District indicates that the population has been increasing rapidly over time. The main cause of rapid population growth is migration, mainly coming from the densely populated highland areas in Karatu and Mbulu Districts (Meindertma & Kessler, 1997a). Several factors have been attributed to migration. These include land scarcity in the area of origin, drought, seasonal labour in irrigated farms in Mang'ola Valley and the Vilagisation Programme of 1974. The

influx of agro-pastoral communities and the opening of large and small-scale farms forced the pastoral Barbaig to squeeze themselves with their livestock in the vastly reduced and drier areas causing overgrazing and severe soil erosion. The population growth rates in the area are also explained as a function of natural increase (Meindertsma & Kessler, 1997a). Available data based on population censuses from the National Bureau of Statistics in Tanzania shows that the population of two selected villages in the Lake Eyasi Basin has increased from 2090 in 1978 to 14,624 in 2002.

Rural – rural population mobility in Tanzania and Lake Eyasi Basin in particular has been taking place since the 19<sup>th</sup> century. These movements have involved both cultivators and pastoralists. Population mobility has diverse social, economic and demographic consequences and effects on social resilience as it alters people's economic wellbeing, changes the structure of the community and affects the natural resource base. Migration affects the income, wealth, knowledge base and labour supply of both the sending and receiving areas.

The arrival of migrants at their destination can also have impact on the livelihood and resource base on which the local residents depend, because migrants often bring new knowledge and technologies to the area. As the technologies are introduced to the existing residents, they may alter their own traditional production systems and the migrants might also claim land for their own use. In some cases these changes may be beneficial, resulting in improved agriculture or land use practice. In other cases, however, they may have a very destructive impact such as the introduction of exotic and domesticated plants or animals that can become invasive (Williams, 2002).

In addition, the migrants can use the land and natural resources in a less sustainable way than the local people and may undermine the resource base, threatening their livelihood and that of the local people alike. In some case, the arrival of migrants can displace the indigenous peoples, forcing them to move to more remote or marginal areas and hence deepen poverty. Incoming migrants usually result in diversification in social structure and can weaken the social bonds of reciprocity and trust often required for land and resource management (Curran & Agardy, 2002). They can have negative impacts which may arise where conflicts with existing local populations arise, often as the result of disruptions of local institutions and resource management systems (Locke *et al.*, 2000). In Kenya, the increase in the area under cultivation, both rainfed and irrigated, has been facilitated by changes in the land tenure policy, both official and customary. The general trend has been towards land privatisation and fragmentation of former communal holdings. For example, the former agro-

pastoralists in the lower parts of Mt. Kenya such as Mbeere and Tharaka have been confined to family plots following land adjudication. This has resulted in bush clearing and change in land use from animal grazing to cropping. Continuous cropping has led to signs of rapid soil degradation. A study by Campbell (1999), in Kajiado – Kenya has revealed that due to increased area under cultivation the number of livestock, especially goats, kept per family has significantly dropped.

In Tanzania, it is reported that as a result of population mobility, land resources in the Usangu basin were put under great pressure as the area for cultivation increased from 33,121 hectares in 1958 to 71,658 hectares in 1978, an increase of 116 percent over the period of twenty years (Charnley, 1994). Furthermore, studies in Tabora region have illustrated that almost all forest reserves in the region have been encroached (Shishira & Yanda, 1998). The encroachment is in the form of new settlements and clearing of forests for agriculture and livestock grazing. The changing population densities and growth rates around the major conservation areas in Tanzania signals the impact of human population and activities on the future conservation of those areas. Trends around the Serengeti-Maswa area demonstrate an increasing potential for conflict between the expanding human population on the one hand, and wildlife population and environmental conservation on the other (Kurji, 1977; Meertens, *et al.*, 1995). Increasing population densities pose a threat to land resources and necessitate an integrated land use management strategy.

Since land resources are crucial for the socio-economic development of the people, the need to have better understanding on how population mobility and demographic changes affect land tenure systems and management is inevitable, as it will help to develop mechanisms to ensure better and sustainable utilisation of land resource. This study, therefore, intends to assess the extent to which population mobility and demographic change have contributed to the current land tenure systems and their implications to socio-economic development in the Lake Eyasi Basin.

This study is part of a larger project on *Mobility, Networks and Institutions in the Management of Natural Resources in Contemporary Africa*. The project investigates the relationship between the new patterns of mobility and natural resource management in African savannah environments. The processes of globalisation, commoditisation and rural impoverishment lead to an increasing flow of people, ideas and capital that influence the regulation of social-ecological systems. Examples of the new patterns of mobility are rural-rural migration of smallholder farmers, the establishment of large-scale commercial farming enterprises by migrants reinvesting economic, social and symbolic capital in rural areas and

the impact of new elites circulating between urban jobs and rural home communities. Mobile people implicated in these processes range from the poor rural farmers and landless people to the labour migrants and urban-based elites. Often these groups compete for access to and control over the same natural resources. As part of the project this thesis focuses on rural-rural migration and its implications on demographic change and land transformation in the Lake Eyasi Basin which has become the receiving region to many rural migrants from within and outside Karatu District.

## **1.2 Statement of the research problem**

Lake Eyasi Basin in Karatu District has an important social and economic value to the people's livelihood. Located in the lowlands, the area has fertile soils, mainly as a result of frequent floods from Mbulu Highlands. Apart from having fertile soils, the area has an important source of water which is located in Qangeded village in Baray Ward. This source supplies water used for irrigation agriculture and domestic use to about eight villages in Mang'ola and Baray Wards. The area has potential for irrigation agriculture and livestock keeping and has attracted many people from different parts of the region and the country at large. The people moving into the area are involved in agricultural activities, as they are engaged casual labour in onion farms, livestock keeping as well agro-business. The main food and cash crops grown in the area are maize, rice, and onions.

As the population has increased with the influx of migrant farmers, livestock keepers as well as casual labourers in the Lake Eyasi Basin, the pressure on available land resources has increased. Despite the increase of population in the area and its obvious impact on land use, little has been written on the influence of population mobility and migration on the traditional land tenure system and land management, in response to the demand for land by the migrants as well as the effects of these changes on the socio-economic conditions of the people in the area. Various studies undertaken in the area have looked at religion (Johnson, 1996; Winter, 1964; Snyder, 1993, 1997), agriculture (Fukui, 1969; Whiteley, 1958), livestock markets (Winter, 1962), migration (Fukui, 1970b; Wada, 1969b; Winter & Molyneaux, 1963), and agrarian and cultural history (Lawi, 2000). The current work draws from these studies but seeks to address the issue of population mobility in relation to land resource transformation in the Lake Eyasi Basin.

The understanding of the patterns of population mobility and changes in land tenure systems and their associated socio-economic effects in Lake Eyasi Basin is an essential tool

in determining the current and future population needs and sustainable land resource management and development.

### **1.3 Research objectives**

The main objective of this study was to investigate the extent to which population mobility has influenced the current land use changes and its implications on the socio-economic conditions of the people in Lake Eyasi Basin.

Specifically, the study sought to:

1. Examine the nature and trend of demographic change in selected villages in the Lake Eyasi Basin;
2. Assess the impact of population mobility/migration on changing land tenure systems and land management, as well as the people's response to the breakdown of their traditional living conditions;
3. Examine the land use changes in the selected villages based on various people's perceptions and satellite images; and
4. Assess the conflicts and threats over land resource use in the villages in the Lake Eyasi Basin and their associated impact on the villager's socio-economic development.

### **1.4 Research questions**

1. What are the dynamics of demographic changes given the demographic history of the area? Which groups of people are attracted to the villages of Mang'ola Barazani and Mbuga Nyekundu?
2. How is land currently owned, allocated, and managed by different socio-economic groups? What are the socio-economic strategies used by the migrants to access land in the Lake Eyasi Basin?
3. To what extent has population mobility influenced the changing land tenure systems and management in the area of study? How has the change in land tenure systems affected the socio-economic conditions of the people. What strategies are being adopted by the local people as a response to the breakdown of their traditional living conditions?
4. What is the structure of decision making in relation to land distribution and management? Are there clear and equitable arrangements for secure land tenure?
5. To what extent has land use changed in the selected villages? What are the driving forces and dynamics underlying those changes?

6. To what extent have land and land-related issues contributed to land conflicts in the Lake Eyasi Basin? At what stage did land become a key factor and why? Who are the main actors in land resource conflicts? How have land conflicts affected the people's livelihood in the area? What measures are being taken by the government and the community to resolve those conflicts and threats over land resources?

### **1.5 Justification for the study**

The *Tanzania National Environmental Policy, 1997* indicates that demographic factors and trends have a synergetic relationship with developmental and environmental issues. In any case, a rapidly growing population even with very low levels of consumption per capita, implies increasing consumption in absolute terms, therefore special emphasis should be placed on policies that combine with natural resource concerns and population issues. Since the interactions of human population growth and migration with environmental factors have long been, and will continue to be, a topic of debate among demographers, natural scientists, and other observers, there is a need of conducting empirical research on the topic. This is in line with the said national policy, which emphasises the need for the generation of socio-demographic information and mitigation of the direct and induced effects of demographic changes on the environment with respect to critical resources such as land, water and ecosystem health, taking into account community needs.

It is expected that the findings of this study are going to contribute to the existing knowledge on the relationship between new forms of mobility and land resources. Understanding of these relationships in villages around the Lake Eyasi Basin will help the communities as well as land resource managers to allocate and use resources wisely in a situation of rapid population increase and population pressure. The findings will also contribute to informing policy makers on making appropriate policy interventions which can improve ways of ensuring sustainable resource management at the local level and rural community at large.

### **1.6 The organisation of the study**

The thesis is divided into nine chapters. After this introductory chapter, chapter two presents the review of different relevant theories, models and approaches used in explaining and understanding population mobility, demographic change and changing land tenure systems and management. It also explains the conceptual framework on which the rest of the chapters are based, relating to the complex relationship between migration and land resources.

Besides, the chapter presents the literature review on the population mobility/migration and land use transformation. Chapter three highlights the major issues of population mobility, migration and land tenure in Tanzania, and in the Lake Eyasi Basin in particular. In this chapter the historical background of population mobility, migration and land tenure management is presented. The methodologies which have been used in this study indicating the research design, historical profile of the selected villages are presented in chapter four.

Chapter five analyses the population characteristics and demographic changes in the research area in terms of size, composition, economic activities and other changes that are taking place, or have taken place. Chapter six focuses on land use changes which have taken place in the area from 1987 to 2010. Based on people's perceptions and analysis of satellite images, the relationship between population growth as well as other land use change driving forces are discussed. Chapter seven critically analyses the relationship between demographic variables, land tenure and management and its implication to sustainable land resource management and the people's livelihood systems in the area. It seeks to explore how population mobility has influenced changes in the land tenure system and land management. Chapter eight addresses issues of land conflicts and how these conflicts are resolved in the area of study. Chapter nine summarises the general findings, presents the conclusion of the study, and provides possible policy options and recommendations for further research.

## **2. Literature review and theoretical framework**

### **2.1 Overview**

This chapter presents the review of different relevant theories, models and approaches used in explaining and understanding population mobility, demographic change and changing land tenure systems and management. The chapter is divided into four parts. The first part provides a brief description of the theory by giving its definition and its classifications. The second part of this chapter is devoted to the theories on population mobility and migration. The focus in this part is to look at what different authors have to say about the processes of population mobility and migration. Furthermore, the linkages between land use change and mobility will be explored. Migration and mobility is an important part of this research because changes in population structure are closely connected to migration. This is also the case in the Lake Eyasi Basin, where this research has been carried out. Besides the effect on population size and composition, migration has another element of importance as migrants and non-migrants are often considered quite different regarding resource use strategies, resource extraction technologies, consumption preferences, and knowledge about local ecosystems (Browder, 1995; Perz, 2003; Pichon, 1997).

The third part focuses on theories related to population growth and land use changes. Land use is primarily an expression of people's use of natural resources. As the population increases and land resources become scarcer, farmers need to farm more intensively. Human activity is partially seen in the changes in the land cover that is conversion of natural forests to farmland and beaches to urban centres. The changes in land use associated with rapid population growth are likely to be disadvantageous to human beings.

The fourth part of the chapter presents a review of literature linked with migration and land resource management which are important aspects in understanding the way different parameters and various conditions are associated with land use transformation. The chapter also presents the analytical framework which is used to link various theories and models to land use transformation and puts them into the perspective of the study.

### **2.2 What is a theory?**

The Shorter Oxford English Dictionary (1973) defines theory as "a schema or system of ideas or statements which has been held as an explanation or account of a group of facts or phenomena". It is "a set of connected statements used in the process of explanation" (Briassoulis, 1999) or "a system of thought which, through logical constructs, supplies an

explanation of a process, behavior, or other phenomenon of interest as it exists in reality” (Chapin & Kaiser, 1979, p. 27 cited in Briassoulis, 1999). A theory is derived from the exploration of phenomena, the identification of, and interrelationships between, concepts surrounding the phenomena and the subsequent development of a framework within which some conclusions can be made.

Theories have been classified into three levels: grand (macro), middle range and micro theories. A grand theory is a comprehensive approach involving the production of explanations for uniformity of social behaviour, social organisation and social change (Merton, 1968). Grand theories are counterintuitive; they give a new slant, make sense of puzzling aspects of existence and generate new ways of thinking and interpreting (Giddens, 1993). Macro or grand theories comprise definitions, concepts, variables, statements and theoretical formats that address issues, theoretical strategies and various analytical forms of classification. The middle range theory is used to guide inquiries regarding limited aspects of social organisation and action. It is characterised by the inclusion of concepts such as status, role, power and socialisation. Variables of substantial size and cohesiveness like sex or class are involved. It includes statements that derive from a combination of concepts and variables. The micro theory consists of a set of hypothetical theoretical statements about narrowly defined phenomena. These statements are derived from interpretations of interrelated concepts. However, it is argued, a micro theory is not a legitimate theory on its own, but simply a set of propositions, models or hypotheses providing the basic blocks of theory.

### **2.3 Theories of population mobility and migration**

Migration theory is primarily concerned with the determinants of migration (Bilsborrow, 1998). Theoretical issues about the determinants of migration are commonly explored at either the macro or the micro level. Traditional micro-economic models of migration were founded on theories relating to individual optimising behaviour (Sjaastad, 1962; Todaro, 1969, 1976; DaVanzo, 1981). For instance, earlier studies view rural-urban migration as a result of large differences in employment opportunities and income. Individuals are seen as likely to migrate when the expected economic benefits exceed the economic costs. Todaro (1969, 1976) argues that people migrate from rural to urban areas as long as the expected wage differential is large, even if the unemployment rate in the urban destination areas is high. Potential migrants are seen as calculating their expected earnings in their place of origin in comparison to various places of destination. The following section explores various migration theories starting with macro theories followed by micro theories.

### 2.3.1 The neo-classical equilibrium perspective

The first scholarly contribution to migration consisted of two articles by the nineteenth century geographer Ravenstein (1885, 1889), in which he formulated his “laws of migration”. He saw migration as an inseparable part of development, and he asserted that the major causes of migration were economic. Migration patterns were further assumed to be influenced by factors such as distance and population densities (Skeldon, 1997:19). This perspective, in which people are expected to move from low income to high income areas, and from densely to sparsely populated areas, that is, the general notion that migration movements tend towards a certain spatial-economic equilibrium, has remained alive in the work of many demographers, geographers, and economists ever since (Castles & Miller, 2003:22), (Bauer & Zimmermann 1998:95; Lee, 1966:48; Passaris, 1989:7). Economic explanations have nonetheless dominated popular and scholarly thinking on migration.

At the macro-level, the neo-classical economic theory explains migration by geographical differences in the supply of, and demand for labour. The resulting differentials in wages cause workers to move from low-wage, labour-surplus regions to high-wage labour scarce regions. Migration will cause labour to become less scarce at the destination and scarcer at the sending end. Capital is expected to move in the opposite direction. In a perfectly neo-classical world, this process of “factor price equalisation” (the Heckscher-Ohlin model) will eventually result in growing convergence between wages at the sending and receiving ends (Harris & Todaro, 1970; Lewis, 1954; Ranis & Fei, 1961; Schiff, 1994; Todaro & Maruszko, 1987). In the long-run, this process will remove the incentives for migrating.

At the micro-level, the neo-classical migration theory views migrants as individual rational actors, who decide to move on the basis of a cost-benefit calculation. Assuming free choice and full access to information, they are expected to go where they can be the most productive, that is, are able to earn the highest wages. This capacity obviously depends on the specific skills a person possesses and the specific structure of the labour markets.

The neo-classical migration theory sees rural-urban migration as a constituent part of the whole development process, by which surplus labour in the rural sector supplies the workforce for the urban industrial economy (Lewis, 1954). By postulating that it “is a well-known fact of economic history that material progress usually has been associated with the gradual but continuous transfer of economic agents from rural based traditional agriculture to urban oriented modern industry” (Todaro, 1969:139), the neo-classical migration theory is firmly entrenched in the “developmentalist” modernisation theory based on teleological views

interpretation seeing development as a linear and universal process consisting of successive stages (cf. Rostow, 1960).

The Neo-classical migration theory can be positioned within the functionalist paradigm of the social theory, as the central argument of factor price equalisation assumes that economic forces tend towards an equilibrium and also because it largely ignores the existence of market imperfections and other structural constraints on development. This is hardly realistic, particularly in the context of many developing countries. Place utility and other micro-theories assume that migrants have the perfect knowledge of the costs and benefits of migration (McDowell & de Haan, 1997:9) and that people move across isotropic spaces.

In most developing countries, factor markets (capital, insurance) are typically far from perfect, making access to financial services and capital difficult or even impossible for the marginalised groups. This makes actual migration patterns difficult to explain within a neo-classical framework that mainly focuses on the expected income. Migration does not take place in a social, cultural, political, and institutional void. The neo-classical migration theory is also not able to deal with constraining factors such as government restrictions on migration.

Generally, the Ravenstein's theories are still applicable in contemporary migration in the developing countries although he was heavily criticised for making the laws of population mobility to have the same rigidity as physical laws. For example, according to Bogue (1969), the "Laws of Migration" were intended to explain the movement of people without regard to any particular temporal situation or location.

### 2.3.2 The push-pull framework

Both neo-classical and historical-structural theories of migration generally fail to explain why some people in a certain country or region migrate and others do not (Massey *et al.*, 1993; Reniers, 1999:680), and why people tend to migrate between particular places in a spatially clustered, concentrated, typically non-random fashion. It is therefore useful to look at some of the spatial models developed mainly by geographers and demographers. Lee (1966) revisited Ravenstein's 19<sup>th</sup> century laws on migration and proposed a new analytical framework for migration. In his view, the decision to migrate is determined by the following factors: factors associated with the area of origin, factors associated with the area of destination, the so-called intervening obstacles (such as distance, physical barriers, immigration laws, and so on), and personal factors. Lee (1966:54-55) argues that migration tends to take place within well-defined "streams", from specific places at the origin to specific places at the destination, not only because opportunities tend to be highly localised but also because the flow of

knowledge back from destination facilitates the passage for later migrants. A migration stream describes the net flow of people moving into or out of an area. A study area can have an “in-migration stream” (its immigrants) and an “out-migration stream” (its emigrants).

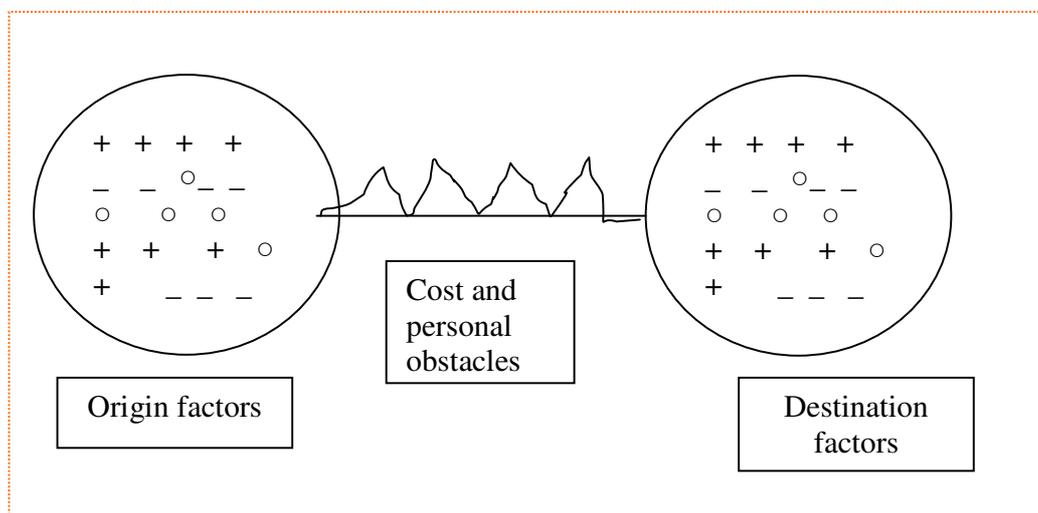


Figure 1: The push-pull concept and relevant obstacles

(Source: Lee 1966)

Lee also states that migration is selective with respect to the individual characteristics of migrants because people respond differently to “plus” and “minus” factors at origins and destinations and have different abilities to cope with the intervening variables (Reniers, (1999:681). Therefore, migrants are rarely representative of their community of origin. This is consistent with the neo-classical perspective which explains migration selectivity by individual differences in human capital endowments and the discriminating aspects of costs and risks associated with migration.

Although Lee did not apparently invent or employ the term himself, his analytical framework is commonly referred to as the “push-pull” model (Passaris, 1989). The push-pull model is basically an individual choice and equilibrium model, and is, therefore, largely analogous to neo-classical micro models. The push-pull model has gained enormous popularity in migration literature.

Most researchers who have applied the push-pull framework have assumed that various environmental, demographic, and economic factors determine migration decisions. Two main forces are typically distinguished to create the pushes and pulls: (i) rural population growth causing a Malthusian pressure on natural and agricultural resources, and pushing people out of the marginal rural areas, and (ii) economic conditions (higher wages), luring people into cities and industrialised countries (Skeldon, 1997:20; cf. King & Schneider, 1991:62-3;

Schwartz & Notini, 1994). At first sight, the push-pull model seems attractive, as it is apparently able to incorporate all the factors that play a role in migration decision-making. Because of its apparent ability to integrate other theoretical insights, it has been frequently suggested that a general view of labour migration could best be achieved using a push-pull framework (Bauer & Zimmermann, 1998; Schoorl, 1998:103).

Despite its strength, it is doubtful whether the push-pull framework is of much analytical use, and whether it can be called a theory at all. It is rather a descriptive model in which the different factors playing a role in migration decisions are enumerated in a relative arbitrary manner. As they are applied in practice, push-pull models tend to have the character of ad-hoc explanations forming a rather ambiguous depository of migration determinants. More problematic is the tendency of push-pull models to confuse different scales of analysis (ranging from individual to global) and do not allow for assigning relative weights to the different factors affecting migration decisions. Neither do they allow for empirical tests on the role and importance of factors that have been included or excluded.

Push-pull models also tend to ignore the heterogeneity and internal stratification of societies, while general contextual factors, habitually defined as either push or pull factors, are likely to work out in a differentiated way on the individual level, and might subsequently encourage some people to leave and others to stay. Another fundamental weakness of this model is that push and pull factors are generally represented in each other. For example, the argument that migrants are lured into big cities or to foreign countries because of the high wage 'pull', is implicitly or explicitly made in relation to an apparent low wage 'push' at the sending end. It then becomes arbitrary and open to subjective judgment to establish whether the push or the pull is dominant. In fact, the differences in the relative scarcity of labour can be aptly expressed in one single variable, that is, wage differentials.

### 2.3.3 Social capital, chain migration and network theory

In addition to the many pushes and pulls mentioned above, migrants are drawn to destinations where family and friends reside (Entwisle, 1998; Laurian *et al.*, 1998). Networks can be defined as sets of interpersonal ties that connect migrants, former migrants, and non-migrants in origin and destination areas through bonds of kinship, friendship, and shared community origin (Massey *et al.*, 1993:). The theory describes the role of the network in terms of its 'channeling' and 'adaptive' functions (Gurak & Caces, 1992). This is a useful distinction as it describes the function of certain contributions that migrants derive from the connections to other person's part of the network and how this contributes towards the migrant's

livelihood. Social capital in the form of migrant networks, therefore, affects the migrant motivation to migrate and the ability to adapt efficiently to the conditions found in the receiving area (de Haan, 2000b).

Migration networks may assuage the stress associated with migration (e.g. Lee, 1966; Massey, 1990; Root & De Jong 1991). The extent and quality of information received from friends or relatives are thus important migration destination determinants (Massey, 1990; Stark, 1991; Stark & Taylor 1991). Conversely, strong local community ties (e.g. Abeysekera 1984; Bilsborrow *et al.* (1987) may favour retention. The importance of migrant networks is found in several examples of migration in Latin America. For example, 37% of out-migrants from the Ecuadorian Oriente Region came from households with previous migrants compared to 19% of non-migrant households (Laurian *et al.*, 1998). Similarly, Guatemalan refugees in Mexico during the 1980s and 1990s enjoyed long contact with neighboring Maya groups sharing linguistic and even familial affiliation prior to migrating, thus directing family and friends to those destinations (Aguayo, Christensen, O'Dogherty, & Varese 1987; Hamilton & Chinchilla, 1991). Migrant networks function as channels of information, resources and normative structures.

The information channelled through the network allows the migrant to be informed about the conditions, opportunities and difficulties expected as part of migration. Through the assistance of friends and relatives, new migrants may be able to obtain information more easily and receive active assistance in finding employment and a place to live, in arranging residence papers, or in finding a marriage partner. Therefore, the formation of an established migrant community at one particular destination will increase the likelihood of subsequent migration to that particular place (Appleyard, 1992).

Massey (1989) argues that once the number of network connections in an origin area reaches a critical level, migration becomes self-perpetuating, because it creates the social structure to sustain the process (Appleyard, 1992). The network effects explain the (often unintended) perpetuation of migration, often over formally closed borders, irrespective of its original causes (Waldorf, 1998). The facilitating role of such "family and friends networks" makes migration notoriously difficult for governments to control. Network connections are a form of social capital that people draw upon to gain access to employment abroad (Massey *et al.*, 1993:448). Besides material and human capital (education, skills and knowledge), social capital is a third crucial migration resource in inspiring and enabling the people to migrate.

The study of migration networks has become popular in the past two decades, but there is a tendency to accept the arguments of network theories too uncritically. Their weak point is that they do not offer insight into the mechanisms that eventually lead to the weakening and crumbling of networks and migration systems. Following the circular logic of these theories, migration seems to go on *ad infinitum* (Massey *et al.*, 1998:48). They do not indicate what the external, structural factors are as well as internal processes that counteract the tendencies that lead to increasing migration through networks (Klaver, 1997:45).

#### 2.3.4 Spatial mobility migration models

These models were largely introduced by geographers who view migration as a process that occurs in space and which leads to a transformation of society. According to Zelinsky (1971) circulation includes a great variety of movements which on most occasions are short-term, repetitive or circular in character, but all having in common the lack of any declared intention of a permanent or long-standing change of residence. Circulation can also be further subdivided into daily, periodic, seasonal and long-term, depending on the length of the circle.

In 1971 Zelinsky produced a theory of mobility transition which tried to link the development of migration patterns with history. In this theory he hypothesised that in pre-industrial societies the more predominant form of migration was rural-rural migration. As the society became more industrialised and modernised rural-urban migration increased and was then followed by urban-urban migration. Further, as industrialisation and modernisation gained pace, the urban-rural migration form of migration resulted which is now known as counter-urbanisation in industrialised countries.

In 1975, Gould and Prothero conceptualised population movements into a formidable working typology. They observed that migration that often involves a permanent change in residence can be most suitably designated by the term 'circulation'.

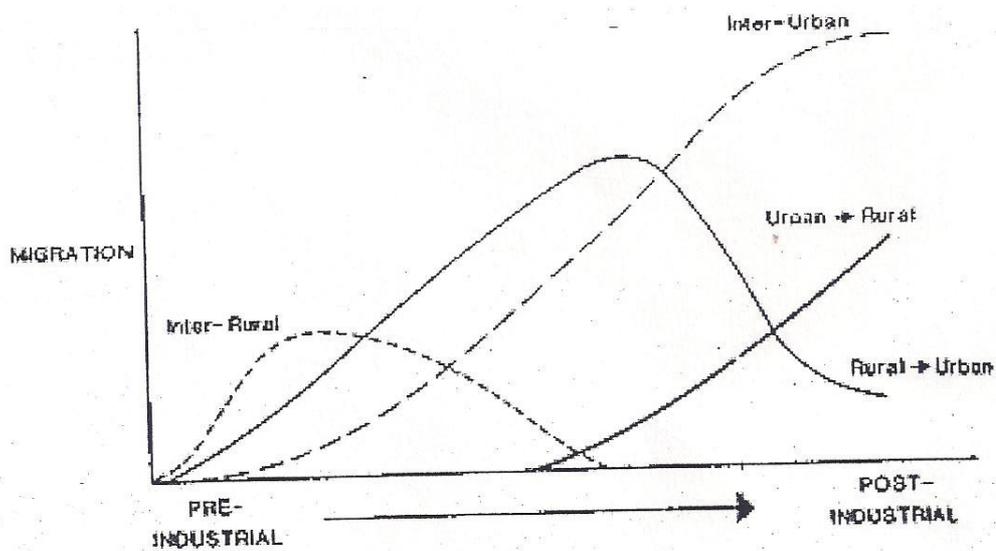


Figure 2: Mobility Transition Model (Zelinsky, 1971)  
(Source: Jones 1990)

Despite its acceptability as a broad description of historical events, provided it is modified for regional and cultural conditions (Jones, 1990: 207; Skeldon, 1990), the model has been subjected to criticisms. According to Pryor (1982:26), the model is inadequate in explaining the role of temporary changes in the dominant mode of production and spatial interactions in the societies which follow the capitalist mode of development. Another criticism is that it is difficult to apply the theory at the micro level because it requires data on mobility over a long time span which is very rare in most developing countries.

However, despite these weaknesses, the validity of this criticism does not necessarily upset the more fundamental idea of Zelinky's hypothesis: there is a fundamental, but complex and non-linear relationship between the occurrence of specific forms of migration and the more general socio-economic and demographic development processes, and if modified can be of great help in studying the migration processes at the micro level in developing countries where the rate of rural-urban migration is leading to excessive levels of urbanisation (Kulaba & Mkai, 2004; Mascarenhas, 1996).

### 2.3.5 The Political Economy Model of Migration

The political economists analyse migration as the byproduct of the overall development strategy based on the centre-periphery model. According to this model, development is concentrated at the centre or core which, however, draws physical and human resources from the periphery (Oucho, 1996). Using the centre-periphery model, Amin (1974) argues that the problems of migration in Africa are caused by the transformation and disruption of underdeveloped traditional economies. This leads to a neo-colonialist relationship where certain parts of Africa are geared towards the production of export primary crops like coffee, tea, sisal and minerals, like gold, copper, iron and others. Other parts export labour to the export dominated sector which together with those areas that are not involved in the capitalist dominated sector, act as labour reserves.

Migration patterns in Africa reflect this type of economic relationship. For example, the analysis of migration by Gregory and Piche (1981) link it with a spatial and social exploitation which produces a centre-periphery relationship. The model is also supported by Oucho (1996:22) who argued that, in Kenya, rural-urban migration was set in motion by disparities in socio-economic development which were rooted in the centre-periphery model of development which the colonial government adopted and was eventually inherited by the Kenyan government after independence. In this model development was concentrated at a few centres leaving the rest of rural Kenya as the reservoirs of cheap labour from which

workers were recruited to serve the economic undertaking in these centres. The result was that the centre developed at the expense of the periphery.

## **2.4 Theories on land use change**

Land use is primarily an expression of people's use of natural resources. As an interface of atmosphere, hydrosphere and lithosphere, land carries the imprints of all human activities. Land use pattern changes at varying rates covering time and scale. Long time changes without any intervention are parts of a natural process and result in various biomass climaxes. Accelerated changes result from outside forces that have become concerns at the global, regional and local levels. A theory of land use change, therefore, describes the structure of the changes from one land use type to another and explains why these changes occur. This includes the explanation of what causes the changes and what mechanisms are at work. So far, no general theory of land use change exists and it is questionable whether such a theory is desirable and possible. Whether or not it is desirable depends to a large extent on the epistemological perspective.

Researchers adhering to idealism, postmodernism and realism who put great emphasis on the importance of context may not consider a general theory appropriate or useful. In addition, the diversity of contexts in which land use changes occur makes it unlikely that a general theory can be developed despite the existence of broad patterns and regularities over space and time. Furthermore, a general theory of land use change would mean loss of the specific details of particular contexts, which often have critical explanatory power. The possibility of developing a relatively simple explanation of "*why we transform the environment the way we do*" remains a challenge (Scoones, 1999; Turner *et al.*, 1993). Nonetheless, the role of the theories of land use change is very important because theory guides policy. Inadequate theories of land use change have the potential to misguide policy and thereby causing damage instead of contributing to more sustainable natural resource management.

### **2.4.1 Malthusian and Boserupian theories**

Despite the non-existence of a general theory of land use change, there are two important historical theories which were developed by Malthus (Meadows *et al.*, 1971) and Boserup (1965) which are used in framing the debate over the impact of population growth and land use changes. Malthus pointed out that while food production levels increase at a linear rate, human population increases at an exponential rate, if unchecked. Therefore, Malthus'

theorem states that as population continues to increase, the decrease of available food per capita will lead to famines and result in the extinction of the human race. Boserup (*op. cit.*) proposed that it is not the agricultural methods that determine population growth (via food supply), but that population growth determines agricultural methods. She showed that increased population leads to agricultural intensification.

Boserup drew attention of the scientific community to the possible link between population growth and land use change. She critiqued the Malthusian theory which argued that the world population will bypass the availability of natural resources, and consequently, the fate of mankind will be mass starvation (Blankson, 1987). The central point of Boserup's argument was that population growth leads to technological change, thereby increasing agricultural productivity through land use intensification. Her model of agricultural change was debated from the 1980s through 1990s (Wieggers *et al.*, 1999).

Boserup regards population increase as an independent variable, which in turn is a major factor determining agricultural development. This is a totally different view of the relationship between population change and agriculture compared to the Malthusian theory. Boserup sees population growth as a stimulating process, which will cause people to look for more efficient ways to practice agriculture. She thinks that Malthus underestimated the potential of the people to be innovative. However, the Boserup hypothesis has been criticised for failing to consider the effects of inadequate public policy on agricultural development. Another set of critiques has focused on the paucity of attention given to societal structures and the processes underlying them for agricultural change. Boserup insisted that social structures mattered for this change and development in general but viewed them as endogenous to changes (arises from intentional investment decisions made by profit-maximising agents) in land pressure and technology, changing over the longer term. She has also been criticised for not including "land extensification", mainly through rural-to-rural migration, as a response to increases in population density.

Bilsborrow and Ogendo (1992) presented a theoretical framework for studying the effects of population change on agricultural development in the rural areas of developing countries. They build upon Ester Boserup's land-intensification hypothesis and Kingsley Davis' theory of demographic change and response (Davis, 1963). Davis suggests a set of several possible demographic and non-demographic responses to increases in population density, such as land intensification through irrigation, use of fertilisers and pesticides, land extensification, higher age at marriage, contraception, abortions, increased abstinence, and net out-migration. He further points out several factors, such as the existing level of living, the

availability of potentially cultivable land, the availability of off-farm employment opportunities, size and distribution of land holdings, potential for labour and technological intensification, rural fertility level, rural-urban population distribution, and the existing crop structure, as determinants of the type of response(s) to be expected. He emphasises the role of socio-economic and institutional factors in determining the nature of such responses. Bilborrow and Ogendo have criticised Kingsley Davis for not including non-demographic responses to increases in population pressure and not specifying the nature, importance, and relationships between different possible responses in his change-response formulation.

Land use change and the associated environmental problems such as deforestation, soil erosion, flooding and desertification are often seen as global in scale despite the fact that their proximate causes and effects are inherently local (Turner, 1990; Buttel & Taylor, 1994). More often than not the interconnections between local, regional and global processes are overlooked. An understanding of the dynamics of regional land use changes requires not only focusing on explanations for local land use changes, but also considering the aggregate effects of these local changes at the regional level (Turner, 1999). Broader political and economic changes also influence land use at the local level.

#### 2.4.2 A Theory of Access

The theory of access attempts to show how unsafe conditions arise from economic and political processes that allocate assets, income and other resources in the society unequally. Access involves the ability of an individual, family, group, class or community to use resources to secure a livelihood. Access to land, and the conditions under which it happens, play a fundamental role in economic development. This is because how the modes of access to land and the rules and conditions of access are set, has the potential of increasing agricultural output and aggregate income growth, helping reduce poverty and inequality, improving environmental sustainability, and providing the basis for effective governance and securing peace.

According to Ribot *et al.*, (2003) there is a working set of categories and examples which are used to guide efforts to map the mechanisms that shape access processes and relation. These categories include right-based and illegal access. The right-based is sanctioned by law, custom or convention and illegal access which are obtained through illegal mechanisms. Based on the two categories of access mechanisms, additional factors which explain how benefits are gained, controlled and maintained were developed. They include technology, capital, markets, labour, knowledge, authorities, identities and social relations.

Access to technology mediates resource access in different of ways (Bunker, 1985). Many resources such as land cannot be extracted without the use of tools or technology; more advanced technology benefits those who have access to it. Access to tube-wells, pumps and electricity can determine who can benefit from ground water pumped from ever-greater distances below the surface (Dubash, 2002). Access to capital is clearly a factor shaping who is able to benefit from resources by controlling or maintaining access to them (Blaikie, 1985; de Janvry, *et al.*, 2002). Access to capital is generally thought of as access to wealth in the form of finance and equipment that can be put into the service of extraction, production, conversion, labour mobilisation and other processes associated with deriving benefits from things and people. Access to capital can be used for resource access control through the purchase of rights. It can be used to maintain resource access when used to pay rent, formal access fees, or to buy influence over people who control resources. The access to market affects the ability to benefit from resources in many ways. The ability to commercially benefit from a resource can depend more on whether its owner has access to markets than whether someone has a right to it (Ribot, 1998, de Janvry, *et al.*, 2001).

Access to labour and opportunities also shape who can benefit from a resource. Those who control access to labour can benefit from a resource at any stage where the labour is required throughout the life of that resource (Appadurai, 1986). Access to labour opportunities includes the ability to labour for oneself and to maintain access to employment with others. Those who control labour opportunities can allocate them for favour as part of patronage relations, (Peluso, 1992). They can use their control to bargain down wages when such opportunities are scarce.

Access to knowledge is another important factor that determines who can benefit from resources. Beliefs, ideological controls and discursive practices as well as negotiated systems of meaning, shape all forms of access (Shipton & Goheen, 1992; Peters, 1994). For some resources, access might be driven by more than economics or moral claims to subsistence rights; it serves social, political and ritual purposes as well. Access to authority also shapes an individual's ability to benefit from resources. For instance, law partially shapes access to resources, capital, markets and labour. Privileged access to the individuals or institutions with the authority to make and implement laws can strongly influence who benefits from the resource in question. The mobilisation of this kind of access can be done through legal channels, as in making an application for a permit or lobbying through official channels.

### 2.4.3 The political ecology approach

According to Blaikie and Brookfield (1987), the political ecology combines the concerns of ecology and a broadly defined political economy. Together, it encompasses the constantly shifting dialectics between society and land-based resources and also within classes and groups within the society itself. The concept 'political ecology' emerged to provide an integrated analysis of the man-nature relationships through the integration of both physical/human ecology and political economy (Blaikie, 1985; Blaikie & Brookfield, 1987; Blaikie, 1989, 1993).

The approach examines the interacting roles that social institutions (international, national, regional and local) play in providing the constraints and possibilities that affect human decisions that in turn affect those institutions as well as the natural environment (Stonich, 1993). Interactions between the environment and the socio-economic sphere consist of dialectical, historically derived and iterative relations between resource use and the socio-economic and political contexts which shape them (Blaikie, 1999). Political ecology develops the common ground where various disciplines intersect and is therefore based on a plurality of disciplinary backgrounds.

In the 1950s, cultural ecology focused mostly on cultural adaptations to the environment (Bryant & Baily, 1997). The notion of 'ethno scientific knowledge' is central to cultural ecology, meaning "knowledge about the resource use strategies of indigenous subsistence communities who have non-Western agro-scientific knowledge" (Peet & Watts, 1996). Cultural ecology was criticised for being too simplistic; it was accused of portraying societies as a product of environmental circumstances, and of not paying sufficient attention to sociological factors (Schubert, 2005). As a result, the 1970s saw the emergence of political ecology, with less of a deterministic bias. Political ecology focuses on the political issues of the structural relations of power over environmental resources (Blaikie & Brookfield, 1987).

Political ecologists refuted most of the neo-Malthusian assumptions that the increase of human population will exceed food production levels, ultimately leading to famine and the extinction of the human race. Blaikie and Brookfield (1987) argue that "critical population density" is unlikely to exist for a certain piece of land, if the carrying capacity of the land changes with new technology or in the years of rich harvests (Schubert, 2005). Blaikie (1985) puts forward a "chain of explanation" model, which examines how multiple processes are shaping resource use. Within this conceptual framework, land degradation is analysed on the basis of causal chains between the "land managers" and their land, other land users,

stakeholders from the wider society who affect them, the state, and finally, the global economy.

In addition, a key concern of political ecology has been to analyse the ways in which the structure of property rights at various scales (e.g. the state, community and households), influences access to resources and land. Of particular interest is how property rights are defined, negotiated and struggled over among different social groups, be it class, gender or ethnic groupings and how this helps to explain the patterns of development and environmental conservation and degradation (Newmann, 2005). The question of who controls access is critical in analysing who participates in, gains from, or is excluded from the process of development. Particular attention has been paid to the spatial aspects of land rights in this question. This includes the way that ownership and rights vary by land type, land use, resource type and location, the notion of territoriality in relation to access control, and the importance of the political-economic context in specific locales.

The recent trends of economic liberalisation and privatisation have hastened the burgeoning of business interests, including foreign businesses and investments. This has concentrated on the tourist industry, while large-scale farming and mining has had considerable impact in high-potential districts including areas occupied by pastoralists. One of the areas which have been affected by this trend is Karatu District where there has been a substantial loss of grazing areas to large scale farms, while tourist hotels and campsites have been established.

The tendency of some villagers including village leaders to collaborate with the well-to-do bureaucrats and successful business people from Karatu and Arusha town to buy and/or rent land from the poor for onion production in villages around Lake Eyasi Basin has increased the inequality among the people in the area. As a result of poor living conditions and high cost of agricultural inputs, the poor people cannot afford to cultivate their land and decide to sell it to the rich. Government policies such as villagisation had also contributed to the movement of many rural people who migrated to other areas. As a result of villagisation there was a great confusion about the state policy concerning land tenure and the extent to which land should be redistributed. However, some changes were made based on direct orders from government officials to the village leaders whereby they were required to allocate land to all peasants in the villages and establish village farms.

The political ecology consists of a theoretically loose collection of holistic approaches that make more explicit how multiple and interacting political, cultural, economic, institutional and ecological processes operating at multiple and sometimes incongruent geographical and

temporal scales shape local environmental problems and affect the options available to the local decision makers to resolve these problems. However, the approach has also been criticised for assigning the blame for many local environmental problems to larger scale forces such as governments, national and international policies, capitalism and micro-economic factors and market forces, and therefore portraying the local people as victims rather than active agents. Little (1994) further argued that the political ecology approach has tended to emphasise the social and political dimensions of resource access and management at the expense of the physical ecological dimensions.

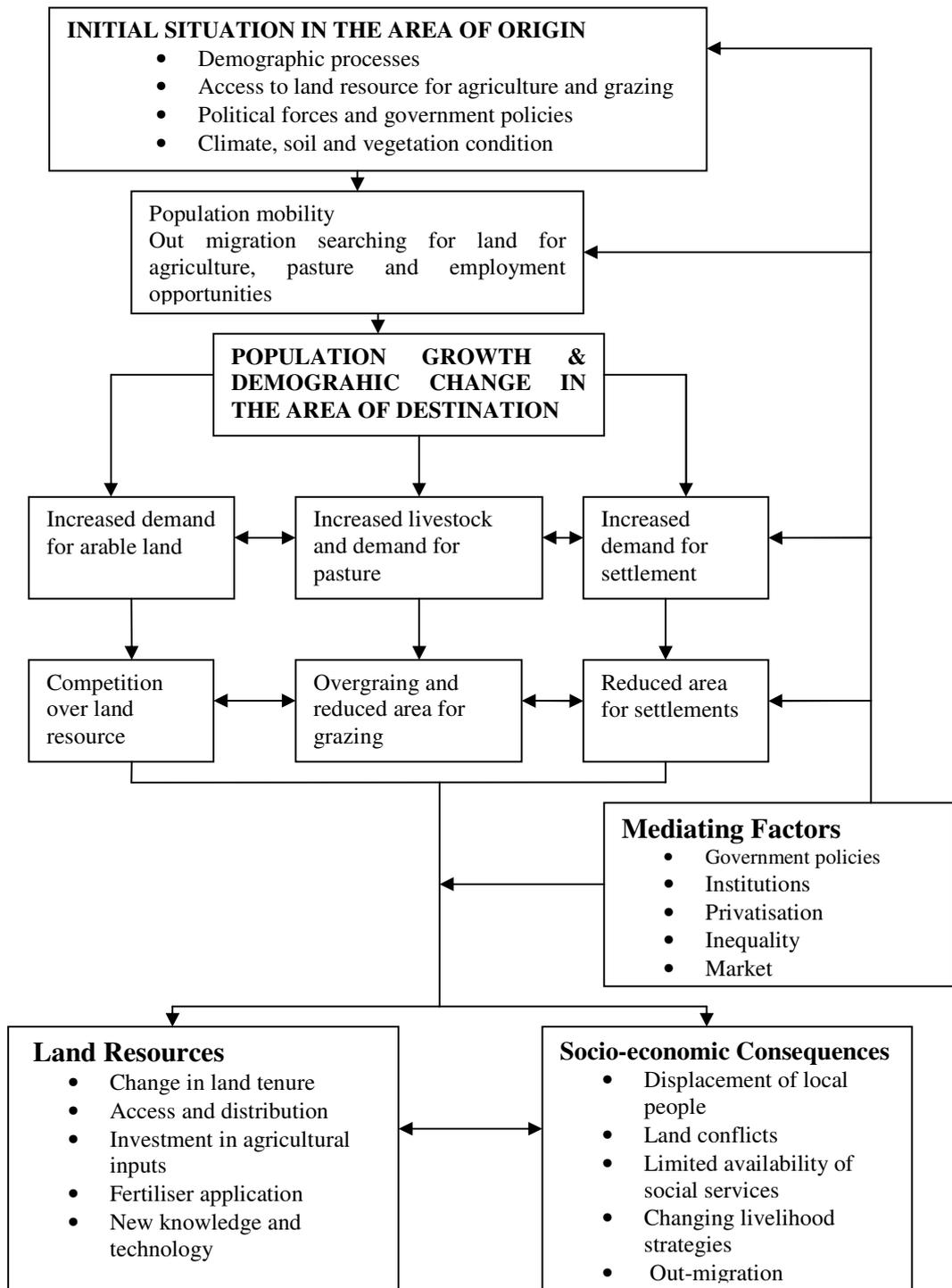


Figure 3: Conceptual framework for analysis of population mobility and changing land tenure systems and management. (Source: Yaro, 2000, with modification)

This conceptual framework shows that land resources in this study are a key mediator of human-environment interactions, in which demographic variables figure prominently among the driving forces to be investigated, and in which efforts have been made to investigate the causal mechanisms by which human population changes affect land use transformation outcomes. The increase in population results in increasing demand for land. The consumption of land for residential and agricultural uses may affect the use patterns of these resource in such a way that it may lead to conflicts over such resources.

High rates of population growth are creating high demand of arable land to meet the subsistence needs of a growing population. High population growth may be linked to the natural increase and in-migration caused by the push factors or pull factors, attracting the people to settle in areas with better livelihood opportunities such as irrigated agriculture. This, consequently, may contribute to agricultural expansion where land is available. However, there are many instances in which a big population has not resulted into the improvement of agricultural production; instead it has led to land degradation, displacement, land conflicts and pressure on the availability of social services.

The mediating factors such as national policies may foster the development of local credit markets, making it possible for farmers to invest in some plots and convert them to the production of cash crops. Raising awareness and convincing the pastoralists to reduce the number of cattle, may reduce the need for pasture, making large areas of land available for producing grain and other crops. The implications of exogenous changes on local land use are not always predictable, although a new road may increase the farmers' incomes and their incentive to invest in soil and water conservation, and it may also contribute incentives to deforest and quickly "mine" the soil's natural fertility (Bergeron, *et al.*, 1999).

The infrastructure, market structures, local organisations, technology and population affect the farmers' decisions either by reducing the costs per unit, by increasing the local output prices or by affecting risk. The farm internalises a complex set of internal and external relations. On the one hand, farmers continuously respond to the economic, technological and political forces which surround them; on the other hand, they routinely exercise options within that range (Lowe, Ward, & Munton, 1992). The main determinants guiding the farmers' selection of options are access to the factors of production; and individual motives and preferences, including their attitude towards risk and time horizon. State dependence, property and ownership issues and physical transformations are important factors in influencing land use as they are involved in land allocation and securing title deeds and the sense of tenure security which affect their willingness to invest.

## **2.5 Demographic change and land resource management**

In a historical study of population growth, agricultural productivity, and land degradation in Machakos District in Kenya, Tiffen and Mortimore (1992) and English (1992) also found support for Boserup's hypothesis. They observed that the colonial policies before the Second World War, when population growth was relatively slower, were mainly responsible for low agricultural productivity and widespread land degradation in the district. But after the Second World War, when the population of the district grew much more rapidly, it was accompanied with improved food production and considerable improvements in land degradation.

The evidence from Machakos in Kenya seems to suggest that population pressure in agricultural areas stimulates changes in farming and income generating systems and reverses the degradation process towards sustainable resource management (Tiffen *et al.*, 1994). Yet the World Bank views population pressure as a major hindrance to economic development and a cause of environmental damage (World Bank, 1989). These contradicting views necessitate a closer look into the linkages between population dynamics and natural resource conservation, including natural resources at the micro-level.

Rapid population growth increasingly generates pressure on the existing cultivated land and other resources, and induces migration to the marginal land of the arid and semi-arid areas in many developing countries, for example, Tanzania (Darkoh, 1982) and Sudan (Ibrahim, 1987; Bilsborrow & Delargy, 1991). Human actions that cause these various categories of changes are influenced to different degrees by the population dynamics (population growth, migration etc). The change from closed forest to open forest is mostly the effect of fuel wood exploitation, grazing and the related fire practices, and selective logging. Population dynamics (e.g. population growth, migration flows, urbanisation) play a role in these phenomena as well.

Population growth emerges as the most forceful driver of land use and environmental change (Gray *et al.*, 2005). Besides, migration of populations to new areas, overexploitation of the forests, expansion of agriculture to marginal lands, fragmentation of farms, intensification and diversification of agriculture, establishment of new settlements, soil degradation (due to reduced fallowing and cultivation of fragile areas), reduction in water availability due to high usage rates and vegetation change, decreased habitat viability and loss of habitat due to fragmentation of landscapes, are all processes that have been mainly driven by population growth. The raised livelihood expectations due to exposure to higher standards of living have further driven land use change (Soini, 2006). Various external influences at different times in history have to some extent influenced most of the major turning points.

A study by Madulu *et al.* (1996) revealed that population growth affects the natural resource base in many ways. Firstly, the increased number of people causes increased demand for food, water, arable land and other essential materials from the natural resource pool. Secondly, the expanded agricultural activities encourage deforestation. Many forests have already been cleared to give way to agricultural expansion. Between 300,000 and 400,000 hectares of forest and bush land are estimated to be cleared annually for agricultural expansion purposes (UN, 1993). An elaborate example of the Usambara Mountain suggests that almost 70 percent of the rain forests have been destroyed since 1954. While in areas like Tabora and Songea tree felling for tobacco cultivation and curing is rampant (Shishira & Yanda, 1998), agricultural expansion in forested areas is very common in Kondoa, Iringa, and Mufindi Districts (Madulu, 1998a, 1998b). Slash-and-burn cultivators set in motion a series of events leading to destruction of forests. Such expansion has intensified the existing land-use conflicts in many areas. Thirdly, population growth leads to increased demand for fuel wood, especially in the rural areas where it is the main source of energy.

According to him, increased population and cultivated land in the upper reaches increasingly consumed more water and reduced the volume and quality of water for downstream, which degraded ecological conditions and worsened the living conditions of the people in the downstream reaches. Some physical effects of human actions through land and water management can be described, if not quantified. Changing land cover and land use practices in the watersheds affect the discharge and quality of water, while forest management impacts downstream flows. Village land and water management and sanitation practices affect the quality and quantity of water available downstream, as the downstream users receive what comes to them from above. They in turn affect users even further downstream, out on plains, but they are unable to have physical impact upstream.

## **2.6 Land use transformations and linkage to the market**

Literature focusing on market demand theories identifies the household as a risk taker and profit maximiser, that higher income drives farmers to maximise production, by responding efficiently to farm market innovation, risk and stimulations in allocating their land and labour sources in farming (Schultz, 1964; Wharton, 1969). Reviewing West African cases, Gleave and White (1969) suggest that the production of cash crop could lead to land use intensification much similar to those induced by high population. Thus changes in the market in terms of price incentives create changes in land use. Market demand could compel households to produce surplus above their subsistence needs (Brush & Turner 1987). This has been due to market incentives, which make farmers to allocate more resources in their

limited land so as to maximise profit. In this aspect, households invest their scarce resources such as labour as long as the market is providing an incentive in terms of profit.

The role of the market in agricultural intensification has also been demonstrated in von Thunen's model of the "isolated state" (see also Hall, 1966; Brush & Turner, 1987; Dicken & Lloyd, 1990). The von Thunen model shows how market processes could influence land use in different locations. The model focuses on the market and the distance it is associated with as determining factors in the intensification process. The von Thunen model of agricultural land use is based on the following limiting assumptions: (i) There is one isolated market in an isolated state having no interactions (trade) with the outside, (ii) The land surrounding the market is entirely flat and its fertility is uniform, and (iii) Farmers in the isolated state transport their own goods to the market via ox carts, across land directly to the central city. The market is characterised by farmers who are much interested in the net profit. All agricultural land uses are maximising their productivity, which in this case is dependent upon their location from the market.

The model assumes that land use close to the market will be highly intensified with high frequency of cultivation associated with production of high value products and perishable crops. Meanwhile, the extent of intensification decreases as farms become further away from the market, depicting zones of different land use intensity. In other words, agricultural production will intensify in areas near the market to support high population demand in the market and vice versa. Despite the fact that the assumptions are too over-simplified to be realistic to the real situation, the model still has some usefulness on how the market and its distance to the given locality influence land use intensity. We may however acknowledge a strong relationship between the transport system and agricultural land use patterns. Also, as one gets closer to a city, the price of land increases.

Although the peasants may be seen as profit maximisers, by responding to market demand through increasing labour or capital investment in agricultural production, such peasants cannot easily achieve economic efficiency in the allocation of resources. It has been argued that peasant households are not true risk takers; they tend to be rather risk averse and optimisers at least to produce to meet subsistence needs as their survival strategy, and therefore respond in a proficient manner (Lipton, 1968; Schuller & Mount, 1976). In the same line of argument, this implies that subsistence farmers may suspend production of certain crops if they fear that their labour output would decline due to various factors including environmental and market related risks of cultivation.

The influence of the market is not the only factor which can explicitly provide an explanation for agricultural land use change. Pingali *et al.* (1987) from their study in Sub-Saharan Africa concluded that population growth and access to markets were the main determinants of intensification. It has also been argued that agricultural land use change is a response to the interaction between demands (consumption or market demands) and the biophysical environment in which it exists (Brush & Turner 1987). Human-environment relationships are shaped by various constraints imposed by the physical environment and the technological abilities of households to match these constraints (Bayliss-Smith, 1982; Blaikie & Brookfield, 1987; Brush & Turner, 1987).

Biophysical factors such as soils, seasonality of rainfall, and inaccessibility of irrigation water may have an impact on land use change despite the presence of high population and good market incentives. The biophysical factors may act as constraints to agriculture intensification as they offer a certain kind of limitation to production. For example, Brookfield (1972) has noted that low soil nutrient problems require specific input to minimise their impact on production; such a situation affects output and consequently the cultivation strategy. It has also been argued that the household's socio-economic production relation is linked to larger regional forms of social organisation such as nation-states (Brush & Turner, 1987; Netting, 1993). The government/state decisions and policies influence household decisions in production, which consequently determine the nature of agricultural land use changes (Blaikie & Brookfield, 1987). Various case studies done in Sub-Saharan Africa have shown that state interventions and government policies have influence on the direction of agricultural land use changes (Hayami & Ruttan, 1985; Tiffen *et al.*, 1994; Birch-Thomsen & Fog, 1996).

## **2.7 Summary**

In order to understand the implication of population mobility on land transformation and socio-economic development in the area of study, different theories, models and perspectives have been employed. The theories, models and perspectives discussed in this chapter have been categorised into three parts which include theories on land use changes, theories on population mobility as well as those which show the link between population growth and land use change. In this section, relevant issues from theories, models and approaches used in this study are discussed.

The neo-classical equilibrium perspective rooted in the theory of the geographer E.G. Ravenstein (1834–1913) was very crucial in this study. This was due to the fact that the theory states the main characteristics of migration and their relationship to physical and level of development of an area. Its assumptions on migration patterns being influenced by

distance and population density were used as bases for analysing the causes for migration from highland to lowlands areas. Distance influences the likelihood of migration, but it also serves as a filter that selects the type of migrants who are the most likely to move from one particular place to another. As the distance becomes shorter, more people will be encouraged to move and it will be easy for people to get information about the destination. Distance, therefore, serves as a selectivity factor for migrants. In that case, it will be useful to examine the kind of people who have moved into the area and determine their impact on land resources.

The push-pull framework was also important in explaining the motivation for people to move from one place to another. Population growth as a function of natural increase in Mbulu highlands increased pressure over land resources which motivated people to move from highland to lowland areas. Apart from population pressure, drought conditions in the area of origin hindered agricultural activities, and shortage of pasture compelled people to move to lowland areas where land and potential for irrigation agriculture and pasture was available. The availability of land for agriculture and pasture were among the pull factors for migration in the destination area.

The usefulness of the spatial mobility model was based on the fact that migration often involves permanent change in residence which can be most suitably designated by the term 'circulation'. According to Zelinsky (1971) circulation includes a great variety of movements which on most occasions are short-term, repetitive or circular in character, but all having in common the lack of any declared intention of a permanent or long-standing change of residence. The presence of migrants who have established permanent settlement and seasonal migrants would have direct impact on land resource in the destination area.

The social capital, chain migration, and network theory was employed in this study in order to understand the level of interaction between the migrants and their area of origin. The theory is a useful distinction as it describes the function of certain contributions that a migrant might derive from the connections to another person's part of the network and how this contributes towards such migrant's livelihood. Social capital, in the form of migrant networks, affects therefore the migrant motivations to migrate and the ability to adapt efficiently to the conditions found in the receiving area (de Haan, 2000b). The channeling functions of migrant networks take mainly the form of channels of information, resources and normative structures. The information channeled through the network allows the migrant to be informed about the conditions, opportunities and difficulties expected as part of migration. Through the assistance of friends and relatives, new migrants may more easily be able to obtain

information and receive active assistance in finding employment and a place to live, in arranging residence papers, or in finding a marriage partner.

The theory of access has been useful in this study as it describes the mechanisms through which people get access to land resource in the area of study. The various categories of mechanisms for access to resources such as technology, capital, market, labour and labour production, knowledge as well as authority have been useful in explaining the process through which rich migrant farmers acquire land through buying, renting or sharecropping with poor farmers who have failed to cultivate their land due to increasing cost of production. The ability to benefit from resources is mediated by constraints established by the specific political and cultural frames within which access to resources is sought. Besides, the categorisation of mechanisms for access to resources has been useful in the analysis of land resource conflicts and how these conflicts are being resolved at different levels in the communities.

The political ecology was also a suitable approach for this study because in political ecology the natural environment is perceived as a setting for human action, which at the same time is modified by such action, thus acknowledging the complexity of human environment interaction; in addition, the approach integrates the historical context and investigates interactions at different scales, both of which are key factors in land use change and management. It also takes into consideration power relations between the actors and allows one to establish the chains of explanation leading from the observed land use changes and management to the proximate causes, and finally to the underlying driving force.

The recent trends of economic liberalisation and privatisation have hastened the burgeoning of business interests, including foreign business and investments. This has concentrated on the tourist industry, large-scale farming and mining, and has had considerable impact in high-potential districts including areas occupied by pastoralists. One of the areas which have been affected by this trend is Karatu District where there has been substantial loss of grazing areas to large scale farms as well as establishment of tourists hotels and campsites. The inclusion of political ecology in this study was also crucial as it draws insights from different disciplines which enable the researcher to develop the modes of analysis that encompass and relate the central social and ecological variables as far as the area of study is concerned.

From the above discussion, it is evident that each of these theories, models and approaches has been used in the study of population growth and land use change in Sub-Saharan Africa and it has its own relevance and limitation in accounting for land use changes.

However, it is more likely that theoretical approaches can have a more meaningful contribution by forming a synergy in the analysis of population mobility and land transformation. Explanatory theories are more usefully considered when they complement each other than when they are applied exclusive of each other (Brush & Turner, 1987).

Therefore, in consideration that the study area is not in isolation from many rural communities in Sub-Saharan Africa, and Tanzania in particular, in order to provide a comprehensive explanation on the influence of population mobility and changing the land tenure system and management in the area of study, the conceptual framework of analysis for this study has employed a holistic approach by combining various theories, models and approaches related to the study.

It is also evident from the theories and literature review that although both variables in relation to population mobility and land use change have been explained, neither of the theories and models explicitly explores the linkages between population mobility and land use transformation and their implication in the land resource management as well as the socio-economic development in the area of study.

### **3. Population Mobility, Migration and Land Tenure in Tanzania**

#### **3.1 Historical background of population and migration**

Migration and mobility are integral elements of livelihood, especially in low and middle income nations, and population movement has been one of the major factors shaping settlement patterns throughout the world. Current patterns of migration and mobility are closely interrelated to the processes of social, economic and environmental transformation. Migration is often conceptualised as a movement from rural to urban areas. However, this is only one direction of migration flows; in many nations urban-urban, urban-rural and rural-rural movements are equally important (Tacoli, 2009).

Like in other countries in the region, there is a long history of rural-rural and rural-urban migration in Tanzania, dating back to the colonial and indeed pre-colonial times. The country also historically saw significant labour recruitment from neighbouring countries to provide the workforce for plantation agriculture. In Tanzania, rural-rural population mobility and migration has been taking place since many centuries. These movements have involved both crop cultivators and pastoralists. Several factors have caused these migrations, and these include climate, security, famine, employment and seasonal labour in high potential districts. A large movement of people has also been triggered by drought and dry-land degradation. Such migrants are referred to as environmental refugees (Timberlake, 1988).

Today's land squeeze caused by the rising population, land deterioration and land grabbing are putting more and more pastoralists of Central and Northern Tanzania on the margin of existence, forcing them to invade other areas. The Maasai, Barabaig, Kwavi and Sukuma are among the pastoral groups which have been migrating southward into Iringa and Mbeya Regions. There are fears that these pastoralists have crossed as far as Rukwa Region and Zambia. The migration of these groups can be dated as far back as the early 1950's. However, the migration of crop cultivators, just like that of livestock keepers, became more pronounced beginning the late 1970s. Thus, until 1972 the population of Usangu was composed mainly of the Sangu, Nyakyusa, Hehe, and Bena, who accounted roughly for 44, 12 and 7 per cent of the total population, respectively.

Until 1976, the largest tribe in the Usangu Plain was the Wasangu, although, the population was very mixed as a result of historical local movements and more recently substantial long distance movement into the plains (Mwakipesile, 1976). It is further argued that perhaps between 50 and 60 percent of the population growth from 1967 to 1976 was the result of immigration (Hazlewood & Livingstone, 1978).

Population mobility in Tanzania has also been experienced in areas around the Pangani Basin. The history of the Pangani Basin is marked by the continuous marginalisation of the indigenous population by both internal and external migrants. Despite widespread resistance from the indigenous population, land was commandeered for large scale plantations of coffee, wheat, sugar cane and sisal during the colonial period (Spear, 1996). This massive settlement led to one of the largest population displacements in Tanzania. The agro-pastoralists and herders forced to move from the better-watered Ngare-Nyuki area had to migrate to more marginal lands occupied by pastoralists like the Maasai.

After Tanzania's independence in 1961, the establishment of national parks and game reserves like Tarangire, Kilimanjaro, Arusha and Mkomazi took land from both the agro-pastoralists and pastoralists, leading to massive displacement and migration. Large tracts of land were also appropriated for the Kilimanjaro International Airport and large scale wheat farms in West Kilimajaro (Campbell, 1999).

Most migrants from outside the Pangani Basin come from the neighbouring parts of the country. New developments within the basin, such as the Lower Moshi Irrigation Scheme new towns and tanzanite mines have attracted migrants from more distant regions. The development of Kilimanjaro International Airport and the increasing urbanisation of regional headquarters like Arusha and Moshi have attracted in-migrants seeking access to water, education and health services. Larger scale migrant farmers from other parts of the country, motivated by the cultivation of new crops like soya beans and flowers, took over large tracts in the lowlands. Today, the cultivation of marginal land areas which were previously reserved for pastoralists extends to interior districts, generating new frontiers for land and water conflicts. Some pastoralists have been forced to change their social and economic activities, for example, the young Maasai have migrated in large numbers to major urban centres in the country for employment (Mbonile, 2001).

### **3.2 Population mobility and migration in Lake Eyasi Basin**

A review of the population records within Lake Eyasi Basin indicates that the population has been increasing rapidly over time. The main causes of rapid population growth in and around the basin are migration, mainly, by the Iraqw people from the densely populated highland areas in Karatu and Mbulu Districts (Meindertsma & Kessler, 1997a). The population mobility and migration in the basin can be categorised in three phases, namely, pre-colonial, colonial and post-colonial periods.

### 3.2.1 Population mobility and migration in the pre-colonial period

The history of population mobility and migration in the Lake Eyasi Basin and Karatu District (formally part of Mbulu District) can be traced back to the early 20<sup>th</sup> century. The mobility involved different ethnic groups such as the Datoga/Barabaig, Iraqw, Nyiramba, Maasai, Sukuma and the Gorowa. The Datoga, a Nilotic pastoral ethnic group, of which the most important subgroup today is the Barabaig, originated from the proto-Southern Nilotes related to the Kalenjin in Kenya (Nandi). They have lived in the area since 1000 AD (Ehret, 1970). According to oral history they settled close to the Ma'ang'watay area, probably in the present Kondo District, where the Cushitic, agro-pastoral Iraqw people were already living. Due to unrest in the Ma'ang'watay area the Iraqw were forced to move northwards into what became Mbulu District, sometime in the mid or late 18th century. The Iraqw were split into two groups: one that came to settle in the Kainam area between the Nou and Marang forests and the other that settled between Babati, Bonga and the Bubu River. This is considered to have occurred sometimes between 1770 and 1800. The northern group came to be called Iraqw while the southern group was called Gorowa. These two groups are consequently closely related to each other and understand each other's language (Schultz, 1971, cited in Loiske, 1995).

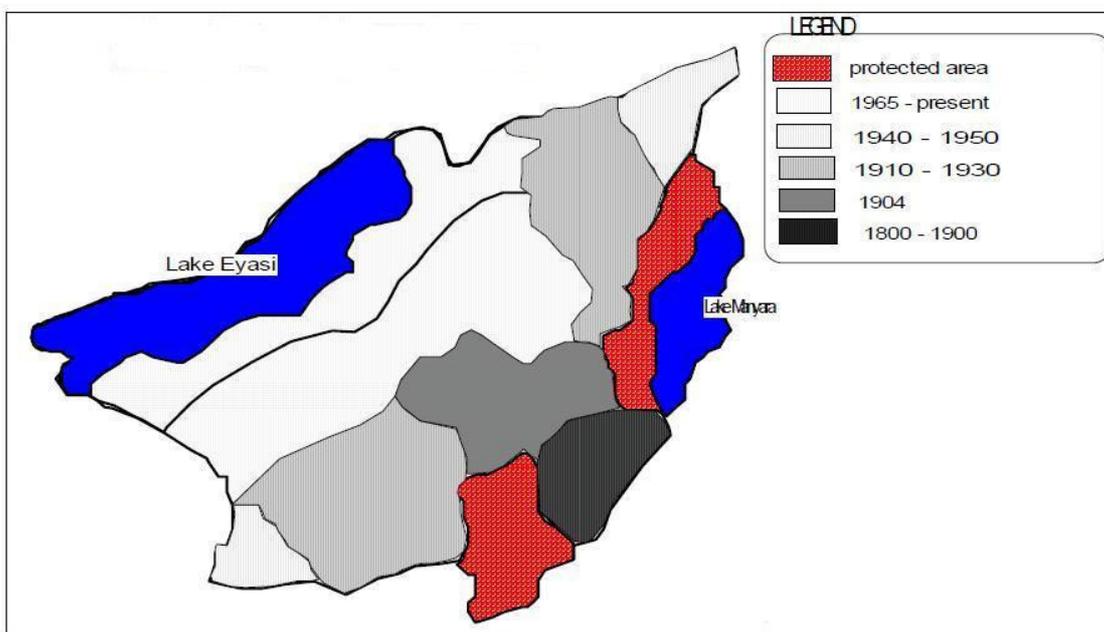
When the Gorowa group came to the Babati area a group of Bantu agriculturalists was living there. Due to Gorowa's migration, some moved to the dry area east of Lake Manyara that is now known as Mbugwe, while others moved southwards and formed the Rangi community in the present Kondo District. This happened some 200 hundred years ago. The most expansive group at the time was the Datoga that dominated large parts of the former Mbulu District (Schultz, 1971; Ehret, 1970). The Khoisan Hadza has probably lived in the very dry Yaida Valley for thousands of years. They live in hunters and gatherers communities of about 50 individuals and their ethnic history is not known (Schultz, 1971; Ingold *et al.*, 1991).

In the early 19<sup>th</sup> century, the Nilotic pastoral Maasai started to migrate southwards from Kenya (Kjaerby, 1979:10). The Datoga were forced to settle closer to each other in the marginal areas in order to be able to defend themselves against the Maasai, and this ended the Datoga expansion. The Iraqw, due to the Maasai pressure, became totally enclosed in the Kainam area. Increased demands on the land resources, due to isolation, and increased population, forced them to develop intensive agriculture in the area. The Mbugwe people were forced, as were the Datoga, to move closer to each other and to more remote areas (Schultz, 1971).

The Nyiramba people from the south-west of the Lake Eyasi Basin were also reported to move east and southward across the Serengeti in search of pasture and water where they encountered the Maasai herdsmen. In the fight, the Nyiramba broke into two groups, one moved north-easterly while another moved south-westerly to cross the Sibiti River basin at two different points: one to the south at Kitangiri Lake and the other through Lake Eyasi Basin in Karatu District.

### 3.2.2 Population mobility and migration during colonialism

Population mobility and migration continued during colonialism, which was between 1920's to 1960's. The movement of the people during this period was caused by an outbreak of tsetse flies in the Mbulu area. The spatial spread of the tsetse flies reached its peak during the 1930s when the government started to combat it seriously (Schultz, 1971). The eradication of tsetse flies started in the late 1920's with minor bush and forest clearings of the species that accommodated the insects. Map 1 shows the expansion of Iraqw in Mbulu and Karatu Districts. Note that Karatu District was split from Mbulu District in 1997.



Map 1: The Iraqw expansion in Mbulu and Karatu District  
(Source: Meindersma, J. & J. J. Kessler, J. 1997)

The major tsetse clearings in the area started after the implementation of the *Mbulu Development Plan* in 1948. Map 1 shows the Iraqw expansion from the 18<sup>th</sup> century to 1962. The Mbulu Development Plan had three aims: to open up new areas for habitation, to decrease the number of cattle in the Mbulu highlands, and to improve land use in the agricultural areas through soil conservation measures (Kjaerby, 1979:19). In the course of implementing the plan three large areas were cleared of tsetse and opened up for expansion during the 1950's, one north, one southwest, and one south of the Mbulu highlands. During this period, the Iraqw were encouraged by the authorities to move out from their over-populated area and afforestation campaigns were introduced in the Mbulu Highlands as well as mechanical soil conservation measures.

### 3.2.3 Post-colonial mobility and migration

Post-colonial population mobility can be classified into two phases; the first phase was experienced in the 1970's, during the Villagisation Programme of 1973-74. After experimenting with a variety of rural development policies, the Tanzanian government launched a Villagisation Programme for the entire Tanzania Mainland countryside. Basically, the programme was meant to replace the traditional system of rural settlements whereby households were located in small isolated pockets, with the creation of large villages in the latter. This entailed moving millions of people into new areas in a relatively short time.

The second phase of migration occurred in the 1990's as a result of increasing demand and soaring prices of onions in Arusha and the neighboring country, Kenya, which motivated businessmen from within, especially those from nearby districts or regions such as Arusha, Singida and Kilimanjaro and outside the country, to move into the area for business purposes. As these people entered the area for business purposes and were later motivated by good prices of onions in the market, they started to buy or rent land from local people who had bigger land, although they could not utilise it fully due to high costs of production.

### **3.3 The National Land Policy (1997)**

The National Land Policy (NLP) 1997 set a direction for land reform, and the new land registration measures include significant changes to the way land can be acquired, held and transferred. The land reform distinguishes between land under the authority of the central government and land under the authority of village governments. Elected village councils are now the managers of village communal land and are charged with the supervision of

adjudication and registration of village land within their respective village spheres of competency, including forests and woodlands.

Consistent with the National Land Policy (1997), the provision of the Land Act (1999) and Village Land Act (1999) and related regulations recognise the existing customary rights in land ownership and allow for registration of these rights. The Land Act also acknowledges that customary land rights are practised in different ways by different ethnic groups all over Tanzania. Customary rights as provided for in the new laws specifically include the right of households, groups or communities to hold commons as registered common property.

The present legal framework and procedures for the regulation of land rights in Tanzania is laid out in the two new Land Acts (i.e. the Land Act and the Village Land Act of 1999 URT 1999a+b) which became operational in May 2001. The policy behind these Acts is the National Land Policy of 1997 (URT, 1997). Land is now divided into three categories: general land, reserve land, and village land, while land management and administration is decentralised. The President in his capacity as the head of the Executive, delegates his powers to ministry officials to administer and manage land in all the three categories. The central office in the administration of land is the Commissioner for Lands.

General land is governed by the Land Act and it is directly under the Commissioner; reserve land is under statutory or other bodies set up with the powers over these lands (Forest reserves are for example governed by the Forest Act of 2002); and village land is governed by the Village Land Act and under the administration of the village council (Shivji, 1999). The village council acts as an agent of the Commissioner in administering land (Shivji, 1999). Village councils operate as trustees on behalf of the village members who together formally compose the village assembly. Thus, the principle is that the village council administers the land through the authority of the village assembly – the highest authority at the village level (Wily, 2003; Shivji, 1999; Sundet, 2005).

The National Land Policy in Tanzania sought to promote equitable distribution of and access to land by all citizens. Its major thrust was the conversion of land into an economic asset to which all citizens should have equal access. The policy also sought to recognise, clarify and secure in law the existing rights in land ownership especially customary rights of small holders. The overall objectives of the NLP are to promote and ensure secure land tenure, encourage the optimal use of land resources, and facilitate broad-based social and economic development without upsetting or endangering the ecological balance of the environment.

Specifically, the NLP intends to:

1. promote an equitable distribution of and access to land to all citizens, ensure that the existing rights in land ownership especially customary rights of small holders peasants and herdsmen who are the majority of the population are recognised, clarified and secured in law;
2. set the ceiling of land ownership which will later be translated into statutory ceiling to prevent or avoid the phenomena of land concentration, i.e. land grabbing;
3. ensure that land is put to its most productive use to promote rapid social and economic development of the country;
4. modify and streamline the existing land management systems and improve the efficacy of land delivery systems;
5. streamline the institutional arrangements in land administration and land dispute adjudication and make them more transparent; and
6. promote land resources from degradation for sustainable development.

The Land Resources Management Programme was conceived in 1999 to operationalise the land policy and the new land laws and to address specifically, the problems affecting the land sector such as lack of security of tenure over land, conflicts in land uses, difficult access to planned and serviced urban plots, uncoordinated land information, and bureaucratic land administration, among others. In fulfillment of the above, the Policy directs that local land use plans should be developed collaboratively between district councils and village councils and that the process should be participatory by involving all the beneficiaries.

The Policy further emphasises that before embarking on the planning process, there should be studies to determine the existing land tenure, land use patterns and land capacity. According to the Policy, village land use plans are a tool for implementing policies for better land use and management and are a basis for guiding extension service packages including techniques in agriculture, livestock, forestry, wildlife, fisheries and environmental conservation. Following these directives all villages in Karatu District have been surveyed by the land department and land use plans have been prepared. With regard to individual land titles, the Village Land Act No. 5 of 1999 provides for certificates of customary right of occupancy to anyone in the village with customary tenure; however, the majority of respondents reported to have no documents which support them to have ownership of land except the boundaries which have been set following mutual agreement with their neighbours.

Apart from the National Land Policy (1997), it is also important to note that Tanzania got its land reform when the parliament passed the 1999 Land Act and Village Land Act in 1999-2000. The acts came into force in May 2001. The reform is one out of many in a new wave of land reforms passed by Sub-Saharan African countries during the last couple of decades (Wily, 2003b:4; Lipton, 2009:258). Tanzania's reform was primarily a response to an increasing number of conflicts over land. Conflicts were difficult to manage and only few rights to land had been registered. By recognising existing rights to land, the reform seeks to improve tenure security. It also aims at creating a market in land which is thought to improve agricultural productivity and economic growth. It does not in any way aim at redistributing land. As such, it is a land law reform which describes how to create better administrative systems to secure those rights and how to facilitate a market in land (Fimbo, 2004).

From a legal point of view, the acts were applied from the day they came into force. From that day they were used by courts to settle disputes. With a significant degree of decentralisation in rural areas, the land reform is in line with general trends in Tanzania during the last two-three decades to gradually decentralise responsibility for delivery of public services to the local level (Max, 1991:100; Tidemand & Msani, 2010:3). Responsibility for management of land rights is vested in existing local governments and institutions at the village level, but the laws merely provide a framework for implementation in rural areas. Implementation is to a large extent left to village and district authorities (Wily, 2003a:1; Sundet, 2005:7).

### **3.4 Land tenure changes in Tanzania**

Careful examination of the relevant literature would seem to suggest that land tenure in Africa, and Tanzania in particular, has gradually evolved from the simple to the complex; from the communal types to those where there is more tight control over allocation of land, suggesting more individual control of land (North, *et al.*, 1961). Before Tanzania was colonised by the Germans and then the British, the general structure of landholding was based on different forms of communal access. The individual, as a member of a family, clan or tribe acquired the rights of use in the arable land he and his family could clear, cultivate and manage (URT, 1997). However, shifting cultivation was practised when the land showed signs of exhaustion. In many of these areas there was, and there is still, communal land for grazing and forest land for cutting firewood. This type of extensive cultivation was acceptable and viable under conditions of low population densities, abundance of land and subsistence agriculture.

Initially many communities had chiefs and elders or headsmen who controlled and allocated land to individuals on behalf of the tribe in a fiduciary capacity. This system was continued even during the German period from the 1880's to the First World War, and during the British Colonial rule from the First World War to independence, in 1961. Through the Imperial Decree of November 26, 1895, the Germans declared that all land, whether occupied or not, was to be treated as crown land under the German Empire. In practice, the settlers owned land because they were issued titles, while the indigenous people were simply left with recognition of the right of occupancy (URT, 1994).

The British colonial period differed slightly from the German period for two reasons. One was that unlike the German period, Tanganyika under the British rule was to be administered as a Mandated Territory under the League of Nations, and as a Trust Territory under the United Nations. The trusteeship system was intended to promote the welfare of the native inhabitants and to advance them toward self-government. The trusteeship system was supervised by the UN Trusteeship Council members of the United Nations administering trust territories and an equal number of other member nations, including all permanent members of the Security Council (Mezerick, 1964). The second difference was that the British colonial policy aimed at developing the country as a plantation/peasant economy as opposed to the settler colony which was the ultimate aim of the German colonial policy. These differences notwithstanding, the alienation of land in favour of settlers characterised both the German and British colonial periods.

Following Tanganyika's independence in 1961, and later the abolition of the chieftaincy by the African Chiefs Ordinance Act No. 13 of 1963 Cap. 51, the controlling power of chiefs over land, which was one of their traditional functions, was rendered obsolete. When land was held under family tenure, each member or heir of that family had a definite share in that property. Each member of the family could not dispose of his/her share without either getting the consent of other family members and the right of preemption from other heirs. Having abolished the chieftaincy in 1963, there was a need to have a comprehensive land policy that would govern land tenure, land use, management and administration in the country.

During the Ujamaa Policy, the traditional land tenure systems changed significantly under the Villagisation and Ujamaa Villages Act of 1975. Land was redistributed in equal parcels regardless of former land ownership. Land was given to individuals including migrants. However, former owners started to claim back their land since the 1980s, based on the traditional customary land tenure. This situation created a struggle for land between the

majority of youths who wanted to be allocated land under the Villagisation Programme and the elders who wanted to reclaim their former lands (Meindertsma & Kessler, 1997b).

The Villagisation Policy was established in 1974 to amalgamate dispersed settlements, and to form village-like structures so that they could be supplied with basic social services like education, water and health care (Shivji, 1994). It aimed to move the entire rural population into cooperative villages and redistributed the land to peasants as well as pastoralists and resettled the people into more compact villages (Rhode & Hilhorst, 2001). The Villagisation Programme in general had some setbacks regarding access, ownership and control of land resources. Its implementation affected the community's land uses either directly or indirectly. Shivji (1994) pointed out that villagisation as a reform of the land tenure lacked clarity of a systematically well-defined tenure system in the relocated villages. The absence of legal security of tenure enhanced multiple land problems in the villages in Tanzania (URT, 2000). In addition, the concentration of people in villages caused concentration of resources extraction in specific localities within and around the villages which have resulted into land use/cover changes and resources deterioration.

### **3.5 Land tenure in the study area**

The historical background of the study area has revealed the presence of different ethnic groups which rendered the traditional land tenure system in the area complex. While the Hadzabe and Barabaig are the original inhabitants and were the sole occupants until recent history, immigration has led to several diverse groups of people coexisting in the area (Kohl-Larsen, 1956; National Archives of Tanzania [File No.807]).

Among the Hadzabe who are hunters and gatherers, there existed a traditional land tenure system which stipulated open access for all Hadza within given territory. Their territory is not adequately protected against encroachment by agriculturists and pastoralists. Until the early 1960's almost all the Hadza lived in small nomadic camps (averaging 18 adults) and moved every two to three weeks. These camps moved for all sorts of reasons, not only to improve access to food, water and material needs, but also to abandon areas where persons had fallen seriously ill or died. The composition of the camps was flexible. Individuals and families constantly moved in and out for all sorts of personal reasons. More recently they have been under pressure from the government authorities to settle and grow crops. Some have done so, but many still live a nomadic life for much of the year. Their movements are much more restricted as a result of a very serious loss of land in recent years. Every Hadza was able to live, hunt and gather wherever he/she chose within the Hadza country. People

are associated with territories and their close kin mainly, but they never seek to exclude other Hadza from these regions (Lee, *et al.*, 2002).

Among the Barabaig/Datoga who are pastoralists, most of the land was used for grazing, and was divided into dry and wet season grazing areas. Land was owned and used by communities; thus, all members of the community had general access to the natural resources. However, after the Barabaig/Datoga left and moved to the Dongobesh area in Southern Iraqw, the whole area came under the Iraqw land tenure system. In Dongobesh area where the Barabaig/Datoga continue to live at the present time in good numbers, the Iraqw have never set up their system of land tenure with a land giver in charge of allocation.

During the late 18<sup>th</sup> and early 20<sup>th</sup> centuries the Iraqw who are an agro-pastoral people expanded in different directions from their origin area of Kainam in search of pasture and land for agriculture. The Lake Eyasi Basin in the lowland area was one of their destinations. The Iraqw who had moved into this area from many places obtained sites by seeking the permission of the nearest Datoga/Barabaig householders. Meindertsma and Kessler (1997), report that the first man (*Kahamusmo*) to enter a new land and build a house became the owner of the land. The whole process of land acquisition begins when the first man moves into a new area. He should go to a rainmaker and obtain magical medicines from him which will give him protection against the manifold dangers of the new and untried area. He then presents the rainmaker with a cow. The individual thus acts as though he were a county leader. The relationship between the rainmaker and the county leader is thus established. The man becomes the county leader and is responsible for the rituals and for the distribution of land within it (NAT, No. 807).

One of the most important rituals in the Iraqw society is the *masay* ritual, which protects the community against external evil forces and establishes the spatial boundaries. The ritual is performed by the *qwaslarmo* who locally is considered to have strong supernatural powers. The ritual takes two days whereby the first day ritually protects the largest spatial entity, the *aya* (the village); and the second day protects the individual households in the *aya*. The *masay* ritual has been conducted in fairly the same way throughout the centuries and there are examples of similar rituals among other peoples of the region.

The *masay* ritual is also important for the spatial expansion. When the ritual is performed for the first time in an area which was initially uninhabited, it is called *s/aa* (the wilderness). Following the ritual, the land is then considered to become a part of the Iraqw world. If the crops fail or if the societies are threatened from outside, the *qwaslarmo* that had performed the latest *masay* ritual is considered too weak and a new ritual leader is appointed

(Thornton, 1980, cited in Loiske, 1995). These cultural characteristics make the Iraqw spatially expansive and strengthen social cohesion in new settlement areas. The Iraqw have, and bring with them, a pattern of organisation and settlement system (neighborhoods) that has made them successful participants in the regional history.

In the beginning, the whole process of land acquisition was rather informal. The site was pointed to the prospective new comer with only vague indications concerning its boundaries. However, as the number of households increases it becomes necessary to set boundaries to the individual holdings. Finally, all the land is assigned to separate households. Thereafter, anyone wishing to settle in the area must obtain permission to use land, not from the land giver (*Kahamusmo*), but from an individual already possessing a holding. The area over which an individual acts as a land giver is not seen as his personal property. He is merely the agent whose duty is to divide it among the people. Thus, once a piece of land has been allocated to an individual the land giver has no power to deprive such individual of the land, at a later date.

The situation is much more informal when a man moves away. The holder cannot prevent other people from using the land when he leaves the area; he can only prevent other people from using it by maintaining his own occupation of the land or by transferring his rights to another individual. When a man changes his residence, when he moves away from Central Mbulu to one of the expansion areas, and he is not concerned with the use of the land he has left behind. He only knows that if he would wish to return at any time in the future, he could do so, and if anyone else is using the land he had left behind, the former can be forced to give way. Thus, the strong rights of the original holder do not lead to a situation in which land remains unutilised. In the simplest case, nearby neighbours take their stock over the holding. Anyone can make use of the abandoned agricultural plots. However, if dispute should arise because two men want to take over the same plot, this can only be settled by appealing to the original holder.

There was no predetermined division of land upon the death of a man. All the land held by him in theory would go to his sons as a group, under the administration of the one who is appointed as his successor. His daughters had no rights to the land. In default of the sons, the rights pass to his brothers or to his nearest male relative in the lineage. In actual fact, the division of land usually occurs during the lifetime of the father. As a son reaches adulthood and marries, he builds his own house and cultivates his own plots. If land becomes scarce, the younger sons move to less heavily populated areas or the older sons may decide that they would rather try their fortunes in new areas. If the land is already taken by elder

brothers, a younger brother may still be able to stay in the area by obtaining land on a loan basis from the neighbours.

When a man moves to another area and dies, his sons in their turn have the right to return to the original holding. In theory, these rights are supposed to go on through the generations forever, but in fact they are extinguished relatively quickly, since grandsons seldom know the precise location of their grandfather's holdings. In this way, of course, people whose holdings were originally obtained on a loan basis convert these claims to the status of the original rights, since the land is theirs unless someone else can prove that the land they are occupying was in fact lent to their ancestors.

The right over a holding given to an individual by a land giver cannot be revoked. The individual is free to do as he wishes with the land, and he may, if he desires, transfer his rights to another person either on a temporary or on a permanent basis. It is possible for a person to buy such rights permanently from their original holder by either brewing special beer for him or by giving him stock. This must be done in the presence of elders, and the man transferring the rights must state clearly that he is giving up all the rights to the land in the future, although this type of transaction was rare. On the other hand the lending of rights to land by the original holder was extremely common. No payment was made in this case. Transfer of these rights on a loan basis is seen by the Iraqw as directly comparable to the procedure by which one man lends a cow to someone else. The latter may use the milk obtained from the cow, but he has no right to dispose of the animal and the owner may recall it any time. Occasionally, the original holder may stipulate the time limit, telling the borrower for instance that he may use the land for only one year, but in most cases it is tacitly understood that the lender will not demand its return in the foreseeable future. He does however have the right to demand it back at any time.

### **3.6 The Structural Adjustment Programme and Land Tenure System**

During the 1960s and 1970s, Tanzania implemented the policies of self-reliance. These included extensive compulsory villagisation (*ujamaa*), nationalisation, and price controls. By the 1980's Tanzania was the world's second poorest country in GDP per capita terms. At the same time, its natural resource base became noticeably threatened (Msambichaka, *et al.*, 1995). These problems necessitated a movement towards more market-oriented policies and a change of political leadership. In 1981, Tanzania launched two consecutive broad-based structural adjustment programmes. The SAP had two aspects to it: crisis management and structural adjustment. The first aspect aimed at getting inflation under control while achieving

a quick restoration of productive activities. The second aspect aimed at pursuing policy measures that would reduce dependence on external support and restore growth momentum.

Crisis management envisaged restraint measures such as cutbacks on government expenditures and imports, in order to restore economic balance both internally and externally. The policy instruments that were used included the budget, prices and credit. It also meant a short-term shift away from new investments in order to mobilise and concentrate the available resources for full utilisation of the existing capacity (Mlambiti, 1998). On the other hand, the Adjustment Programme, among other things, envisaged a broad set of mutually consistent and interacting policies whose general objectives were to restructure future economic activity, to rationalise production and to improve planning and control systems through more effective budgeting, monitoring, evaluation and enforcement of the agreed priorities.

According to Reed (1997) the Structural Adjustment Programme attempted to correct economic imbalances and improve efficiency of developing and transitional economies, thereby setting the state for further development. In an attempt to understand the effectiveness and impacts of such programmes Reed studied nine cases, the findings of which showed that generally the Structural Adjustment Programme in Tanzania had increased the rates of environmental degradation by increasing input prices, promoting unsustainability through market liberalisation, and reducing expenditures on reforestation. In addition, unrelated sectoral policies had exacerbated degradation problems. According to him, the ending of *ujamaa*, poor agricultural extension, poor enforcement of land clearing, ambiguous land tenure, and inappropriate energy pricing, all reduced the incentives to conserve.

Structural adjustment has also differentially hurt the poorer farmers because pricing schemes have caused the cultivation of marginal lands. Thus, a positive feedback loop has been created causing a downward spiral of economic and environmental wellbeing. Furthermore, the majority of the rural population was becoming poorer and poorer (Msambichaka & Naho, 1995). The rise in grain output has proved unsustainable and the combined earnings from traditional export crops are down. Bienefeld (1995) concluded that Tanzanian farmers are facing a bleak future under the ERP. Producer price increases turned out to be small and short-lived and were mostly nullified by input price increases. Mbonile (1995) argued that the removal of subsidies on agricultural inputs was a devastating blow to agriculture and rural development because it coincided with the time that the farmers had started to realise the importance of these inputs.

Farming practices have not improved because structural adjustment has limited the farmers' access to better technologies like the use of superior seeds and fertiliser because they are not affordable due to lower crop prices and higher input prices. Cropping patterns have also changed due to adjustment. Tanzania experienced a 17 percent increase in the land planted with cash crops. About 80 percent of this increase consists of highly erosive crops such as potatoes, tobacco and vegetables. Although several speculative reasons have been suggested, the structural adjustment's market liberalisation facet is known to be the main contributor to the problem. It has encouraged the production of cotton and maize for export, both highly erosive, and both major cash crops in terms of the cultivated area.

A notable weakness on the part of the SAP 1982 was the lack of specific policy measures with regard to the agricultural sector, especially concerning increasing production (Skarstein, Havnevik, & Mmbaga, 1988). This weakness, however, was compensated through another policy document- the Tanzania National Agricultural Policy. As a policy document, NAP thoroughly covers the agricultural sector in all its aspects. It reviews various modes of production carried out in the country, the land tenure system, crop production, farm labour, agricultural marketing, the input supply and delivery systems, finance, and foreign exchange allocation.

The crucial areas that compensate for the weakness of SAP are those concerned with the modes of farming and land tenure systems, agricultural prices, finance and the whole issue of the private sector. On the modes of farming and land tenure systems, NAP recognises the presence and role of large scale private farming. Although technically land still remained the property of the state, the policy directed that its allocation for agricultural development should be on a longer term basis, with a minimum of 33 years, in order to provide for the security of private investors.

Since the IMF agreement of 1985, the trends of economic liberalisation have hastened the burgeoning of business interests, including foreign businesses and investments. This has concentrated on the tourist industry, large scale farming and the mining of gem stones. This policy had a considerable impact in high potential districts, including areas occupied by pastoralists. For example, in Simanjiro District this policy resulted in substantial loss of grazing land to large scale farms, the operation of businesses in the district and the expansion of mining activities. As a consequence of population pressure from the surrounding agricultural areas, there is now competition over natural resources between the pastoralists and small scale farmers, as well as between the pastoralists and large-scale farming and business interests (Muir, 1994).

The natural resources under threat in the four villages studied by Muir were loss of natural water sources to large scale farms, reduced trees and browse as a consequence of opening fields and the production of charcoal, and restricted wildlife movement because of the development of large scale farms for which wildlife movement could be a nuisance or a threat to crops and people. By 1993, over 45,000 hectares had been acquired in Simanjiro District for 72 largescale farms ranging in size between 90 and 12,400 ha (Kamal, 1993). This figure excludes land acquisitions not lodged with the land adjudication office, and subsistence farms. But in some instances land acquisition has not followed the laid down procedure and most of the purchases are by the well-to-do people and are based on speculation on future markets rather than immediate use.

Furthermore, a study on household food economy assessment in Arusha region, carried out by the Prime Minister's Office under the United Nations World Food Programme in 1999, revealed that land grabbing in the late 1980s and early 1990s, following new investment provisions passed during the Structural Adjustment Programme led to a number of contentious court disputes in Kiteto and Simanjiro Districts. For most part, these disputes have centred on the claims by pastoralists that commercial interests including large-scale bean and flower farmers, hunters, mining companies, ranchers and conservationists have overstepped the bounds of their original land allocations and are infringing on the remaining land of the pastoralists.

Diminishing resources have clearly played a central role in shaping the current context of these areas in both negative and positive ways. On the negative side, loss of prime pasture lands has strained a livelihood system that pivots on the access to grazing and scarce seasonal water sources. On the positive side, as evidenced by the legal actions themselves, this pressure to establish claims on land has created a new awareness among the pastoralists in Simanjiro particularly, and they in turn have risen to the challenge and vigorously defended their rights. Through resistance against encroachment, new knowledge about their rights and opportunities has grown (Boudreau, 1996). This new awareness, combined with an increasingly poor livestock market, has encouraged most to begin claiming land themselves, and to begin cultivating to cover subsistence requirements.

Land acquisition by internal and external investors has also been experienced in Karatu District. By the year 2008 it was estimated that about 11,356 hectares had been acquired for large scale farms mainly involved in wheat, barley, coffee, onions and sunflower production (DALDO, 2010). This figure excludes lands which have been acquired for the establishment of tourist hotels and campsites, as a result of growing tourism in the area. In all

cases, the land acquisition process in the area has increased pressure over land resources and has become the major cause of people's migration in the area.

## **4. Research Methodology and the Study Area**

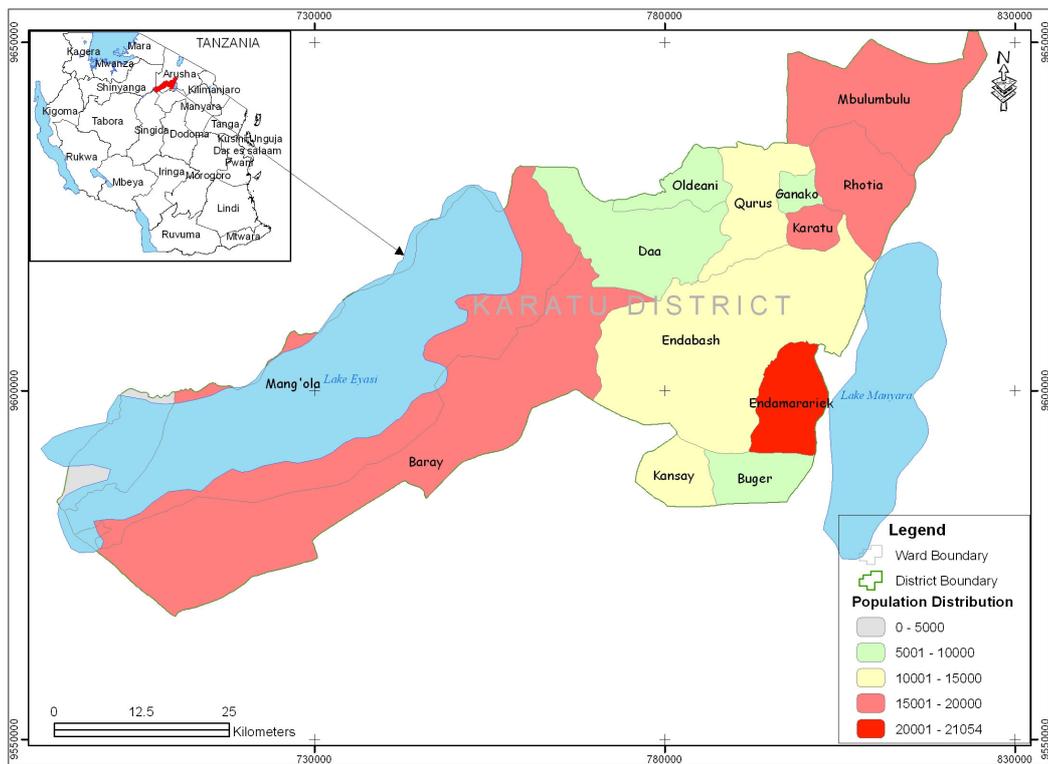
### **4.1 Overview**

This chapter outlines the methodologies which have been used in this study. The first section discusses the location and the description of the study area which includes the landscape, soils, climate and vegetation. The section also provides insights into the historical profile of the selected villages in the district. The section is followed by the methodological approaches used in the study and the sampling procedures. The main sources of data, instruments and details of analysing this data are presented in this chapter.

### **4.2 Location and description of the study area**

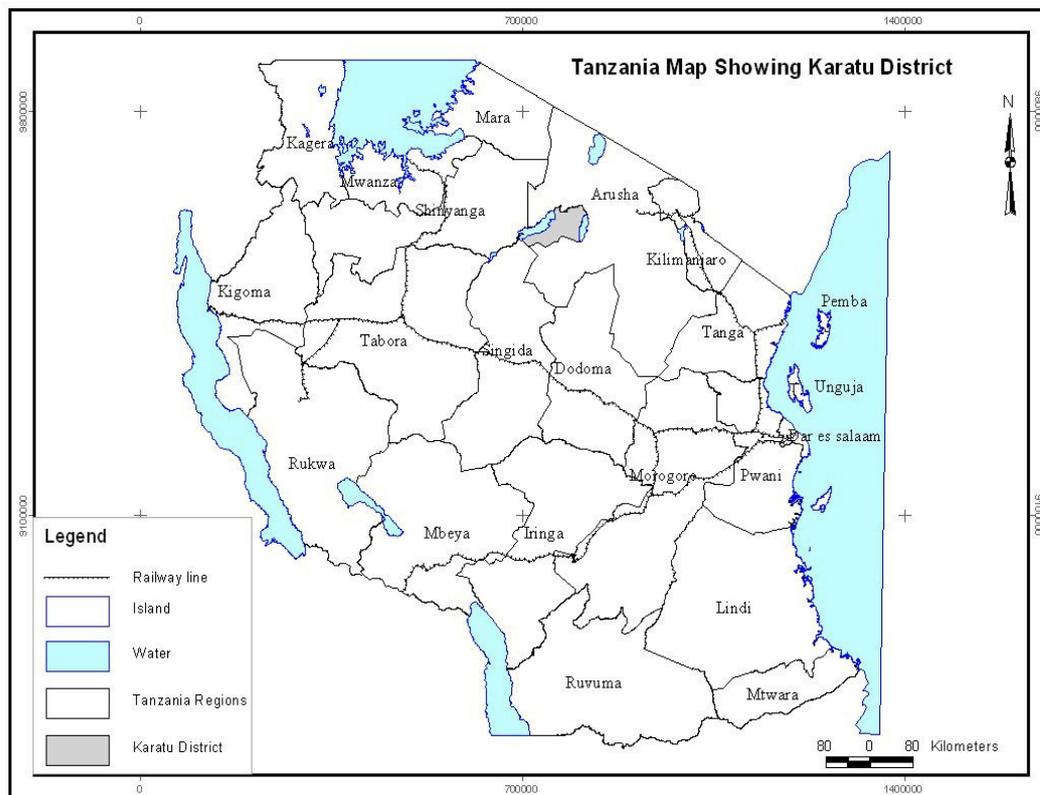
#### **4.2.1 The study area and demography**

Karatu District is one of the seven districts in Arusha Region in Northern Tanzania. The district lies between latitude 3°10'14"S and 34°47' – 35°56'E. Administratively, the district is divided into 4 divisions, 18 wards and 45 villages. The estimated area of the district is 3300 km<sup>2</sup>. Arable land accounts for 102,573ha, grazing land is 155,808ha, forest and grasslands account for 61,218ha and Lake Eyasi has 1,060ha. The total human population is 209,316 (108,844 males and 100,472 females) with a dependence ratio of 97. The population growth rate is 3.1 % per year and the average household size stood at 5.4 compared to 4.5 for Arusha Region (NBS, 2002). The average population density is 52 persons/km<sup>2</sup>, with low densities in the western zone along Lake Eyasi (7–10 persons/km<sup>2</sup>) and higher densities (100 persons/km<sup>2</sup>) in Karatu and Mbulumbulu divisions (URT, 2004b). Most people live in the higher rainfall areas where the average population density tends to be high. Map 1 show the population distribution of Karatu District based on the 2002 Tanzania Population and Housing Census.

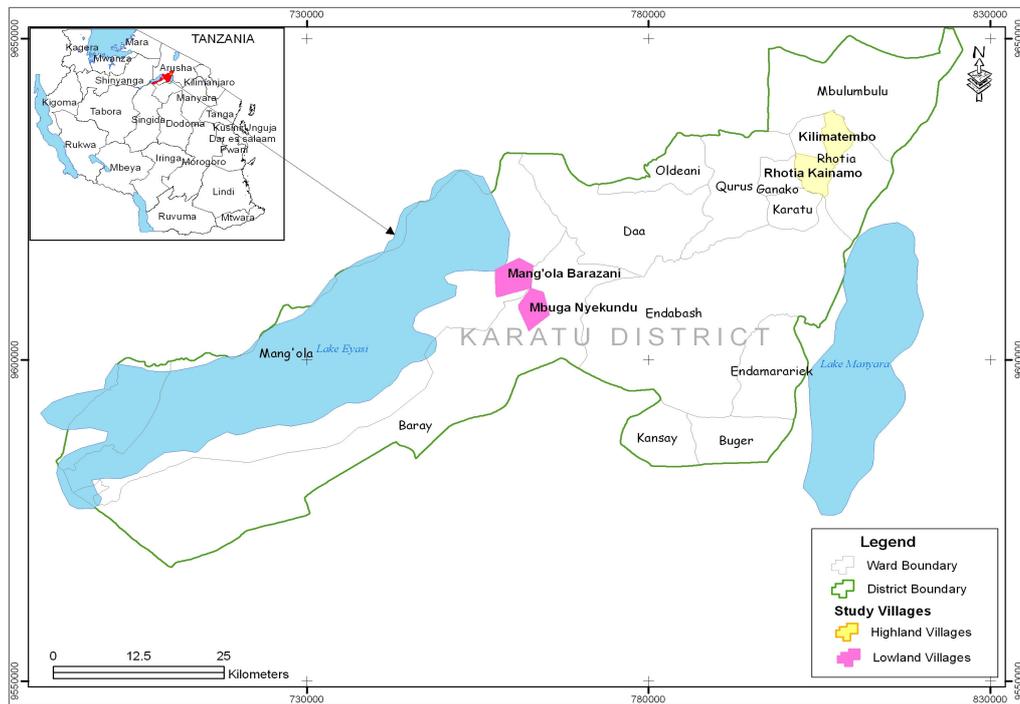


Map 2: District population distribution of Karatu.

Geographically, the district is divided into three geographical areas, namely, the highlands, mid-lands and lowlands. The field study was conducted in four villages: two located in the lowlands around Lake Eyasi Basin and the other two located in the highlands of Karatu District. Maps 2 and 3 show the location of Karatu District in Tanzania and the village study areas which are Mang'ola Barazani and Mbuga Nyekundu in the lowlands, and Rhotia Kainam and Kilimatambo in the highlands respectively.



Map 3: The location of Karatu District in Tanzania



Map 4: Location of the study areas in Karatu District

#### 4.2.2 Historical profile of the study villages

##### 4.2.2.1 Villages located in the lowland areas

###### a) Mang'ola Barazani

Mang'ola Barazani Village is dominated by its lowland, irrigated farming system. The village is located in Mang'ola Ward which is approximately 80 kilometres south-west of Karatu District headquarters and approximately 210 kilometres west of Arusha Town. Mang'ola Barazani is dominated by the Iraqw who consistute about 70 percent of the population and followed by the Chagga and Barabaig, and other ethnic group from different parts of the country. The village is connected to the highway by a rough road that is easily passable during the dry season but difficult to use in the rainy season. Public transport is the common means of local transportation. Mang'ola Barazani has an area of about 3181.20 hectares (43.98km<sup>2</sup>), of which 2800 hectares comprise of arable land. The village was officially registered in 1974. Currently, the village has 10 sub-villages, namely Shuleni, Sasgwenju, Mlangareni, Antsa, Mbuyu Centre, Mibuyu Miwili, Kisimangeda, Mayfolah, Mswakini and Naray. The population is much concentrated in Shuleni sub-village where there are various social services such as shops, schools, a health centre and dispensaries. According to the 2010 village statistics, there were about 8,546 people, with 1884 households and an average of 5.6 household size, that year.

There are 3 primary schools in the village, namely, Mang'ola Barazani, Mang'ola Chini and Antsa. The village has three secondary schools, which are Domali and Mang'ola Secondary Schools owned by the government, and Anna Gamazo Secondary School which is privately owned. There is a health centre which is owned by the Catholic Church and two dispensaries, one of which is owned by the village government and the other one is privately owned. The dispensaries and the health centre in the village provide all the basic medical care, and maternal and child health services.

#### **b) Mbuga Nyekundu**

The village is located about 85kms south-west of Karatu District. Almost 80 percent of the villagers are Iraqw, followed by other ethnic groups. Formerly, Mbuga Nyekundu was a sub village of Jobaj Village, but due to increased population in the area the sub village was promoted to a village in 1999. It has an area of 4398.13 hectares (28km<sup>2</sup>) and four sub-villages, namely, Mbuyuni, Mpomeni, Baray and Darajani. According to the village statistics, the population of the village in 2010 was estimated to be 2364, of which 1289 were male and 1075 female. There were 781 households with an average household size of 6.2. In terms of social services, the village has one primary school, one village government dispensary, and a water department which is responsible for the distribution of domestic water in the village.

#### *4.2.2.2 Villages located in the highland areas*

##### **a) Rhotia Kainam**

Rhotia Kainam is located 12kms north-west of Karatu District headquarters. It is one of the five villages which comprise Rhotia Ward. Almost 99 percent of the villagers are Iraqw who migrated into the area in the 1950's from Kainam Village in Mbulu District. According to discussion with the elders, Kainam is the original place of the Iraqw people before they expanded to other areas of the district as it is shown in Map 3.1. The village was officially registered in 1975. The village has an area of 7000 hectares with three sub-villages which are South Kainam, Jaranjar and Juhudi. The village population in 2010 was estimated to be 2760, of which 1226 were males and 1534 were females. There were 518 households. Agriculture is the main economic activity followed by livestock keeping. The food crops grown in the village are maize and beans, while wheat, pigeon peas and beans are the major cash crops. The village has three primary schools and one secondary school.

##### **b) Kilimatambo**

Kilimatambo Village is located 15kms on the north-west highlands of Karatu District. As it was experienced in Rhotia Kainam, the village population is dominated by the Iraqw making almost 99 percent of the population. The village has four sub-villages namely, Huduma,

Kilimatembo Juu, Barabarani and Gilala. The population of the village was 4115 in 2010 with 821 households. Among the population, 2005 were males and 2110 were females. Total village area is 7850 hectares of which 5870 hectares are suitable for agricultural activities. More than 90 percent of the villagers are agro-pastoralists although the number of cattle has decreased due to the expansion of farms and lack of grazing areas. There are 3 primary schools in the village and 2 dispensaries, one belonging to the village government and the other one is a private dispensary, which provide basic treatment and MCH services. Referral patients are sent to hospitals in Karatu or Arusha Town.

#### 4.2.3 The landscape and soils

##### 4.2.3.1 *Landscape*

The landscapes in Karatu District are highly contrasting, ranging from highly dissected hilly and mountainous areas to extended alluvial and lacustrine plains. In the northern part of the district volcanic mountains rise to an altitude of about 3,650 m, often with smaller volcanic cones on their slopes. At the foot of these mountains are broad, gently dissected piedmonts. The central part of Karatu District is a broad plateau bounded by the Manyara Escarpment to the east and the Yaeda Escarpment to the west. Elevations on this plateau reach 2,400m. Below the Yaeda Escarpment a gentle dip slope leads to the salt pans of Lake Eyasi. The southern and south-western parts of the district form a slightly dissected peneplain at an elevation of 1,600 - 1,900m. This peneplain is characterised by bare granitic hills and chains of hills rising to between 1,830 and 2,125m. Extensive grassland systems are common on this peneplain (a relatively flat land surface produced by a long period of erosion).

Lake Eyasi is the most significant water body in the Eyasi and Yaida internal catchment basin, which also includes the Wembere steppe and Lake Kitangire. The Lake lies in a trough between the Mbulu Highlands to the east and south-east and the Ngorongoro Highlands to the north and north-west. It is 80 kms long with an average width of 14.5 km and is fed mainly from the south-west by the Sibiti River. The shallowness of the lake, the low amounts of direct precipitation (around 600 mm per annum), and high rates of evaporation ensure the water is highly alkaline. During the years of low rainfall, the lake is reduced to a dry soda crust. The escarpment wall to the north-west rises some 800m, virtually from the shore of the lake, and assists in protecting the western shoreline. To the north-east, numerous farms have expanded in recent years, exploiting the seasonal streams to grow vegetables.

#### 4.2.3.2 Soils

As described by Magoggo (1992), Brom and Van der Wal (1994), as well as the Tanzania's National Soil Service (NSS) (1990), the main factors which control variations in soil characteristics in the district are parent rock and topographic position. There are four main parent rocks to be distinguished, i.e. granite, gneiss, schist (all belonging to the Basement Complex) and undifferentiated volcanic rocks (basalt, lavas, scoriae and ignimbrite). As initial approximation, the soils of the district can be distinguished on the basis of parent rock. The topographic position and other factors give rise to variants of the main characteristics as determined by the parent rock.

Based on these factors, the highlands zone is characterised by the alluvial soil type which is typically found along the valley floors and is considered among the soil types that are highly suitable for cultivation, though it is prone to flooding. The valleys are considered only marginally suitable for cultivation because of their steep slope and pronounced stoniness. Clay soils of moderate fertility are also found in the valleys in gently rounded summits and on slopes overlying soft gneiss rocks. There are also predominantly volcanic clay soils the origins of which are found in the Ngorongoro land system which includes moderately steep foothill ridges of volcanic cones, lava plains and foothill slopes. Soils with recent ash deposits rich in salts are highly erodible.

In lowland areas around Lake Eyasi Basin the soil types are Solonchak/Solonetz Arenosols (saline or alkaline sands) in nature, as well as Gleysols (sticky, waterlogged), Eutric Fluvisols (calcium- and magnesium-rich flooded soils) and Vertisols (vertically mixed with clay for 30 percent). Arenosol sands are found in the north-west and south-west areas of Lake Eyasi. They developed on alluvial (stream) or lacustrine (lake) sediments carried by water into the Lake Eyasi Basin. Arenosols have very little organic matter and no clay subsoil, hence cannot support vegetation other than small amounts of locally specialised species. In the dry season, they are wind eroded. Gleysols are sticky, gray to blue soils that become seasonally waterlogged by surface flooding or rising groundwater. The gley soils at Lake Eyasi are both luvisol and cambisol. Luvisol has a clay lower horizon originally transported from another location by water or wind along with sand or silt. The clay is leached out of the sand or silt upper horizon. Cambisol is silt soil that is just beginning to develop horizons and has no significant amount of clay. At Lake Eyasi, gley soils developed above indurate (hardened) sediments underlain by granite or gneiss. The grey soils in the area have low structural stability. It is also quick in wetting which leads to rapid slaking and often crusting. The tillage

when wet can result in remoulding or smearing. This results in reduced water infiltration, increased soil strength and affects plant root growth.

#### 4.2.4 Climate and vegetation

The climate of Karatu District varies from one area to another. The lowland area where the Lake Eyasi Basin is located lies within a region of inland drainage which is primarily a semi-arid region with sparse vegetation and characterised by low rainfall and high daily temperatures. The annual received rainfall is between 300mm to 400mm, while in the highland areas it ranges between 900 mm to 1000 mm per annum. The wettest month is April when the rain intensity can be high enough to cause great erosion. The area experiences four seasons, which are short rains, extended from November to December; short and hot dry period, from January to March and mid-May; while the long and cold seasons occur from June to October. The mean monthly temperature ranges from 25° C to 30°C (Mabulla, 1996). Table 4.1 presents the rainfall distribution of Karatu District from 2000 to 2005.

Months	Year					
	2000	2001	2002	2003	2004	2005
January	-	149.3	124.6	18.7	65.9	37.5
February	25	48.8	126.3	14.2	26.3	48.4
March	90.6	148.9	115.5	104	54.7	67.2
April	94.4	180.6	222.5	20.9	124	38.8
May	4.0	30.1	89.3	137	3.9	27.7
June	-	4.4	-	1.1	2.5	1.1
July		3.5		1.0		1.5
August			9.1			1.5
September			18.5			
October		6.4	62.5	14.2	53.6	40.7
November	31.5	67.9	24.4	61.7	68.0	22.4
December	10.5	171.2	15.3	42.7	198.5	3.9
<b>Total</b>	<b>256.0</b>	<b>811.1</b>	<b>808.0</b>	<b>415.5</b>	<b>597.4</b>	<b>320.7</b>

Table 1: Karatu District rainfall data (mm) 2000 - 2005

(Source: Karatu District Agricultural and Livestock Development Office, 2006)

The vegetation is dominated by savannah grassland, miombo woodland, and scrub and, in a few areas, thickets. Common trees are *Brachystegia* sp., *Pterocarpus* sp., *Angloensis* sp., *Dicanthium* sp. and *Baobab* sp. In the valleys *Acacia kirkii*, *Tortillis* sp. and *Delenix alata* sp. are common trees (Aitken, 1950). The ridge crests with their granite outcroppings and thin stony soil do not support much more than a handful of thorny shrubs of *Preudo posoppis*, *Combretum*, *Burthia*, *Grewia* and *Bussia* sp. (Aitken, 1950).

#### 4.3 Ethnic groups

Lake Eyasi Basin is the homeland of a number of ethnic groups including the Hadzabe, the Barabaig/Datoga, the Iraqw, the Isanzu, the Iramba and the Sukuma. The Hadzabe are hunters and gatherers whose numbers are estimated to be less than 3,000 people (The Sieff, D.F. [1995]). Recent DNA research indicates that the Hadza split off from the Sandawe of Tanzania and San people of Southern Africa between 40,000 to 90,000 years ago. They have always lived there and are believed to be one of the original people in the area. The Barabaig are highland Nilotic pastoralists who moved to Tanzania several hundred years ago from North- Eastern Africa. While some of the early Barabaig immigrants moved into the southern areas of Lake Eyasi, most Barabaig/Datoga presently in the basin have moved there in the

last few decades as they were displaced by the agriculturalist Iraqw and commercial wheat farmers in Hanang District. The Barabaig economy is dependent on livestock keeping.

Another ethnic group are the Iraqw who are Cushitic language speakers who migrated into Tanzania from Ethiopia as long as a few thousand years ago. After being displaced for hundreds of years by the Barabaig/Datoga from the Ngorongoro highlands, they settled on the highlands of Mbulu Plateau. Population growth and the need for land drove them into the more recent Barabaig/Datoga lands of Hanang. The Iraqw are agro-pastoralists whose need for land has driven them in small numbers into the Eyasi Basin wherever there is a chance to grow crops. The Isanzu and Iramba are other ethnic groups found in the basin. They are closely related to the Bantu neighbours who moved several hundred years ago from the west to the southern side of the basin. Their economy is mostly crop agriculture with some livestock keeping. For many years they have been able to grow enough food due to the floodplain character of their fields and some very limited irrigation potential. The Sukuma are also found in the basin. These are Bantu agro-pastoralists and are numerically the largest among Tanzania's over 120 distinct ethnic groups. Within the last few decades they have spread from the Shinyanga area and are now pushing to the south-western borders of the Yaida - Eyasi Basin.

#### **4.4 Methodological approach**

In the social sciences there are two major approaches to research: qualitative and quantitative. Shank (2002) defines qualitative research as "a form of systematic empirical inquiry into meaning". By *systematic* he means "planned, ordered and public", following rules agreed upon by members of the qualitative research community. By *empirical*, he means the type of inquiry which is grounded in the world of experience. As for *inquiry into meaning* he says researchers try to understand how others make sense of their experience. Denzin and Lincoln (2000) claim that qualitative research involves an *interpretive and naturalistic* approach. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them.

The qualitative research approach is a type of scientific research which consists of an investigation that seeks answers to a question, systematically uses a predefined set of procedures to answer the question, collects evidence, produces findings that were not determined in advance and produces findings that are applicable beyond the immediate boundaries of the study. The strength of qualitative research is its ability to provide complex textual descriptions of how people experience a given research issue. It provides information

about the “human” side of an issue – that is, the often contradictory behaviours, beliefs, opinions, emotions, and relationships of individuals. Qualitative methods are also effective in identifying intangible factors, such as social norms, socio-economic status, gender roles, ethnicity, and religion, whose role in the research issue may not be readily apparent.

In addition, qualitative approach is useful for preliminary exploration work when the researcher has no or little information about the research field. From the informant’s words the researcher attempts to understand the people by investigating what they think and their experiences (Oxford, 2007). The information is detailed enough to ensure the validity of the research results. Nevertheless, since the number of informants is small, the findings cannot be used to generalise to the wider population (Hakin, 1987). Objectivity in qualitative research is differently understood from that in quantitative perspectives. Objectivity here exists when the research findings are accepted and appreciated by colleagues and society (Sarantakos, 1998).

There is also the quantitative approach which collects numerical data in order to explain, predict and/or control phenomena of interest. Data analysis is mainly statistical and it is categorised with descriptive research correlation research, causal-comparative research and experimental research. The result of research is a number, or a series of numbers, presented in tables, graphs or other forms of statistics. The advantage of quantitative research is that it investigates social problems objectively (Sarantakos, 1998). Sarantakos asserts that objectivity is the main concern in quantitative research because objectivity requires researchers to remove personal prejudice and bias and see things the way they are. Moreover, objectivity is a significant indicator in establishing the validity of information (Kumar, 1996). In doing so, investigators become neutral observers and analysts. Ragin (1994) has indicated that quantitative data is best understood as data enhancer, and improved data is helpful in seeing the key aspects of scenarios more clearly.

Since social phenomena are multi-dimensional and are affected by many factors, they have to be defined by different variables in order to be measured. These variables are nominal, ordinal and numerical (interval or ratio). A variable has to have two or more categories or values (Coolican, 1990; Bernard, 1994; Neuman, 2003). In statistics, in order to process data, the values of a quantitative variable are usually coded with numbers. To ensure reliability, one other important condition in quantitative research is that the findings of any research can be repeated and the results have to be the same every time.

In quantitative survey research, sampling is also a matter of concern, especially for research in developing countries (Bulmer, 1983). There are two broad kinds of samples:

probability and non-probability. Probability sampling is the only approach that makes possible representative samples (Kidder & Judd, 1986). Therefore, the research findings can be used to generalise to the total population (de Vaus, 1995). However, using probability sampling is costly and a sampling frame is not always available, especially in developing countries. In such cases non- probability techniques are used. This type of sampling is appropriate when sampling frames are unavailable or the population is widely dispersed, making it impossible for cluster sampling (de Vaus, 1995).

Both qualitative and quantitative approaches have been used for analysis. Qualitative analysis has been used for assessing opinions given by the respondents through focus group discussion and in depth interviews. The results from the qualitative study were used as the basis for developing the questionnaire that led to the quantitative study and hence statistical analysis. The understanding of both paradigms has helped to identify the ways these divergent approaches complement each other and become effective in understanding the dynamics of population mobility and migration on land resources in the Lake Eyasi Basin.

#### 4.4.1 Research methods

The most common methods used in social science research are surveys, experiments, histories and case studies. All of them can be used to explore, describe and explain phenomena. Each approach has its own logic of collecting and analysing empirical evidence. Moreover, each strategy has its own advantages and disadvantages. In this study, household surveys, case study and histories have been used as appropriate strategies. Household surveys were used to collect data on migration history, economic activities, household income, production, and agricultural inputs in land management in the study area. Since households are important units for the intergenerational transfer of property rights in natural resources, it was deemed important to get first-hand information on the variation of household types, household structures (in respect to gender and age for example) through survey techniques. Initial household surveys prepared the ground for more detailed household studies with smaller samples (e.g. focusing on intra-household transfers, inter-household interaction in relation to natural resources).

A case study was used to investigate the forces and processes of demographic change, especially on population mobility that contribute to land transformations and socio-economic development. Thus the key questions on how and why migration and land transformations took place were inevitable. Furthermore, extended case studies are a well-established social science methodology in documenting conflicts on natural resources.

Extended case studies of conflicts over land and environmental governance were also done. Historical methods were used to identify specific (indicative) conflicts which are densely documented from the perspective of different stakeholders. This made it necessary to document also the socio-economic status and the embedded nature of the stakeholders, and discuss with them specific strategies applied during the conflicts.

#### 4.4.2 Data collection methods

Household surveys and case studies can use several data collection methods. Yin (1994) provides an overview of six: interviews, direct observation, documentation, archival records, participant observation and physical artefacts. In this study, the first five methods were used together with focus group discussion.

##### 4.4.2.1 Primary data collection

Quantitative methods involved household interviews to collect a variety of information including socio-economic conditions, migration, land use and associated environmental problems. Qualitative methods involved the use of participatory observation and various Participatory Rural Appraisal methods such as focus group discussions and resource mapping.

Key informant interviews were used to get a historical background to factors responsible for changes in the Lake Eyasi Basin and examine how these factors have affected land transformation and socio-economic development of the area.

Structured households' interviews, semi-structured interviews and seasonal diagramming were used to collect information. Seasonal diagramming is normally used to indicate the annual variations and different activities carried out in different seasons. The tool was used to obtain information on season calendars. This facilitated understanding of the diversity of economic activities in the area, and also in the period for which the task was being performed.

Observation and transect walks were also used in this study, as this enabled the researcher to get conversant with the research area.

Formal and informal group discussions were used in data collection. Different discussion groups with homogeneous characteristics, like farmers, pastoralists or only women were formed and the results were used to discover and compare the groups' opinions.

#### *4.4.2.2 Instruments used in primary data collection*

##### **(i) Household questionnaire**

A copy of the structured household questionnaire which is attached as Appendix A was administered. The household questionnaire which was directed to the head of household was divided into four sections which included the history of the household head and the household demographic information, socio-economic characteristics of respondents, migration, land transformation as well as land use conflicts and conflict resolution. The first section of the questionnaire dealt with the historical background of the respondents in lowland and highland areas. The respondents were asked to indicate their birth date and the time of arrival at their new destination, and whether they had stayed somewhere else before coming to the current destinations. This information was used to determine the extent of mobility and the duration of living in the current destinations. In order to understand the reasons for moving into the current destinations six options were to be considered. This was done due to the fact that the factors influencing the decisions to move are heterogeneous, and therefore, the respondents were requested to select the reasons relevant to their decisions. Furthermore, the respondents were required to state why they had chosen the place of their destination.

The management of natural resources such as land depends on many factors that are not easy to discuss exhaustively (Agrawal, 2000; Poteete & Ostrom, 2003). Demographic factors are among important factors for natural resource management. In this context an overview of the demographic characteristics of the population such as age, sex, household size as well as other socio-demographic variables which include marital status, household composition, ethnicity, education, and residence were important variables to be investigated. The information about socio-demographic variables was sought from the household head who was also responsible for providing information about other members of the households. This helped to create a larger picture about each respondent and the household members. It also described some of the outcomes that were used as a basis for analyses in the study and provided a starting point for many research questions including those about migration and land resources management in the study area.

Since economics plays the most important part in migration and the type of economic activity (ies) one is involved in, as the main indicator of his/her economic life, questions were asked about their main and auxiliary economic activities. Based on preliminary field observation, six categories of economic activities were identified and the respondents were required to pick the main economic activity and consider others as auxiliary economic activities. Apart from economic activities, questions about household income were asked including their major source of income. Income related questions were addressed to all

respondents in all areas. Reporting about income in developing countries like Tanzania is difficult due to limited understanding of what constitutes income generating activities, particularly for self-employment activities, and lack of proper and up-to-date records from various income sources.

Despite these difficulties, it was important for the study to capture some details with regard to household income since it is an important aspect in connection with land resources acquisition and management. In order to find out the average household income, the respondents were requested to mention various sources of income and how much they were getting from various sources in terms of money or crop production. In order to be able to estimate income from crop production, the respondents were requested to state the number of onion or maize bags they obtained per season and how much they sold these, depending on the prevailing prices of the crops. Livestock keepers were requested to mention the type and number of livestock they sold per year. Finally, the average income of the household was obtained by summing up the individual incomes from different sources.

Access to land, agricultural input, and the economic opportunities they offer, are key factors for households that depend on agriculture and other self-employment activities for their livelihood (Zeza, 2007). Questions about ownership of land and agricultural implements were asked in order to determine the household head's economic status as well as explain the extent to which land resource was being managed in the area. Land acquisition processes among different socio-economic groups in the area of study were also addressed.

Information on the consequences of migration on land transformation was sought where the respondents were required to provide a comprehensive insight on the availability of land between the time they arrived in the area and the time of the survey, and to provide the reasons for their insights. Further questions on the important land use changes which have taken place since their arrival in the area were asked and the respondents were also required to give possible reasons for such changes; besides, they were asked about the previous and current applications as well as availability of various agricultural inputs and the extent to which the applications of these inputs compromised sustainable utilisation of land resources. Questions on how migrants and non-migrants interact with land resources were also asked.

The last section looked at the occurrences of land use conflicts and mechanisms for resolving the conflicts. Kagwanji (2009:4) asserts that across Eastern Africa (specifically Kenya, Uganda, Tanzania and Rwanda) the question of the use and ownership of, and access to the increasingly scarce land and related resources has been at the centre of festering conflicts between ethnic groups in the region. Based on these findings, the

respondents were asked about occurrences of land related conflicts in the area. The causes and presence of institutions for resolving these conflicts were also examined.

#### **(ii) In-depth study questionnaires**

Detailed discussion from each of the four villages with elders of different gender was undertaken. The reason for undertaking the discussion was to gather more information on the historical background of the area in terms of ethnic composition of the population, economic activities, land availability, tenure systems and perceived land use changes in the villages. Another in-depth interview involving various officials at the district and ward levels was undertaken. The officials involved were the District Agricultural and Livestock Officer, District Land Officer, District Planning and Community Development Officers as well as Agricultural and Livestock Officers at ward level. The purpose for undertaking discussions with these officials was to obtain technical information and explanation on various issues related to agriculture, land resources allocation and other technical aspects pertaining to the study.

#### **(iii) Checklists**

The checklists for village chairpersons were meant to obtain information on the history of their respective villages, their boundaries, population size, composition, expansion of the village area, social services, involvement in the allocation of land resources and other issues related with the mobility of the people and land management in their villages.

#### *4.4.2.3 Secondary data collection*

A geographical analysis of population data, based on past population censuses of 1978, 1988 and 2002, was undertaken.

Secondary data was collected from different sources including literature surveys in libraries and documentation centres, government and national archives, journals, aerial photographs and satellite images, to determine land use/cover changes which had taken place since 1980's.

#### **Satellite image analysis**

The satellite image analysis used Landsat images of 1987 and 2010 to examine the changes which took place from 1987 to 2010. Landsat TM imagery was chosen because of its high spatial resolution, regularity of acquisition and availability for multiple days and years. This imagery was obtained from the United States Geological Survey Global Visualisation

(USGSGLOVIS). Ground reference data from a field study was available as a source of ancillary data and was of much importance in the classification of the satellite imagery.

The images were classified into thematic land use maps and changes between different land use classes were computed. The classification process involved translating the pixel values in a satellite image into meaningful categories. In the case of land cover classification, these categories comprised different types of land cover defined by the classification scheme that was being implemented. There are dozens, if not hundreds, of classification methods that can be used to group image pixels into meaningful categories.

In addition, as it was stated in the previous section regarding primary data collection, quantitative (survey) as well as qualitative interviews (in-depth discussions with elders, village agricultural officers, ward and district levels as well as government officials) were used to examine the changes which had occurred and the underlying driving factors behind these changes. There are two reasons which necessitated the use a combination of methods in assessing the land use/cover changes of the study area. The first reason was to allow the investigation of the research objectives, one of which was to examine the extent to which population mobility and migration have contributed to land transformation in the area.

The second reason was motivated by Fairhead's and Leach's (1996) findings on forest changes in West Africa who found striking differences in land use changes between the findings based on the analysis of satellite images and their own findings from intensive anthropological fieldwork. Therefore, a combination of ethnography and remote sensing appears to be the most effective approach, as remotely sensed data can provide focus for research questions and for testing broad-scaled hypotheses (Guyer & Lambin, 1993). Furthermore, social science methodologies can be used to improve the interpretation of remotely sensed data (Rindfuss & Stern, 1988). The results from the remote sensing analysis and from in-depth interviews with local stakeholders complement each other to yield a more holistic perspective.

#### **4.5 Sampling**

Sample selection was done in the following three distinct stages:

- Choice of the study area in Karatu District, that is in the lowland and highland areas;
- Selection of villages to be involved in the study; and
- Selection of households in the selected villages.

#### 4.5.1 Selection of districts, wards and villages of study

Karatu District was purposively selected for the study because of its high net migration record in Arusha Region. Four villages were purposively selected for this study. These included two villages located in the lowland area, namely, Mang'ola Barazani and Mbuga Nyekundu from Mang'ola and Baray Wards respectively in the Lake Eyasi Division; and the other two villages namely, Rhotia Kainam and Kilimatambo in Rhotia Ward located in the highland areas. The selection of the villages for this study was made in consultation with district officials. Moreover, population increase, population trend, and economic activities taking place in the area were the criteria that guided the selection of the villages.

#### 4.5.2 Sampling frame

There were two stages in the sampling procedure. The first stage involved the selection of villages to study and the second stage involved selecting the individual households. In the selected villages, all households were listed and formed the sampling frame. In order to select the respondents at the village level, a stratified simple random sampling procedure was employed. The population was stratified according to its major economic activities and gender. A specific group of migrants and displaced people were also selected for in depth interviews with regard to land use changes in the area.

This work was done in consultation with the local leaders who led the key informants' identification process for inclusion into the sample. Respondents in different categories were selected to provide the required information. These included migrants and elders who had settled in the area for a long time (more than 30 years) and those who knew the history of the villages and the changes which have taken place over time. Five key informants were selected from each village.

#### 4.5.3 Sampling size

The question of how large a sample a researcher should take is very crucial and arises early in the planning of a survey. Taking a larger sample than necessary to achieve the desired results is a waste of resources, while a very small sample often leads to results that are of little practical use. The size of a sample depends on the size of the population, the population standard deviation, the desired degree of reliability and the desired interval width. Based on the number of households available in the two villages, a total of 252 households were involved in the study. Among these, 160 households were selected from the lowland area and 92 from the highland area.

#### **4.6 Data processing and analysis**

Both quantitative and qualitative methods of data processing and analysis have been used. Data processing involved cleaning the questionnaires, data coding and entry into the computer. The Statistical Programme for Social Sciences (SPSS) (Version 13) was used for data processing and analysis. Frequency distribution tables, cross tabulation, and Chi-square analysis methods were used for analysis.

Based on the population censuses of 1978, 1988 and 2002, further analysis on population change, growth rate as well as age and sex structure, and composition of the population in the four villages by location, were determined. Sex and dependence ratio were also calculated. Cross tabulation was used to measure relationships between variables. Age and sex with respect to respective family size, levels of education, and income of respondents were tabulated and correlated with their respective economic activities related to land ownership and management.

In dealing with qualitative data, both enumerative and iterative modes of analysis were used. Information which had been tape-recorded was transcribed to prepare some notes, and that which had been jotted in a diary was analysed and reflected upon to arrive at a conclusion.

## **5. Socio-Economic Characteristics and demographic Change of the surveyed Study Population**

### **5.1 Overview**

This chapter reports on the analysis of the population characteristics and demographic changes in the research area in terms of size, composition, economic activities and other changes that were taking place, or had taken place. The analysis of demographic changes was based on four selected villages: Mang'ola Barazani and Mbuga Nyekundu, located in the lowland areas and Kainam Rhotia and Kilimatembo located in the highland areas. The data on demographic changes was based on the Tanzania population and housing census of 1978, 1988 and 2002. Besides, recent developments of demographic data based on village statistics are also assessed. These basic elements of demographic data are important for understanding the influence of migration in the Lake Eyasi Basin in the next chapter.

### **5.2 Demographic and socio-economic characteristics of the respondents**

#### **5.2.1 Age and sex structure of household heads and members**

Distribution of population according to age is one of the most fundamental features of population (Bogue, 1969). The age structure affects the economic activities and social behaviour of the population. The analysis of male-female disparity is of interest to demographers because of the contrasting roles of the two sexes in the economy and society (Clark, 1990). The findings show that 100 (62.5%) of the household heads in the lowland areas are young, and their age structure ranges from 25 to 34 and 35 to 44, compared to 40 (43.5%) of the same age structure in the highland areas. At the same time, the old age structure that is over 65 years is more pronounced in highland areas where there are 20 (21.7%) household heads compared to 8 (5.0%) in lowland areas, from the sampled population. The difference in age structure in the two locations is associated with the fact that migration is age selective, since it is the young people who can easily migrate to other areas than old people because the young people have less to lose in their areas of origin due to the fact that many resources including land are owned by the old people (see Table 2).

Age group	Lowland areas		Highland areas	
	Number	(%)	Number	(%)
25 – 34	52	32.5	14	15.5
35 – 44	48	30.0	26	28.7
45 – 54	42	26.2	22	24.0
55 – 64	10	6.3	9	9.8
65 and Above	8	5.0	20	22.0
	160	100	92	100.0

Table 2: Percent distribution of household head age structure by location  
(Source: Field Survey, 2010)

Further analysis on the age composition of household members for the sampled population in the two locations shows that the population of household members is characterised by young people, but with slight differences between the lowland and highland areas. In the age group of 0 -14, the age differential between the lowland area and highland area is big.

The age differentials might be associated with the natural increase, from young migrants on the lowland who are in the active reproductive age. This is pointed out by Hart *et al.*, (2001) that migration is often seen as the major cause of rapid population growth. However, after the migrants have settled, natural growth becomes increasingly important. Whereas these differentials are relatively high in the age group of 0 – 14, the situation is different in the old age group of 65 and above, where the sampled population shows the age differential to be low at 4.6% with more old people 45 (6.7%) in highland areas than lowland areas which has 19 (2.1%).

The sex of the household head is an important determinant of livelihood strategies, since in the African setting, most decisions on investment, location of household and other major decisions are made by men. An example of this is given by Manundu (1997) who observed that women in Kenya are usually not equal partners when communities create property rights over any resource. The findings of this study show that 141 (88.1%) of the households in the lowland areas are male-headed compared to 81(88.0%) in highland areas. Furthermore, the proportion of female-headed households is slightly higher 11(12.0%) in the highlands than in the lowland areas which is 19 (11.9%).

### 5.2.2 Household size and composition of study population

The overall average household size for the four villages in the target area was 6.3. Comparatively, the household size in the highlands was 7.3 which is significantly higher than in the lowland areas which was 5.7. The reported national average household size for rural areas in Tanzania is about 5.0. Looking at the national average household size, it can generally be concluded that the overall average household sizes for both sites is higher than the national average. The analysis of households composition shows that children in the highland areas constitute a large proportion 428 (65.8%) of household members compared to the lowland areas where children constitute 501 (56.4%) of household members. On the other hand, the proportion of other family members including parents, brothers, sisters, grandchildren and other relatives is also high 90 (10.1%) in the highland areas compared to the lowlands where other family members constitute 56 (8.6%). The high proportion of children and other family members in the highland areas suggest a higher fertility rates as well as larger extended families compared to the lowland areas where there are more nucleated households. The assessment on households composition in the lowland areas shows that a high proportion 58 (76.3%) of other family members is dominated by seasonal labour migrants who stay in the households for four to eight months working on onion farms.

### 5.2.3 Major economic activities of the study area

Several economic activities were reported from both study sites. These included agriculture, petty businesses, livestock keeping, agro-business, formal employment and casual labour. As a coping strategy against income failures from individual activities, there were hardly any households whose incomes were strictly non-agricultural. Almost all households except 23 (16.7%) in the lowland and 20 (21.7%) in the highland areas were reliant directly on farming or indirectly on trading of farm produce or working in farms as labourers. Similar to these findings, Bryceson, *et al.* (1995) working in Tanzania and other countries of Sub-Saharan Africa observed a turning away from the narrow option of farming towards multiple income sources. Despite having multiple sources of income, agriculture was the major economic activity practised by all respondents in both study areas. See Figure 4

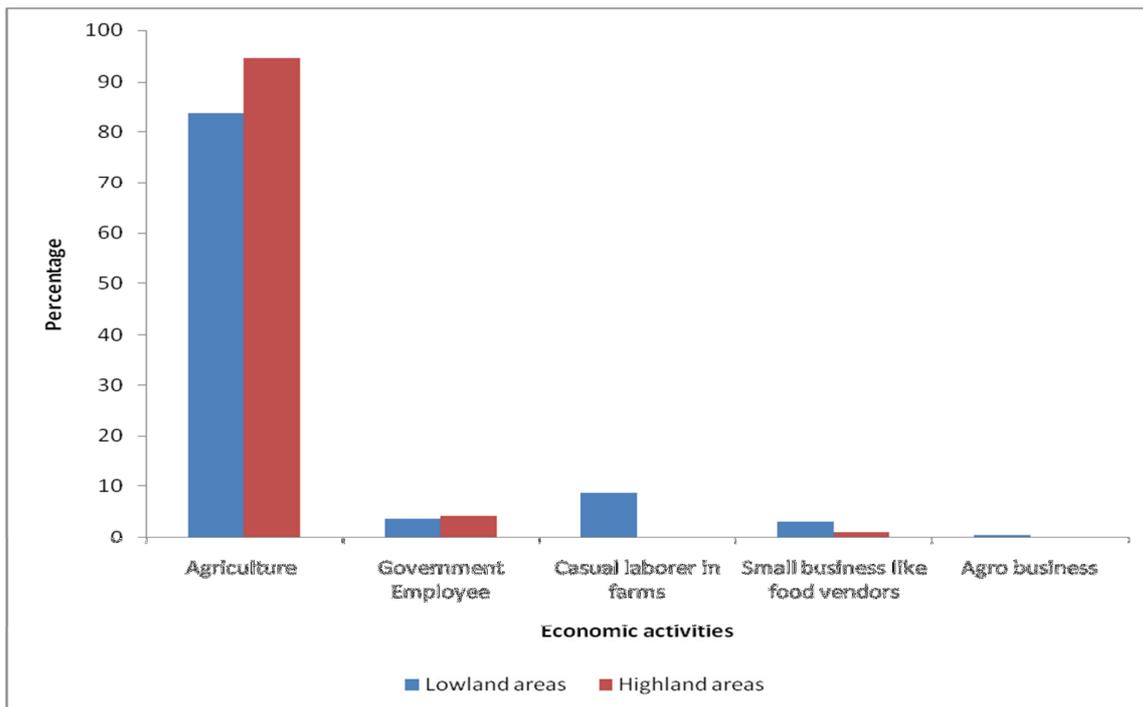


Figure 4: Percent distribution of household head by major economic activities

The findings showed that 134 (83.7%) and 87 (94.6%) of the respondents were engaged in agriculture as their major economic activity, followed by casual labour which was a dominant activity in the lowland areas in the farms with 14 (8.8%). Government employees constitute 6 (3.8%) in the lowland and 4 (4.3%) in the highland areas. Small businesses like food vending were also an important activity which accounted for 5 (3.1%) and 1 (1.1%) in the lowland and highland areas respectively. People involved in crops business like buying onions were found in the lowland areas and these constituted only 0.6%.

Livestock keeping was mentioned as the second economic activity to the majority of the people in both locations, though in the highland areas the percentage of the respondents who reported to have second economic activity was slightly lower than in the lowland areas. The percentage distribution of household heads' second economic activities are summarised in Table 3

Economic activities	Lowland areas		Highland areas	
	Number	(%)	Number	(%)
Agriculture	38.0	27.7	2.0	2.7
Livestock keeping	51.0	37.2	63.0	87.5
Government employee	1.0	0.7	0	0
Casual laborer in farms	18.0	13.2	3.0	4.2
Small business like food vendors	19.0	13.9	4.0	5.6
Agro-business	10.0	7.3	0	0
<b>Total</b>	137	100.0	72	100.0

Table 3: Percent of distribution of household head second economic activities  
(Source: Field Survey, 2010)

#### 5.2.4 Education status of household heads

Education is an important aspect of human life because it is likely to increase households' opportunities for employment and may increase the people's ability to start up various non-farm activities (Barrett *et al.*, 2001; Deininger & Okidi, 2001). Educational achievement is mentioned as an important determinant of migration in the broader migration literature (Bilsborrow & Oberai, 1984; Gubhaju & De Jong, 2009). In examining migration among towns and small cities in Brazilian Amazon, Mougeot (1985) found that lower education was associated with selecting rural destinations. He hypothesised that these migrants move to where they can best compete in the work force, perceiving themselves as less capable of competing in urban areas. Since education plays a significant role in the determination of migration decisions and patterns, it was important for this study to examine the respondents' level of education. Figure 5 presents a summary of education level among the household heads in the study area.

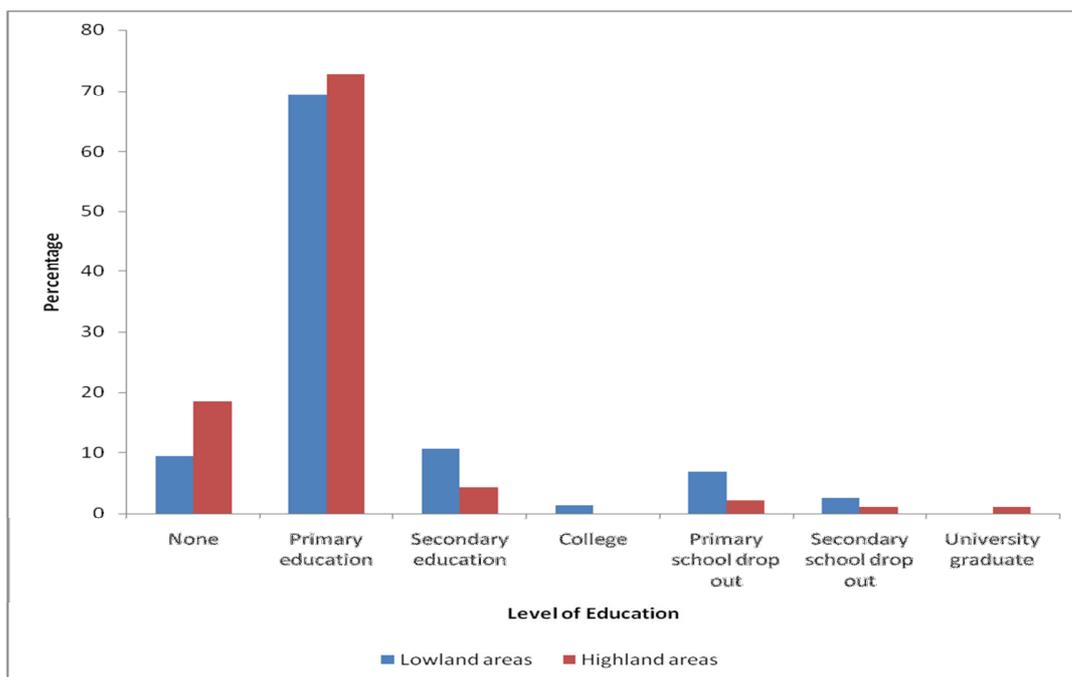


Figure 5: Percent distribution of household head by level of education.

The majority of household heads in the two locations had completed primary education; these were 187 (70.6%), while about 32 (12.7%) had had no formal education at all. Another 13 (5.2%) had attended, but had not completed primary education, while 21(8.3%) had attended secondary education. Comparatively, the level of education in the two locations was not very different from each other, although the literacy level was a bit higher as demonstrated by a higher percentage of those who had completed primary education 111 (69.4%) in the lowland areas compared to 72 (72.8%) in the highland areas. The percentage of those who had not attended any formal education was slightly higher in the highland areas 17 (18.5%) than in the lowland areas 15 (9.4%), and those who had completed secondary school education were more in the lowland areas 17 (10.6%) compared to 4 (4.3%) in the highland areas.

The Household Budget Survey (2007) shows that the rural adult Tanzanian population is made up of 52.4% of those who have completed primary education, 28.5% who have had no formal education, 12.3% have incomplete primary education (of at least four years), while at least 4.1% have attended secondary education. This suggests that the educational status of household heads in both lowland and highland areas is above the national average of primary education. This might be associated with the availability of primary schools which have provided opportunities for more people to get access to primary education. For instance, in Mang'ola Barazani Village, in the lowlands, there are three primary schools: two owned by the village and one by the Catholic Church. In many parts of the country, especially in the

rural areas, there is only one primary school, a situation which hinders access to education to the majority of the people, especially those who are staying far away from the school. The proportion of those with secondary education is below the national average.

#### 5.2.5 Marital status of the respondents and household members

Marital status is a very important factor in determining how a person gets affected by land tenure. Widows are particularly vulnerable because land is generally controlled by men and upon the death of their husbands they are not considered heirs. In Central Kenya, for example, Davison (1988) found that unmarried or divorced women have very few options for gaining land. They can remain and work with their family, and even when they have children their fathers are hesitant to give them a plot of land; all land should go to their male children. Access to land and security of tenure are necessary for people to raise and stabilise their incomes and to participate in economic growth. These are also essential prerequisites for diverse land-based livelihood, economic growth, and preservation of people's culture (Chauveau *et al.*, (2006). As such, it was deemed necessary to examine the marital status of the respondents and household members in this study. The findings are summarised in Table 4.

Marital status	Lowland areas		Highland areas	
	Number	%	Number	%
Married	137	85.6	74	80.4
Widow	10	6.2	12	13.0
Divorced	9	5.7	3	2.2
Single	4	2.5	7	3.3
Total	160	100.0	92	100.0

Table 4: Marital status of household heads by location  
Source: Field Survey, 2010

With regard to marital status, large proportions (137 (85.6%) of the respondents in the lowland areas are shown to be married and are therefore in male-headed households. The female-headed households comprise 10 (6.2%) of the widowed, 9 (5.7%) of the divorced, and 4 (2.5%) of the respondents are single. The same trend was observed in the highlands, where the majority are married -74 (80.4%), followed by the widowed -12 (13.0%) who are slightly higher in proportion compared to the lowland areas.

### 5.2.6 Average household income in the study area

Questions on income in the study area were asked to all respondents. However, it should be noted that reporting income in developing countries, like Tanzania, is almost always unrealistic because there is limited understating of the income generating activities particularly regarding self-employment. For employees, other incomes besides salaries and wages are usually not revealed. The other major contributing factor for not revealing other incomes is lack of proper and up-to-date records for various sources of income. Due to these complexities, the income presented in this study is merely indicative and was obtained by summing up the individual incomes of household heads from different sources such as agriculture and livestock.

From the survey, the average monthly income of the household in the lowlands is TShs. 68,163 ( $\approx$  49 USD) while in the highland areas the average household income per month is TShs. 87,083 ( $\approx$  62 USD). Based on the Tanzania's Household Budget Survey - 2007, the average household monthly income in the rural areas was TShs. 28,418 ( $\approx$  20.3 USD). These show that the average household income in these areas was slightly higher than the national average household income in rural areas. The slightly higher household income is associated with intensive production of cash crops such as onions, wheat and barley, which have become an important source of income in the area. The distribution of average household income by location is indicated in Table 5:

Average household income per year in Tshs.	Average household income per year in USD	Lowland areas		Highland areas	
		Number	%	Number	%
Low income – Less than 400,000/=	Less than 286	69.0	43.1	13.0	14.2
Middle income 401,000 – 800,000/=	287 – 714	49.0	30.6	55.0	59.7
High income More than 801,000/=	Above 715	44.0	26.3	24.0	26.1
<b>Total</b>		<b>160.0</b>	<b>100.0</b>	<b>92.0</b>	<b>100.0</b>

Table 5: Percent distribution of household income  
Source: Field Survey, 2010. Exchange rate - 1 USD = 1400 Tanzanian Shillings

Generally, the data presented in Table 5 shows that there was a high proportion of households in the lowland areas which were low income earners compared to the highland areas. On the other hand, a high proportion of respondents in the highlands were concentrated in the middle income group, while the high income group was almost similar in the two locations. Further analysis was done to examine the relationship between the place of birth and the average household income. The results are presented in Figure 6:

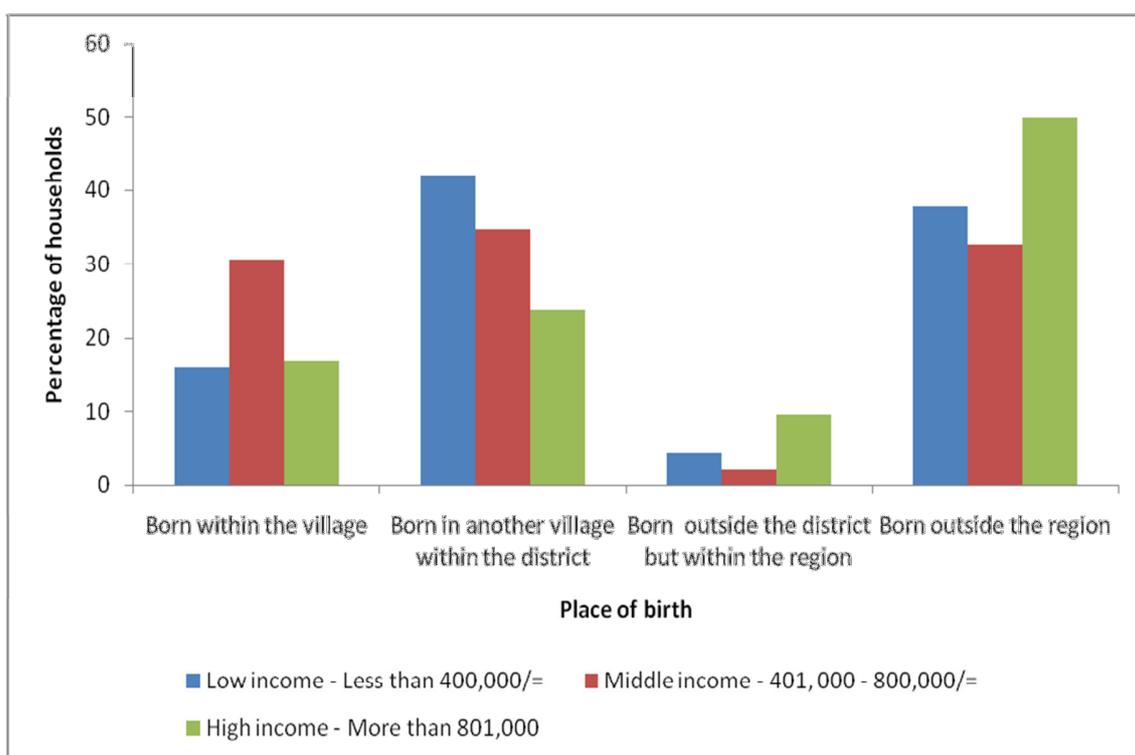


Figure 6: Percent distribution of average household's income by place of birth in the lowland areas

The analysis of data has shown a significant relationship between the place of birth and the average household income, since the majority of high income earners were born outside the village. From the analysis only 7 (16.7%) of the respondents who were born within the village had high income compared to 35 (83.3%) of those who were born outside the village. Within the middle income group 15 (30.6%) were born within the village compared to 34 (69.4%) who were born outside the village. It is also important to note that within the low income earners, the majority 58 (84.1%) were from outside the village. The situation was different in the highland areas where a slightly higher proportion of respondents 55 (59.8%) belonged to the middle income group; among them, 42 (76.4%) were born within the village and 13

(23.6%) were from outside the village. Low income earners from within the village constituted 10 (15.4%) compared to 13 (20.0%) in the high income group.

From this analysis, it is evident that there is a clear difference in terms of income between and within locations. While the lowland areas have a significant number of low income earners, the majority of the people in the highlands are middle income earners. Having a high proportion of low income earners as well as a small group of high income earners who are mainly migrants might have implications on access to land and how land is managed in the lowland areas.

#### 5.2.7 Household sources of income

Household income is the sum of income from crop production, livestock production and income from non-farm activities (e.g. trading, selling of handicrafts, brewing beer, making bricks, selling of poles or charcoal). The decisions about allocation of labour and other assets to these different activities determine the household's income. In this study the household's recorded income was received from a wide variety of types and sources which included incomes from employment and self-employment, as well as payment in kind.

The findings show that the contribution of agriculture (crop production) to household incomes was the largest in all locations and it comprised 197 (78.2%) of the respondents, followed by agro-business 22 (8.7%), casual labour 15 (6.0%), small businesses like food vending 10 (4%) and lastly, government employment with 8 (3.2%) of the respondents. The assessment of household incomes based on location shows that agro-business and casual labour as sources of income were only reported in the lowland areas. This is because of the presence of migrants who were employed as casual labourers on the onion farms and agro-business in the area. Figures 7 and 8 show the percentage of distribution of sources of income in the two locations.

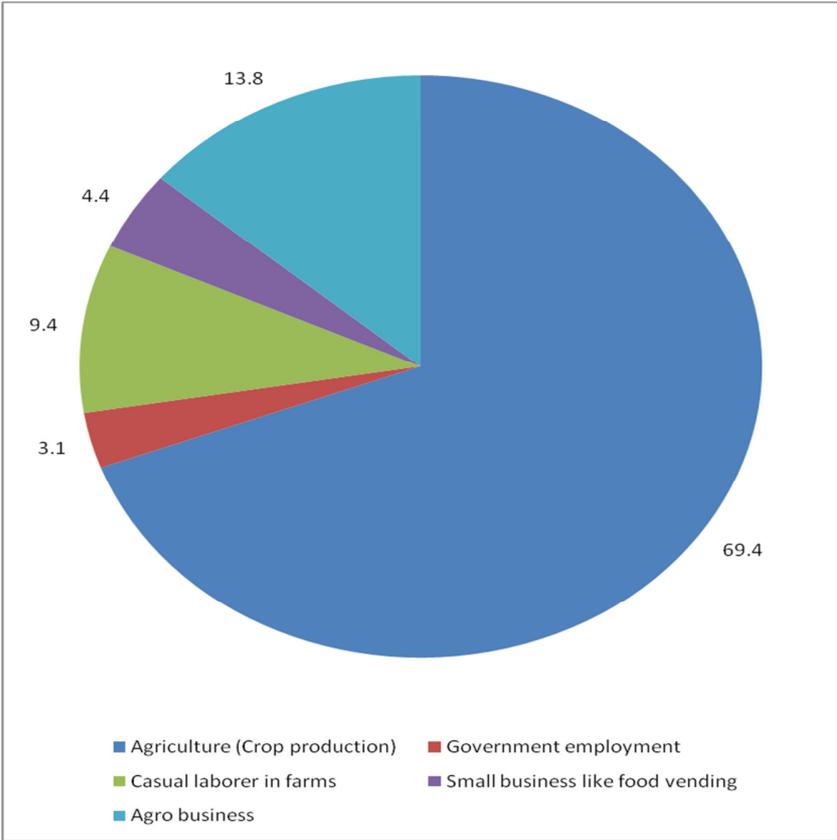


Figure 7: Major sources of income in the lowland area

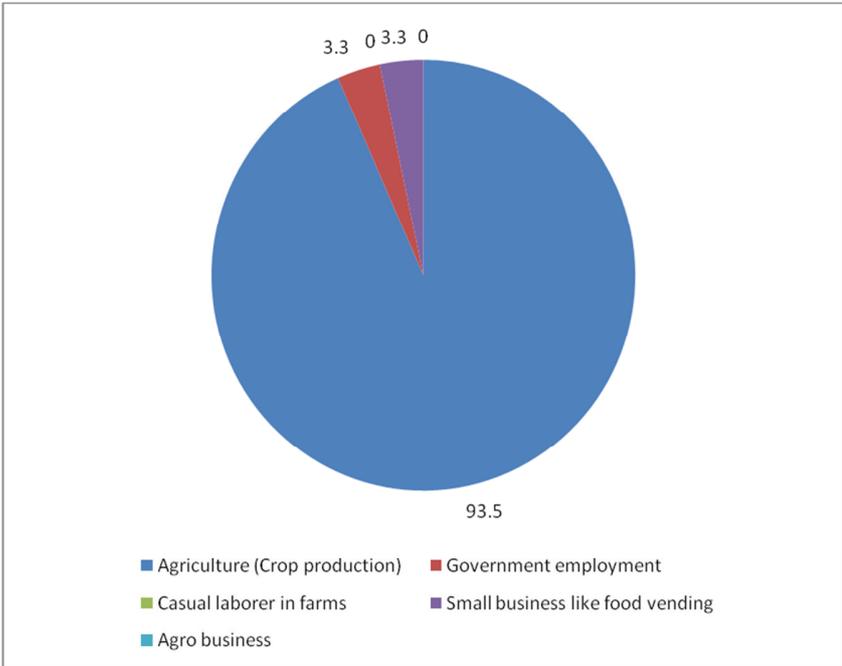


Figure 8: Major sources of income in the highland area

### 5.2.8 Land size possession by location

Land in Karatu District, as in many parts of the country, is an important means for earning livelihood. However, as the population is growing, land is also becoming very scarce. Apart from population growth, there are many investors who are buying and renting land from the villagers to invest in either campsites or hotels.

An assessment of land size possession in the study has shown that the overall mean farm size of the respondents in all villages, excluding those who are landless is, 2.8 acres with farm size ranging from 0.5 to 15 acres. The average farm size in lowland areas is 2.4 acres compared to 3.6 acres in the highland areas. About 138 (96.7%) of the respondents reported that their farms are within the villages, except for a few cases 7 (4.5%) in the lowland areas and 1 (2.2%) in the highland areas who reported to have farms in the nearby villages. Most of these farms in the lowland areas are used for onions, rice and maize production, depending on the season, while maize, wheat and beans are cultivated in the highland areas. Further investigation has shown that scarcity and high cost of renting or buying land in their villages are among the factors which compelled them to find land in the nearby villages. Figure 9 shows the percentage distribution of land for the selected households in both locations.

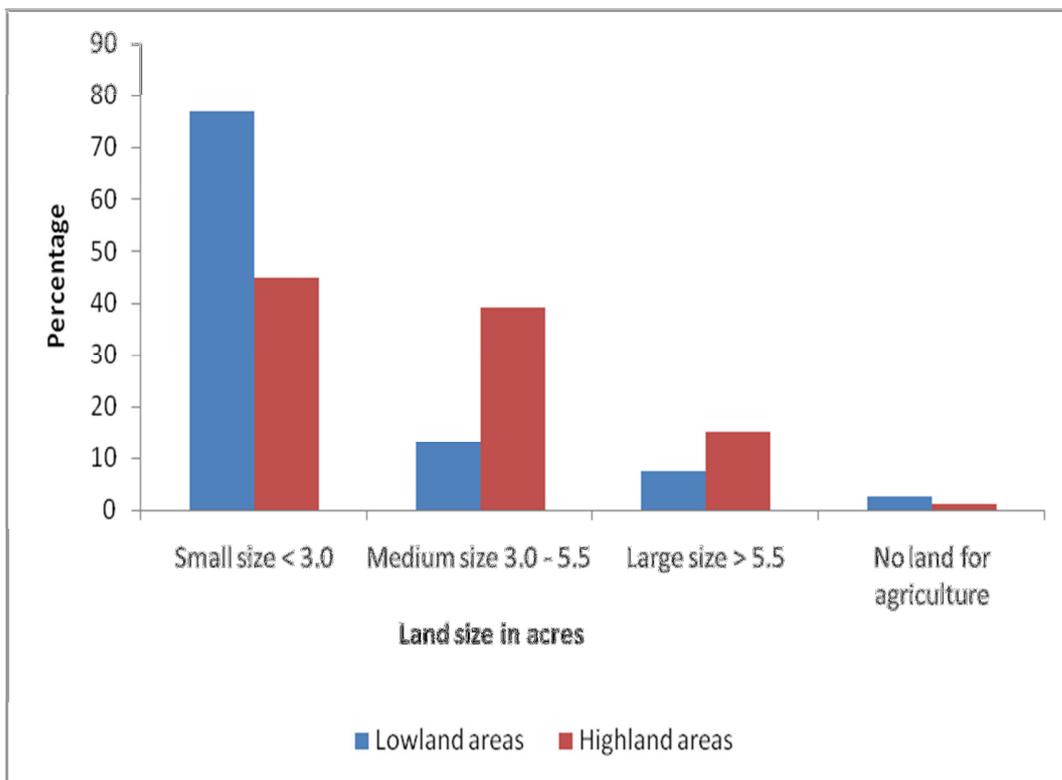


Figure 9: Percentage distribution of household's land size per acre by location

Land size was categorised into three groups: small size for those with less than 3.0 acres, medium size for land size ranging from 3 to 5.5 acres and large size for land which is more than 5.5 acres. The survey shows that the majority of the respondents 164 (65.9%) own or occupy a small size piece of arable land of less than 3.0 acres. Among the households with land, 9 (3.7%) have medium-size farms ranging from 3 – 5.5 acres, and those which have large farms of more than 5.5 acres comprise 26 (10.3%). About 5 (2.0%) of the respondents reported that they had no land for farming. It was further noted that 18 (60%) out of 30 female household heads had farms of less than 3.0 acres, those with medium size farms of 3 -5.5 acres were 9 (30%) and 3 (10%) had large farms of more than 5.5 acres. No female household head reported to have no land. Table 6 below summarises the distribution of land by location.

Location	Small size < 3.0		Medium size 3 - 5.5		Large size > 5.5		No land for agriculture		Total	
	Number	%	Number	%	Number	%	Number	%	Number	%
Lowland areas	123	76.9	21	13.1	12	7.5	4	2.5	160	100
Highland areas	41	44.6	36	39.1	14	15.2	1	1.1	92	100
Total	164	65.2	57	22.6	26	10.3	5	1.9	252	100

Table 6: Percent distribution of household land size in acres by location  
Source: Field Survey, 2010

The analysis based on the location shows that a high proportion of 123 (76.9%) of those who own less than 3.0 acres of farm size are from the lowland areas, while 41 (44.6%) are in the highland areas. It was further revealed that about 4 (2.5%) of the respondents in the lowland areas are landless compared to 1 (1.1%) in the highland areas. The landless observed in lowland areas are migrants working on onion farms as casual labourers who arrived in the 2000's when there was no more land for allocation; the one in the highlands was also a migrant involved in small business. As stated earlier in this section the average farm size in the highland areas is slightly bigger than that in the lowland areas. The differences in average farm size observed between the two locations has been caused by redistribution of arable land in the lowland areas due to population increase and reduced pressure over land resources in the highlands due to out-migration. This is justified by the fact that about 75 (46.9%) of those who own less than 3.0 acres in the lowland areas are recent migrants who arrived in the area in the 1990's and 2000's.



### **5.3 The extent of migration and its demographic impact from 1978 to 2002**

Human migration has long been considered an important element of population dynamics which can have significant consequences on both areas of origin and destination. According to Oderth (2002) migration has shaped the nature of both the receiving places and places of origin more than any other phenomenon in human geography. The existence of an intricate relationship between in-migration and development is also captured by Hammer *et al.*, (2002) who claim that migration can have a decisive impact on the direction and speed of development on both the origin and destination. It was from this understanding that the researcher developed interest in assessing the population and migration patterns in Karatu District. In order to determine the extent of migration in the area, the respondents were requested to mention their place of birth and explain whether there was any person in the household that had migrated as well as the status of the residence of the household members.

In general, the data collected from the study area shows that about 154 (61.1%) of the respondents were born outside the village and 98 (38.9%) were born within the village. Among the migrants, 64 (41.6%) are from within the district, 9 (5.8%) are from outside the district but within the same region, and 81 (52.6%) are from outside the Arusha Region and mainly from Manyara, which was part of Arusha Region before it was split into two regions in the year 2002. Further analysis based on location shows that the lowland areas around Lake Eyasi Basin have a high proportion of rural migrants 127 (80.1%) compared to the highland areas where there are only 27 (19.5%) of the respondents who reported to have migrated into the area. The percentage distribution of the household head place of birth by location is presented in Figure 10.

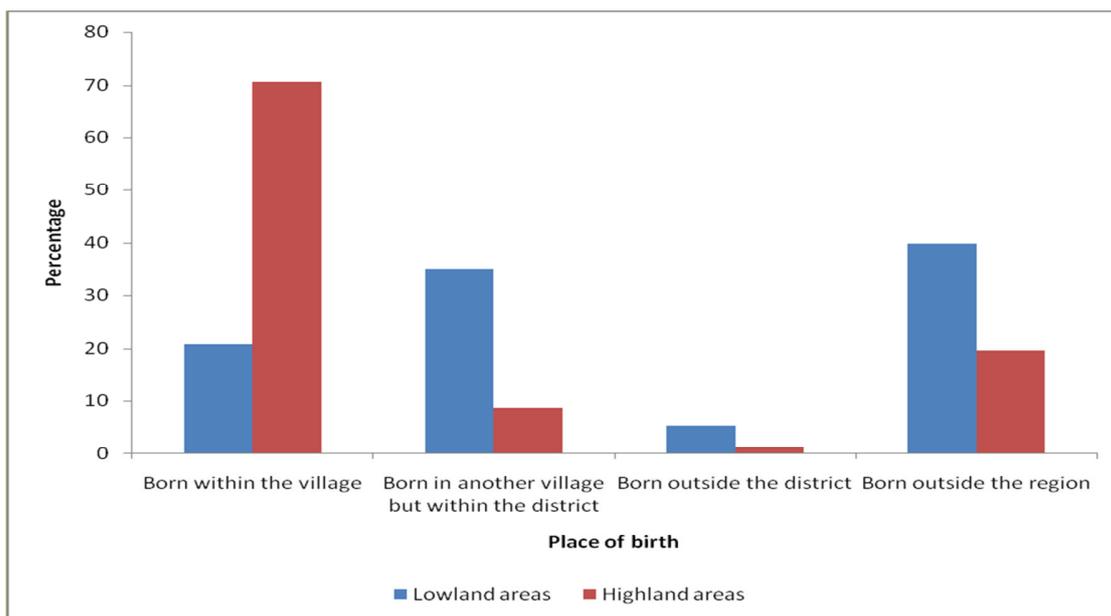


Figure 10: Percent distribution of the household head place of birth by location.

From Figure 10 it is evident that the lowland areas have received more migrants than the highlands. The majority 108 (67.5%) of the respondents in the lowland areas are the Iraqw, followed by the Barabaig who are 8 (5%), the Chagga 8(5%) and other 12 different ethnic groups which constitute about 36 (22.5%) of the respondents. In the highland areas the situation is quite different because about 91 (99%) of the respondents are Iraqw and only 1 (1%) respondent was from a different ethnic group from Dodoma Region, in the central part of Tanzania. Among the migrants in the lowland areas, male migrants were 116 (91.1%) and female migrants were 11 (8.9%).

Although this study did not intend to make a comparison of long and short distance migration based on gender, the findings differ from what is documented by Davis (1968) in the International Encyclopaedia of the Social Sciences who argues that in long distance migration males tend to outnumber females, but in short distance migration females tend to predominate. The respondents were also requested to state the year they arrived in the villages. The results are shown in Table 7.

Year of arrival	Lowland areas		Highland areas	
	Number	%	Number	%
1940's - 1960's	3	2.3	7	25.8
1970's	18	14.2	12	44.4
1980's	18	14.2	4	14.8
1990's	53	41.7	3	11.1
2000's	35	27.6	1	3.7
<b>Total</b>	<b>127</b>	<b>100.0</b>	<b>27</b>	<b>100.0</b>

Table 7: Percent distribution of household head by year of arrival in the village.  
Source: Field Survey, 2010/11

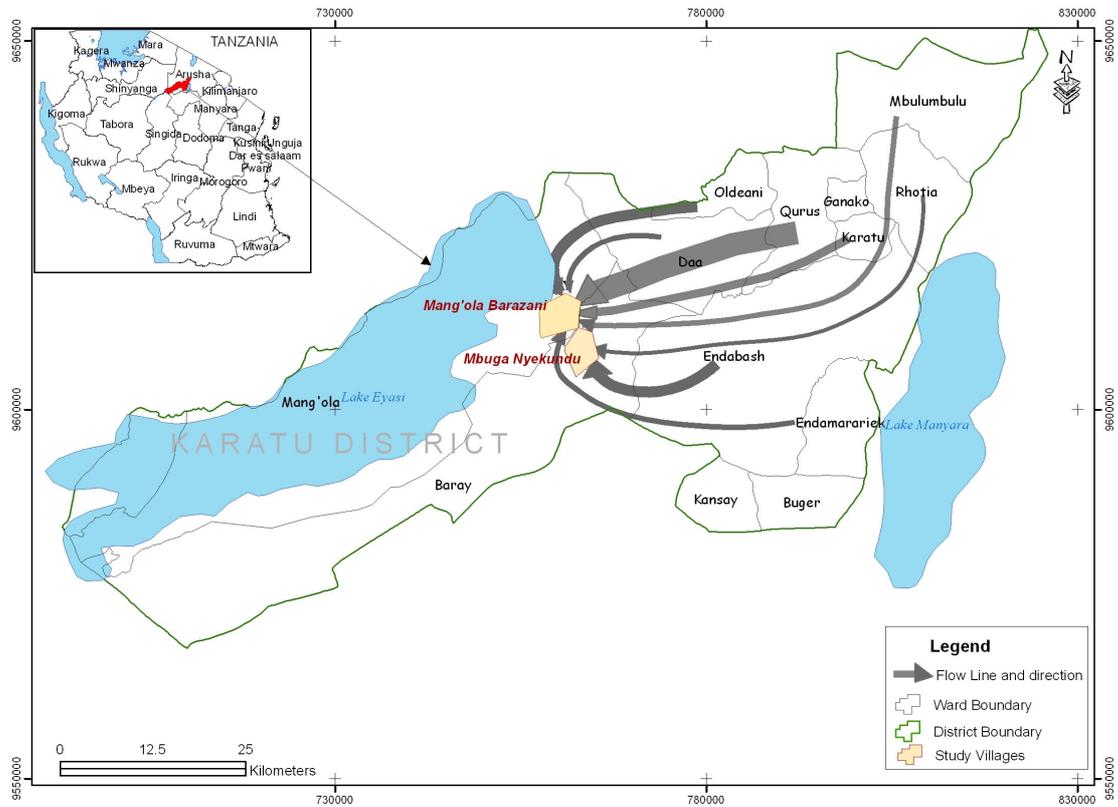
From Table 7 above, almost half of the respondents 53 (41.7%) in the lowland areas arrived in the villages in the 1990's compared to the highland areas where 12 (44.4%) arrived in the 1970's. In the 2000's the lowland areas continued to be the receiving area by receiving 35 (27.6%) migrants, while the highlands were no longer the receiving area but continued to be the sending area as the majority 38 (66.7%) of the migrants in the lowland areas came from the highland wards such as Rhotia, Oldean, Endabash, Qurus and Karatu town.

### 5.3.1 Migration patterns

Various developments in Tanzania have implied a high level of population mobility and migration in many parts of the country. Currently, four major streams of internal migration can be distinguished, namely, migration from one rural area to another rural area (rural-rural migration), from a rural area to an urban area (rural-urban migration), from an urban area to another urban area (urban-urban migration), and from an urban to a rural area (urban-rural migration). This categorisation distinguishes the geographical/spatial distribution of migration which involves both agriculturalists as well as pastoralists. The choice of destination has been largely determined by the type of migration – seasonal, circular or permanent – in which the villager intends to participate. The patterns of mobility and migration depend on the nature of external opportunities, and can change accordingly.

From the household survey it was found that rural-rural migration is the most common pattern of migration since the majority of migrants in the lowland areas reported to have come from the villages mentioned above. These are located in the highlands of Karatu District. This pattern was followed by urban-rural migration because 6 (11%) of the respondents who

migrated within the district and have established permanent settlements in the lowland areas reported to have come from Karatu Town (See Fig. 11).



Map 5: Flow line map showing migration flow in Karatu District

Furthermore, it was revealed that permanent migration was the most important kind of migration since the majority of the respondents confirmed that they had established permanent settlements in the area. Besides, one of the households which were interviewed in the highland area confirmed that some household members had permanently migrated out. In that household, six out of ten children had migrated permanently to other villages and regions in Tanzania, and two of them to Mang'ola Barazani in the lowland area where they were involved in agriculture and casual labour on onion farms. Below is a family tree showing the parents and other family members who have migrated to different areas within and outside the district.

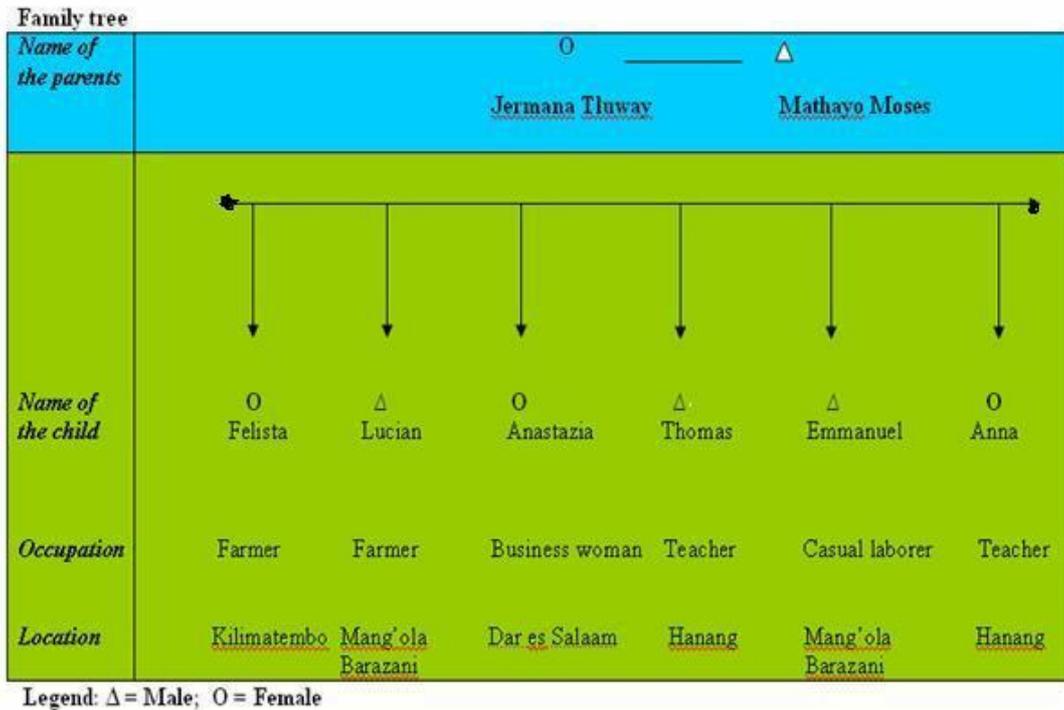


Figure 11: Family trees showing out migration in highland areas

Apart from permanent migration, seasonal labour migration was also observed. Seasonal labour migration in the lowland areas normally occurs during the periods of high agricultural labour input seasons, especially during farm preparation and harvest periods. During the household survey it was reported that 58 (6.4%) household members in the lowland areas are not permanent residents and most of them had stayed there for three to six months working as casual labourers on onion farms. In the highland area, 8 (1.2%) household members were non-resident, among them four were working in farms, two were students attending day school and the others were staying with their relatives recovering from long illness. As stated above, most of the non-resident migrants go back home when agricultural activities are not intensive.

The presence of seasonal migrants was also reported during the discussion with village government leaders who confirmed such presence, especially during the preparation of onion farms and harvest. The village leaders expressed their concern about farm owners who were employing people to work on their farms without reporting them to the village government. According to the village leaders, such a situation has resulted in social insecurity and difficulty in controlling crime in the village because some of these unidentifiable migrants.

It is important to make a distinction between permanent migration and seasonal labour migration because they have different impacts on the region of destination. Permanent migration may cause a lasting change on the population size and increase pressure on land resources in the receiving area. Seasonal labour migration, on the other hand, causes temporary changes in the composition of the population in the receiving area, because it is usually men that migrate, especially in agricultural communities.

### 5.3.2 Reasons for migration

The patterns of migration discussed above have been caused by a number of factors which are presented in Table 8.

Reasons for migration	Lowland areas	%	Highland areas	%
Search for land for agriculture and grazing	63	49.6	17	62.9
Villagisation programme	22	17.3	-	-
Trading and casual labour opportunities	11	8.7	1	3.7
Accompanying with relatives	11	8.7	3	11.2
Marriage	2	1.5	4	14.8
Drought	18	14.2	-	-
Transfer/Government employee	-	-	2	7.4
	<b>127</b>	<b>100.0</b>	<b>27</b>	<b>100.0</b>

Table 8: Percent distribution of household head - reasons for migration by location  
Source: Field Survey, 2010

The respondents were asked to mention their reasons for migrating into the area. Many of them 63 (49.6%) mentioned shortage of land for crop production and grazing in their areas of origin, as the main reason that had compelled them to move to other places. The Villagisation Programme of 1970's was mentioned as another reason for moving into the area. Drought conditions which had affected most parts of the country including Arusha Region were also an important push factor for people to move from their areas of origin. The data shows that 18

(14.2%) of the respondents reported that persistent drought of the 1980/90's had resulted in critical shortage of food and pasture for livestock. As a consequence, people from the affected areas moved to Mang'ola Barazani and Mbuga Nyekundu Villages in search of pasture and agricultural opportunities. Despite being located in a semi-arid and persistently dry zone, the lowland areas is a potential source of natural spring in Quangeded Village, which supplies water that is used for irrigation agriculture, throughout the year. Furthermore, frequent floods in Mbulu Highlands occurring in the lowland areas have an important contribution to the improvement of soil fertility, making the area more productive.

As observed earlier, trading and casual labour migration has been a feature of livelihood diversification strategies and an important cause of mobility especially for men in the lowland areas. About 11(8.7%) of the respondents in the lowlands said they were attracted the by the onion business and the availability of casual labour in onion farms, compared to 1 (3.7%) respondent in the highland area. Narratives from focus group discussions revealed that following the floods in the lowlands in the early 1990's which were caused by heavy rainfall in the Mbulu Highlands, production of onions was greatly affected. The low production of onions created high demand of the product which also led to an increase in onion prices on the market. This attracted businessmen from other parts of the country, especially from nearby areas such as Karatu and Arusha Towns, and Singida and Kilimanjaro Regions. Attracted by good prices for onions in the market, traders became farmers as well, and started buying and renting land from local people or earlier migrants.

Onion production in the lowland areas is labour intensive. The expansion of onion farms also increased the number of people who became involved in agriculture and this created a high demand for human labour to work on the farms. The problem of labour was accelerated by the unwillingness of the local people to work on those farms. This made migrants who had already acquired land to invite relatives from their homes of origin, especially from Singida and nearby villages to come and work on the farms. Having worked for some years as casual labourers, the new migrants established networks within the villages which enabled them to apply for village membership and established permanent settlements in the villages.

Another important group of people which significantly contributed to the increasing number of people in the lowland areas is that of ex-prisoners from Mang'ola prison. Although, it was difficult to establish the extent to which the prison has contributed to population growth, as no ex-prisoner was ready to reveal his previous status, the focus group discussion confirmed

that a number of people who were at the time living in the village were ex-prisoners who had been granted village membership after being released from jail.

#### 5.4 Demographic change in the area of study

Available population data from the three last censuses of 1978, 1988 and 2002 indicates that the population in the district had been increasing especially in the lowland areas which used to be less populated compared to the highland areas. The lowland areas in the Lake Eyasi Basin have experienced high population increase since the 1970's. As observed above, one of the reasons for the increasing trend of population in the area is migration of people from highland areas. As it is indicated in Table 9 the inter-censal growth rate of the two villages in the lowlands was very high compared to the national growth rates which stood at 2.8 percent for the year 1978/88, 2.9 percent for 1988/2002, and district growth rate which was estimated to be 3.2 percent. The inter censal growth rate was also higher compared to the two villages located in the highland areas.

Location/Year	Village				Growth rates	
		1978	1988	2002	1978/88	1988/2002
Lowlands	Mangola	960	1728	8527	5.9	11.4
	Barazani					
	Mbuga Nyekundu/Jobaj	1130	2093	6097	6.2	7.6
Highlands	Kainam Rhotia	1325	2134	2948	4.8	2.3
	Kilimatambo	1676	2247	3252	2.9	2.6

Table 9: Population growth and growth rate from 1978 to 2002 population census

Source: 2002 Population and Housing Census and Tanzania National Bureau of Statistics, 1978 and 1988.

From Table 10 it is evident that the population size changed profoundly in both villages from 1978 to 2002. The population in general increased quite considerably, but with significant variations between the lowland and highland areas. The observed change can have different explanations. First of all, the population may grow through natural increase; secondly due to the fact that migration is normally characterised by young people who are in the active reproductive age group; and thirdly, due to improved health services. Another reason which has significantly contributed to the rapid population growth in the lowland areas is migration. The role of migration in population growth has also been discussed by Bilborrow (1997) who argued that population growth can occur in two ways: through migration and natural increase.

In addition he argued that migration often occurs much more rapidly and less predictably than natural population growth, and through migration, growth in an area can happen much more quickly.

#### 5.4.1 Change in the age and sex structure

Further analysis was carried on the basis of the census data in order to determine the percentage of population change in the two locations. In 1978, the total population was 5,091, and out of these 2,564 were aged 0 - 14, accounting for 50.5% of the total population; and 2,393 were aged 15 - 64, accounting for 47.0% of the total population. In addition 134 were aged 65 and above, accounting for 2.6% of the total population. This did not remain static as in 1988 the total population was 8,202, out of which 3,724 were aged 0 - 14, accounting for 45.4%; 4,155 were aged 15 - 64, accounting for 50.7%; and 323 were aged 65 and above, accounting for 3.9% of the total population. In 2002 the total population was 18002, and out of these 7,135 were aged 0 - 14, accounting for 39.6%; 10,313 were aged 15 - 64, accounting for 57.3% of the total population; while the remaining 554 were aged 65 and above, accounting for 3.1% of the total population. Table 10 and Figures 12, 13 and 14 summarise the age structure changes based on the population census in general as well as sex by location.



Age group	Total					Males					Females				
	1978	1988	2002	Δ1	Δ2	1978	1988	2002	Δ1	Δ2	1978	1988	2002	Δ1	Δ2
<b>Total</b>															
0 – 14	50.4	45.4	39.6	-5	-5.8	26.2	23.6	20.7	-2.6	-2.9	24.2	21.8	19.0	-2.4	-2.8
15 – 64	47.0	50.7	57.3	3.7	6.6	24.2	28.4	33.2	4.2	4.8	24.2	22.3	24.1	-1.9	1.8
65 +	2.6	3.9	3.1	1.3	-1.8	1.5	2.5	1.5	1.0	-1.0	1.1	1.4	1.6	0.3	0.2
<b>Lowland areas</b>															
0 – 14	48.0	41.5	36.1	-6.5	-5.4	24.1	21.4	18.6	-2.7	-2.8	23.9	20.0	17.4	-3.9	-2.6
15 -64	48.6	55.4	61.9	6.6	6.5	23.5	33.3	37.2	9.8	3.9	25.3	22.1	24.7	-3.2	2.6
65 +	3.4	3.1	2.1	-0.3	-1	2.0	2.3	1.1	0.3	-1.2	1.1	0.8	1.0	-03	0.2
<b>Highland areas</b>															
0 – 14	51.9	48.8	46.1	-3.1	-2.7	27.6	24.5	24.5	-3.1	0	24.4	26.9	21.9	2.5	-5
15 – 64	45.5	46.5	48.5	0.9	2.0	27.4	25.6	25.6	-1.8	0	26.6	25.6	25.9	1.0	0.3
65 +	2.6	4.7	4.9	2.4	0.2	1.2	2.3	2.3	1.1	0	1.1	2.3	2.7	1.2	-1.5

Table 10: Percent changes in age and sex composition in the lowland and highland areas from 1978 - 2002  
Source: Calculated from 2002 Population and Housing Census, 1988, and 1978.

Δ1 and Δ2 represent percent change for the year 1978/88 and 1988/2002

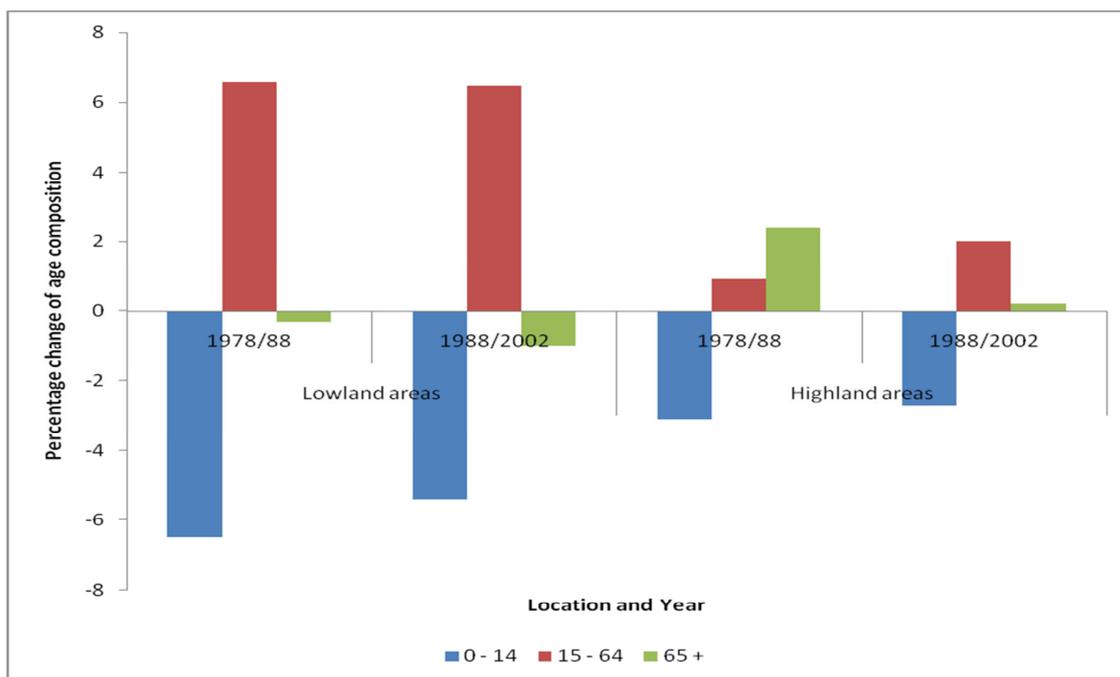


Figure 12: Percent change of age composition

Figure 12 drawn from Table 10 shows the changes in age composition in the two locations for the two inter-census growth rates. According to the figure, there is a wide disparity across the locations. For example, in the lowland areas, for the years 1978, 1988 and 2002 there was an increase in population composition for the age group of 15 – 64 which increased from 48.8%, 55.4% to 61.9% respectively. This increase makes a percentage change of 6.6 for 1978/88 and 6.5 for 1988/2002. At the same time the percentage of changes for the age group 0 -14 in the lowland areas show a decreasing trend from 48.0%, 41.5% to 36.1% with a percentage change of -6.5 and -5.4 respectively. This trend suggests that the increased population in the age group of 15 -64 which demographically includes the reproductive age does not significantly contribute to the increase of children population of the 0 -14 age group. These results suggest that the age group 15 – 65 might be dominated by young seasonal migrants who are unmarried and expected to return home when the casual labour demand is low due to reduced farming activities, thus affecting the population fertility rate of the area. For the age group of 65 and above, the findings show an increasing trend of population composition in the highland areas (2.3, 4.7 and 4.9) for the respective years, compared to the lowland areas which show a decreasing trend (3.4, 3.1 and 2.1). These results reflect the young sex-age selectivity nature of migration. Apart from age group composition analysis, male and female composition was analysed in the lowland and highland areas. Figure 5.9 shows the age-sex composition in the lowland areas.

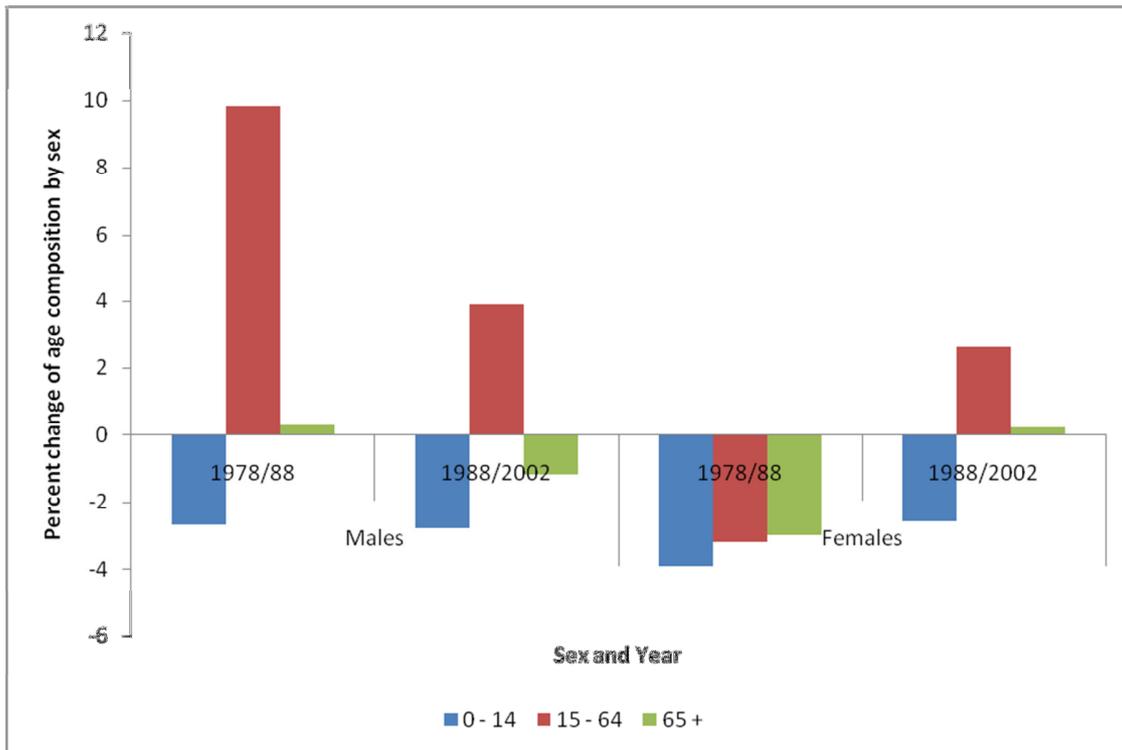


Figure 13: Percent change of age composition by sex in lowland areas

Figure 13 shows a comparison of the age composition between males and females in different age groups. It is clear from the figure that in the lowland areas, the proportion of males for the age group of 15 – 64 for the years 1978, 1988 and 2002 were very high (23.5, 33.3 and 37.2 respectively) compared to the female population which stood at 25.3, 22.1 and 24.7. The sex differentials in the same age group in the lowland areas was also very high because the change in percentage of the male population for the years 1978/88 and 1988/2002 was higher (9.8 and 3.9) than that of the females which was -3.2 and 2.6 respectively. The big number of males in the lowlands is attributed to the fact that a number of male adults who were in-migrants were living with their relatives or landlords as members of the family rather than forming a separate household. While the age-sex composition in the lowland areas shows increasing numbers of males in the age group 15 – 64, the analysis in the highlands shows a different direction – a slightly fluctuating trend compared to the lowlands, as presented in Figure 14.

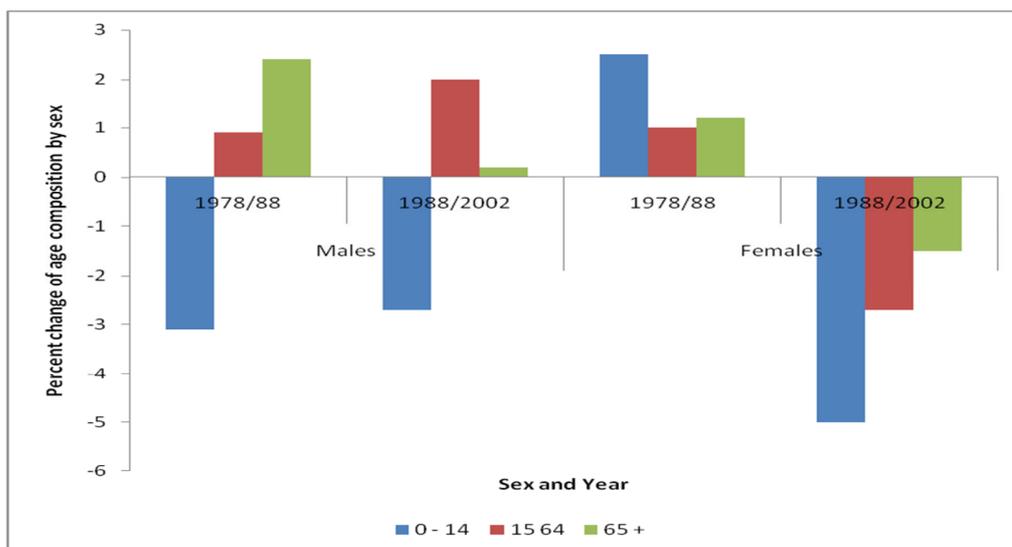


Figure 14: Percent change of age composition in highland areas by sex

Figure 14 shows the decreasing proportions of male children aged 0 – 14 from 1978 to 1988. At the same time, it remained constant for the years 1988 to 2002. The trend for female population slightly fluctuated from 1978 to 2002. The same trend was observed for the age group 15 – 64, where the figure shows a slight decrease in the proportions of male population from 1978 to 1988 from 27.4% to 25.6% respectively with a percentage change of -1.8, and remains constant for 1988 to 2002. On the other hand, female population slightly increased between 1978 and 1988 and decreased in 2002 (26.6%, 25.6% and 25.9) with a percentage change of 1.0 for 1978/88 and 0.3 1988/2002. The decreasing trends in male population in the age group 15 - 64 in the highlands might be associated with migration to other areas.

#### 5.4.2 Change in sex ratio

Sex ratio represents the number of males to the number of females, usually expressed as males per hundred females. Sex, together with age, are such indispensable demographic variables that sex ratios have applications in many and varied studies from living arrangements, consumer behaviour and social inequality. Social and cultural practices shape the role of men and women in the society together with their differences, for example in their access to education and employment (Riley, 1997). This may also apply to the allocation of land resources. Disparities in land access and ownership are the leading causes of gender inequality especially in rural areas.

The sex ratio in lowland and highland areas shows that men outnumber women by a considerable margin, however, with variations between the locations. In the lowland areas men outnumbered women by 111 men per 100 women, in 1978; 132 men per 100 women, in

1988; and 136 men per 100 women, in 2002 indicating the rising trend of male mobility. In the highland areas, although the number of men outnumbers the women, it shows a decreasing and fluctuating trend of sex ratio because in 1978 there were 112 men per 100 women, in 1988 there were 109 men per 100 women, and in 2002 there were 110 men per 100 women. Figure 15 summarises the sex ratios for the locations.

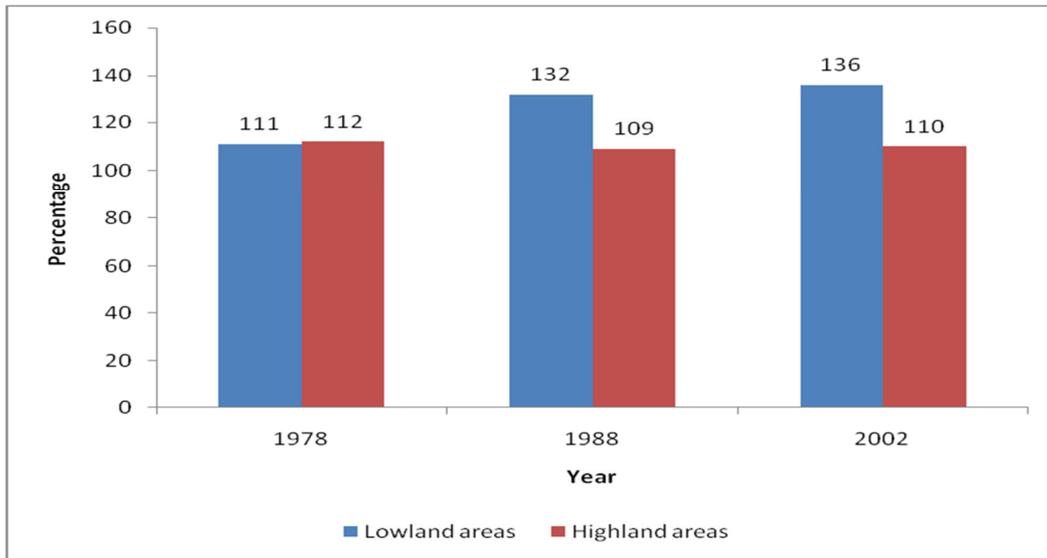


Figure 15: Trends of sex ratio by location

In general, the sex ratio observed in the area of study, particularly the lowland areas, is higher than the national sex ratio which was 96 males per 100 women in 1978, 1988 and 2002. The big number of males in the lowland areas resulted from the preponderance of male out-migration from the highlands in search of land for agriculture and the need for men to work in onion farms in Mang'ola Barazani and Mbuga Nyekundu villages. This corroborates the findings by Gultiano, *et al.* (2003) who opined that a shift in the sex ratio or sex structure occurs when one sex is more prominently involved in the process of migration. This has increased the dependency burden in the area of origin due to the absence of labour force, and has also increased pressure over resources in the receiving area.

#### 5.4.3 Change in dependency ratio

The age-groups of 0-14 and 65+ are usually referred to as the dependent age-groups while the age-group 15-64 is known as the working age-group or the "economically productive age-group" that normally supports the dependent age-groups. The dependency ratio is a useful indicator to reflect the ratio of child dependents, old-age dependents, and total dependents to those in the working ages of 15-64 years in a population. The total dependency ratio is

usually written as age dependency ratio. This ratio measures the dependency burden of the population – the higher the ratio the greater the expenditure and related support. This means less saving and more burden on the working age population. Table 11 summarises the dependency ratio and the percentage distribution of household members from 1978 to 2002, by location.

Census year	Lowland areas			Highland areas		
	Child dependency ratio	Old-age dependency ratio	Age dependency ratio	Child dependency ratio	Old-age dependency ratio	Age dependency ratio
1978	98	6	105	114	5	119
1988	75	6	80	105	10	115
2002	58	3	62	96	10	106

Table 11: Population dependency ratios for 1978, 1988 and 2002  
Source: Calculated from 2002 Population and Housing Census, 1988, and 1978.

When comparing the last three censuses of 1978, 1988 and 2002 in Table 11, the child dependency ratios for lowland areas was low and significantly declined between 1978 and 2002, while the old-age dependency ratios remained constant for 1978 and 1988, but which rapidly declined in 2002. On the contrary the child dependency ratio in the highland areas was high in 1978 and 1988, but slowly decreased in 2002. There was also an increase in the old-age dependency ratio which reflects the age selective nature of migration. Looking at the age dependency ratio, the analysis shows that the age dependency ratios from 1978 to 2002 in the lowland areas were low compared to those in the highlands, although with a decreasing trend in all locations.

The demographic implication of the low dependency ratio experienced in the lowland areas is that the area has a lower proportion of younger children and older people depending on the working population for survival than those living in the highlands. The age dependency ratio shows a downward trend due to the increasing number of young migrants working in the area. However, it should be noted that for the dependency ratio to have meaningful interpretation, other socio-economic factors such as the availability of resources should be taken into consideration. In this case the low dependency ratio experienced in the lowland areas may have implications on the availability of land resources.

## 5.5 Summary

The chapter has presented empirical findings for the household survey of four villages located in the lowland and highland areas of Karatu District. The study found out that in the two locations of the study area, which have different climatic conditions, the majority of the households had between four and ten members, and they were dominated by children within the age group of 0-14 years. Despite the high rate of migration from the highlands to the lowlands, the sampled highland villages still had a high average household size of 7.3 compared to the lowland area which was 5.7. In addition, about 58 (6.4%) of the household members in the lowland areas were not permanent residents, and the majority were casual labourers in onion farms. Age has been established to have a positive relationship with the rate of migration.

It is evident that the incidences of migration between the two locations were high, as the majority of the people had migrated from highland to lowland areas. However, a significant number of migrants who were found in the lowland areas were reported to have come from outside the district. Rural-rural migration was found to be the common pattern of migration, to some extent followed by urban-rural migration in which people from Karatu Town migrated to lowland areas. It was further observed that permanent and seasonal migrations were the most important type of migration in the area. While a number of migrants were found to have established permanent settlements, some of them were moving on a seasonal basis in the onion farms especially during harvest and farm preparation time, as casual labourers and business people. Land scarcity in places of origin was mentioned by 63 (49.6%) respondents as the main cause of migration to the lowlands, followed by the Villagization Programme which was mentioned by 22 (17.3%) respondents. Drought, lack of rainfall or unpredictability were mentioned by 18 (14.2%) respondents, and casual labour and trading by 11 (8.7%) of the sampled respondents.

In relation to land size possession, the study found that the average land size in the two locations was 2.8 with slight variations between the locations. The land size possession in the highland areas was found to be greater than that in the lowlands by 1.2 acres. Small farms in the lowlands were associated with an increasing number of people which had led to land fragmentation in the area. This was justified by the fact that about 75 (46.9%) of those who owned less than 2.5 hectares in the lowlands were migrants who arrived in the area in the 1990's and 2000's.

In quantitative terms, the analysis of population census data from the government has provided evidence that migration has influenced the population balance in the lowland areas in a number of ways. First, rapid increase of population was evident from the fact that the

population size for the villages in the lowland areas had rapidly increased as shown by high inter-census growth rates of 5.9% and 11.4% for Man'gola Barazani Village and 6.2% and 7.6% for Mbuga Nyekundu Village in the years 1978/88 and 1988/2002, respectively. This was caused especially by permanent migration by which people had decided to establish permanent settlements in the lowland areas.

Secondly, migration had changed the age and sex compositions of the population. Analysis of the three last censuses for 1978, 1988 and 2002 established that in the lowland areas there was a rapid increase of population in the age group of 15 – 64, with a high proportion of males compared to that in the highlands. At the same time, the population composition of the age group of 0 – 14 in the lowland areas showed a decreasing trend despite the increasing trend of age group 15 – 64. The decreasing population composition in the age group of 0 – 14 showed a low fertility rate in the area, which might be associated with the presence of young seasonal migrants who were unmarried and were expected to return home.

## **6. Population Mobility and Changes in Land Use**

### **6.1 Overview**

This chapter focuses on land use changes which have taken place in the area from 1987 to 2010. Based on the people's perceptions and analysis of satellite images, the relationships between population growth and other land use change driving forces are discussed. The first section provides a general understanding of land use changes and a general overview of land use distribution in Karatu District. The second section discusses the processes of change in land use that took place in the lowland areas from 1987 to 2010, with emphasis on the two study villages of Mang'ola Barazani and Mbuga Nyekundu. The third section focuses on land use that has taken place in the highland areas in Rhotia Kainam and Kilimatambo Villages. In all locations the changes are analysed by looking at the changes in a number of variables which include settlements, farmlands, grasslands, forests, water bodies, shrubs and trees, and some aspects of expansion.

#### **6.1.1 Population growth and land use change**

Land is a major resource used for agriculture to provide products that service human needs and wants including nutritious foods such as meat, vegetables and fruit; and fibres for clothing and furnishings. Changes in the use of land reflect a variety of environmental and social factors, necessitating an equally varied suite of data to be used for effective analysis. While remote sensing, both from satellites and air photos, provides a central resource for studies of this nature, socio-economic surveys, censuses, and map sources also supply a wealth of valid information (Aspinall *et al.*, 2008). In the light of these observations, the analysis of satellite images of 1987 and 2010, the socio-economic surveys and censuses were undertaken to address important land use changes which took place in the area.

Karatu District has an estimated area of 3,300 sq.km., which is divided into various land uses. According to the District Land Officer, the area suitable for agriculture is 102,573 hectares while the area reserved for grazing is 155,808 hectares. Forests and bushlands cover about 61, 218 hectares, the area unsuitable for agriculture constitute 9,341 hectares, while 1,060 hectares is covered by Lake Eyasi. Suitable land for irrigation agriculture in the Lake Eyasi Basin is estimated to be 3,600 hectares.

According to the Agriculture and Livestock Census of 2003, the district grows agricultural crops for cash and food. The cash crops grown in the district are barley, coffee, onions and pigeon peas, while the food crops are mainly maize, beans and millet. More than half of the land is tilled with the help of tractors, and the rest is cultivated by means of the hand hoe and

ox-ploughs. The most important livelihood activity for smallholder households in Karatu District is annual crop farming, followed by livestock rearing. The district is famous for maize production in the region with a planted area of over 19,230 hectares; however, the planted area per household is 0.7 hectare which is the third largest in the region. There is a little production of paddy and sorghum in the district and highest production of wheat in the region. The production of beans in Karatu is the third lowest compared to other districts in the region with a planted area of 10,423 hectares. Oil seed crops are produced on a small scale. Vegetable production, including onion production, is the second most important in the district. The most important permanent crops in Karatu are bananas and pigeon peas which are grown in the plated area of 191 hectares and 2,536 hectares respectively.

Large areas of the southern part of Karatu District are covered by Miombo forests. This forest area is of great importance to many people as it provides them with the much needed resources like firewood, charcoal, timber, and honey. But as the population is increasing rapidly, there is deforestation. In the north-eastern parts of the district there are forest areas, and crops are grown in the higher altitudes. The most limiting factor for agriculture in the lowlands is low rainfall. Another factor is that land in Karatu is very scarce because the population is fast growing and many investors are buying land from the owners to invest in campsites or hotels as well as agriculture.

#### 6.1.2 Land use changes in the lowlands

In order to examine land use/cover changes in the area of study, two approaches were used. The first approach was interview-based assessment of land use changes, where people were requested to give their perceptions on the major land use/cover changes which had taken place since they arrived in the area. The second approach was the analysis of satellite images from 1987 to 2010. The people's perception of land use changes are represented in Figure 16.

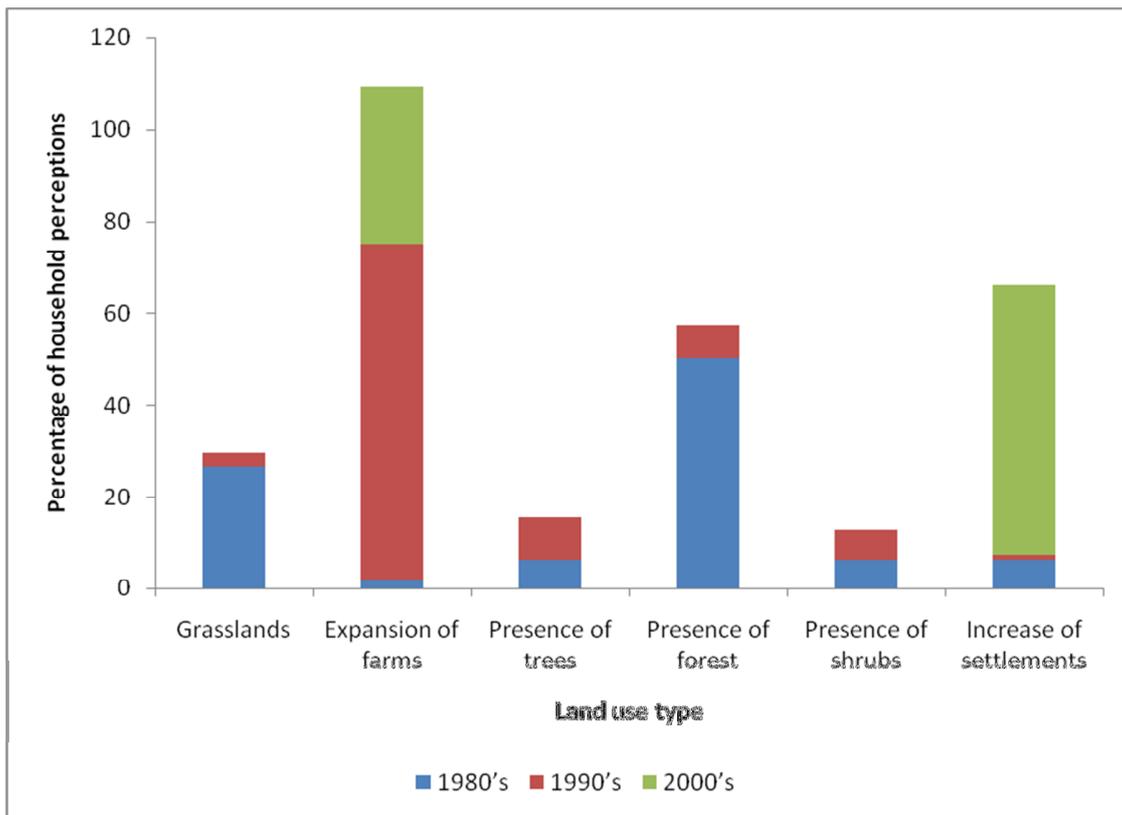


Figure 16: Percentage of people's perception of land use changes in the lowland areas from 1987 - 2010

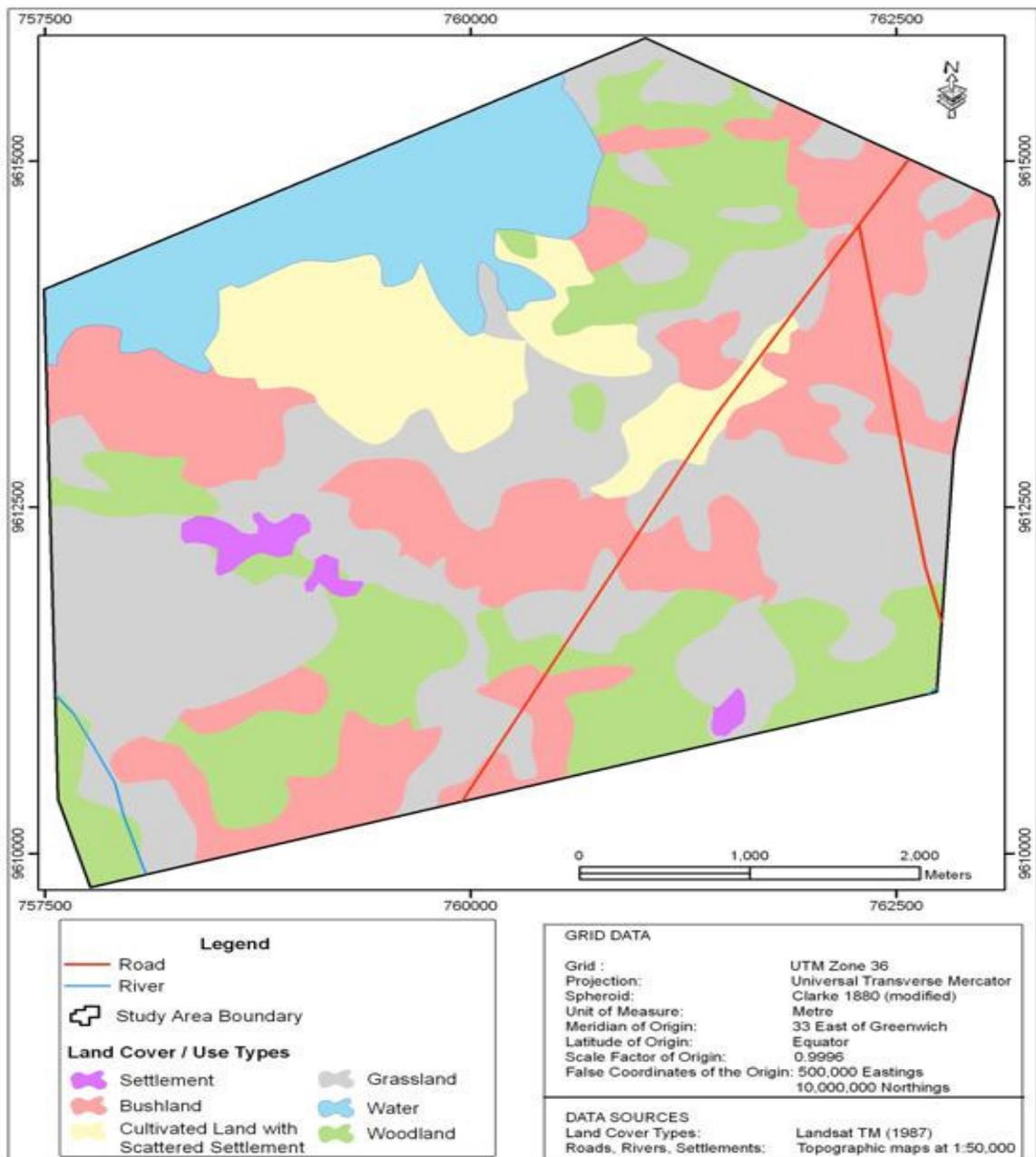
Based on Figure 16, people's perception indicated that among the respondents who were present in the 1980's only 4 (6.3%) admitted that there had been expansion of the settlements, compared to 60 (58.8%) who were present in the 2000's. The same trend was reported with regard to the expansion of cultivated land where only 1 (1.6%) of the respondents who were present in 1980's noted this expansion, compared to 80 (73.4%) of the respondents who were present in the 1990's. Furthermore, with regard to forest cover and grasslands, the majority of the respondents admitted that forest cover had been reduced to a great extent, which was a reflection of the expansion of farms and settlements. During the focus group discussion, one of the elders lamented about how changes in land use were affecting their livelihood. He had the following to say:

*In the 1970s and 1980s a large part of the village was covered by heavy forests and dense bushlands. There was plenty of water in River Baray and its distributaries, the river never dried. The streams receiving water from Qangded water springs had also plenty of water. The presence of heavy forests, dense bush lands and water attracted wild animals like lions, hippos, rhinos, steinbecks and others, but now you cannot see any of these animals. The*

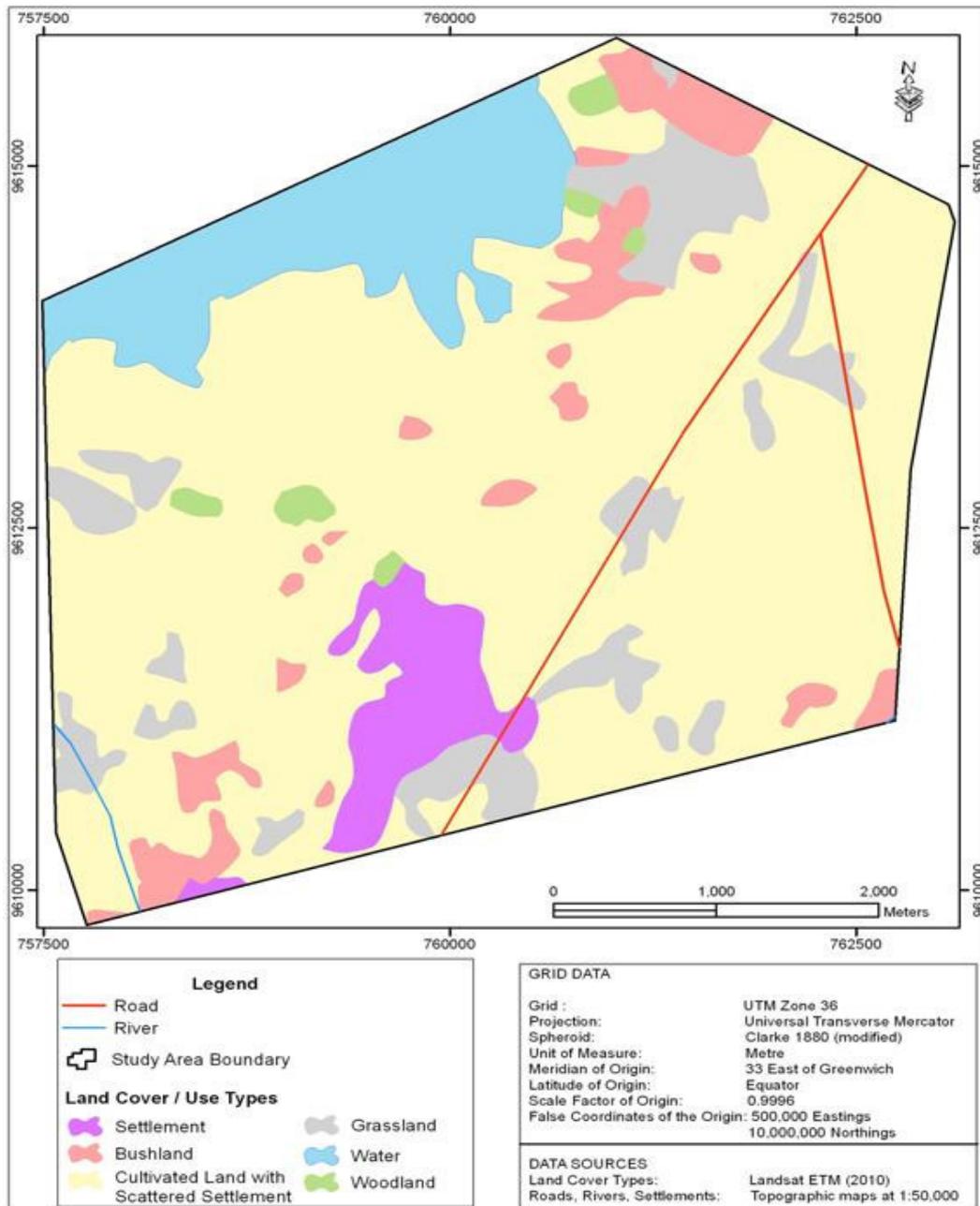
*only animals we have here are our livestock. The whole area is now covered by onion farms and houses, and even our livestock have nowhere to graze.*

The elder's observation with regard to the disappearance of wild animals in the area is supported by a study by Woodburn (1995) in which he observed a diminishing wildlife population. One of the reasons for this disappearance, he said, was a huge influx of people and livestock which resulted in severe competition with wildlife for both grazing and dry season water. Furthermore, when the respondents were required to explain the reasons for these changes in land use/cover, population growth ranked number one, followed by good market and the price of onions, the major cash crop in the 1990's which attracted people to come to the area. Availability of irrigation water from Qangdend springs was the third reason given.

As stated above, in order to understand whether the respondents' perception of land use changes was supported or not supported by scientific data, satellite images of Mang'ola Barazani and Mbuga Nyekundu Villages in the lowland areas for the period 1987 to 2010 were analysed. The results of the analysis of the changes shown on Maps 6 to 9 are summarised in Tables 12 and 13.



Map 6: Land use in Mang'ola Barazani Village in 1987

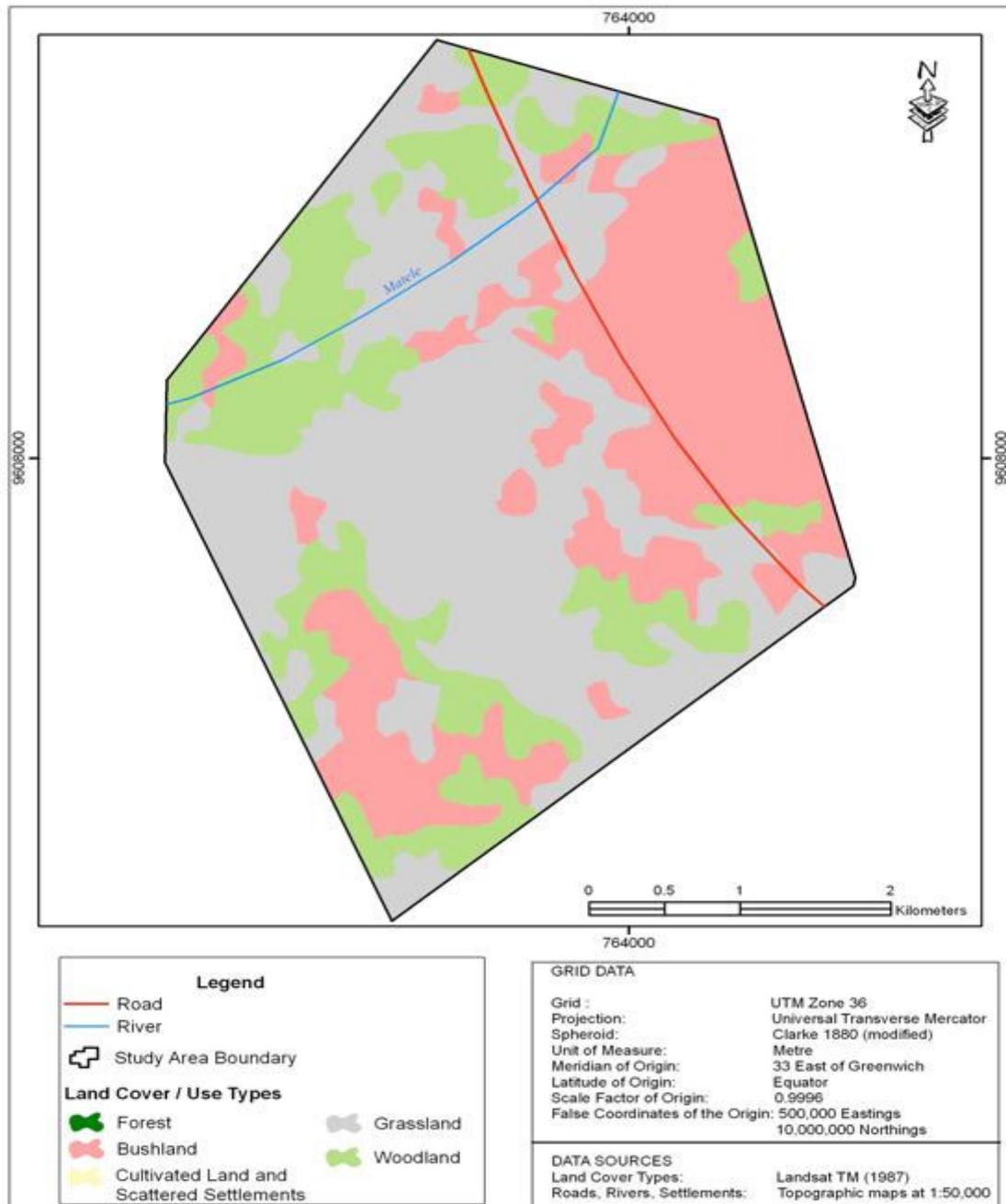


Map 7: Land use changes in Mang'ola Barazani Village in 2010  
 Source: Own interpretation of Satellite Landsat Imagery (acquired in February, 1987 and March, 2010).

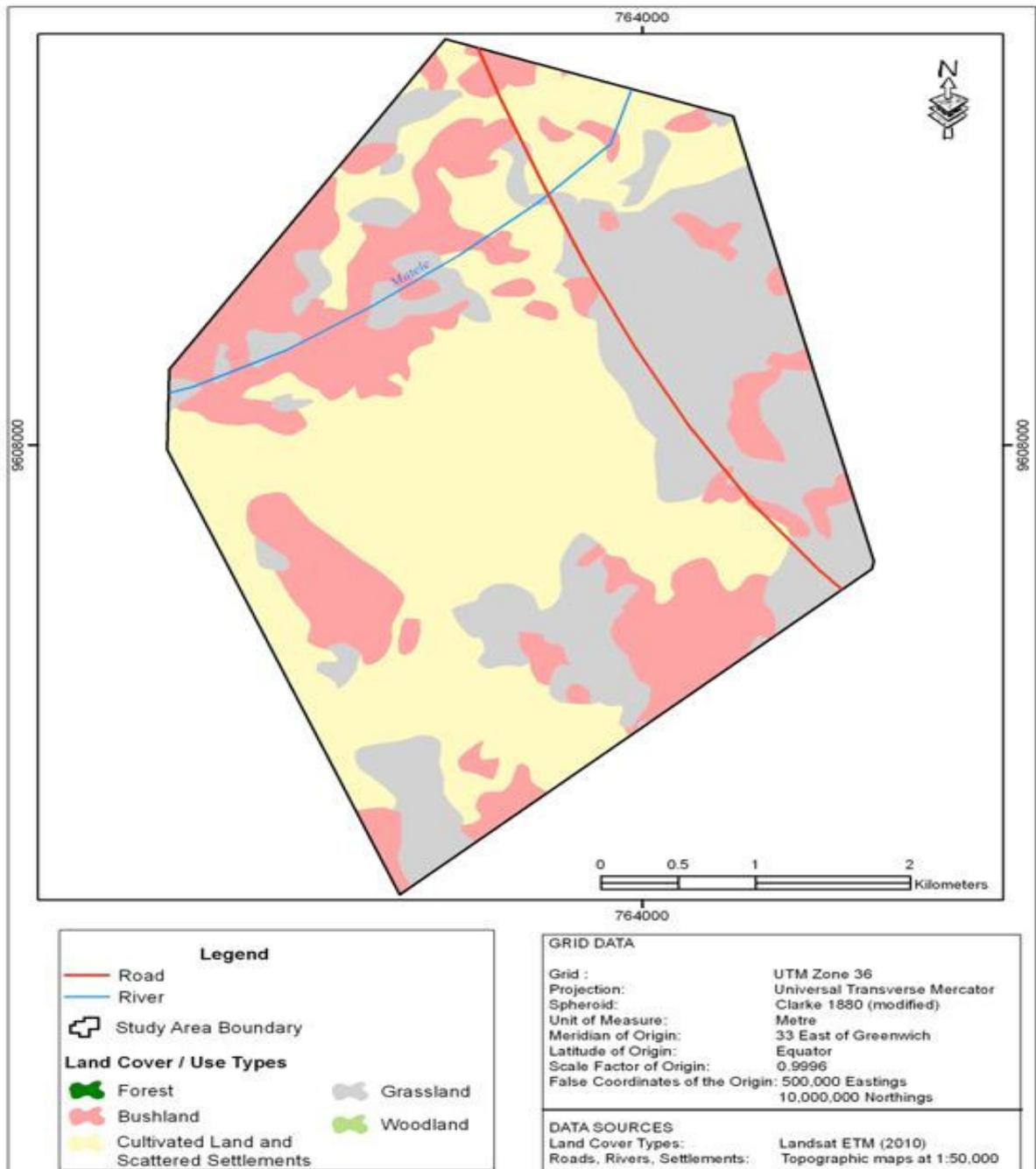
Type of land use	Coverage in hectares				Cover Change	
	1987		2010		1987-2010	
	Ha	%	Ha	%	Ha	%
Bushland	585	23.5	145	5.8	-440	-75.3
Cultivated land with scattered settlements	250	10.0	1689	67.8	1439	576.6
Grassland	872	35.1	235	9.4	-637	-73.0
Settlements	28	1.1	119	4.8	91	325.0
Water	277	11.1	274	11.0	-3	-1.1
Woodland	477	19.2	27	1.0	-450	-94.3
<b>Total</b>	<b>2490</b>	<b>100.0</b>	<b>2490</b>	<b>100.0</b>		

Table 12: Land use changes in Mang'ola Barazani Village

Source: Calculated using GIS analysis.



Map 8: Land use in Mbuga Nyekundu Village in 1987



Map 9: Land use changes in Mbuga Nyekundu Village in 2010  
 Source: Own interpretation of Satellite Landsat Imagery (acquired February, 1987 and March, 2010).

Type of land use	Coverage in hectares				Cover Change	
	1987		2010		1987-2010	
	Ha	%	Ha	%	Ha	%
Bushland	586	30.7	478	25.2	-108	-18.4
Cultivated land with scattered settlements	0	0	898	47.2	898	100
Grassland	872	45.7	525	27.6	-347	-39.7
Woodland	443	23.6	0	0	-443	-100
<b>Total</b>	<b>1907</b>	<b>100.0</b>	<b>1907</b>	<b>100.0</b>		

Table 13: Land use changes in Mbuga Nyekundu Village  
Source: Calculated using GIS analysis

Type of land use	Coverage in hectares				% Land use Change	
	1987		2010		1987-2010	
	Ha	%	Ha	%	Ha	%
Bushland	1171	26.7	623	14.2	-548	-47
Cultivated land with scattered settlements	250	5.7	2587	58.9	2337	935
Grassland	1744	39.7	760	17.3	-984	-56
Settlements	28	0.6	119	2.7	91	326
Water	277	6.4	274	6.2	-3	-1
Woodland	920	20.9	27	0.7	-893	-97
<b>Total</b>	<b>4390</b>	<b>100.0</b>	<b>4390</b>	<b>100.0</b>		

Table 14: Land use changes in the lowland areas  
Source: Calculated using GIS analysis

The interpretation of the satellite images shows that the total area of dense bushland (Bd) in the two villages decreased from 26.7% to 14.2% (Table 7.3) with a percentage change of -47. The cultivated lands together with settlements increased from 5.7% in 1987 to 58.9% in 2010 with an increasing percentage of 935. Similarly, there was an increase in settlements by 326 percent. A major change in the settlement pattern and localisation took place as a result of the villagisation process from 1974-76, when people were brought together in the nucleus village (Sano, 1999). Further analysis shows a decreasing trend of the woodlands from 20.9% of woodland cover in 1987 to 0.7% in 2010. The grassland area was also reduced to a great extent and the analysis shows that the percentage for grassland cover did decrease by

56. The increasing and decreasing trends of land use changes are very clear for the category of bushland, settlements, cultivated land, woodland as well as grassland.

In general, the findings based on the interviews with the farmers and those based on satellite images analyses from 1987 to 2010 (Fig. 6.2) indicate pressure on land resources in the lowland area, where a large part of Mang'ola Valley was under cultivation. Observation made during the field study showed that farming expansion was still happening in Mbuga Nyekundu by encroaching some of the areas which had formerly been used for settlements. The land owners are now moving into areas which are not suitable for agriculture in the upland areas within the village.

As it has been revealed in the household's survey, population growth has played a significant role in land use change by increasing the area under cultivation. The growing importance of commercial onion agriculture and the availability of arable land in Mang'ola Barazani and Mbuga Nyekundu are reflected in the population figures shown in Table 5.9, in Chapter Five. The analysis of population data shows that the population in the study area increased from 1,728 in 1988 to 8,427 in 2002, and from 2,093 in 1988 to 6,097 in 2002 for Mang'ola Barazani and Mbuga Nyekundu respectively. This makes an annual population growth rate for 1988/2002 to be 11.4% for Mang'ola Barazani Village and 7.6% for Mbuga Nyekundu Village. The annual growth rate experienced in this area is very high compared to the district population growth rate which is estimated to be 3.2%, while the regional growth rate is 4.0%, and the country population growth rate is 2.9% (NBS, 2006).

The population growth is also reflected in the expansion of settlements which is evident from the increasing number of people who build houses in the flood prone areas. The settlements in the flood prone areas which were observed in Mang'ola Barazani have come about due to land shortage and the need by the new migrants and young couples to establish their own homesteads. Another evidence for the increasing population and settlements in the lowland areas was the registration of the new village (Mbuga Nyekundu) in 1999. As it was pointed out in Chapter Four, Mbuga Nyekundu was formerly part of Jobaj Village and according to the satellite image of 1987 in Map 8, the area had not been inhabitable. However, in the early 1990s, Jobaj Village continued to experience an influx of migrants which increased the number of people in the area and necessitated the Karatu District council to split the village into two villages. According to the Local Government District Authorities Act, 1982 a sub-village with more than 250 households qualified to be a full village after the approval of the Minister for Land and Human Settlements.

The role of the market in land use changes has also been observed in the lowland areas. As it has been suggested by Gleave and White (1969), the production of cash crops could lead to land use intensification very similar to that induced by high population. Thus, changes in the market in terms of price incentives create changes in land use. The increase in the prices of onions in the market in 1994 which was caused by the low supply of onions due to floods motivated the people to expand their farms through buying or renting land, as well as increasing production by investing highly in chemical fertilisers and pesticides. This is in line with Brush and Turner's 1987 findings who suggested that market demand could compel households to produce surplus above their subsistence needs.

### 6.1.3 Land use changes in the highland areas

Reporting on land use changes, respondents in the two villages located in the highlands informed that in the 1980s the areas was mainly covered by grasslands which decreased in the 1990s and 2000s. The decreasing trend of grasslands was associated with the increasing trend of the farms which became more pronounced in the 2000s. Similarly, the respondents testified that there had been expansion of settlements in 1980s and 1990s, but there was no expansion of settlements in the 2000s. Forests and tree cover were reported to be on the increase in the 2000s. This increase might be associated with the afforestation campaign conducted by the Tanzania Association of Foresters, which was actively involved in planting trees in Karatu District. The respondents' perception with regard to land use changes in the villages in the highlands are shown in Figure 17.

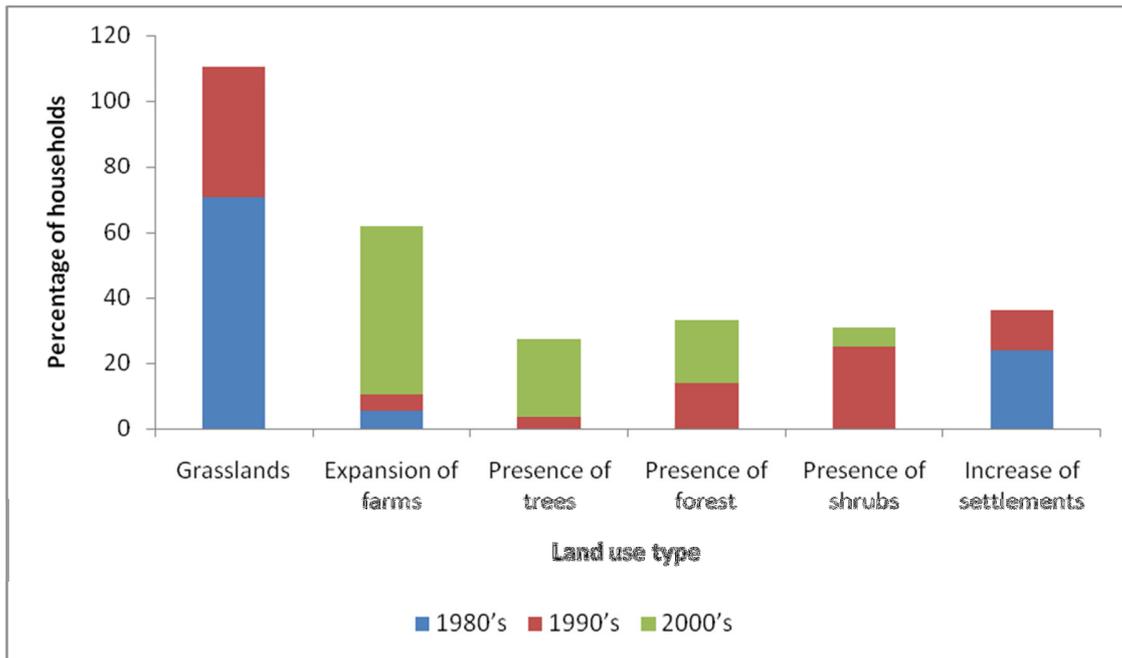
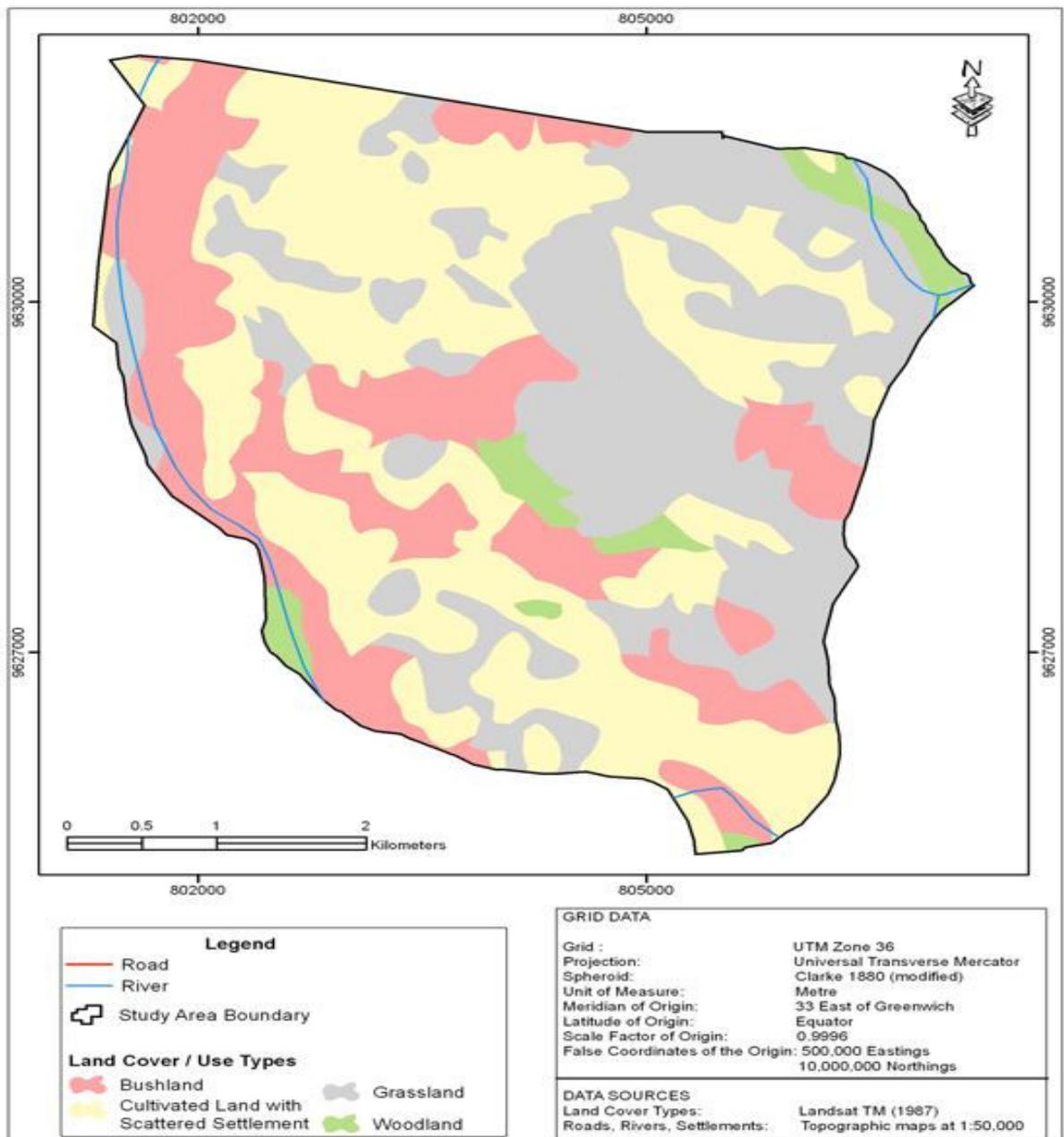
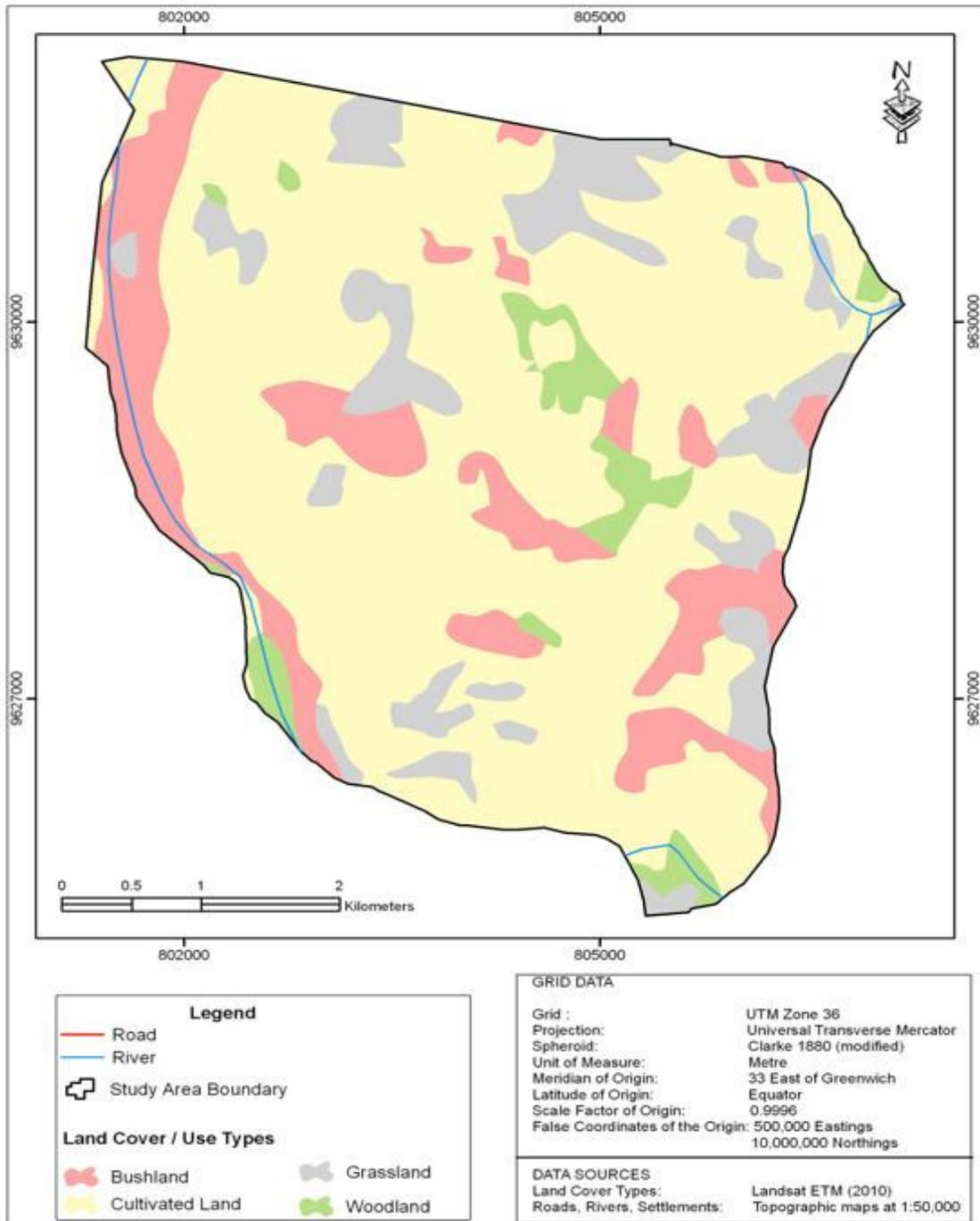


Figure 17: Percentage of people's perception of land use changes in the selected villages the highland areas from 1987 - 2010

As it was done in the case of the lowland areas, the satellite images for 1987 and 2010 were used to indicate the changes which had taken place in the surface area. The analysis of these satellite images and their interpretation are shown in Map 10 to 13 and Tables 15 and 16 for Rhotia Kainam and Kilimatambo Villages respectively. Also the summary of the changes in the two villages are shown in Table 17.



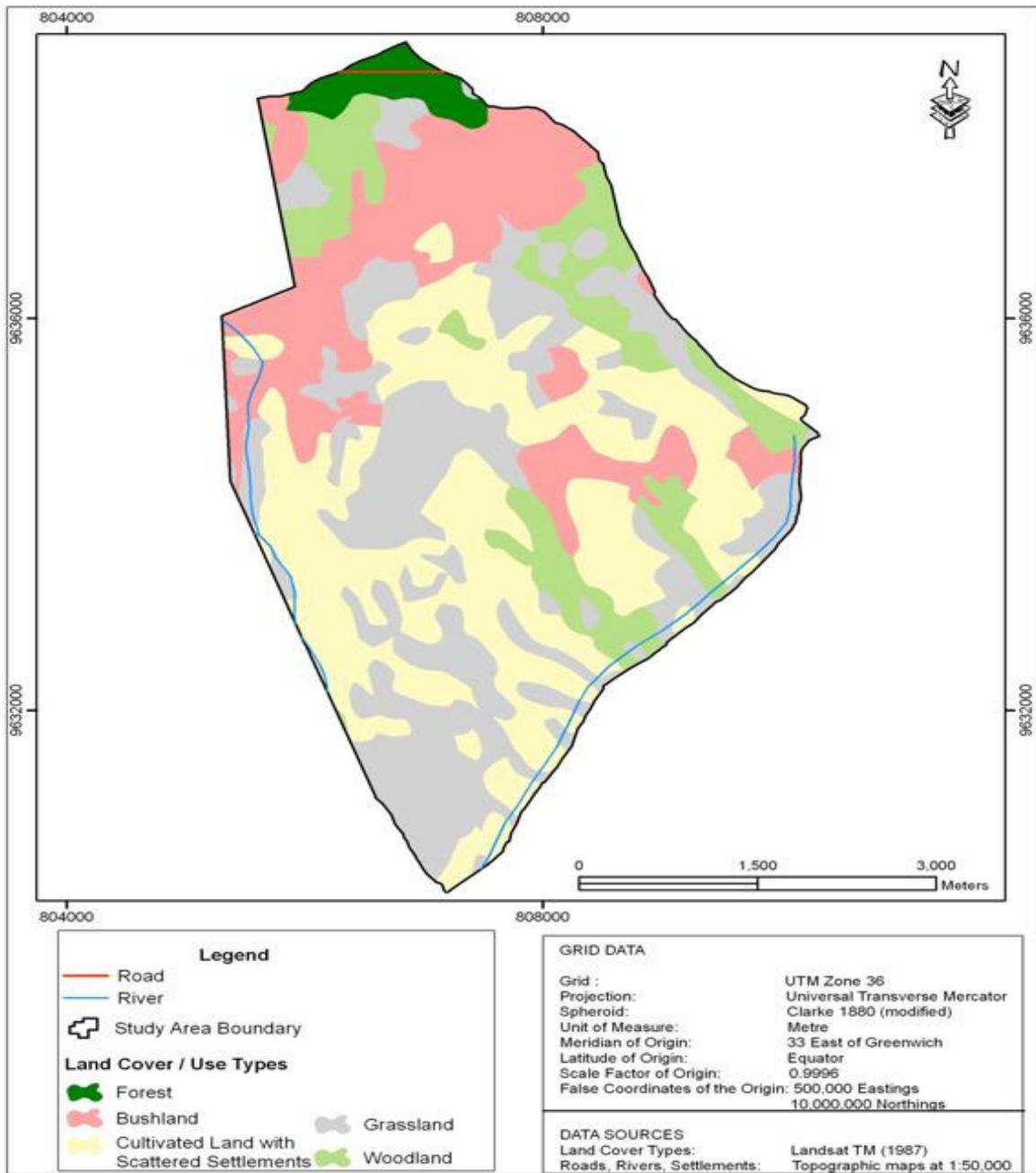
Map 10: Land use in Rhotia Kainam Village in 1987



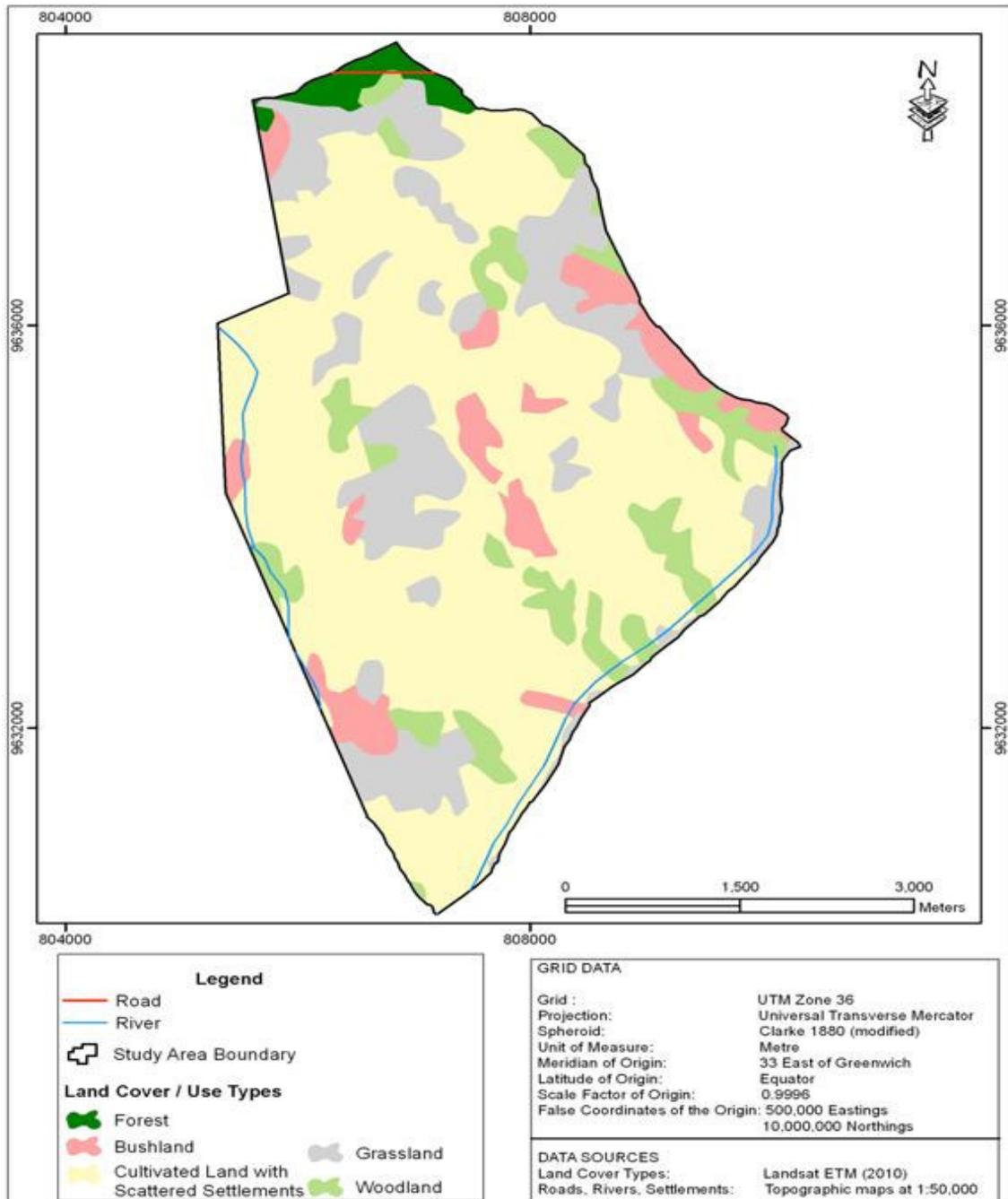
Map 11: Land use changes in Rhotia Kainam Village in 2010  
 Source: Interpreted from Satellite Landsat imagery (acquired in February, 1987 and March, 2010).

Type of land use	Coverage in hectares				Cover change	
	1987		2010		1987-2010	
	Ha	%	Ha	%	Ha	%
Bushland	624	23.5	427	16.1	-197	-32
Cultivated land with scattered settlement	1046	39.4	1796	67.7	750	72
Grassland	888	33.5	320	12.1	-568	-64
Woodland	95	3.6	110	4.1	15	16
<b>Total</b>	<b>2653</b>	<b>100.0</b>	<b>2653</b>	<b>100.0</b>		

Table 15: Percentage of land use changes in Rhotia Kainam Village  
Source: Calculated using GIS analysis.



Map 12: Land use change in Kilimatambo Village in 1987



Map 13: Land use changes in Kilimatambo Village in 2010  
 Source: Interpreted from Satellite Landsat imagery (acquired February, 1987 and March, 2010).

Type of land use	Coverage in hectares				Cover Change	
	1987		2010		1987-2010	
	Ha	%	Ha	%	Ha	%
Bushland	517	20.6	186	7.4	-331	-64
Cultivated land with scattered settlements	870	34.7	1558	62.2	688	79
Forest	66	2.6	49	1.9	-17	-26
Grassland	745	29.7	477	19.0	-268	-36
Woodland	309	12.4	237	9.5	-72	-23
<b>Total</b>	<b>2507</b>	<b>100.0</b>	<b>2507</b>	<b>100.0</b>		

Table 16: Percentage land use changes in Kilimatembo Village

Type of land use	Coverage in hectares				% Land use Change	
	1987		2010		1987-2010	
	Ha	%	Ha	%	Ha	%
Bushland	1141	22.1	613	11.8	-528	-47
Cultivated land with scattered settlements	1916	37.1	3354	65	1438	+75
Forest	66	1.3	49	0.9	-17	-26
Grassland	1633	31.6	797	15.4	-836	-51
Woodland	404	7.8	347	6.7	-57	-14
<b>Total</b>	<b>5160</b>	<b>100.0</b>	<b>5160</b>	<b>100.0</b>		

Table 17: Percentage land use changes in the highland areas

Source: Calculated using GIS analysis

Land use changes observed in the highland areas between 1987 and 2010 show that grassland cover had been depleted from 31.6% to 15.4%. Likewise, there was a slight decrease in the bushland and woodland from 22.1% to 11.8% and 7.8% to 6.7% respectively. The bushland and woodland have been replaced by cultivation and settlements. The same trend was observed in the forest cover which had decreased from 1.3% to 0.9%. The decreased trend in forest cover shown in the analysis of the satellite images is different from the people's perception who reported an increase in forest cover. As it was pointed out in the previous section, the differences might have been caused by the increased number of trees planted by the Tanzania Association of Foresters in the village, which must have made it

difficult for villagers to differentiate between a forest and the trees which had been planted and scattered in the villages. While the bush lands and forests showed a decreasing trend, the area used for cultivation and settlements increased from 37.1% to 65.0%. The observed satellite images show that a large part of the forests was converted to woodland and bushland, which suggests that people were cutting trees for building materials, charcoal making as well as grazing. The following table illustrates some historical events summarised from different sources to show how land use has been changing over time in the study area.

<b>Source of information</b>	<b>Villages land use history</b>	<b>Context History</b>	<b>Type of land use</b>
Archives	<p>1900 - The Hadzabe traditionally occupied the western and eastern areas of Lake Eyasi, well endowed with natural resources which supported sources of their livelihood</p> <p>1940's – Livestock keeping as a major land use type, mainly by the Barabaig pastoralists</p>	<p>The Hadzabe are hunter-gatherers who live in the Eastern Rift Valley in Northern Tanzania</p> <p>In the 1930's and 40's the Datoga/Barabaig began moving into Hadza country</p> <p>The Sukuma and Nyiramba from the Shinyanga and Singida respectively spread in south-western borders of the Lake Eyasi</p>	<p>Hunting game, collecting honey, digging tubers, and gathering berries and baobab fruit</p> <p>Grazing, hunting and collecting of fruits and livestock keeping as a major land use</p> <p>Decreased grasslands and bushlands</p>

	Indigenous hunter-gatherer communities	<p>The Mbulu Development Plan in 1948, which opened up new areas for habitation. Decreased the number of cattle in the Mbulu Highlands and improved land use in the agricultural areas through soil conservation measures</p> <p>Movement of people during this period was caused by an outbreak of tsetse flies in the Mbulu area. Iraqw agro-pastoral expansion</p>	<p>Clearing of vegetation in the highlands to eradicate tsetse flies</p> <p>Establishment of new settlements within Mbulu/Karatu</p>
Topographical maps of 1980's	<p>1970 livestock continued to be the main livelihood, cultivation very little, mainly onion agriculture by the Iraqw</p> <p>With its agricultural overtones the <i>ujamaa</i> strategy emphasised sedentarisation and largely failed to benefit the pastoralist</p>	<p>Villagisation Programme of 1973 and 1974</p> <p>Drought and death of livestock in 1974</p> <p>Agro- pastoralists (the Iraqw) migration in search of 'open' lands and water</p>	<p>Significant land loss for the hunting and gathering group</p> <p>Environmental decline of the fragile dry land ecosystem (eg. habitat loss and wildlife decline, deforestation, and overgrazing)</p>
Satellite Images 1987 to 2010	<p>1980s: change in the production system from livestock keeping to agriculture</p> <p>Introduction of animal traction</p>	<p>Out-migration of the Barabaig pastoralists</p> <p>Reduced number of livestock in the households</p> <p>Introduction of zero grazing system</p> <p>Adoption of new economic activity</p>	<p>Livestock keeping replaced by agriculture</p> <p>Loss of grazing land</p> <p>Expansion of cultivated land</p> <p>Increased settlements</p>

Focus group discussion and in-depth interviews with village leaders and elders		from pastoralists to agriculturalists	Decreased grasslands, woodlands and bush lands
	Expansion of farms and changing ecological systems. Introduction of tractors in agriculture	More influx of people of different ethnic groups from within and outside the district	Excessive use of chemical fertilisers and pesticides
	1994 floods led to the destruction of onion farms. Low production of onions	Increased demand and high prices of onions in Arusha market	Disappearance of wildlife like elephants and rhinos due to loss of habitat  Increasing land and resources use conflict.

Table 18: Some historical events and associated land use in the study area

## 6.2 Summary

Looking at the map and the data presented above, it is evident that land use changes have taken place in all locations, although at different rates. The lowland areas have experienced rapid expansion of cultivation and settlements caused by, among other factors, the influx of migrants who have established permanent settlements and buying or renting land from the local people. The patterns of land use in the lowland areas are highly determined by irrigation agriculture and other soil characteristics. Furthermore, the expansion of cultivation was favoured by the introduction of drawn ploughs, tractors and the application of chemical fertilisers which raised the production potential in the Mang'ola Valley. This change in technology also affected the cropping pattern toward an increased production of onions. According to the interviews and image analyses, a similar but slower process of expansion of cultivation took place in the highlands mainly caused by the expansion of wheat and maize farms. The differences in land use change was reflected by the magnitude of change which shows that the cultivated land and settlements in the lowlands had increased by + 935 in the lowland compared to +75 of highland areas. Similarly, the area used for settlements only in the lowland areas had also increased by +326 while in the highlands settlements were within the cultivated land. Population growth as a proximate cause of demographic factors is not driving land use change in the highlands as population growth rates are actually decreasing from 4.3 to 2.3 in Rhotia Kainam Village and 2.9 to 2.6 in Kilimatambo Village.

## **7. Changing Land Tenure Systems and Agricultural Production**

### **7.1 Overview**

In order to provide better insights into the dynamics of population and land resource management, it is important to examine the relationships between different demographic variables such as sex and age composition, migration patterns, marital status, level of education, income as well as land ownership and management of land resources in the area of study. This chapter, therefore critically analyses the relationship between demographic variables, land tenure and management and its implication to sustainable land resource management and people's livelihood systems in the area. It seeks to explore how population mobility has influenced changes in land tenure system and management.

The chapter is divided into four sections. The first section explores how the land tenure system has been changing over time and elucidates the factors behind these changes. It also discusses the land acquisition process and how and why wealthy farmers and businessmen acquire land at the expense of poor farmers. Land tenure security and how it affects the management and sustainability of land resources is also discussed in this section.

Agricultural investments and access to implements/inputs are discussed in section two. The section discusses the extent to which wealthy farmers and agro-businessmen invest into infrastructure such as fertilisers, pumps, herbicides and pesticides and their implications to land resources. The section also discusses how different socio-economic groups get access to these agricultural inputs and the role played by various institutions to improve agriculture and sustainability of land resources. In general, the section analyses the way highly capitalised land management profoundly changes the landscape and threatens the sustainability of land resources in the area and the people's socio-economic development.

Section three focuses on population mobility and the changing socio-economic development, by looking at various economic activities taking place in the area and how these activities have been changing over time. A seasonal calendar of agricultural activities and contract farming agreements as a survival strategy for the poor land owners and how it operates as well as its impacts to the people's socio-economic development is discussed. Finally, section four analyses the influence of marketing, storage facilities and transport to agricultural development. The discussion examines the interrelationships between the farmers and onion businessmen and how these relationships affect their livelihood and the land as their resource base<sup>1</sup>. The information in this chapter is mainly derived from field observation, household surveys and focus group discussions. In addition, related literature review with regard to

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<sup>1</sup> Onions are the major cash crop in the area.

migration, land tenure systems and land management in Tanzania in general, and Karatu District in particular, are reviewed in order to contextualise the study.

## **7.2 Changing land tenure systems**

Land tenure is used to mean two different but interrelated things. On the one hand it means the length of time that a farm has been bestowed to the household by the prevailing rules or customs and, on the other hand, it means some form of security in the sense of a household's ability to continue owning a plot that it currently operates (Feder *et al.*, 1987). Land tenure in Karatu District has undergone many changes since the first colonial land laws of the 1920's. Uncertainty about the laws governing ownership and tenure has been rife particularly in the period following Tanzania's independence (Loiske, 1995). Following the First World War and the British colonial takeover, the 1923 Crown Land Ordinance placed all land under the control of the Governor; the government thus became 'simultaneously a trustee and conqueror' (Igoe & Brockington 1999) controlling the rights of occupancy, whether 'deemed' (customary) or 'granted' (newly allocated). The local people's customary rights were largely protected as 'deemed rights of occupancy'. However, after the Second World War the colonial administration increasingly took land from the local users and granted it to the settlers. Moreover, Nyerere's vision of a united nation in which every citizen would be Tanzanian, rather than a member of a tribe, led to a post-independence policy with citizens having the right to live anywhere in Tanzania.

The Lake Eyasi Basin is currently inhabited by many ethnic groups including the Iraqw who form the majority group, followed by the Babaraig (Datoga), the Chagga and other small groups. As it was discussed in Chapter Three, according to Iraqw traditions, the first man (*Kahamusmo*) to enter a new land and build a house became the owner of that land. He had the authority to allocate land to those who came after him and he was expected to settle land disputes and punish those who were found guilty. Therefore, the Iraqw security of tenure depended on the leadership capacity of the *Kahamusmo*. Under the traditional land tenure system, land was communally owned among the Iraqw and the Barabaig up to the 1970's when the Villagisation Programme was introduced in Tanzania. Following the Villagisation and Ujamaa Villages Act of 1975, the traditional land tenure systems changed significantly in many areas, including the Mang'ola Valley (URT, 1975). The broader goals of the programme were to allow a planned utilisation of land and other local natural resources, enable the government to provide social and economic services more efficiently and above all, organise the communities spatially and politically so that they could engage successfully in collective improvement of their own social and economic wellbeing.

It was during the Villagisation Programme that people from different villages within and outside Mbulu District, and then Karatu District, migrated to Mang'ola Barazani and Mbuga Nyekundu in the lowland areas. During this period, land was redistributed in equal parcels of six acres to the elders and three acres to the youths, regardless of former land ownership. Ndagala (1994) further argued that the allocation of land erased the ethnic dimension of access to land and foreshadowed the extinction of customary rights. However, it should be noted that after the relaxation of the Ujamaa Villages Regulations in the late 1980s the former owners claimed back and recaptured their land. This situation created conflicts over land between the majority of the youths who mostly acquired land through the Villagisation Programme and the elders who wanted to reclaim their former land obtained through the customary land tenure system (Meindertsma & Kessler, 1997b).

As new migrants continued to come to the area, the village government continued to allocate land to these newcomers after being granted village membership. In order to apply for village membership the new migrants were required to meet the following requirements: to write an application letter and submit an introductory letter from the village of origin, explaining one's relationship with the community in which one was living, in the area of origin. In addition, due to shortage of land, which was an important pull factor for the majority of the migrants, the village government cautioned the applicants not to request for land for agriculture or business purposes as a condition for being granted village membership.

#### 7.2.1 The land acquisition processes

Since the Villagisation Programme, most people continued to obtain their land through this formal system, although some portions were obtained through inheritance of pieces of land, which had previously been allocated through the Villagisation Programme. The system of allocating land to the newcomers was stopped in 1998 when it was realised that no more land was available for distribution in the villages.

In order for the migrants to acquire land in the area, they have to go through different social, economic and cultural processes. To begin with, through extended social networks, they get into the area where they are employed as casual labourers in the farms of local residents or earlier migrants. Through working in those farms, they establish social relationships such as learning the Iraqw language and sometimes they intermarry in the local community. Having established such relationships, it becomes easier for the migrants to get access to land through village allocations, buying, renting or contract farming agreements.

Shortage of land for distribution to newcomers compelled the migrants to start informal land transactions and arrangements with customary landowners in order to gain access to land for onion production and the establishment of settlements. The transactions with landowners were in two forms: one form involved buying land from the owners and the other form involved renting land for agricultural activities. Figure 18 presents various means of acquiring land in the area of study.

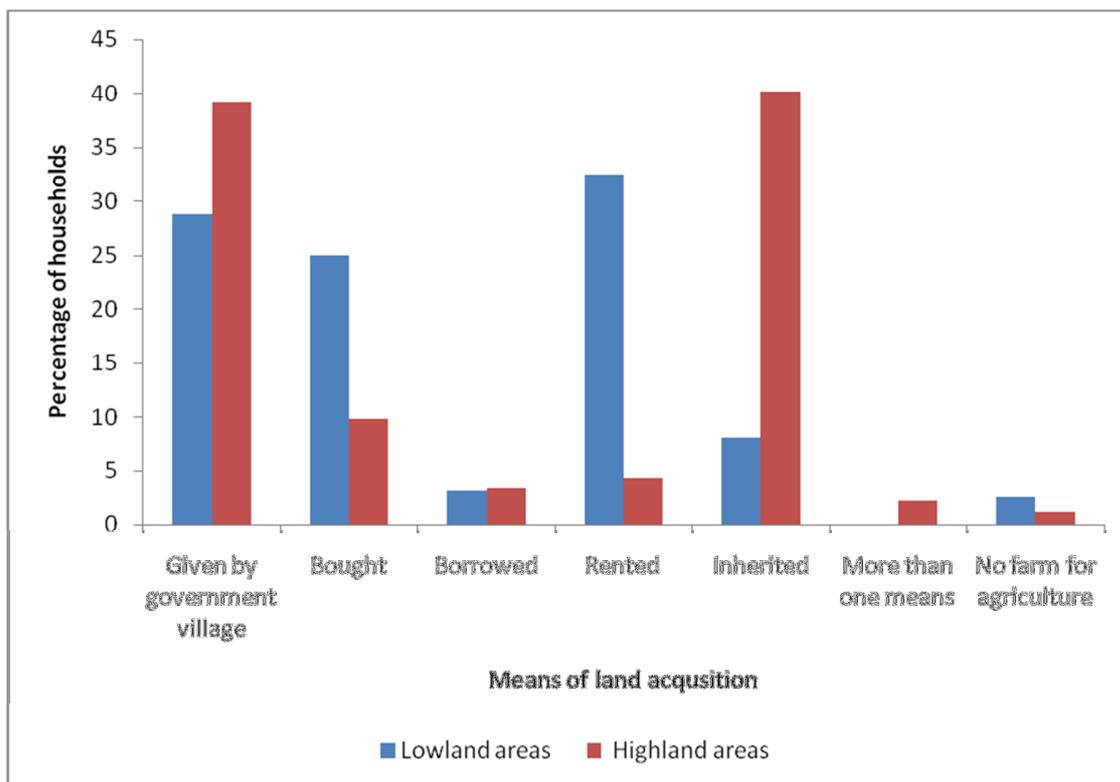


Figure 18: Percent distribution of household head means of land acquisition by location

It is evident from Figure 18 that land acquisition in both locations was mainly through the village government, although with slight differences between the two locations. While 36 (39.1%) of the respondents in the highlands obtained their land through the village government, 46 (28.8%) of the respondents in the lowland areas obtained land through the same means. With continued influx of migrants and expansion of onion agriculture, the demand for land has increased as well, consequently accelerating the shortage of land. This has made the potential for an internal land market within the villages inevitable. Household interviews in Man'gola Barazani and Mbuga Nyekundu Villages have shown that 48 (48.5%) of those who possess land have rented part of their land to other people, 36 (25.3%) have sold part of their land and 16 (16.2%) have neither rented nor sold their land.

Further analysis has shown that renting and buying land are the most important means of acquiring land in the lowlands where 52 (32.5%) and 40 (25.0%) acquired land through renting and buying, respectively, compared to 4 (4.3%) and 9 (9.8%) from the highland areas. Inheritance as a means of acquiring land is more pronounced in the highland areas where 37 (40.2%) of the respondents inherited their land compared to only 13 (8.1%) in the lowland areas. The low percentage of people acquiring land through inheritance in the lowland areas is a reflection of the presence of new migrants who need land since 31 (78%) of the respondents who have bought land are migrants from different areas. It also reflects the increased value of land in the area compared to the highlands where there are no new migrants, and the rate of selling land is minimal. However, it is also useful to point out that there is significant association between the place of birth and the means of acquiring land in the lowland areas.

The main reasons for selling or renting land include failure to cultivate land due to high cost of agricultural inputs 46 (54.8%); raising money for medical treatment for family members 10 (11.9%); raising money for school fees 15 (17.8%); and building new houses or renovating old houses 13 (15.6%). It was noted that a large area of land was being rented or sold to people from neighbouring regions rather than from within or nearby village(s).

All means of acquiring land, except when the allocation has been done by the village government, have different implications for the poor. In areas where land is sold or leased and demand for land is increasing due to population growth, the ability of poor migrants to pay and have access to land is limited. The cost of renting land ranges from Tshs. 70,000 to 200,000, per acre for one harvest, which normally takes three to four months depending on the type of crops grown. The cost of buying land, although the situation is different today, ranged from Tshs. 1,000,000 to 3,000,000 per acre depending on the fertility of the soil and proximity to irrigation canals. Compared to other strategies, renting has been used as an important strategy for acquiring land among the migrants in the area. This shows that land is so valuable that no one is willing to lose it completely, as it supports most of the peoples' livelihood. The following structure summarises the land transaction processes in the area of study.

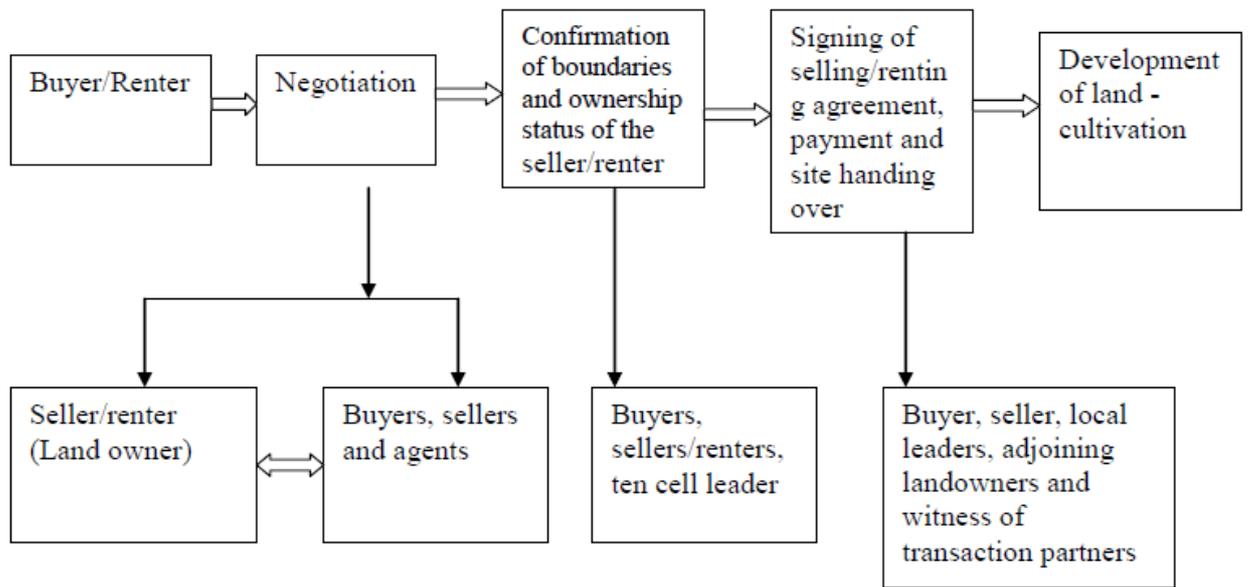


Figure 19: Diagrammatic presentation of land transaction processes and actors involved.

Once the land has been sold, the rights over land holding given to the buyer by the land giver cannot be revoked. The buyer is free to use the land as he wishes, and he might even transfer his rights to another person either on temporary or permanent basis. It is possible for a person to buy such rights permanently from the original holder. The land transaction processes either by selling or renting must be done in the presence of elders, and transfer of the rights must state clearly that the owner is giving up all the rights for the whole period of the agreement.

As disclosed earlier, the cost of buying land ranged from Tshs. 1,000,000 to Tshs. 3,000,000 per acre, depending on the location of the plot. Usually, plots which are located in the lowland areas with good soil fertility, as well as those close to irrigation canals are more expensive than those with poor or sandy soils and far from irrigation canals. The farms are rented for a minimum duration of four to six months to a maximum of three or more years depending on the financial capability of the renter or the needs of the land owner. While ordinary land owners are not willing to sell and lose completely their land to the migrants or to wealthy people from town, even wealthy migrants prefer renting to buying land because it is cheaper to rent and at the same time it is easier to convince other people around the field to rent than buy. In expressing the unwillingness to sell his farm, one farmer gave the following comment:

*It is difficult for me to sell my farm because it has been helping me to solve many family problems such as paying school fees for my children, paying for medical treatment, as well as*

*buying food in case of shortages. If I sell it, it is most likely that the money will be spend in a short period and when I run into a problem that requires money, it is going to be difficult even to get someone who can trust me with a loan.*

Wealthy people have also the opportunity to rent many acres of land in one area, which makes it easy to manage and supervise. This was confirmed by Mr. Sultan, who is one of the successful migrants and agro-businessmen in Mang'ola Barazani who said:

*It is easier to rent than to buy land because nowadays, land is very expensive to buy compared to 1980's when people were allocated land by the village government or borrowed it from neighbours in the village. You need to have Tshs. 2,000,000/= to 3,000,000/= to buy one acre of land compared to Tshs. 80,000/= to 150,000/= needed for renting one acre, per season. After all I am not intending to live here permanently.*

#### 7.2.2 Marital status and access to land

As it was pointed out in Chapter Five, marital status, especially for women, is very important because traditionally, women's access to land has been based on status within the family and involves the right of use, not ownership (Juma & Ojwang, 1996). Widows are particularly vulnerable because land is generally registered in the husband's name and upon the death of the husband the woman is not considered a heir. In the lowland areas where widows constitute 10 (52.6%), female-headed households acquired their land through inheritance compared to only 11 (7.8%) of male-headed households who acquired land in the same way. The divorced and single who constitute 9 (47.3%) of the female-headed households also possess land which they either bought or rented from other people in the village. The findings on women buying and renting land is supported by Weiss' (1993) findings in the western part of Tanzania who found that wealthier women responded to tenure insecurity by purchasing land that was clearly in their name, land that they could use and transfer as they wished. Weiss further argued: "...with regard to gender and land access in Tanzania, over the on-going, contentious and fractious process of clan and family formation, women's capacity to control farm land is severely restricted, and as a consequence of these restrictions, women's practical attempts to control farm land dispose them to both buying and selling." Also, in the findings by Douwe and Kessler (1997) in Mbulu District it is pointed out that traditionally women and youths had limited access to and control of land even though they were responsible for most of the agricultural work. However, economic forces, relaxed traditional

norms, and awareness of women's rights have contributed to women's liberation and engagement in business on almost equal terms as men.

The analysis of data based on gender of the head of the households in the lowland areas shows that among the female-headed households, 14 (73.7%) had small size farms of less than 3.0 acres; 4 (21.1%) had medium size farms and only 1 (5.3) had a large land size of more than 6 acres. The findings from the highlands show that there is a slight difference in terms of land size distribution among the female-headed households compared to the lowlands where the majority possessed less than 3.0 acres. The data shows that 4 (36.4%) have small farms of less than 3.0 acres, while 5 (45.5%) have medium size farms, and 2 (18.2%) own large farms of more than 6 acres. The same trend is observed for male-headed households whereby the land size is almost equally distributed among the households where 37 (45.7%) have small farms, 31 (38.3%) have medium size farms and 12 (14.8%) own large farms. The high proportion of respondents possessing small land sizes in the lowland areas is an indicator of shortage of land for agriculture. The situation has led to the fragmentation of the existing plots to enable the household to subdivide the land to family members as well as selling some to new migrants. This process of farm fragmentation has contributed to a progressive but fundamental change in the traditional management of rights to land, leading to the individualisation of land ownership.

### 7.2.3 Household income and ownership of cultivated land

As it was discussed in Chapter Five, determining average household income was very complicated and subjective due to lack of a clear record of incomes from different sources. However, it was important to establish the annual average household income by taking the sum of income from crop production, livestock production, and non-farm activities (e.g. trading, selling handicrafts, beer brewing, brick making, and selling poles or charcoal) and monthly salaries for those who are employees in order to assess how such income influences land ownership.

Ownership and control of land and related resources are often associated with influence on decision making and its effect on the outcomes. Hutchison *et al.*, (1991), cited in Rugege *et al.* (2007:27) contend that ownership, like all real rights, consists primarily of a relationship between a legal subject and a thing or legal object, encompassing complete and absolute control over the thing concerned as well as possible rights and capacities over it. Since most household income in villages generally comes from agricultural activities, land as a factor of production was deemed to be very important.

Based on this fact, agricultural land ownership is an important asset in rural livelihood as it affects the level of household income and is often associated with the social status of the household. Although it is true that the number of acres cultivated by a household does not necessarily reflect the number of acres owned by that household due different means of acquiring land in the area, it is also true that having a large plot of cultivated land reflects the socio-economic status of an individual. For this reason, land ownership by the household in this study was found to be in different forms, such as permanently owned by the household, rented, or sharecropped land, and all these forms of land ownership reflect the socio-economic status of the households. This section, therefore, discusses land ownership in relation to the average household income based on location.

The findings with regard to cultivated land size have shown that in general the overall mean farm size for respondents in all villages, excluding those who have no land for agriculture is 2.8 acres, ranging from 0.25 to 15 acres. The average land size in the highland areas is 3.7 acres, slightly higher than in the lowland areas where it is 2.2 acres. The average cultivated land size is an indicator of more land fragmentation caused by the increasing number of people in the area. With regard to farm location, about 149 (94.8%) of the respondents reported that their farms were within the villages, except for a few cases 6 (3.8%) in the lowland area who reported to have farms in the nearby villages. In highland areas 77 (84.6%) of the respondents reported to have land within the villages compared to 14 (3.6%) who had acquired other pieces of land in the nearby villages. Further investigation has shown that scarcity and high cost of renting or buying land in their villages is one of the factors which compelled a few of them in both locations to find land in the nearby villages. Table 19 presents the percentage distribution of the average household income in relation to land size possession in the two locations.

Household farm size and average income	Lowland areas						Highland areas					
	Low income - less than 400,000/=		Middle income - 401, 000 - 800,000/=		High income - more than 801,000/=		Low income - less than 400,000/=		Middle income - 401, 000 - 800,000/=		High income - more than 801,000/=	
	No	%	No	%	No	%	No	%	No	%	No	%
Small size < 3.0	56	45.5	41	33.3	26	21.1	8	19.5	27	65.9	6	14.6
Medium size 3 - 5.5	7	33.3	5	23.8	9	42.9	4	11.1	23	63.9	9	25.0
Large size > 5.5	2	16.7	3	25.0	7	58.3	0	-	5	35.7	9	64.3
No land for agriculture	4	100.0	-	-	-	-	1	100.0	-	-	-	-
<b>Total</b>	69	43.1	49	30.6	42	26.3	13	14.1	55	59.8	24	26.1

Table 19: Percent distribution of average household income and cultivated farm size in the highland and lowland areas.

Source: Field survey

From Table 19 it is evident that there is a difference in land size possession among the households in the two locations. The lowland areas recorded a high proportion 56 (81.2%) of households with low income ranging from less than Tshs. 200,000 to 400,000, who have a small size farm land compared to the highland areas 8 (19.5%) who have the same average household income. On the other hand, the proportion of high income earners (more than Tshs. 801,000) who possess large farms in the highland areas is slightly higher 9 (37.5%) compared to the lowland areas which have 7 (16.7%) of the households with large farms. Furthermore, in the lowland areas there a significant number of households from the low income group who are landless compared to the highland areas. The analysis of migration history shows that those who are landless are new migrants who arrived in the area in the 2000s and work as casual labourers in onion farms. Although the number of landless households is small, it still reflects the shortage of land in the area and how difficult it is for the

new and poor migrants to access land resources. The same case was observed in the highlands, although the landless are fewer than those in the lowlands.

Looking at Table 19, it can be concluded that there is a positive relationship between the average size of land owned and the income of the household although in some cases in all locations there are households from low and medium income groups who own large farms as well. This can be associated with the land acquisition processes during which some early migrants acquired land through government allocation as well as inheritance. It was further observed that in Mang'ola Barazani and Mbuga Nyekundu Villages, in the lowland areas, most households received three to six acres (six for an elder, three for a youth) at the time of land allocation in the 1970's. The current variations in land ownership are explained by the fact that some households who already had large tracts of land before reallocation were able to keep them, and others managed to purchase land to augment their original three to six acres. During the interviews, only two households reported to own 15 and 20 acres, but the majority who were cultivating more than 20 acres had rented land from households that owned four to twelve acres, but due to increasing costs of production they were able to cultivate only around two to four acres. Thus, the majority of households which owned more than 4 acres cultivated less, and the rest are rented to richer households.

#### 7.2.4 Land tenure security and land management

Land tenure security is of prime importance for sustainable land management. Only those who own or have secure access to their land are interested in maintaining it (Shetto, 2007). The in-migration of the crop cultivators and pastoralists in the lowland areas is certainly deemed to have some implications on the destination areas. One of such implications has been on the changing land tenure systems and the management of land resources. The effects of population mobility and migration on the land resources and the changing land tenure systems are more profound in the lowland areas compared to the highlands, mainly because some permanent and seasonal migrants who originated from within and outside the district are successful businessmen and farmers. Using their wealth, they have made land an important commodity, and they have increased the value of land as well as commercialised onion agriculture. It is the wealthy people who have introduced new land management practices including continuous cultivation throughout the year and intensive application of fertilisers and pesticides, and the use water pumps, a situation which is different from that of the 1980's and early 1990's when land was put under fallow and without or minimal chemical fertiliser application.

It was further observed that the majority of early migrants in the lowland areas who own land can no longer cultivate their land due to the increased costs of production. As a result, they have decided to rent their land to new wealthy migrants on a seasonal basis. Since most of the land is currently acquired through renting, the land owners have no decision about how their land should be managed. Land utilisation relates closely to different land tenure systems. This is because the purpose, interests and rights of the parties involved impact greatly on the activities and innovations that occupants and/or owners can undertake on the land.

A study by Tukahirwa (2002), in Uganda, found that the most developed pieces of land in Uganda are generally found to be under the freehold and leasehold systems, the main reason being that the holders enjoy unquestionable and unimpeded user rights fully backed by law. As a result, the holder is in a position to inject any amount of capital to develop the land. In addition, a study by Lee (1980) identified a significant relationship between investment on land and different ownership titles bestowed on farmers in the Honduras and Thailand. In Lee's study on the factors influencing the extent of soil erosion on plots in the USA, it was observed that farms with different ownership rights reacted differently to conservation with a consequent result of different soil erosion patterns.

The situation is slightly different in this study as a migrant farmer or agro-businessman who rents land on a seasonal basis of four to eight months is vulnerable to the owner's demand and change of mind. Since the renters are not sure of getting the farm for another season, they make sure that they use chemical fertilisers as much as possible in order to maximise production without considering the sustainability of the production. This was revealed during the focus group discussion with the land owners who expressed their dissatisfaction regarding how renters manage their land especially with regard to the application of chemical fertilisers. They claim that the migrants do not care about the sustainability of land use because they apply too much fertiliser in their fields for the purpose of maximising production per acre. The renters are not ready to use other means of soil conservation such as the application of animal manure; they believe that application of chemical fertilisers is more effective in increasing production and less time consuming in terms of application. Furthermore, discussion with the land owners revealed that since land has become a source of income through renting, the land is no longer put under fallow as a means of soil conservation before the use of chemical fertilisers. In the highland areas where renting is not common, the majority of farmers apply chemical fertilisers only in small quantities if necessary, as it will be discussed in Section 7.2.5.

### 7.2.5 Agricultural investment and access to implements/inputs

Promoting sustainable agriculture requires farm management techniques that foster synergies, conserve nutrients and increase productivity. Since both rain-fed and irrigation agriculture is conducted throughout the year, land in the selected villages is no longer put under fallow. Farm expansion, increased demand of onions and continuous cultivation has led to the deterioration of land fertility, and all have compelled commercial farmers to invest highly on agricultural inputs in order to increase production. This section examines the level of agricultural investment, its accessibility and application among different socio-economic groups. A total of five variables were used to examine the villages' relative access to and application of various agricultural implements/inputs. These included the respondents' assessment of the application of chemical fertilisers, pesticides, and access to tractors and seeds.

### 7.2.6 Application of chemical fertilisers and pesticides

During the interviews, the most important inputs that farmers mentioned, as far as improvement of soil fertility was concerned, were fertilisers and pesticides. The term 'fertiliser' may have various definitions. In this study a distinction has been made between chemical fertilisers and natural or organic fertilisers. In the area in which this study was conducted, farmers mainly use chemical fertilisers. The common fertilisers applied in these area include Urea and Calcium Ammonium Nitrates (CAN) for planting and Sulphates for plant growth. In order to understand the level of chemical fertiliser application in the study area, the respondents were requested to explain the quantity of fertilisers used and the time when they started to apply the fertilisers per acreage. For comparison purposes, a time frame of ten years was determined, and the use of fertilizers was investigated within this period. This time interval was considered reasonable to ensure that new migrants of the 1990's and 2000's were captured in the questionnaire. Table 20 shows the time when the households started to use chemical fertilisers in their farms in the lowlands and highlands.

<b>Beginning of chemical fertilisers application</b>	<b>Lowland areas</b>	<b>%</b>	<b>Highland areas</b>	<b>%</b>	<b>Total</b>	<b>%</b>
1970's	10	6.3	1	1.1	11	4.4
1980's	19	11.9	0	0	19	7.5
1990's	50	31.3	1	1.1	51	20.2
2000's	65	40.6	27	29.3	92	36.5
Never used modern fertilisers	12	7.5	62	67.4	74	29.4
No farm	4	2.5	1	1.1	5	2.0

Table 20: Application of chemical fertilisers by location between 1970s and 2000s (in %)  
Source: Field Survey

The responses from Table 20 indicate that there is substantial increase in the number of households applying chemical fertilisers in the lowland areas compared to the highland areas. About 144 (90%) of the respondents in Mang'ola Barazani and Mbuga Nyekundu in the lowland areas reported that they were using chemical fertilisers, although in varied quantities depending on the financial position of the owners and the location of the farms. The increasing numbers of fertiliser applicants in the lowland areas, as stated above, can be linked with the continued deterioration of soil fertility and the desire of farmers to maximise production per acre. However, the situation is different in the highland areas where only 28 (30.4%) of the farmers were using chemical fertilisers. Farmers in the highlands are reluctant to use fertilisers because they believe that chemical fertilisers might affect the quality of their land.

In relation to the quantity of chemical fertilisers applied per acre, the findings show that there has been an increase in the number of bags (1bag = 50kgs) of fertiliser per acreage in the past ten years, as represented in Figures 20 and 21.

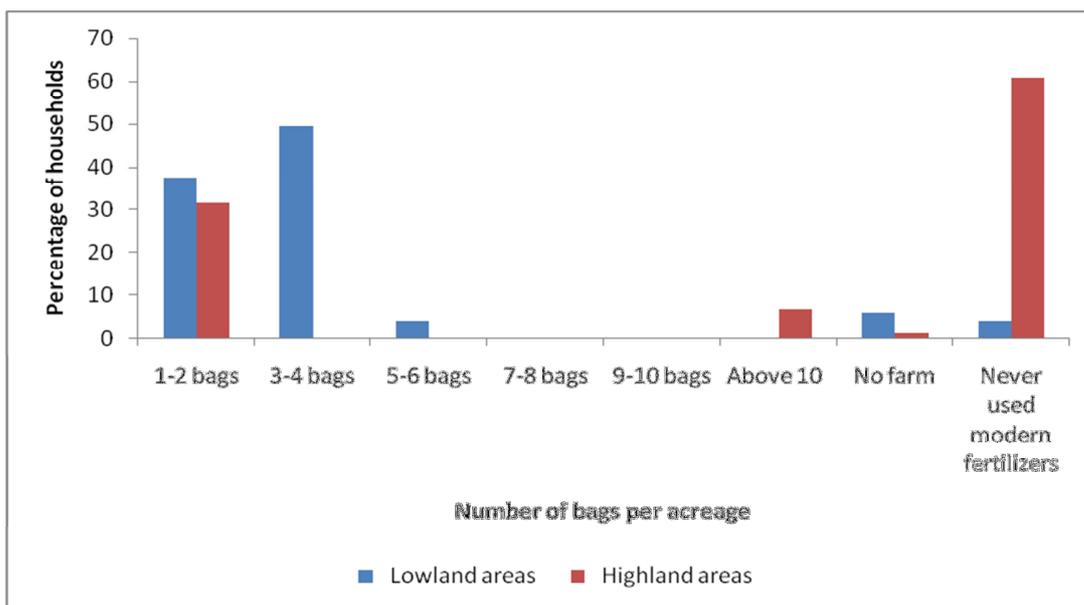


Figure 20: Application of chemical fertiliser by households in the past 10 years (in %).

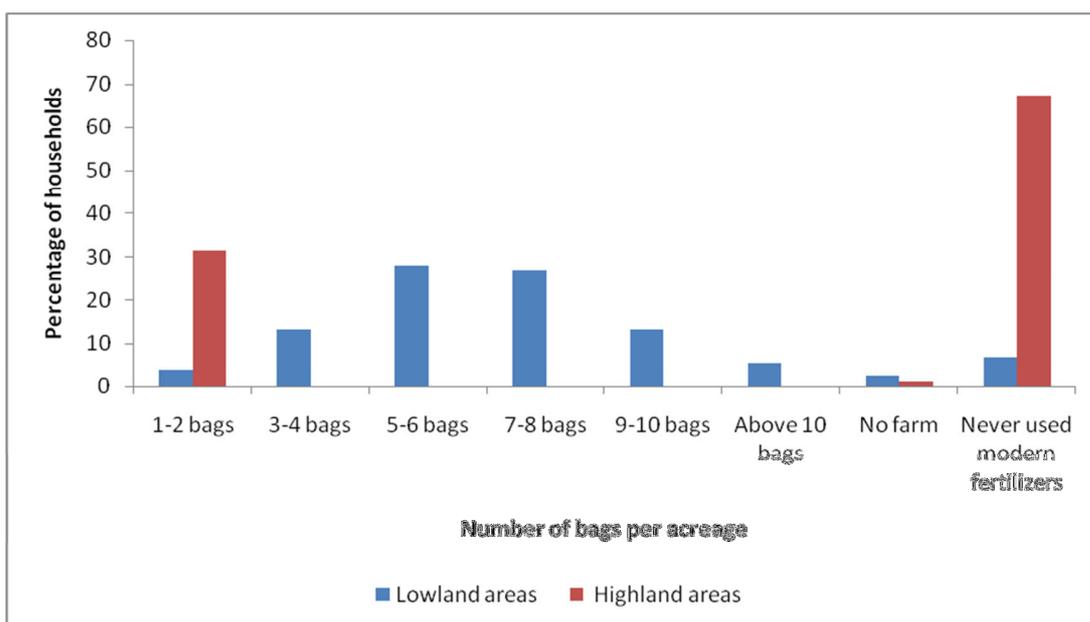


Figure 21: Application of chemical fertiliser by households today (in %).

From Figures 20 and 21, it is evident that in the lowland areas the majority of the farmers 139 (86.9%) who applied chemical fertilisers in the past ten years spent one to four bags per acre, while a few of them 6 (3.8%) spent up to six bags, and another 6 (3.8%) did not apply any chemical fertilisers in their farms. In the highlands only 29 (31.5%) reported that they spent one to two bags per acre and the majority of the households did not use any fertilisers at all.

Investigating the current quantity of chemical fertiliser application in the lowland areas has shown an increased trend compared to the past 10 years. The number of households using five to more than ten bags per acre has increased from 6 (3.8%) to 118 (73.8%); however, a few farmers are still using one to two bags per acre. It is interesting to note that in the highlands the number of households using chemical fertilisers has remained the same for the last ten years. As noted earlier, the fertility nature of the soils and the type of crops cultivated in the highlands do not require a lot of chemical fertilisers. Furthermore, farmers believe that chemical fertilisers may cause deterioration of soil fertility. The prohibitive price of chemical fertilisers could be another reason for the low level of fertiliser application in the area.

During focus group discussion, it was reported that fertiliser application for onion production had increased from an average of one to three bags of 50 kgs in the 1990s to eight to ten bags per acre in the 2000s, while for rice and maize application had increased from zero to 4 bags per acre. As said earlier, the number of bags used depended on location of the farm and the type of soil. Farms which are located in the lowlands, with alluvial soils, need less quantity of fertilisers compared to those which have sandy soils.

The study was also interested in finding out how households from different socio-economic groups get access to chemical fertilisers. For analysis purposes the households were classified into three categories based on the average household income, as discussed in Chapter Five. These categories are: low income households which earn less than Tshs. 400,000 per year, middle income earners earning Tshs. 401,000 to Tshs. 800,000, and high income earners who get more than Tshs. 801,000 per year. The relationship between average household income and the quantity of fertiliser applied per acreage is shown in Figure 22.

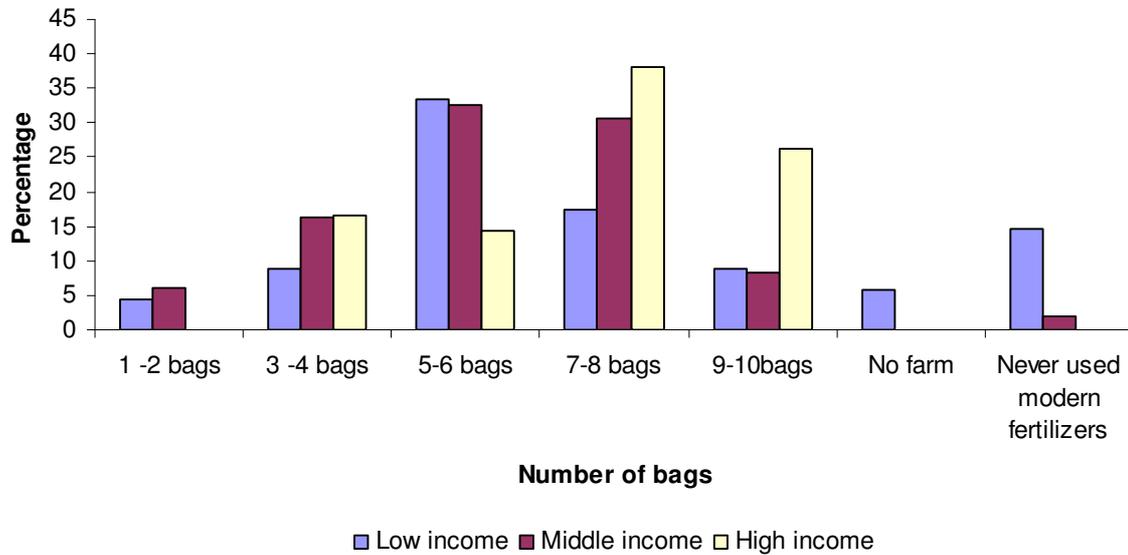


Figure 22: Percent distribution of average household income by quantity of fertiliser applied per acre in the lowlands

Based on socio-economic classification as seen in Table 19, 69 (43.1%) of the respondents in the lowland areas are low income earners, 49 (30.6%) are middle income earners and 42 (26.3%) belong to the high income group. Among the low income earners, 10 (14.1%) have never used chemical fertilisers in their farms while all the respondents in the high income group have used chemical fertilisers though in different quantities. About 35 (83%) of the wealthy farmers use seven to more than ten bags of chemical fertilisers compared to 23 (33%) and 21 (42.8%) of low income and middle income farmers, respectively, who spend the same quantities of fertilisers. Generally, the analysis has shown that there is significant association between the average household income and the quantity of chemical fertiliser application among social groups in the lowland areas. Figure 23 shows the percentage distribution of the average household income by quantity of fertilisers applied per acre in the highlands.

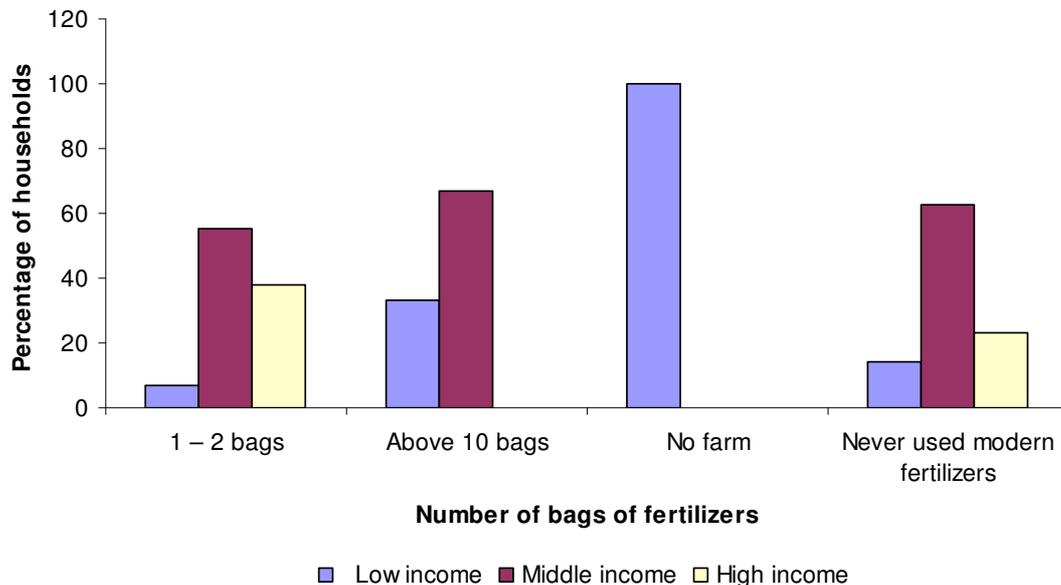


Figure 23: Percent distribution of average household's income by quantity of fertiliser applied per acre in the highlands

As observed in the preceding discussion, the application of chemical fertilisers is very low in the highlands compared to the lowland areas. The data shows that 11 (37.9%) of the households in the high income group spend one to two bags of fertilisers compared to 2 (6.9%) and 16 (55.2%) of the households from the low and the middle income groups respectively. Besides, a few households from the low income and middle income groups were spending more than ten bags of fertilisers per acre while no one from the high income group was spending more than ten bags. From these results, it is evident that there is no relationship between the income of the household and the amount of chemical fertilisers applied by the households.

Pesticides and herbicides will continue to be used for improvement of agriculture in Karatu District. The planting of onions, as a major cash crop in the area, takes place during the rainy and dry seasons of the year, without sufficient rotation. This practice has encouraged the build-up of pests. Downy mildew and storage rots are among the most important diseases affecting the onions. The continuous cultivation and emergence of diseases and pests has forced farmers to use pesticides for maintaining agricultural productivity and to increase income.

In order to understand the trend in pesticide and herbicides use, the farmers were requested to explain what they thought of the use of these agricultural inputs. About 100 (64.1%) of the farmers said the trend was increasing compared to the past 10 years, while 42 (26.9%) felt it

was constant, and 14 (8.9%) felt it was decreasing. The increasing trend of pesticides application as it was reported by the majority of the respondents has negative implications to the poor farmers because most of them cannot afford the price, as it was experienced in the case of chemical fertilisers application. Photographs 1 and 2 show farm casual labourers preparing pesticides and spraying them on onion farms.



Photograph 1: A farm labourer in Mang'ola Barazani preparing pesticides and spraying the onion farm

Furthermore, during the field observation it was noted that the process of preparing pesticides before spraying was done close to the irrigation canals, while the water in the canals was used for drinking in the lowland villages, like Langhareri, which does not have safe, clean, piped water. Other risk behaviours were also identified such as washing the containers and pumps used in spraying pesticides close to irrigation canals, inadequate disposal of empty pesticide containers, eating and drinking during pesticide application, and using inadequate protective gear.



Photograph 2: Cleaning and improper disposal of pesticide containers along the irrigation canals in Mang'ola Barazani

The analysis of data has shown that the majority of the respondents in the lowland areas apply chemical fertilisers and pesticides although at different amounts regardless of their economic status. This does not mean that all farmers can afford to buy these agricultural inputs. The reasons for increased amount of fertiliser application, among other factors, include the desire for farmers to maximise onion production per acre and the deterioration of soil fertility caused by continuous cultivation. Discussion with farmers and other officials in the villages has confirmed that the cost of production, especially of onions, which is the major cash crop and cultivated almost by all farmers, is increasingly becoming unaffordable. It was observed that the price of fertilisers has increased from Tshs. 15,000 (11 ≈ USD) in the year 2000 to Tshs. 40,000 (≈ 29 USD) in the year 2010. It was further noted that in order to get a good yield of onions per acre, one may require an average of 10 bags of fertilisers which cost about Tshs. 400,000, let alone other agricultural inputs such as insecticides, herbicides, water pumps for plots located in upland areas, and seeds. Labour charge for farm preparation, planting, irrigation, spraying of herbicides and insecticides and harvesting is also high. In general, a farmer needs an average of Tshs. 1,500,000 (≈1071 USD) to produce onions from one acre.

Due to high cost of agricultural inputs, the majority of farmers have failed to cultivate their farms and have decided to sell or rent these farms to wealthy migrant farmers who have enough capital to invest in agriculture. For those who are not willing to sell or rent their farms they have decided to enter into agreement with wealthy farmers on a seasonal basis, with the agreement periods varying from four to eight months, depending on the type of agreement between the land owner and the renter.

As it will be discussed later, the contract farming agreements seem to be exploitative and many farmers have complained to village governments about this. In order to assist the farmers to get access to chemical fertilisers and pesticides, the village governments in collaboration with the district council established cooperative unions (SACCOS) which provide loans to farmers to buy fertilisers and other agricultural inputs. In some cases farmers are supplied with fertilisers and pesticides on agreement that they will pay back after harvest. All farmers who have been registered as members of the cooperatives, unless they still have debt, are eligible for credit from the cooperatives. As pointed out by Walusimbi *et al.* (2004), access to credit may enable farmers to purchase inputs or acquire physical assets, thus contributing to increased income. Credit availability may also enable households to invest in non-farming activities. Hence, the impact of credit availability on income is likely to be positive, provided that households have profitable uses for it (Deininger *et al.*, 2001). This is different from what was found in Mang'ola Barazani and Mbuga Nyekundu where despite the fact that farmers were given credit to buy agricultural inputs, the discussion with cooperative leaders revealed that the credit that had been intended to help them to improve their agriculture had not done so because about 86 (58%) of the cooperative members have not paid back their debts. This makes them ineligible for other loans, thereby making them unable to cultivate their farms. Risk and uncertainty in agriculture and misuse of credit are some of the reasons that have caused poor returns of the credit. As a consequence, farmers are reluctant to apply for more credit, especially after the decision by cooperatives to confiscate some of their properties to recover their debt. This situation has also forced poor farmers to surrender their farms to wealthy farmers by renting or entering into contract farming agreements as pointed out earlier.

#### 7.2.7 Farming implements

From the beginning of onion agriculture in the lowland areas in the 1940s up to the early 1990s the hand hoe was the major tool for agriculture in the villages. However, the influx of wealthy migrants in the early 2000s expanded onion agriculture by renting large farms, which marked the beginning of using ox-drawn ploughs in the area. The use of ox-drawn ploughs was accelerated by a decision made by the Tanganyika Farmers Association (TFA) Limited to establish its sub-branch in Karatu District in 2005, which later in 2008 was elevated to a full branch in its bid to improve its services to farmers. The Tanganyika Farmers Association (TFA) has been the main supplier of agricultural inputs throughout the country, including Karatu District. According to the discussion with the District Agricultural and Livestock

Development Officer (DALDO), the association has been supplying inputs such as seeds, fertilisers, pesticides and fungicides, hand tools, draught-animals, power equipment and sprayers. Figure 7.6 below shows the extent of use of these farm implements, by the farmers, in the study area, in percentage.

Continued expansion of onion agriculture in the past ten years in the Mang'ola Barazani and Mbuga Nyekundu Villages in the lowland areas has witnessed further changes in the type of farm implements used for agriculture. Many households have moved from total reliance on the traditional hand hoe and ox-drawn tools to tractors and power tillers, to a varying degree. Modest changes have also occurred within each power source in terms of the quality and diversity of the tools and implements in use.

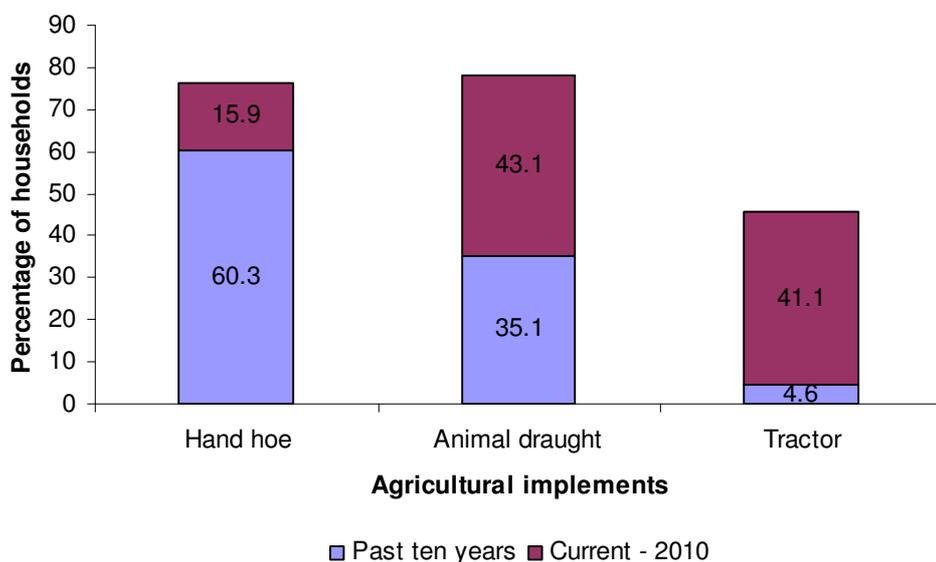


Figure 24: Extent of use of farm implements by farmers in the study area, in percentage

Field data shows that the number of people who use ox-drawn ploughs in preparing their fields has slightly increased from 53 (35.1%) to 65 (41.1%) compared to the last 10 years when the hand hoe was the most common implement used for agriculture. This is used by about 91(60.3%) of the respondents who own land for cultivation. Similarly, the use of tractors has become common nowadays compared to the last 10 years because the number of farmers who use tractors has significantly increased from 7 (4.7%) to 62 (41.1%). In the highland areas draught animals are used by 51 (56.0%) in farm preparation compared to 33 (36.3%) and 7 (7.7%) who use tractors and the hand hoe, respectively. The use of tractors in the highlands is not favoured by the majority of farmers because they believe that tractors

destroy their soils by loosening it and making it vulnerable to erosion and eventually turning it to hardpans.

Despite the fact that the number of people who use ox-drawn ploughs and tractors has increased, it should be noted that most of the people do not own these implements; they either borrow or hire them from the few successful farmers who arrived in the area in the early 1980s, some tractors are owned by agro-businessmen in the villages. A few other farmers who are using ox-drawn ploughs and tractors are staying in Karatu and Arusha Towns but have farms in the villages. The field survey shows that among the respondents only 9 (5.6%) people said they own ox-drawn ploughs and 3 (1.9%) own tractors.

#### 7.2.8 Use of quality seeds

Quality of seeds is a critical component as far as land management is concerned since poor quality seeds or varieties unsuitable to certain places will never produce enough harvest for farmers and will therefore not help them become self-reliant. In an effort to improve agriculture in the area, various institutions including the Tanganyika Farmers Association, as mentioned earlier, have played a significant role. The Tanganyika Farmers Association's efforts to improve agricultural activities in the district have been supported by the Liberalisation Policy of 1994 which paved the way for the private sector to participate in seed production and distribution, and marketing reformation of the Tanzanian seed industry. The current institutional structure for the national seed programme is based on the Seeds Act of 2003 and the Seed Rules and Regulations of 2007, with the rules and procedures for seed certification that have simplified the seed production structure by giving more rights to research stations, private companies and individual farmers to prepare seeds and thus reduce the costs (Muendo *et al.*, 2004c).

The Seed Act of 2003 encouraged the farm seed production system by small-scale farmers at village level for the production of Quality Declared Seed (QDS) grade. This provision has resulted in the innovation of a new variety of onion known as Mang'ola Red Onion which has been developed by the farmers who were trained to produce quality onion seeds for themselves and the company. Before the innovation of this variety, the Mang'ola farmers were using the Red Bombay and Red Crole varieties which are commonly cultivated in many parts of the country. The expansion and commercialisation of onion agriculture by wealthy migrant farmers has increased the price of Red Bombay and Crole seeds, thus making them unaffordable to poor farmers. The introduction of a new variety has reduced the cost of production by lowering the price of seeds and increased seed availability to the poor farmers. Muendo *et al.* (2004c) admitted that the seed produced in Mang'ola is of good quality due to

its higher yields, longer storage period, at the same time it is relatively cheaper. These results are consistent with the Boserupian theory of intensification and the findings of Nkonya *et al.* (2004) and Pender *et al.* (2004b) who see population growth as a stimulant process which encourages people to be more innovative in order to improve agriculture. Photograph 3 shows the process of preparing seeds in Mang'ola Barazani Village.



Photograph 3: Onion seed preparation in Mang'ola Barazani

In addition to the Mang'ola Red Onion variety, there is another recent onion seed variety known as Jamba F1 which was introduced by Kenyan businessmen who had come to buy onions in the area. It was revealed during discussion with farmers that the seed is of good quality and is resistant to pests and diseases. However, the majority of farmers are reluctant to use it because it is too expensive and not available at all times. The analysis of seed utilisation has shown that only 16 (10.3%) of the respondents from the high income group have used this type of seed. This result confirms the claim that richer farmers are more likely to adopt innovation, than poorer farmers.

### **7.3 Population mobility and the changing socio-economic status**

#### **7.3.1 Irrigation agriculture**

As a result of population mobility and migration in the lowland areas, livelihood systems have changed from livestock keepers, who were mainly the Barabaig/Datoga, to agro-pastoralists and diversified agro-pastoralists who also engage in additional non-farming activities such as petty trade, food vending, local brew making and operating bars. Such non-farming activities are mainly carried out by the Iraqw and other ethnic groups which have migrated to the area.

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