

**AN ASSESSMENT OF HIGH HUMAN POPULATION DENSITY
AND ITS IMPACTS ON LAND RESOURCES IN MOSHI DISTRICT
COUNCIL, TANZANIA**

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AND ITS IMPACTS ON LAND RESOURCES IN MOSHI DISTRICT
COUNCIL, TANZANIA**

**By
Emmanuel Alphonse**

**A Dissertation Submitted in Partial Fulfilment of the Requirements for the Award
of the Degree of Master of Science in Environmental Management (MSc. EM) of
the Mzumbe University**

2013

CERTIFICATION

We, the undersigned, certify that we have read and hereby recommend for the acceptance by the Mzumbe University, a dissertation entitled “**An Assessment of High Human Population Density and Its Impact on Land Resources in Moshi District Council, Tanzania**”, in partial/fulfilment of the requirements for the award of the degree of Master of Science in Environmental Management of the Mzumbe University.

Signature

Major Supervisor

Signature

Internal Examiner

Accepted for the Board of Institute of Development Studies

DIRECTOR, INSTITUTE OF DEVELOPMENT STUDIES

DECLARATION AND COPYRIGHT

I, Emmanuel Alphonse, declare that this dissertation is my own work and has not been presented for a degree in any University, and that all sources of materials used for the study have been duly acknowledged.

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DEDICATION

To my beloved mother a widow Mrs Alphonse Kessy, for her unconditional love, patience, hope and inspiration, all through my studies, to my pastors and many others for their successful prayers.

LIST OF ABBREVIATIONS

ESA	Economic and Social Affairs
FAO	Food and Agriculture Organization
HA	Hectare
GDP	Gross Domestic Product
PD	Population Density
PSK	Per Square Kilometre
SECAP	Soil Erosion, Conservation and Agro Forestry Project
SSA	Sub-Saharan Africa
TPC	Tanganyika Planting Company
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNFAO	United Nations/Food and Agriculture Organization
URT	United Republic of Tanzania

ABSTRACT

This study attempted to assess the impacts of high human population density on land resources in Moshi District Council. Generally, other studies show that, developing countries experiencing the high demographic pressures while land resource to support the growth is fixed or limited and the mechanisms to adapt to, grow very slowly. Specifically, there is an extremely high human population density in areas around Kilimanjaro, especially in the Moshi District Council. This leads to land shortage that would be useful for agricultural production and infrastructure development, poor settlement planning, land use conflicts, land degradation, and serious environmental implications that can be linked to the increase of poverty level including lack of employment to the youth.

This study used a case study design and sampling techniques based on purposive/non probability sampling and simple random sampling/probability sampling, while the sample size of a hundred respondents that was taken, was based on Nassiuma's formula. The type and source of data were entirely on primary and secondary sources related to the study topic studied. The methods of data collection based on, written questionnaires/structured interview for key informants and field respondents, field observation of human settlement arrangement and cultivation areas. The documentary technique based on, written sources/secondary sources i.e. related reports, population census, books, and internet.

Finally, the data were analysed and presented with descriptive statistics such as percentage, frequency, graphs and tables. This was done by using the Statistic Package for Social Science (SPSS) version 16. Microsoft Excel was used to produce charts and graphs and Microsoft Word was used in compiling and writing up the reports.

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CHAPTER ONE

1.0 INTRODUCTION

This study attempted to assess the impacts of high human population density on land resources which have significant effects on agricultural production, land degradation and infrastructure development especially roads, industries, and settlement planning. Land scarcity has resulted in land conflict forcing Chagga people to move away from their residential areas to urban areas, in search for employment (Soini, 2002a). The increased demand for land resources such as arable land, forests, soil materials, water, and so forth, was due to the pressure of the fast rapid growth. This led to agricultural expansion and the consequent land degradation, that was caused by overgrazing and the clearing of trees for preparation of farms and hence resource depletion. The situation was enlarged since the beginning of the 20th century (Hoffmann, 2000). Therefore other countries and Tanzania in particular, should consider the sustainable ways to ensure land resources are properly managed for the purpose of securing ecological functions and climatic patterns, which have been gradually altered by the increasing human population growth and development. Thus the study is a paramount of the Moshi District Council as far as human population density and land scarcity are concerned.

1.1 Background to the Study

The world human population expanded from 2.5 billion in 1950 to 7 billion by late 2011 (United Nations, 2009). The rate of growth was determined after the Second World War, where many developing countries especially Asia and Sub Saharan Africa entered into the early stage of the demographic transition with declining mortality and sustained high fertility. The rapid growth of human population, with its high human population density, has resulted to inadequate food supply, leaving a number of people with hardly enough to live on. This is due to rapidly declining of tropical farmland, caused by greater competition for farmland (Sands, 2003). The critical human population growth has led shortage of land resources (MEA, 2005). The capacity to adapt and prevent to land resource scarcity is very low in most of developing countries. This has been considered as a dangerous situation (Homer-Dixon, 1999).

Asia is the most densely populated in the world according to the United Nations Demographic Year Book of 2007, Asia had 126 people per square kilometre (PSK), followed by Africa continent with 32 people per square kilometre. The most densely populated countries in Asia are China, India, Cambodia, Bangladesh, Viet Nam and Singapore (Furlund, 2008; World Bank, 2007). However, the studies have shown that; South Asia is even extremely densely populated than any other part of Asia. This alarming growth has a big impact on natural resources. The clearing of forests for the use agricultural activities, the building of settlements, and the decreased food supply, hinders development, and it also results in poverty (Basnyat, 2009). Furthermore, in most of Asian towns agricultural land has been replaced by urban built up areas (Keskinen, 2008). Conversely, high human population density has seen as a core factor to motivate development by increasing labour force, and markets for the manufactured goods (Keskinen, 2008). The projection shows that human population growth will still increase rapidly in South Asia and other developing countries, more than even any other part of the world (ESA/UN, 2011).

Human population density in Africa is becoming a serious issue. Evidence shows a large number of Africa's rural population lives in densely populated areas. For example, Rwanda is among the leading densely populated country in Africa. It has a population density of 397 people per square kilometre, which is relatively higher, compared to other countries (ROR, 2000), and yet another example is Kenya where the majority of the rural dwellers have above 250 inhabitants per square kilometre, another example is taken in Nigeria, Burundi, Uganda and Malawi, where rural dwellers are also living on land over 250 persons per square kilometre. Kenya and Rwanda being among the countries mentioned above account for roughly 35 percent of Sub Saharan Africa's total population, this is according to data from Columbia University's Global Rural-Urban Mapping Project as cited by (Jayne, 2012). However, the United Nations' report showed that the ratio of people differs across regions, and normally high human population density causes stress on smaller land areas (UN, 2004). Moreover, the total arable land area available for agricultural production will be increasingly constrained by land requirements for other purposes, like infrastructure development, urbanization,

bio-energy production, or biodiversity protection (Sands, 2003), but also by soil degradation, and all these, shrinks the arable land (McNeill, 2004).

The national population census results of 2012 show that Tanzania has more than tripled. From 12.3 million of people in 1967 to 44.9 million of people in 2012, meanwhile the statistics are; 44,928,923, of which 43,625,354 are in Tanzania Mainland and 1,303,569 are in Zanzibar. The Average Annual Growth Rate is 2.7 percent in 2012, however, this declined from 3.3 percent in 1967. While in Zanzibar had a growth rate of 2.8 percent in 2012; and again this declined from 3.1 in 2002. Moreover, the average household size in Tanzania is 4.8 (<http://www.nbs.go.tz/sensa/popu.php>).

Nevertheless, Tanzania has slightly population density of 51 persons per square kilometre. The numbers differ in every region. The leading densely populated regions in overall are in the country's mainland and in Zanzibar, i.e. Dar es Salaam and Mjini Magharibi Regions with population densities of 3,133 and 2,581 persons per square kilometre respectively. In mainland the leading regions are Dar es Salaam with 3,133 people per square kilometre, followed by Mwanza with 293 and Kilimanjaro with 124 persons per square kilometre, this is the general average. However, there are some districts in Kilimanjaro Region that have a higher density compared to the regional size. For example, the Moshi District Council had 273 persons per square kilometre, while the areas with the lowest population densities are Lindi with 13 people per square kilometre) and Katavi with 15 people per square kilometre (<http://www.nbs.go.tz>).

The Moshi District Council is one of the most densely populated areas in Tanzania with a high human population growth. This is having significant implications on the land resources that affect farming systems due to the reduction of the farm sizes. The preparation of settlements and forest fires that are used for harvesting honey is a major cause of deforestation. Also challenge to infrastructure constructions especially roads and industries are common (Soini, 2002a). In addition Zongolo *et al*, (2000b) observed a high human population density in Moshi particularly in the highlands and the midlands and even some parts of lower belt areas. Whereby highlands had 650 people

per km² while midlands and some parts of lower belt had 250 people per km² (Zongolo *et al*, 2000b). Furthermore, in recent decades, population pressure has led significant ecological changes on the southern slopes of Mt. Kilimanjaro including the Moshi District Council. The recent land use change analysis shows the expansion of agricultural production, has extended along the marginal land, downward the slope, right into uncultivated land. The disappearance of land vegetation, due to the clearing of forest, farm preparations, an extreme division of natural bush and land distribution to the sons, has resulted to land resource scarcity and degradation (Soini, 2002a).

Due to the high human population and land constraints in Moshi District Council motivated a researcher to be interested to investigate and suggest the sustainable strategies, that probably would be implied by the Moshi District Council to ensure human population growth are controlled and land constraint issues are solved or minimized.

1.2 Statement of the Problem

The fastest human population growth has taken place in developing countries than any other region in the world (ESA/UN, 2011)¹. In which, Tanzania is the one of these countries, with its fast increasing population. According to the national population census, there were 23.1 million people in 1988, 34.4 million people in 2002 and there were 44.9 million people in 2012 (<http://www.nbs.go.tz>).

Due to the high human population density in Moshi District Council leads the pressure on natural resources including land has increased, and thus resulting in a drastic decrease in farm size, scarcity and fragmentation of land, migration and expansion of agriculture into the lowlands. It has also resulted to intensification of land use. Furthermore, the area has experienced with significant environmental changes, declining productivity and loss of natural habitats (Soini, 2002a). However, the regional authority has emphasized in the resettlement program in order to reduce the impacts of high human population density and land scarcity.

¹The projection indicated that African population is expected to increase by over 360 million to 1.2 billion by 2025, and by over a billion to 1.9 billion by 2050. In fact, food production does not keeping pace with African population growth (ESA/UN 2011)

Despite the role played by the regional authority in encouraging people to move to unoccupied land, particularly to Tanga and Morogoro Regions through resettlement program and land use intensification and expansion, there are still serious constraints concerning with high human population density and land scarcity which on the other hand has led to the reduction of farmland and has also brought conflicts in infrastructure developments and poor settlement planning. The study attempted to investigate and suggest the appropriate strategies that could be implied by the Moshi District Council, ensuring the planning of population reduction, the planning of land use for the infrastructure development and agricultural production, confirms the fact that the land in Moshi District Council is scarce (Sevaldsen, 1997).

1.3 Objectives of the Study

The objectives of the study are subdivided into general and specific objectives

1.3.1 General Research Objective

The general objective of this study was to assess high human population density and its impacts on land resources, in Moshi District Council-Kilimanjaro Region. Hence, the specific objectives of the study are as follows.

1.3.2 Specific Objectives

- i. To examine how high human population density affects farm size and leads to food shortage.
- ii. To assess how high human population density affects land degradation.
- iii. To assess the strategies used to ensure the human population reduction.
- iv. To examine the land use planning for infrastructure development and agricultural production.

1.4 Research Questions

This study is attempted to address the following questions

- i. How does high human population density affect farm size and lead to food shortage?
- ii. How does high human population density affect the land degradation?
- iii. Which strategies are being used to ensure human population is reduced?
- iv. Which land usage strategies are being implied for the planning of infrastructure development and agricultural production?

1.5 Scope of the Study

The study was focused on high human population density and its impacts on land resources in Moshi District Council-Kilimanjaro Region in Tanzania. The researcher observed a high human population density, land scarcity, and degradation in various areas. A further investigation was on the reduction of farm sizes due to high human population density. Moreover, the activities of the residents/respondents were observed plus the constraints associated with population pressure and land shortage such as small farm holding, unemployment, the phenomenon of street children and food shortages.

1.6 Significance of the Study

The study intended to enable the researcher to be awarded the Degree of Master of Science in Environmental Management (MSc. EM) at the Mzumbe University. Also, the results increase understanding to the regional stakeholders, the policy makers, the farmers to intensify on land arrangement plans including settlements and resettlement plans, commercial, residential and agricultural centre's arrangement. In addition, the study increases awareness of population control by implementing family planning. By doing so land scarcity, degradation and population growth would be reduced.

1.7 Limitations of the Study

The study faced with the following limitations:-

- i. Lack of accurate land measurements which caused inaccurate land dimensions of the Moshi District Council.

- ii. Lack of standardized national categories that show classifications of human population density i.e. low, medium and high. A number of literatures show different human population density categories; a standpoint that challenges the study in determining classification of human population density.

1.8 Study Delimitations

The lack of accurate land measurements in Moshi District Council left the researcher with no option but to use the most acknowledged measurements by different writers. Delimitation of lack of authorized national categories that show classifications of human population density. The researcher also used international categorization of human population density.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter involves reading and summarizing the review studies related to the topic under discussion. The general purpose does not to have the whole content of the related studies, books, journals and articles basing on the particular subject, but to understand what has been already done and to identify if at all any glaring gaps in the literature and what the specific study attempted to do about the identified gaps.

2.1.1 Terminologies and Their Interactions and Implications

2.1.2 Human Population

Human population is the number of inhabitants with a common feature such as land area, gender, age, and services like religion, hospital and schools (Engelbrecht, 2005; Aschengrau and Seage, 2008).

2.1.3 Human Population Density

The human Population density refers to the total number of people in a bounded place divided by the given land size in which they live per square mile or kilometre (McDonald, 2010).

$$\text{Human Population Density} = \frac{\text{Number of Inhabitants}}{\text{Land area in which they occupied}} = \frac{\text{Inhabitants}}{\text{Sq.km}}$$

2.1.4 High Human Population Density

High human population density is considered when the population density of a given land area is above the global standard. The Classification of human population density based on Euro stat/European Commission Regions; Statistical Yearbook 2006 page 156 stipulates three major categories of populated areas which includes dense populated areas (>500 inhabitants per km²), intermediate areas (500-100 inhabitants per km²) and thinly populated areas (<100 inhabitants per km²) (Antonsich, 2007).

2.1.5 Land and Land Resources

Land² and Land Resources including the earth's surface above and below it, is encompassed all resources found in it, including living and non-living things. In other words they include the biosphere such as the animal populations, plants, and insects, the hydrosphere (all water bodies such as rivers, lakes, marshes and swamps), the geology includes rocks, soil and mountains, the infrastructure include the human settlement patterns and human activity (drainage structures, roads, buildings, underground oil pipelines, water canals, terracing, etc. (FAO/UNEP, 1997).

2.1.6 Relationship between Human Population Density and Land Resources

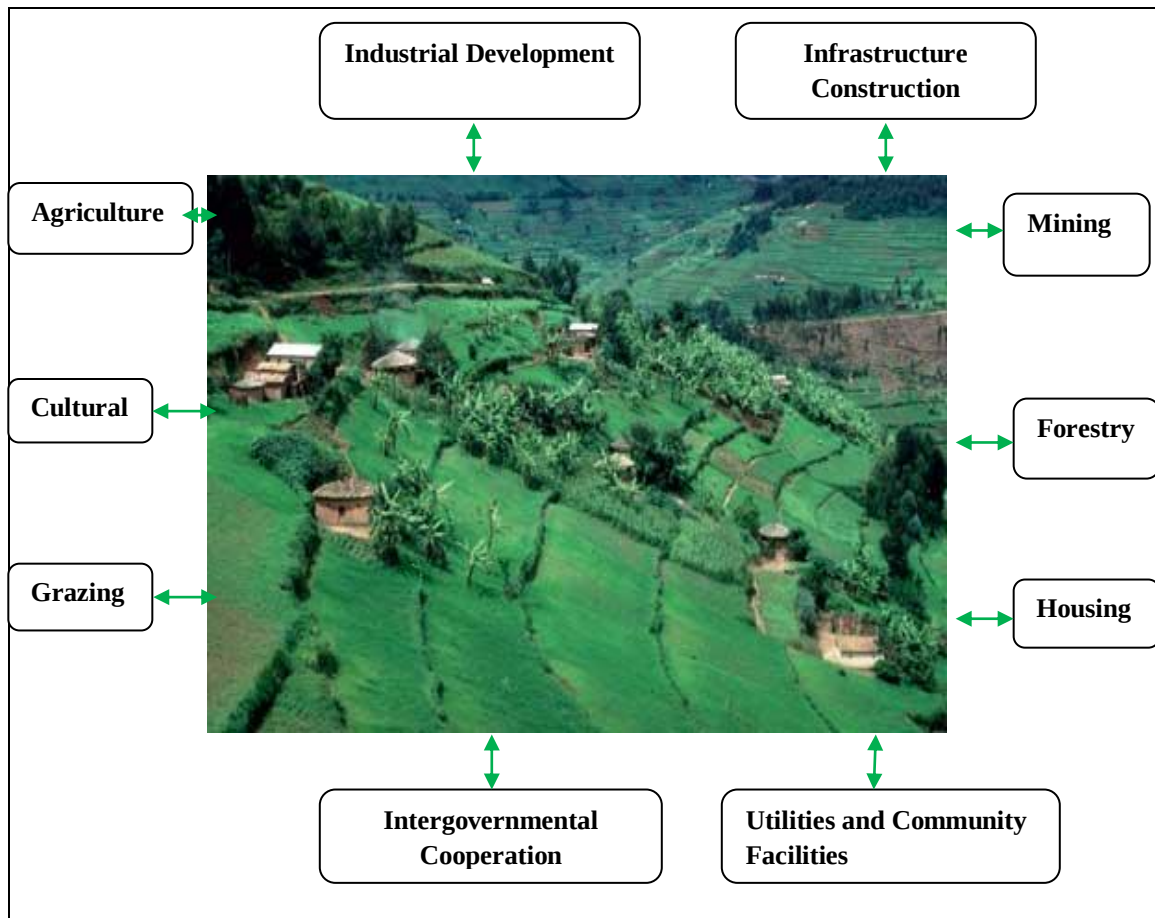
High human population density has interrelated with land resources. It is proved that densely populated areas have increased pressures on land resources in particular (MEA, 2005). The FAO, (1997) reported that, sixteen percent of the world arable land is degraded and the percentage is increasing. This is a major stress factor on land resources (FAO, 1997). Land management systems are not appropriate to the extent of land degradation. The core reason for the problem is the rapid human population growth that leads to the increasing demand for land resources. Externalities related to global development also have constrained land resources.

2.1.7 The Interaction to Land Resources

It is the truth that our survival is directly interacting with land resources. Things like infrastructure construction, housing, agriculture, mining, industrial development, cultural, forestry, intergovernmental cooperation, utilities and community facilities, and grazing, cannot be separated from land resources making it inevitable for a community to plan for development without considering the opportunities, constraints, and impacts associated with land resources (Robinson, 1914).

² Land is an important and economic good; its value is ascending rapidly (<http://www.ardhi.go.tz>).

Figure 2.1 The Dependants of Land Resources



Source: Modified from (Robinson, *Ibid*), and photo: form (<http://www.fao.org/>)

2.1.8 An Overview of the High Human Population Density and Its Impacts on Land Resources

Globally, there is an increase of population pressure on land resources. The world human population rose by 34 percent from 1987 to 2007, also seen that the rapidly increasing human population, leads to the changing land use. However, the projections still expects an additional number of people in the near future from approximately 6.8 billion to 9.2 billion in 2050. Furthermore, land size per individual has been declining from 7.9 ha in 1900 to about 2 ha in 2005 (Gitay *et al*, 2007). Meanwhile, the projection average land size per person in world perspective in 2050 will be 1.6 ha (GLP International Project Office and authors, 2010). The prediction reveals that there will be an increasing of land business particularly in areas where there are high land resources; however, this will hold if other things remain constant. The Global land

project indicates that countries like China and India will experience much demand on land resources and even a small country like Saudi Arabia will likely be in the same situation (GLP International Project Office and authors, 2010).

In Asia, human population pressure and rapid industrial developments, has caused an increase critical challenge in land shortage, particularly a country like China. Arable land is being reduced day to day. More than 13 million hectares of arable land have been lost, since 1952 as reported by Zhang *et al*, (2000). This was caused by other land use activities such as expansion of settlements, physical infrastructure constructions like roads, bridges and buildings. There is only 7 percent of the world's arable land regarding the increase human population growth (Zhang *et al*, 2000). Brown (1995), plus other Malthusians questioned China's capacity, as to how it would satisfy its 1.25 billion people in the coming future. Despite this question, China has managed to produce her self-sufficiency food crops over the past 20 years (Zhang *et al*, 2000).

Despite the declination of arable land areas/cultivated areas, one of the critics of Malthusians failed to regard the issue of increase of land productivity³ such as; inter-cropping, soil conservation. However, China managed to enlarge a product of limited arable land. The multiple-cropping index, has enlarged by more than 13 million hectares since 1952 (Zhang *et al*, *ibid*).

The role of Malthusians does not function in China. They face challenges of their ideas. The understanding the driving force of cultivation in China determines the future crops production and trade situation. It is proved that the food crops have increased even more than the total arable land available. Now knowing that there is land scarcity and high human population density in China, the critical question today is: Can China maintain the maximum crop production by increasing intensity, regardless the loss of farmland through other activities such as building of industries? (Zhang *et al*, *ibid*).

In Africa there is a good number of rural and urban population living in densely populated areas as indicated in some African countries like Nigeria, Rwanda, Uganda, Kenya, Malawi, Burundi and some parts of Tanzania mainland like Dar es Salaam,

³ For instance, Brown (1995) forecasted a decline in both arable land area and additional cropping.

Mwanza and Kilimanjaro (Jayne, 2012; URT, 2013). Furthermore, land has been usually considered as an abundant resource in Sub-Saharan Africa (Deininger *et al*, 2011). However, empirical studies showed different pictures in some of the national farm surveys. Firstly, half or more of Africa's small farm holders possess below 1.5 hectares in size with small or no area for settlements and agricultural expansion. This is because of high human population density that is rooted by high human population growth (Jayne *et al*, 2003). Secondly, the large number of farmers knows the difficulties in acquiring more land through customary law like in the Chagga tribe, even the areas where land appears to be unoccupied (Stambuli, 2002; Jayne *et al*, 2009). Thirdly, in some areas such as Kenya, a number of young men and women start their families without inheriting any land from their parents. This situation forces them to engage in non-agricultural activities, so as to have a capital to purchase land from the increasingly regular land sales market (Yamano *et al*, 2009).

Moreover, the reviewed research suggested some possible solutions to the consistent land shortage. First, the available arable land should remain unused, because it doesn't receive any obligatory public investment in physical infrastructure like irrigation, roads, electrification, schools, health facilities, water and other uses, that is required to raise the value of land and thereby to attract people to move and establish settlements in these areas (Jayne *et al*, 2009). This has resulted in some African governments, giving chances to the large-scale investment and not to the majority small scale farm holders. These large-scale investments in agricultural developments also feed a large number of rural populations in most of African countries. This paradigm also attracted many foreign investors who acquired large pieces of land for agriculture in African countries. This is usually termed as "land grabs" (Jayne *et al*, 2009).

Second, the countries which were under colonial settler such as Zimbabwe, Zambia, Kenya, and Malawi have been separating land ownership by customary laws and that of the state (Deininger and Binswanger 1995; Woodhouse 2003). However, land under customary ownership, has been facing borne constraints since independence. The good numbers are people living in rural areas, where land in the early days was vast and undivided. Moreover, much of this unused arable land is under government possession,

and this makes it even difficult for the smallholder to have tenure. The truth is; most of the African post independence governments have distributed large arable land to investors. Where a smallholder is faced with land scarcity and degradation in which challenges their agricultural development as well as their daily activities (Mbaria, 2001; Stambuli, 2002; Namwaya, 2004).

There are no successful strategies, as far as the dense population and land constraints and challenges facing Africans is concerned. No satisfying outcome of the discussion of how Africa's government institutions and policies, would help smallholders for expanding their farm sizes and increasing arable land intensity in order to reduce rural poverty (Jayne, 2012).

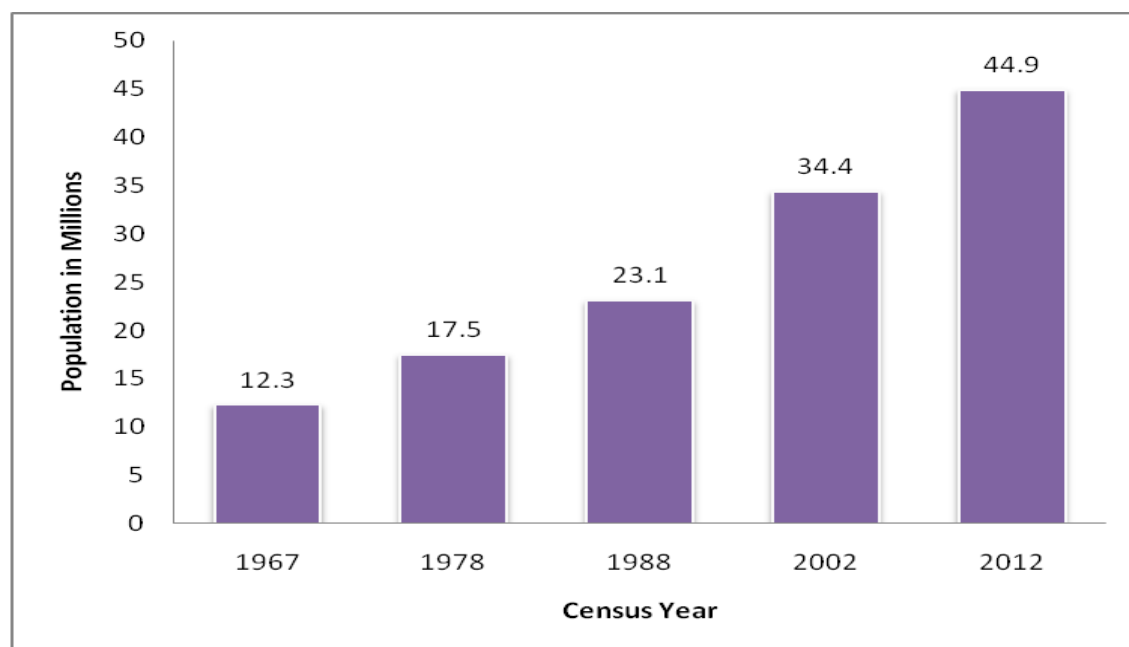
In Tanzania, there are some regions experiencing high human population density and land constraints, the leading regions in overall are the country's mainland and Zanzibar. These are Dar es Salaam and Mjini Magharibi Regions with population densities of 3,133 and 2,581 persons per square kilometre respectively. The leading regions in human population densities in the mainland are Dar es Salaam with 3,133 people per square kilometre, followed by Mwanza with 293 and Kilimanjaro has 124 persons per square kilometre, this is the general average. Nevertheless, there are some districts in Kilimanjaro Region with higher densities, for example the Moshi District Council with 273 people per square kilometre. All regions experiencing high human population densities have land constraint issues (<http://www.nbs.go.tz/sensa/popu.php>).

Table 2.1 Basic Human Population and Land Data in Tanzania

Land and human population classification	Size
Total Land Area	881,289 km ²
Total Population	44,928,923 (2012 Population Census)
Population Density	51 people per km ²
Population Growth p.a. 2012	2.7 percent
Average household size	4.8

Source: Tanzania Population Census, (2012)

Figure 2.1.1 Population Trends in Tanzania, 1967 to 2012 Census



Source: (<http://www.nbs.go.tz/sensa/popu.php>)

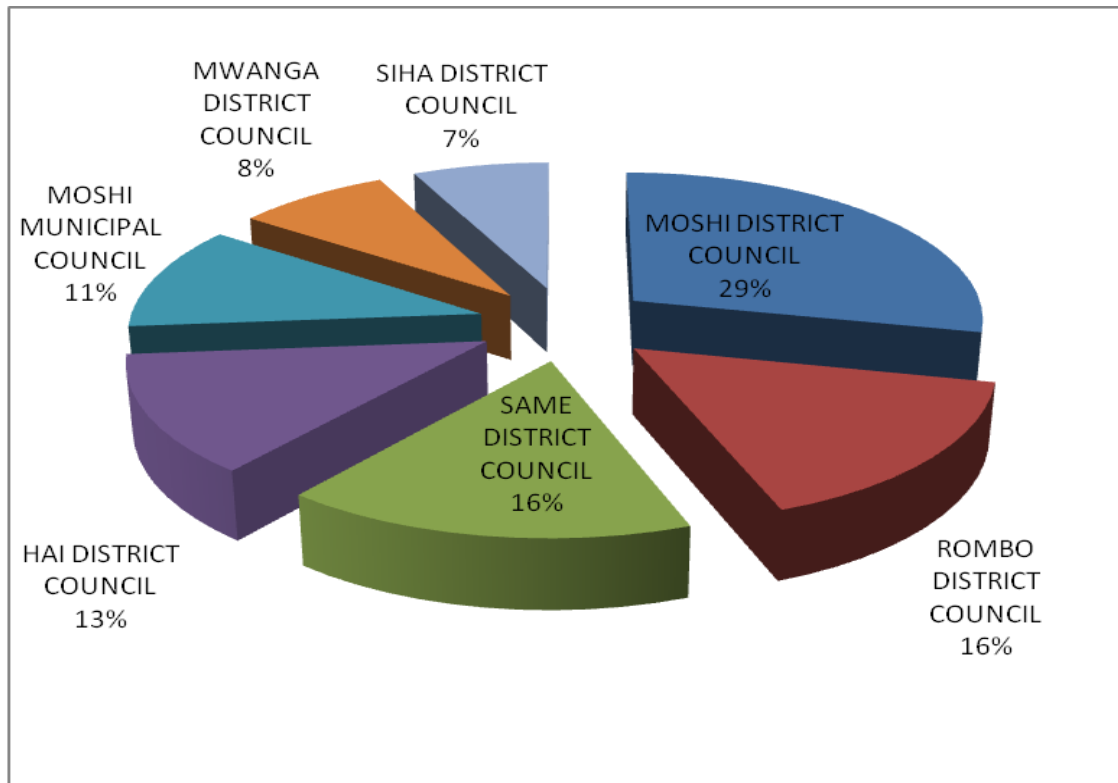
According to the 2012 census, Kilimanjaro Region has a human population of 1,640,087 and 1.8% annual growth rates as per figure 2.1.2. The region has an area of 13,209 km² and it has a human population density of 124 people per km², a difference to the Tanzania national average of 51 people per km². The highlands southern slopes of Kilimanjaro and Pare mountains, where most agriculture takes place had a human population density of over 350 people per sq.km (<http://www.nbs.go.tz>).

Table 2.1.1 Population of Kilimanjaro Region by Sex, Average Household Size and Sex Ratio

S/No.	District/Council	Population (Number)			Average Household Size	Sex Ratio
		Total	Male	Female		
	Total	1,640,087	793,140	846,947	4.3	94
1	Rombo District Council	260,963	124,528	136,435	4.4	91
2	Mwanga District Council	131,442	63,199	68,243	4.4	93
3	Same District Council	269,807	131,515	138,292	4.5	95
4	Moshi District Council	466,737	225,767	240,970	4.2	94
5	Hai District Council	210,533	102,457	108,076	4.2	95
6	Moshi Municipal Council	184,292	89,174	95,118	4.0	94
7	Siha District Council	116,313	56,500	59,813	4.3	94

Source: URT, (2013) 2012 Population and housing census, Tanzania

Figure 2.1.2 Percentage of Human Population of Kilimanjaro Region by Each District



Source: URT, (2013) 2012 Population and housing census, Tanzania

2.1.9 Land Size in Each District of Kilimanjaro Region

The districts around the land area in Kilimanjaro Region all differ. Same District is the leading which has 5,186 square kilometres, followed by Mwanga District has 2,698 square kilometres, Hai District has 2,112 square kilometres, the Moshi District Council has 1,713 square kilometres, Rombo District has 1,442, Moshi Municipal District has 58 square kilometres, and Siha District the data was not available. Nevertheless Moshi District Council has the leading human population size irrespective of its relatively small land size. This cause high human population density compared to other districts in this region, as presented in table 2.1.1 (Regional Commissioner's Office, Kilimanjaro, 1998).

Table 2.1.2 Land Size of Each District in Kilimanjaro Region

District	Area in sq km
Hai	2,112
Siha	NA
Rombo	1,442
Mwanga	2,698
Same	5,186
Moshi Municipal Council	58
Moshi District Council	1,713
Total	13,209

Source: <http://www.kilimanjaro.go.tz>; Regional Commissioner's Office, Kilimanjaro 1998

Kilimanjaro Region has a high human population density that increases pressure on land resource. Recent study commented that 70 percent of the households in Kilimanjaro Region had insufficient quantities of land resources to sustain their livelihoods for agricultural activities and settlement expansion (Soini, 2002a). This marked the third highest human population density in Tanzania mainland. Particularly, from the year 2002 to 2012, the human population increased by 16 percent. This is still a fast rate of population growth, at 1.8 percent per year, compared to the land available which is 13,209 square kilometres. This shows the increased pressure on land resources particularly in Moshi District Council (URT, 2013), where 85 percent of the population is thought to be concerned with farming for a whole time of their lives (URT, 2006b).

Furthermore, failure to expand for agricultural cultivation in upper and middle zones of the Moshi District Council, in Kilimanjaro Region, due to land shortage and insufficient opportunities, left people with no-option but to switch to vegetable gardening; concentrating on crops such as cabbage, tomatoes, onions, sweet peppers and eggplants. This is done around their home places, regardless of how small the farm sizes are, (Soini, 2002b). Also Sevaldsen (1997) observed that due to the shortage of access to land, cheap labour became very common, that is why many people were/are ending up working in vegetable gardens. These vegetable gardens become a very significant economic activity in the recent years, even more than coffee productions.

This has caused many people to cut off coffee plants and replace with vegetable gardens and also intensify on planting crops like tomatoes and onions (Grove, 1993).

However, diversification of crops has also been seen in middle and lower slopes of Kilimanjaro Region, where tomatoes and onions have become the significant and leading crops. Meanwhile, many people are concentrating on these new crops due to the increasing water-shortage problem which supports the production of coffee in some middle and lower zones, but even though these crops have gained significant income to some of the lower zones, especially in the Makuyuni ward (Sevaldsen, 1997). They still face challenges like; water shortage, which is very useful for the irrigation system. The market competition is also high; so many farmers are now turning to non-agricultural activities to sustain their lives (Sevaldsen, 1997).

2.2 Theoretical Studies

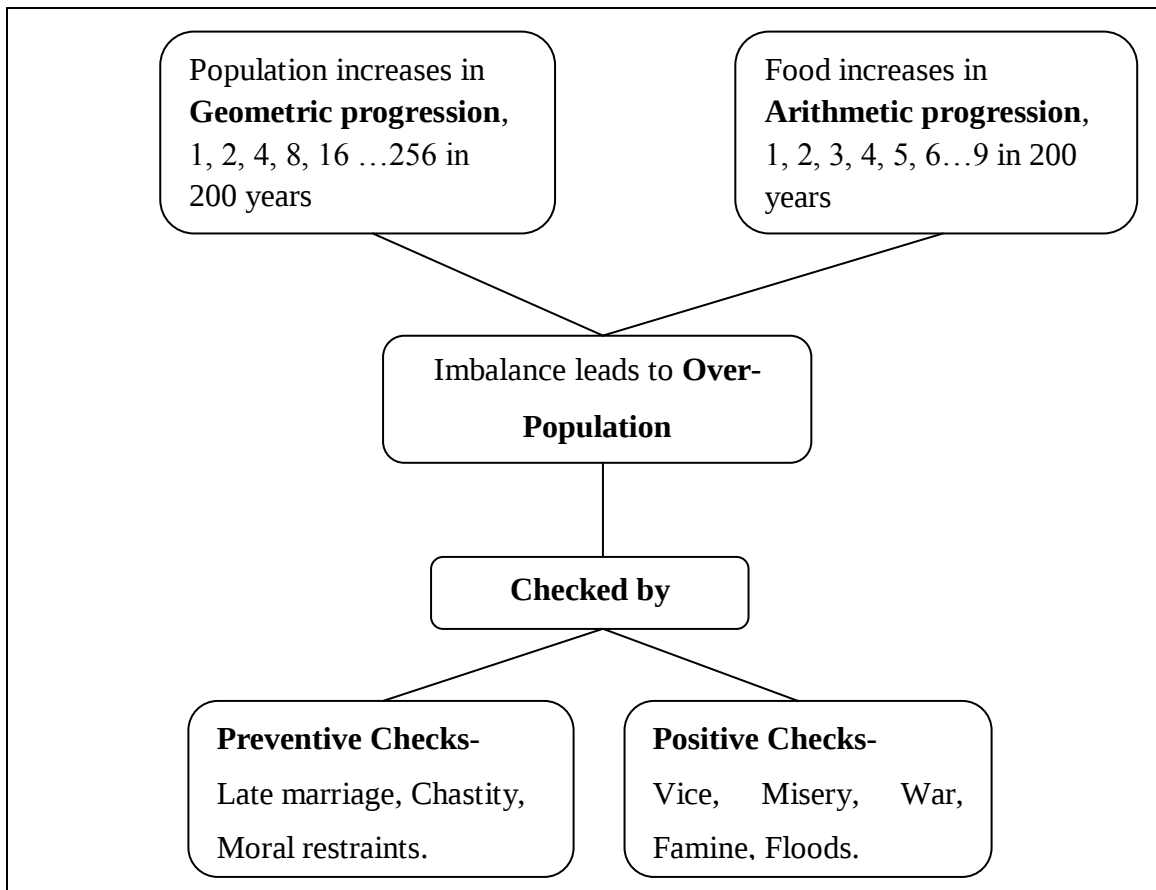
The study was governed by Malthusians/classical economists', neoclassical economists' and neo Malthusians theories, both they discussed the human population growth and land resources in different perspectives.

2.2.1 Human Population Growth, Food Supplies and Limited Land

Malthusians' theories on the relationship between human population growth and natural resources traced in 1798, with the father of Malthusians (Thomas Malthus) stated that "The rate of population growth is greater than the rate of the earth which is not big enough to produce food that would satisfy the present and future generation," (Malthus, 1986:23). Moreover, Malthus predicted that population growth would exceed limited supply of natural resources especially land resources (Malthus, 1986). He argued that human population grew geometrically while subsistence increased arithmetically. He also hypothesized that, while the human population increases with fast rate, foodstuff would be insufficient to feed the entire number of the people. However, the human population would be adjusted below the carrying capacity of agricultural systems by "positive and preventative checks." Positive checks would include the increasing mortality rate due to outbreaks of disease, famine, higher infant mortality, malnutrition, and war. Preventive checks would include lowering of fertility through delays in

marriage, contraception, abortion, and infanticide (Malthus, 1986). This "Principle of Population" depended on the idea that population if unchecked increases at a geometric rate (i.e. 2, 4, 8, 16, 32, 64, $2n$), whereas the food supply grows at an arithmetic rate (i.e. 1, 2, 3, 4, 5, 6, n).

Figure 2.1.3 Malthusian Theory of Population Model



Source: Malthus, (1803)

Moreover, classical economists later supported Malthus' theory through the law of diminishing returns that; as the labour force increases the workers output decreases; quite similar to what Malthus argued that as population increases the food supply decreases (Ricardo, 1887)⁴

In the 19th century there were many theorists in the World who criticized Malthus' theory, perhaps the best known were Karl Marx and Henry George: Marx's thought the

⁴ Means declining of land productivity, although, intensification can be applied.

resulting of poverty and misery based on excess of low income population, and not as Malthus' argued that in the world of capital accumulation, the poverty and misery were caused by unemployment, Marx disapproving the wording used by Malthus. Conversely, Henry George together with other theorists who attended the debate on Malthus's views, came up with a different perception that population growth is more economically advantageous than disadvantageous as viewed by Malthus (Jowett, n.d).

Other thinkers who criticized Malthus' assumptions were, Jain (2007) and Ghimire (2009) based on the following criticisms firstly, incorrect mathematical expression of Malthus, that population increases in geometric progression and subsistence in an arithmetic progression: However, there is no historical evidence for this idea, some decades back there were some countries where population declined for example in France, hence this goes contrary to the Malthus' argument. Moreover, food production increased than in an arithmetic progression. In fact, he ignored the role of standard of living which is better today than a century back (Jain, 2007). Secondly, there is the possibility of increasing returns: Malthus was a pessimist, he obeys the Ricardo's law of diminishing returns and he rejected that food couldn't increase in geometric progression, however due to the land intensification like fertilizers, agro forestry and soil conservation and advances of modern agricultural technologies, the food production has been increased much than the growth of population. Therefore, Malthus' prediction has been proved wrong⁵ (Jain, 2007). Thirdly, difficult to adopt preventive checks: Malthus' assumes that preventive checks would be used to control growth of the population, such as late marriage, celibacy⁶, moral restraints and chastity, however, these preventive checks are difficult to adopt. He most prefers to these options, but, also considered them as suggestions. A perfect family planning program is needed to check population control rather than preventive checks (Ghimire, 2009). Fourthly, the growth of population is not always undesirable: Malthus was negative when it came to additional population; on one aspect he thought of the challenges food production, however, in some cases the growth of the population may be advantageous by

⁵ Sometimes Ricardo's law of diminishing returns is not applicable (Jain, 2006-07).

⁶ Someone who is unmarried, especially because of religious vows (Chambers 21st Dictionary).

increasing labour, sometimes large number of people are the sources of strength and power (Ghimire, 2009).

Neo-classical economists such as an agronomist Ester Boserup explained differently to Malthus' views on human population pressure and land productivity (Boserup 1965; 1981; 1990). Boserup argued that people would actively intensify land productivity/increasing agricultural yields, such as multi-cropping, irrigation, and soil conservation and application better agricultural technologies all these would compensate human population growth. Boserup commented that there are no limits to human population growth that would be satisfactory to the intensification of agricultural productivity (Boserup, 1965). Moreover, other, neo-classical economists added that when the annual cropping are normal, other forms of land intensification will be added to raise the agricultural products, for instance the use of fertilizers, pesticides and herbicides (Bilsborrow, 1987; Turner, Hanham, and Portoraro, 1977). Furthermore, Bilsborrow viewed that human population growth and subsistence can be adjusted by fertility reduction, emigration and off-farm employment. According to Turner, Hanham, and Portoraro, (1977), these reactions cause an alternative to the human population growth probably occur simultaneously/multiphase. Another one is; the hypothesis of land use adoptions may cause fertility reduction and emigration while the off-farm employment opportunities exhaust (Bilsborrow, 1987; Bilsborrow and Carr, 2000).

Neo Malthusians like Ehrlich, Ehrlich and Daily (1993) and Pingali (1990) criticized the neo-classical theorists. They said that, there are constraints in application of land intensification. These include land degradation, soil erosion and declining of agricultural products, they associated problems and the use of agricultural inputs such as pesticides and chemical fertilizers. Moreover, the agricultural inputs may harm the environment by declining biodiversity of both cultivated crops and wild flora, they pollute freshwater and cause air pollution and climate change. Nonetheless, green revolution researches supported their views that, the new chemical agricultural inputs have impacts on decreasing diversity, soil depletion and air pollution (Ehrlich, Ehrlich and Daily 1993; Pingali, 1990).

However, Repetto and Holmes (1983) and Pingali (1990) thought that, the depletion of natural resources cannot only be associated with human population growth, but there are other factors which interact with human population growth such as unequal distribution of natural resources, the growing movement of commercialization, the great demand on natural resources and disregarding traditional ways of conserving natural resources.

2.3 Empirical Studies

This part reviews different works done by other scholars that are more or less related to this study. Generally, many studies have shown there is an interrelationship between human population density and natural resources particularly land resources. The following are some of the studies which have been conducted in different angles of the world.

Jayne and Muyanga (2012) studied the *“Land constraints in Kenya’s and densely populated rural areas: Implications for food policy and institutional reform.”* They used data from five panel surveys on 1,146 small-scale farms from 1997 up to 2010 also they used econometric methods to determine how increasing rural human population density is affecting farm size holding among the families and agricultural productivity. The results indicated that population density caused declining of landholding sizes and area in hectares cultivated per adult, considering the seasonal period, smaller farm sizes reduce agricultural products. The authors commented that to overcome decreasing landholding sizes, the farmers intensified land productivity such as fertilizers, soil conservation, and multi-cropping in order to increase output per hectare. However, the input intensity increases with human population density of around 650 people per sq.km, above this population density threshold, land intensification declines.

The same thing has been revealed in a number of research reports conducted in Rwanda related to high human population density and land resources showing that there is negative results between high human population density and natural resources, include the study of Clay *et al*, (1998) entitled *“Inequality and the emergence of non-farm*

employment in Rwanda” where the survey method was used in administering surveys questionnaires in various members of sampled households. The researchers also observed that the reduction of farm sizes has also become smaller among the land holdings. One of the reasons was; the limited land available, but also the effects of the rapid human population growth. Moreover, the findings showed that, 47% of farm households in Rwanda are engaged in non agricultural activities.

Musahara (2001) in the study of “*Land and Poverty in Rwanda*” used a diagnostic and descriptive analysis of land and poverty in Rwanda; he found that, the fast human population growth has increased pressure on marginal land and resulted in an unequal division of land, the analysis found that more than 60 percent of Rwandans have less than 0.5 ha, moreover, those who possessed small farms were not satisfied with their agricultural production, he also observed the increase of landless holders, where the majority of them being poor.

In addition, the study conducted by Haba and Bizimana (2005), on “*Assessment of the implementation process of the new land policy in Rwanda*” through the use of qualitative research design in the view of reduction of cultivated land size, the results showed that 51% of the land holdings were estimated to be less than 0.5 hectares, but according to FAO a farm size should be at least 0.90 hectares, so that it should be at least economically viable. Furthermore, the report found on the youth experienced land constraints, had no land to possess and those who come from poor families’ inherited very small land.

Furthermore, Kebede and Nicholls, (2011) studied the “*Population and asset exposure to coastal flooding in Dar es Salaam (Tanzania): Vulnerability to climate extremes*”. Case study method was used to provide in-depth information of the significant human population related to economic assets in the coastal zone of Dar es Salaam. The study indicated some land constraints in Dar es Salaam, particularly the agricultural land. They started by showing the major economic activities in Dar es Salaam, which include tourism, forestry and fishing, urban agriculture, mining and quarry, manufacturing and others. The data showed that, a total of 110,850 ha (52,000 ha in Kinondoni, 45,000 ha

in Temeke, and 13,850 ha in Ilala) of land has potential for agriculture practices, of which over 52% is already in use for non agricultural activities (Dar es Salaam City Council, 2004). However, due to high human population density, the land use plans changed from agriculture to other commercial and industrial activities (Kombe, 2005).

Nevertheless, in the study of the *“Analysis of population dynamics and poverty reduction in the United Republic of Tanzania in the context of MKUKUTA and MKUZA”* by Oucho and Mtatifikolo (2009), through the use of three research methods include: (i) the analytical framework; (ii) the information gathering approaches and content, and (iii) the synthesis part. Generally, they commented that a human population size is not a critical problem in Tanzania, however, in some areas the size of the human population size is a serious issue compared to the land available. They gave an example of Zanzibar, which showed a very high human population growth compared to the land which is very small. However, the study did not pay more attention to other regions with a similar land problem and human population densities like Dar es Salaam, Mwanza and Kilimanjaro. Apart from that, they commented that Tanzania should address the issue of human population density and pressure on natural resources to ensure sustainable environmental management (Oucho and Mtatifikolo, 2009).

Conversely, according to MEA (2005), in the assessment of *“Ecosystems and Human Well-being Synthesis”* by the Millennium Development Goals, investigated the ecosystem disappearances through the use of observation and synthesis. The research methods, found that there is a rapid degrading of ecosystems that support human’s living and wellbeing. The Millennium Ecosystem Assessment investigated 24 serious ecosystems in some parts of the world in which people are depending on for their survival, and the results show that 60% were being untenable and degraded (MEA, 2005). Poverty is the core barrier that hinders the achievement of the Millennium Development Goals. However, this is caused by poor who degrade ecosystems through clearing of forest, in order to meet their needs. Moreover, the results showed that human population growth is the key factor in the ecosystem service degradation. The results also showed that there is an interrelation between human population growth,

ecosystem and poverty. The report concluded that changes on human population growth have effects on ecosystems/natural resources i.e. land resources.

Mascarenhas (2000), studied *“Poverty, environment and livelihood along the gradients of the Usambaras in Tanzania”* the methodology for the study was rooted in the conceptual framework by ensuring development takes place in a sustainable manner, and by controlling the consumption of rural population over the natural resources. The researcher not only cited but also found an example of land degradation caused by human population pressure in Mlalo-Lushoto where land degradation has taken place because of clearing marginal land for agricultural use and extreme overgrazing. Furthermore, the study shows that, the most critical problems in the region are land degradation and deforestation; moreover, an investigator reported that, the government of German in cooperation with Tanzania established a project that aimed to combat the soil erosion and ensure sustainable natural resource conservation. The project is known as the Soil Erosion Conservation and Agro forestry Project (SECAP).⁷ Furthermore, there were other ways in which people coping with the limited small sized land by opting for off-farming activities. However, in the highlands of Lushoto people distributed the small land they had in the line of inheritance.

2.4 Research Gap

Many studies have been undertaken in different regions and various research methods were applied. However, there are some key issues that have not yet been addressed, concerning the rapid growth of human population in relation to the limited land resources. The issues of settlement planning and population control are the challenges of rural human population particularly in developing countries (ROR, 2000). However, developed countries achieved in human population control and settlement planning, though their land is scarce compared to the number of people, these countries increase physical infrastructures i.e. buildings, roads and recreational areas. In Tanzania’s case, the rapid increase of human population growth has brought challenges to resources in some regions including Kilimanjaro Region. The critical issue is on limited land

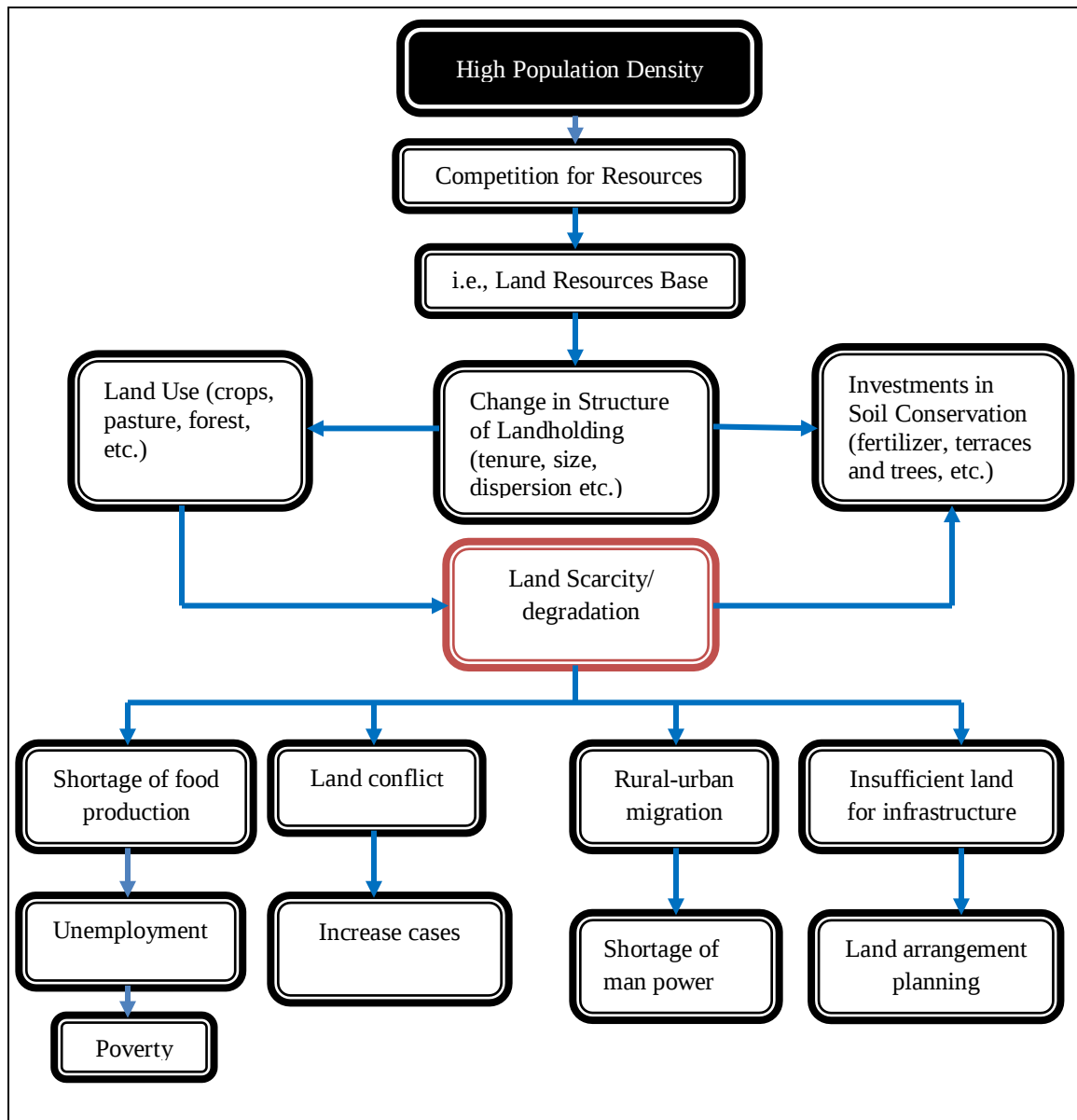
⁷ SECAP is the latest among a series of projects designed to halt land degradation in the Western Usambara

(<http://www.nbs.go.tz>). Furthermore, the measures to population control i.e. family planning and land use planning i.e. settlement planning has not yet been achieved particularly in rural areas where the human population is high. This was the gap in which this study addressed and suggested some potential resolutions in the fourth and fifth chapters.

2.5 Conceptual Framework and Research Model

High human population density has impacts on land resources that cause changes in the structure of landholding and land management (land use and investments in soil conservation and fertility), land scarcity, conflict, shortage of food production and land for infrastructure development as the result of poverty.

Figure 2.1.4 High Human Population Density and Its Impacts on Land Resources



Source: Adapted and modified from Clay et al, (1994)

2.5.1 Conceptual Linkages

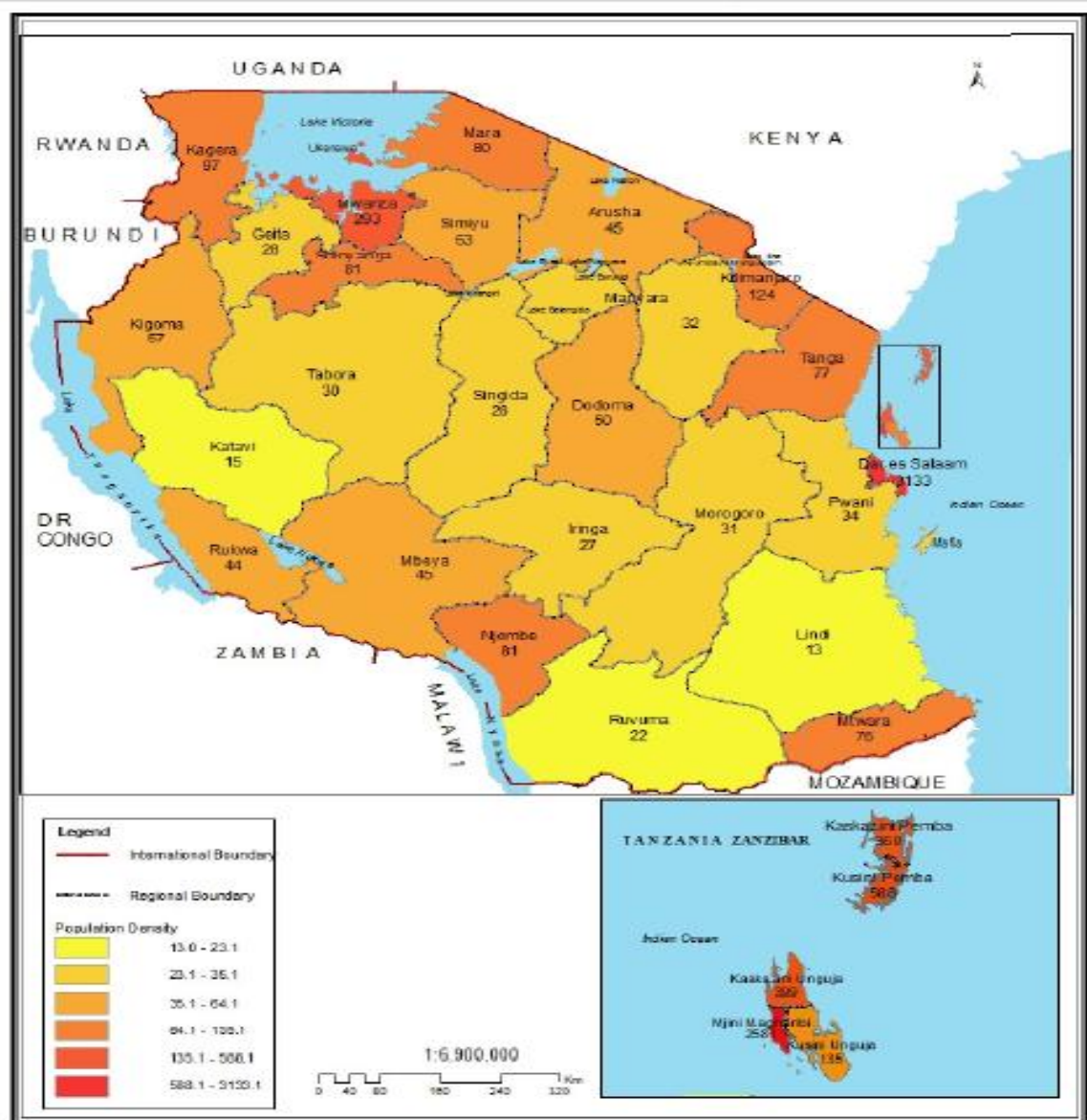
High human population densities especially in Kilimanjaro Region, Tanzania and other third world countries has affected the ways in which households manage their land. This has caused some farmers to adopt new agricultural mechanization such as irrigation, drainage, soil conservation, etc., in response to declining farm size or land occupancy. The competition for land use in agriculture, pasture, forest, settlement and

infrastructure construction i.e. road has brought new challenges. This is due to the land shortage which is caused by high human population density and improper ways of land sales to investors and rich people in spite of many governmental speeches restricting foreign ownership of land resources in Tanzania. In issues of land shortage, many farmers engage in non-agricultural activities, others migrate to urban centres searching for employment, while others are struggling hard to find work. This situation has created poverty to most of rural dwellers particularly in the Moshi District Council.

2.5.2 Land Dispute, Scarcity and Human Population Density in Tanzania

The right to own land is a key source of land conflicts in some developing countries and Tanzania is among these countries. Most of the land disputes are found in urban and some rural areas, such as Dar es Salaam, Mwanza, and Moshi District Council in Kilimanjaro Region and Ngara District in Kagera Region. However, some urban and rural areas have more than 500 persons per square kilometre see figure 2.1.5. This population density is higher than the normal standard, as a result it causes significant pressure on land, where smallholders fighting to have land right. Therefore this is the critical problem that people should be fully aware of and should be investigated upon, on how to reduce the population density and land resources challenges (URT, 2013).

Figure 2.1.5 The Map of Tanzania Shows Human Population Density by Region, 2012 Human Population Census



Source: URT, (2013) 2012 Population and housing census, Tanzania

2.5.3 Land Fragmentation

The meaning of land fragmentation adopted from the World Bank (Blarel 1989), that stand for the “geographic dispersion” of land holdings whereby small farms and large farms can be divided into small portions according to the demand of the number of people. High human population pressure increased pressure on the land resources and has an effect on the sizes of the farms, therefore leading to more fragmentations. In

Chagga custom, every son inherits a portion of land known as ‘*Kihamba*’. The evidence shows that high human population density and the continuing land fragmentation in Marangu, Mamba and Kilema wards, has reduced the land holdings to about less than 0.5 and 1 hectare per person. The pasture is now limited to zero grazing, with no further expansion for free grazing (Lymchai *et al*, 1998; Lyimo *et al*, 1999).

2.5.4 Land Tenure

Land tenure⁸ is the relationship between people and terms of use land resources. The system is categorized into four types, which are namely private, communal, open access and state (UN-EU, 2010). In Tanzania, the state owns the whole land, it is under the President who is a trustee or it is on behalf of the Tanzanians. However, in Tanzania the tenure classifies land into two categories; customary and statutory land tenure. Both categories exist in rural and urban areas. Those who want to own land in Tanzania can consult the relevant authorities like municipalities and councils for land.

While the high human population pressure, has made many realise how valuable and important land is, the needs of privatization and land-marketing in African countries has risen, and is now challenging land tenure. Some of the people are even going as far as changing the customary tenure, by stepping into the land market dealing.

This situation is experienced much more in rural lands and Moshi District is among the others. Despite the government warnings about marketing land resources, and regardless of customary tenure, many people are still getting land through purchasing. Conversely Maro (1988) argues that the reduction of farm sizes in Tanzania is another reason that has caused the changes of land use and investment.

⁸ In other cases property rights and land tenure are usually used interchangeably

2.5.5 Land Use for Agriculture and Food Shortage

There is the relationship between land and agricultural productivity. Farming activities are taking place on land (Robertson and Pinstrip-Anderson, 2010). Therefore the improvement of smallholder land ownership and agricultural productivity is very significant. It would make a difference if the land was secure and if there would be an increasing food production. However, that is not the case, many of the farmers possess less than 0.5 hectares which is not enough for them to undertake sufficient food production, Haba (2005), and an inefficient agricultural technology has challenged smallholders. So not only do they backslide but they also lack labour productivities hence, causing food shortage.

2.5.6 Size of Holdings and Soil Conservation

The size of farm holdings can affect land management in many cases. Agricultural activities, large scale land holders have better position than smallholders, simply because they invest a large amount of money to improve their production (Grabowski, 1990). Conversely the small scale land holders face land scarcity that leads to low agricultural productivity among their farms. One of the biggest advantages in densely populated developed countries is that they're able to offer cheap labour. This can be used to construct and maintain drainage ditches, terraces and other soil conservation. Furthermore, large holders can be better off in controlling soil erosion by modern technologies. There is a great need for soil conservation in many African regions due to the farming activities taking place, just like in the southern slopes of Mount Kilimanjaro, Tanzania which is experiencing a soil degradation problem. Boserup (1965) argues that as human population density increases and land becomes scarce (farms sizes grow smaller), land intensification such as fertilizers, irrigation, and soil conservation must be taken to improve agricultural yields.

Evidence from Moshi District Council shows farms are shrinking in size due to fragmentation of land among the sons for '*Kihamba*'. Moreover, human population pressure⁹ has led to ecological disturbances creating needs for conservation (Soini, 2002a). More expansion of home gardens/settlements has put pressures on land and the

⁹ The existence of rapid population density causes ecological changes and land scarcity

size of holdings become smaller than the standards, such that most of the smallholders end up possessing less than 0.5 hectares (Haba, 2005).

2.5.7 Relationship between Human Population, Natural Resources and Poverty

Human population growth and ecological change are the key factors contributing to poverty (MEA, 2005). The rapid growth of human population and land constraints challenges in most of poor countries (Chen and Ravillion, 2008). Observation shows that over 1.4 billion persons in the world live below 1 US dollar per day. This is an extreme poverty (Chen and Ravillion, 2008).

2.5.8 Land Use Planning and Migration

Population pressure leads to the changes of land use planning, Hoffmann (2000), and people voluntarily migrate to find unoccupied land or low land pressure areas. However, sometimes may migrate involuntary by the means of resettlement programs (Sokoni and Shechambo, 2005), government infrastructure development or any other government investment.

2.5.9 Role of the Study

This study was motivated to assess high human population density and its impacts on land resources which specifically have impacts on food security, infrastructure developments, land degradation and poverty. It also shows that the human population density has been so high in Moshi District Council and that land is also limited. The study aimed to investigate and suggest the sound programs that would ensure a proper human population reduction as far as family planning is concerned, has not yet been achieved much, whereby the usage of land is still remains low on the uses of agricultural production.

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.1 Introduction

This chapter describes the structure and methods of the study. It elaborates the research design, type of the study, the area of study, the population of the study, the sample size, the research approaches, the research sampling, the data collection tools and the analytical instruments for data analysis.

3.1.1 Research Design

This study used a case study design; this is an in-depth investigation study focusing either on an individual, a family, a group, a society, or an institution, or even a very small number of subjects which are examined intensively, basing on triangulated data collected (Yin, 1994). However, the number of variables is usually very large. Note that; a case study can be a pillar on research design or method. In this study, the community of Moshi District was examined on the ground of the impacts of high human population density on land resources.

3.1.2 Type of the Study

This study used both qualitative and quantitative research in assessing the impacts of high human population density on land resources, a case of the Moshi District Council, Kilimanjaro, Tanzania.

3.1.3 Qualitative Research

Various reasons motivated this type of research. First of all, qualitative research involves the collection and analysis of in-depth information in some limited group of interviewees. According to Neuman (1997), qualitative research allows researchers to learn different ideas from respondents by providing free responses in answering the questions. In this study the respondents were given open questions and requested to complete them through their own words.

3.1.4 Quantitative Research

Involves collection of data through quantified, measured and presented by the means of numerical form. The information about a social phenomenon is expressed in numerical terms that can be analysed by statistical methods (Gilbert, 1992). The study quantified the human population size per household and farmland size respectively. However, both qualitative and quantitative studies can aim at description of social phenomenon.

3.1.5 Study Area

Moshi District Council occupies an area of 1,713 square kilometres on the Southern Slopes of Mount Kilimanjaro. The most significant physical feature in the district is the snow-capped Mount Kilimanjaro, which is the highest mountain in Africa. It extends from a Rombo District in the east and Hai District in the west for about 80 kilometres. The inhabited land in the area consists of three belts; lowland belt (known as farming animals zone) lengthens up to 900 meters above sea level, middle lands belt (specialized in maize, beans and sunflower) lies between 900 and 1200 meters, and highland belt (specialized in home-garden with coffee and banana) ranges between 1200 and 1800 meters above sea level, (Misana *et al*, 2012; Regional Commissioner's Office, 1998). However, the study area covered eight (9) wards of the Moshi District Council which including Marangu East, Kirua Vunjo West, Uru East, Kibosho Central, Kilema South, Mwika North, Makuyuni, Kirua Vunjo South and Kirua Vunjo East.

Figure 3.1 Kilimanjaro Region Map Showing the Study Area



Source: Misana *et al*, (2012)

3.1.6 Study Population

Moshi District Council like other districts in Kilimanjaro Region is a land-scarce district. The 2012 census indicated that Moshi District Council land area covers 1,713 Km² and has a human population of 466,737; of which 25,767 are males and 240,970 are females. The population density is higher at 273 people per sq.km. The human population growth rate is 1.8 percent. However, the average household size is at 4.2 people. The high human population density has forced youth either to migrate to urban areas or end up doing other commercial activities rather than agricultural activities (<http://www.nbs.go.tz/sensa/popu.php>). Table 3.1 below describes human population statistics of the Moshi District Council by each ward based on 2012 population census and table 3.2 shows a comparison of human population and land statistics of Moshi District Council within three census periods.

Table 3.1 Population Statistics of Moshi District Council by each Ward 2012**Population Census**

SN	WARD/ SHEHIA	TOTAL	MALE	FEMALE	HOUSEHOLD SIZE
1	Mwika South	19,645	9,591	10,054	4.0
2	Mwika North	21,177	10,387	10,790	4.2
3	Mamba North	9,065	4,366	4,699	4.0
4	Mamba South	10,060	4,888	5,172	3.9
5	Marangu East	23,734	11,455	12,279	4.3
6	Marangu West	18,976	9,132	9,844	4.2
7	Makuyuni	22,442	10,781	11,661	3.7
8	Kilema North	9,669	4,592	5,077	4.5
9	Kilema South	22,711	11,114	11,597	4.4
10	Kirua Vunjo East	8,657	4,306	4,351	4.2
11	Kirua Vunjo West	12,840	6,266	6,574	4.1
12	Kahe	19,142	9,581	9,561	4.4
13	Kahe East	11,384	5,789	5,595	4.4
14	Old Moshi East	9,528	4,575	4,953	4.2
15	Old Moshi West	8,100	4,036	4,064	4.3
16	Mbokomu	14,606	7,036	7,570	4.1
17	Uru East	14,781	7,248	7,533	4.3
18	Uru Shimbwe	6,107	2,844	3,263	4.2
19	Uru South	22,904	11,065	11,839	4.3
20	Uru North	11,081	5,331	5,750	4.4
21	Mabogini	28,992	14,320	14,672	4.2
22	Arusha chini	13,960	7,227	6,733	4.4
23	Kibosho West	14,148	6,374	7,774	5.1
24	Kibosho Central	10,258	4,613	5,645	4.0
25	Kibosho West	20,291	9,737	10,554	4.2
26	Kindi	21,391	10,222	11,169	4.4
27	Kiruavunjo South	19,378	9,455	9,923	4.2
28	Kirima	10,709	4,890	5,819	4.6
29	Okaoni	10,446	4,709	5,737	4.0
30	Kimochi	13,562	6,476	7,086	4.1
31	Kilema Central	6,993	3,361	3,632	4.1
	Total	466,737	225,767	240,970	4.2

Source: (<http://www.nbs.go.tz/sensa/popu.php>)

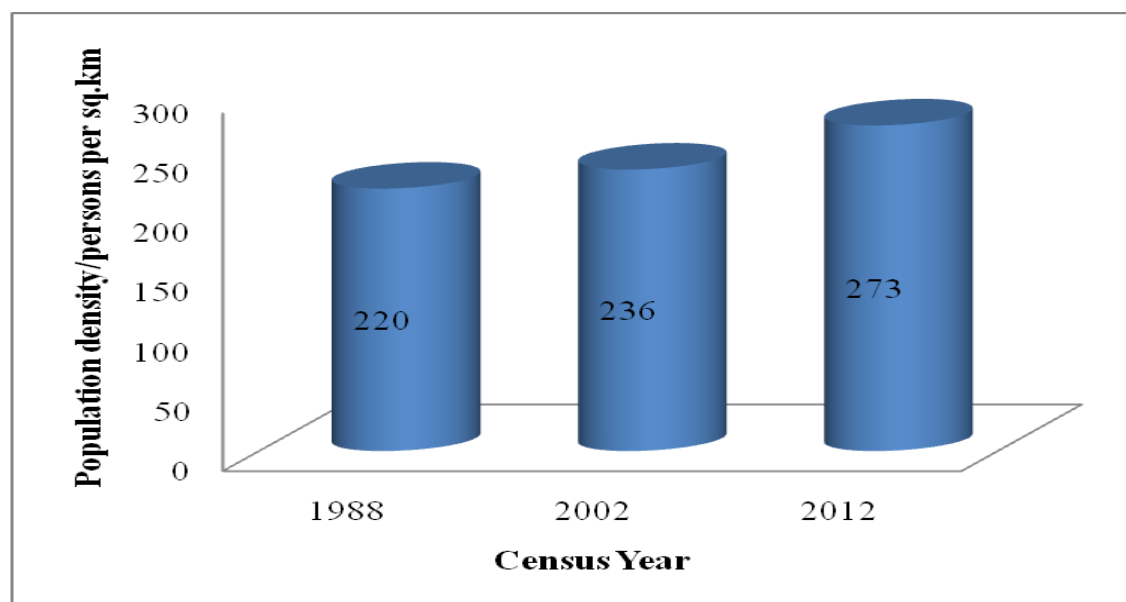
Table 3.1.1 Population and Land Statistics in Moshi District Council 1988-2012

Years	1988	2002	2012
Human Population	342,760	404,287	466,737
Area (Km ²)	1,558	1,713	1,713
Population Density/Km ²	220	236	273

Source: (<http://www.nbs.go.tz/sensa/popu.php>)

Figure 3.1.1 below shows the population density in Moshi District Council by comparing census reports from 1988-2012. In 1988 population density was 220 people per sq.km, in 2002 population density was 236 people per sq.km while in current population census in 2012 population density was 273 people per sq.km. This implies that, the population density has increased by 19% from 1988-2012 in a fixed land of 1,713 sq.km. This increases challenges to the land resources available (<http://www.nbs.go.tz>).

Figure 3.1.1 Comparison of Human Population Density in Moshi District Council From 1988-2012



Source: Extracts from (<http://www.nbs.go.tz/sensa/popu.php>) and Moshi District Council

3.1.7 Units of Analysis

Variables describe units of analysis. The study analysed components such as high human population density, land resources, agricultural production, infrastructure development, size of land holdings, farm size and land degradation in Moshi District Council-Kilimanjaro Region.

3.1.8 Variables and Their Measurements

The variable is an observable and is a measurable feature of an observation unit, which varies across different units. Observation unit (i.e. Research unit, case) such as individual, group (e.g. Family, household, couple) institution, organization or community (e.g. School, church, enterprise, municipality), text (e.g. Newspaper article, a novel, research report), event or activity (war, strike, flood, revolution) (Gilbert, 1992). In this study variable such as human population density, farm size, land degradation, infrastructure development and settlement were focused and measured accordingly.

There are relationships between three variables. First, dependant variable changes in response to changes in other variables. Land resource was the dependent variable in this study. Secondly, independent variable causes changes in dependant variables, high human population density were independent variable. However, both can be dependent or independent variables. Lastly, extraneous variable causes changes in the independent variables, thereby providing an alternative explanation of our independent variables. The extraneous variations were high human population growth (birth and migration).

3.1.9 Sample Size

The sample size of the study was 100 respondents. Ninety eight (98) respondents from different wards in Moshi District Council were selected randomly from the lowlands, middle and highlands wards which include Marangu East, Uru East, Kirua Vunjo West, Kibosho Central, Kilema South, Mwika North, Makuyuni, Kirua Vunjo South and Kirua Vunjo East wards, and two (2) key informants from land and agricultural office in the Moshi District Council. This sample size was calculated based on Nassiuma's formula as shown below.

Nassiuma's, formula shows how to get a sample size

$$n = \frac{NC^2}{C^2 + (N-1) e^2}$$

Where:

n = Sample size required

N = Population (466,737)

e = Standard error/Sampling error (1%)

C = Coefficient of variation (10%) - Ranges from 10-20%

Application of the formula

$$\begin{aligned} n &= \frac{466,737 * 10^2}{10^2 + (466,737 - 1) 1^2} \\ &= 99.9 \end{aligned}$$

Therefore the sample size required = 100

Table 3.1.2 Distribution of Respondents and Data Collection Schedule

S/No	Ward	Village	Respondents	Date
1	Marangu East	Arisi	12	4/3/2013
		Ashira	02	4/3/2013
2	Kilema South	Legho Mlo	10	26/2/2013
		Kilema Pofo	10	04/3/2013
3	Mwika North	Maring'a	05	04/3/2013
		Mrimbo Uuwo	02	04/3/2013
		Lole Marera	03	04/3/2013
4	Kibosho Central	Uchau South	05	25/2/2013
5	Uru East	Mrini	02	25/2/2013
6	Kirua Vunjo East	Mrumeni	07	26/2/2013
		Kileuo	07	26/2/2013
7	Kirua Vunjo West	Kanji	03	26/2/2013
		Nduoni	06	28/2/2013
8	Kirua Vunjo South	Uchira	11	28/2/2013
		Uparo	05	01/3/2013
9	Makuyuni	Himo	08	04/3/2013
10	Key informants from land and agriculture office in Moshi District Council		02	15/2/2013
		Total	100	

Source: Study findings, 2013

3.2 Sampling Procedures/Techniques

Sampling techniques are methods that enable a researcher to collect representatives from subgroup rather than a complete population. This study used a simple random sampling and a purposive sampling/non-probability sampling technique to select some of the study respondents/key informants.

3.2.1 Simple Random Sampling

This is a sampling technique that was used when the selection of the respondents was entirely based on chance or probability. Every person of the population has an equal chance of being selected for the respondents/representative of the study. An independent chance means no one can hinder the chance of another person/element being selected (Kothari, 1990). Simple random sampling was used to get respondents from land resources holdings and non-holdings in Moshi District Council, Kilimanjaro

3.2.2 Purposive or Non Probability Sampling Techniques

This method means a deliberate selection of sample population that meet the researcher's criteria which regards study theme. It is based on purposive choice and excludes any random sampling process (Statistical and Technical Team, 1992). It's usually based on key informants. Purposive selection was based on human population, agriculture and land resources officers in Moshi District Council-Kilimanjaro Region.

3.2.3 Types and Sources of Data

The study used both primary and secondary data. The primary data involved collection of data from field survey, through field observations and questionnaires or structured interviews based on the study topic by studying family size/population size and land size of a family. On other hand, secondary data collected from literature/documentary reviews from previous research reports, journals, articles, internet and books. All these were used as sources of data.

Table 3.1.3 Analysis of the Use of Types and Sources of Data

Types of data and sources		
Theme	High Human Population Density and Its Impacts on Land Resources	
	Primary data	Primary sources
Variables	❖ Land use and size ❖ Human population density ❖ Land degradation	❖ Field observation/questionnaires ❖ Structured interviews/questionnaires of key informants ❖ Field observation/structured questionnaires
	Secondary data	Secondary sources
Variables	❖ Human population density ❖ Land resources scarcity ❖ Land degradation	❖ Tanzania national bureau of statistics/ census report of 2012. ❖ Studies about land degradation in Moshi District Council-Kilimanjaro ❖ Journal and article about land resources use and degradation in Moshi District Council.

Source: Designed by researcher, 2013

3.3 Methods/Instruments of Data Collection

Methods/Instruments of data collection include the use of questionnaires/structured interviews, field observations to collect primary data and documentary reviews for collecting secondary data.

3.3.1 Questionnaires

This involved structured interview/questionnaire a type of written questionnaire that allows respondents to complete the questions verbally in the presence of the researcher (Merriam, 2009). The Tanzania Census Bureau done 2012 was a good example of oral survey. However, both verbally and written methods were used for answering questions. The questionnaires were firstly set in English, and then translated into Swahili language, an option for all respondents regardless their ability to speak a second language (English). The questions were 22 for household members and 21 for the key informants.

Questionnaires were used as the instrument of collecting the quantitative and qualitative data. A hundred (100) respondents from household surveys and key informants within the Moshi District Council from selected wards were questioned under the supervision of the researcher.

3.3.2 Types of Questionnaires used

(i) Structured Questionnaires: Consist of closed questions that limit the responses from the respondents. May be designed to gather socio-demographic data, the researcher may want to know everyone's gender, age, marital status, employment, income and level of formal education (Merriam, *ibid*). The fundamental aim is to gather quantitative information in a large number of interviewees particularly more than 30 respondents. They may be administered by means of telephone, face to face or self completion depending on the research budget and respondent type.

(ii) Unstructured Questionnaires: Are made up of open ended questions that ensure free responses to the interviewee. The respondent can answer the question according to his/her own words depending on the nature of the question, also interviewer is flexible

to add the question which didn't appear in the paper. However, unstructured questionnaires can be administered through face to face, in-depth telephone interviews and the aim is to collect the qualitative data (Dey, 1993).

3.3.3 Field Observation

This method is a helpful tool in research, because the researcher makes direct field observations of what is related to the topic under study. Greenstein (2003), comments that the observations can be used to get information in both qualitative and quantitative studies. Similarly, Nueman (1997) suggests that an observation is a primary instrument that a researcher absorbs all the sources of information, as he/she pays attention, watches and listens, uses all sense of organs what he/she has seen, touched, heard, smelled, or tasted. The researcher observed the area, how the inhabitants were located on the highlands and some parts in lowland areas, the sizes of the family's plots, activities of residents/respondents and could directly experience their constraints such as those of land scarcity, land degradation, small farm holdings, joblessness, food shortages and many others.

3.3.4 Documentary Reviews

This technique gathers written documents to get secondary data records of family, society or community (Punch, 2000). The secondary data for the study was collected from different sources which include related research reports, books, journal, article contents, and Tanzania national bureau of statistics. Background information and literature review on the topic was reviewed from different documents and websites. The documentary reviews helped in generating theoretical and empirical materials drawn from published and unpublished documents on high human population density, land issues, such as scarcity and degradation in Moshi District Council-Kilimanjaro, Tanzania and elsewhere.

3.3.5 Validity Issues

Validity refers to whether the method measures what is intended to be measured (Steve, 2005). The issue of validity was addressed by using multiple sources of data collected by the use of structure interviews/questionnaires were prepared accurately to measure

family size, farm size and land size of the households, on documentary sources, the authenticity of the authors were adhered for liability matters. Observations were made on degradation and densely populated settlements while the camera and Google imagery were used to capture different photographs in selected wards like Mrimbo-Kirimeni in Mwika South and Marangu East which were some of the areas experiencing high human population density and land scarcity.

3.4 Data Analysis and Presentation

The data were analysed by the use of Statistical Package for Social Sciences (SPSS) version 16 to organize and describe data based on the set up questionnaires or may be done through field observations, the output was in the form of frequencies and percentages while tables, graphs and charts were drawn by using Microsoft Excel. In this study, human population size and its impacts on land resources were described and clarified based on the set up questionnaires.

CHAPTER FOUR

RESULTS PRESENTATION, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter aims at the presentation, interpretation and discussion of the findings of research on an assessment of high human population density and its impact on land resources in Moshi District Council, Kilimanjaro Region-Tanzania. The findings are based on the set up questionnaire.

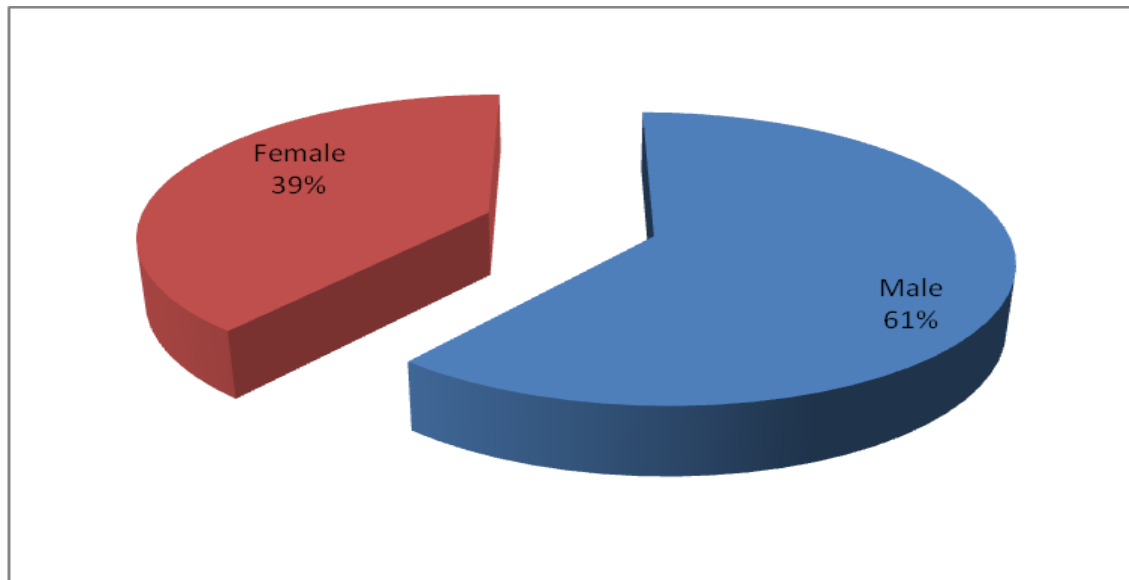
4.2 Description of the Respondents

The sample size was 100 respondents, where by 98 respondents were members of the households, while the rest (02) respondents were key informants which summed up to 100 respondents as per Nassiuma's formula.

4.2.1 Respondents' Gender

The findings show that 61 percent of the respondents were males, while 39 percent were females. This means that men volunteered more in filling questionnaires as presented in figure 4.1, regardless of the fact that equal chances were given to both. However, in Chagga's customary law, men are more favoured than women when it comes to land inheritance. Some of the respondents who answered the question said: "It is not Chagga's custom and tradition for women to inherit land because they can be married at any time, so only men inherit the land to establish their settlements". This is in line with Maro (1974) who reported that, when the Chagga's sons marry, their fathers provide home garden plots to inherit and this customary land is passed on to the son's next generation. In his study conducted in the 1970s on inheritance and purchase of home gardens and lowland fields, he found out that 82 percent of the homesteads in the highlands were obtained through inheritance and 23 percent of the lowland farms were also inherited. However, population density and sub-division between Chagga's sons, led to the reduction farm sizes and also increased land scarcity over the Southern Slopes of Mount Kilimanjaro where the case study was conducted (Soini, 2002a).

Figure 4.1 Percentage of Respondents' Gender

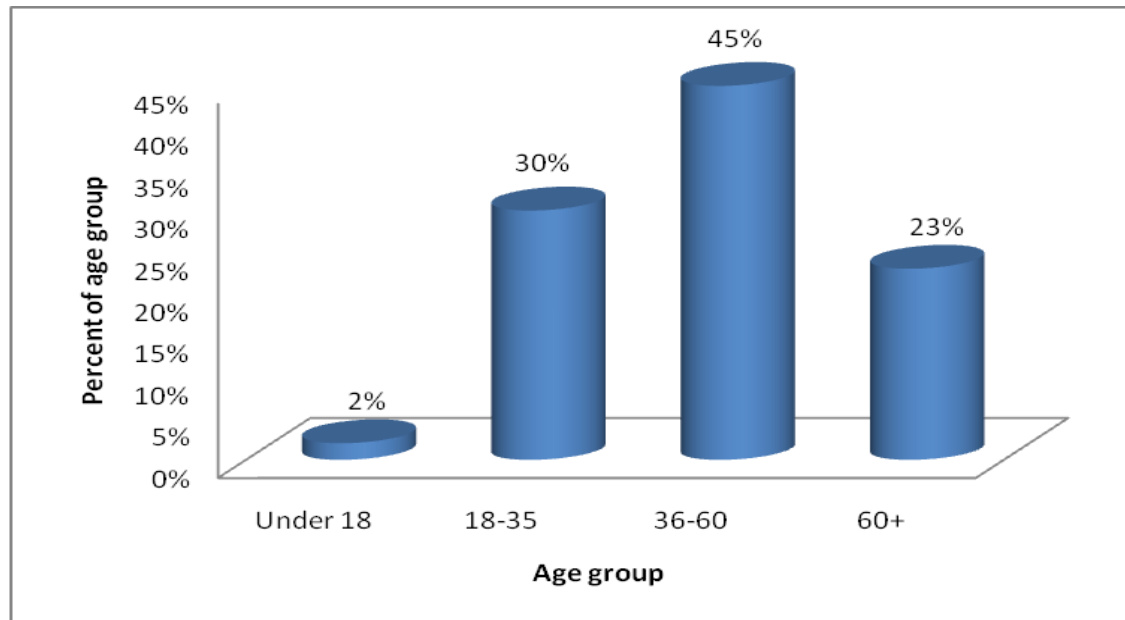


Source: Research data, 2013

4.2.2 Respondents' Age

The results showed that the majority of respondents were aged between 36-60 years representing 45 percent of them, followed by 18-35 age groups which represent 30 percent. The next age group was respondents above 60 years which accounted for 23 percent. Finally, the age group under 18 years accounted for 2.0 percent. This implies that majority of adults own land, followed by youth and elders while age group under 18 years was rarely to have land tenure (Figure 4.1.1). The findings indicated that people with sound mind (aged from 18–60 years) owned land as they were capable of accomplishing family assignments and thus trusted and inherited land from their elders. A few exceptions exist where people under 18 years inherited land mainly as orphans or displaying exceptional traits. Nevertheless some of the elderly group over 60 years owned land due to some circumstances such as late childbearing and family security as the fact holds that land can be used as collaterals for securing loans from different financial institutions.

Figure 4.1.1 Percentage of Respondents' Age Group

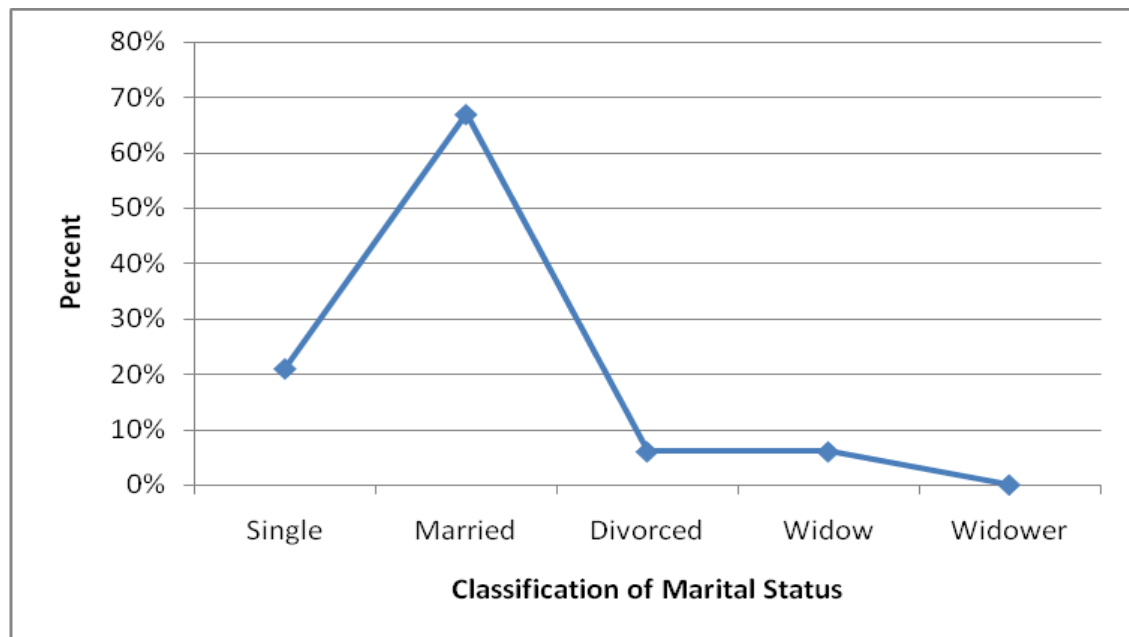


Source: Research data, 2013

4.2.3 Marital Status

According to this study, the marital status was classified into four categories namely single, married, widow and widower. The findings showed that 21 percent of the total sample sizes were single, 67 percent were married, 6 percent divorced, 6 percent were widowed and no widower as shown in figure 4.1.2. The majority of respondents were married and led to land ownership; this is supported by Maro (1974) that the sons who were in the marriage age were given land to establish their homesteads. However, fragmentation of land size to the sons, reduce the land size. Currently, the land resource in Southern Slopes of Mt. Kilimanjaro was very scarce due to its population density that is caused by the high fertility rate, even while the inheritance of land become difficult for many families, the last born sons still benefit from land allocation (Fernandes *et al*, 1984). Moreover, when Maro (1975) did his study, he found that 53 percent of the farms were not subdivided and 43 percent were divided. This hence, forced others to buy land in the lowland areas where huge land was available. As reported by Maro (1974), the sons who did not inherit land from their fathers, decided to establish their own settlement on dry areas.

Figure 4.1.2 Marital Status of the Respondents



Source: Research data, 2013

4.2.4 Educational Level

The data indicated that, 4.0 percent of the respondents were illiterate, 51 percent had primary level education, 24 percent had an ordinary level education, advanced level education acquainted by 5 percent of the respondents, 3 percent had vocational training education, 4 percent had diploma holders and 9 percent had university level education as presented in table 4.1. This implies that the majority of the respondents went to school but were not educated; this is verified by the fact that 51% had a primary level education, followed by the students who had ordinary level education constituted 24% of the respondents. This means that most respondents had no general environmental knowledge that may help them to manage land resources into practical conservation. It is true that, low education may hinder, population control, as most of this class could engage in early marriage, and in excess of fecundity, simply because they have no the knowledge over population control. Chiras (2013), viewed that education can help the realisation of population control, through the use and dissemination of information and contraception and also through environmental education and awareness programs.

People could develop their knowledge, attitudes, and skills towards land resources management through participation in practical conservation. However, low level of education may limit awareness, knowledge and skills on land resources management (Joy *et al*, 1995).

Table 4.1 Educational Level

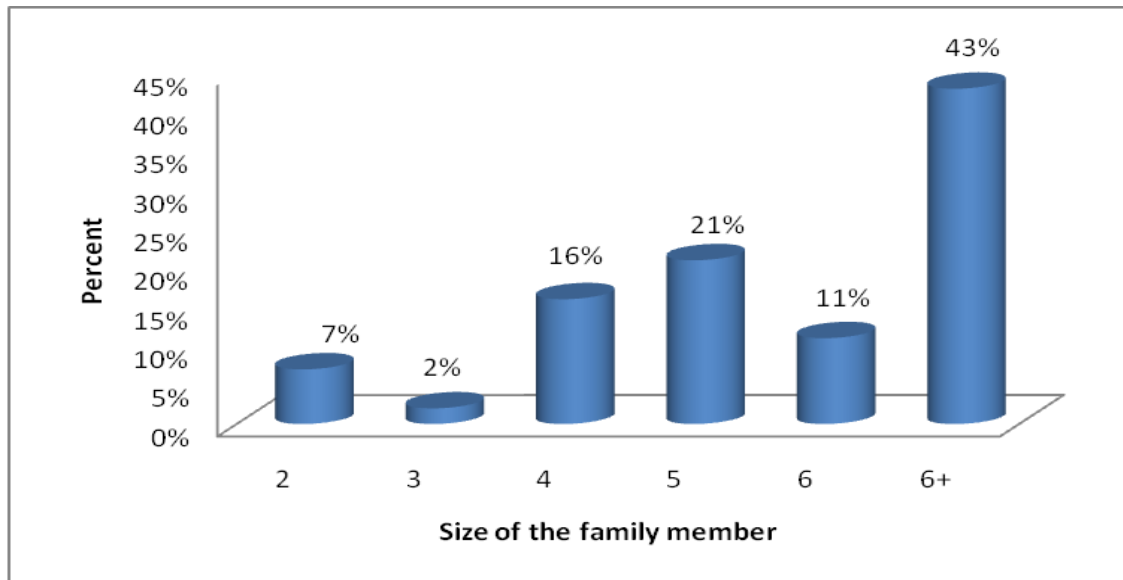
Educational level	Frequency	Percentage
Illiterate	4	4.0
Standard 1-7	51	51.0
Form 1-4	24	24.0
Form 5-6	5	5.0
Diploma	4	4.0
Vocational Trainees	3	3.0
First degree and above	9	9.0
Total	100	100.0

Source: Research data, 2013

4.2.5 Households Size

The findings showed that, 7% of the respondents consisted of two (2) members of the households, 2% of the respondents had three (3) members of the households, 16% of the respondents had four (4) members of the households, 21% of the respondents had five (5) members of the households, 11% of the respondents had six (6) members of the households and 43% of the respondents had more than six (6) members of the households as shown in figure 4.1.3. This shows that most of the respondents (43%) had many members; this means more than 6 people in their households. So either population increased naturally by birth rate because of poor family planning or immigration; hence, it had impacted on land resources by reducing the size of the division of land and farm size.

Figure 4.1.3 Members of the Households Size



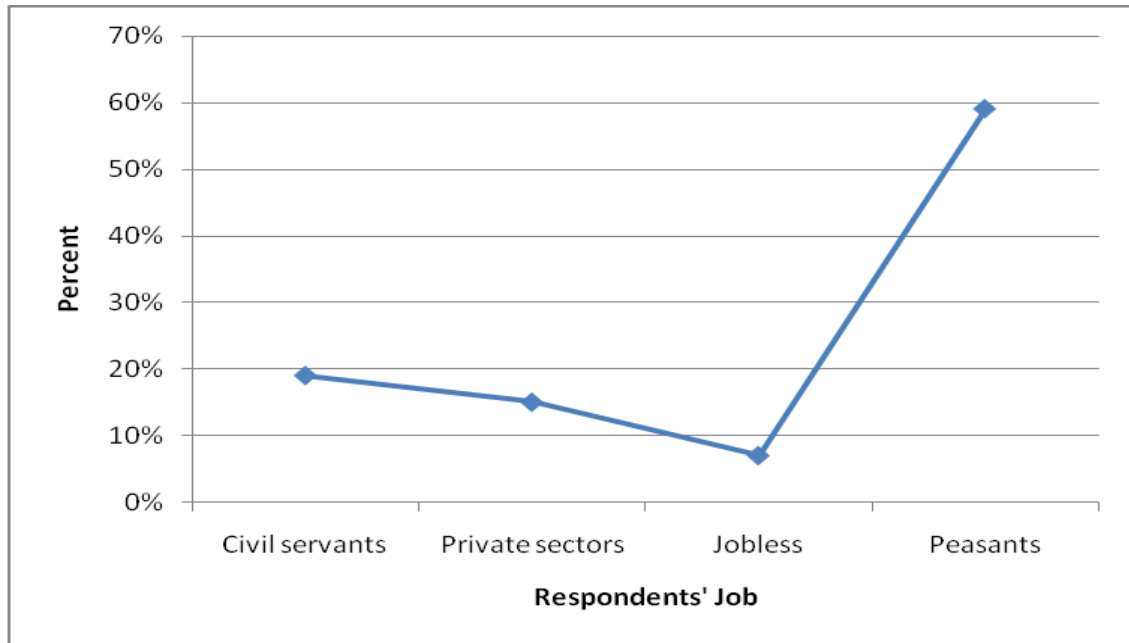
Source: Research data, 2013

4.2.6 Respondents' Job

The study showed that, most of Chagga's people in Moshi District Council have been involved in small scale farming, as per figure 4.1.4, it is clear that 59 percent of the respondents were peasants/small farmers, 19 percent of the respondents were civil servants, 15 percent of the respondents were in private sectors, while 7 percent of the respondents were jobless. This implies that there would be an extreme demand for land resources, hence, the marginal land and reserve areas would be under pressure. Conversely, the value of land resources would be multiplied and its scarcity would be tremendously expanded. Moreover, the limited land caused land exhaustion and loss of its natural fertility resulted in the land degradation. In a related study conducted by Soini (2002a) showed that the rate in which the cultivation of land was being expanded had increased, in such a way that, even the unutilized land was cultivated, this led clearance of land vegetation and natural bushes. Furthermore, the Chagga's farmers were in a situation which had limited their agricultural economic performances. They faced with challenges include; a drop of prices of agricultural products, shortage of rainfall, population pressure and scarcity of land resources. The Chagga's farmers could minimize the challenges through agricultural intensification and mechanization,

but the question that still remains is; the maintenance of environmental sustainability (Meena, 2008).

Figure 4.1.4 Shows Percentage of Respondents' Job



Source: Research data, 2013

4.2.7 The Family Land Size and the Level of Satisfaction

The study observed that, the size of land holding varies according to the land size they inherited from their parents. The obtained data justified that 10 percent of the respondents owned land size less than 0.25 hectares, while 12 percent of the respondents owned a land size between 0.25-0.5 hectares, 22 percent of the respondents owned 0.5-1.0 hectare, and 31 percent of the respondents owned above 1hectare, while 25 percent of the respondents did not own land (Table 4.1.1). This situation entails that the size of land owned by the majority of families were not satisfying due to cultural inheritance system from time to time where the number of families increases while land is fixed.

Table 4.1.1 The Family Land Size

Land size	Respondents	Percentage
Below 0.25 ha	10	10.0
0.25-0.5 ha	12	12.0
0.5-1 ha	22	22.0
Above 1 ha	31	31.0
They didn't have	25	25.0
Total	100	100.0

Source: Research data, 2013

This study went further on finding out their satisfaction in line with size of land owned. 25 percent of the respondents were satisfied with their land ownership, while the most of the respondents 75 percent were not satisfied with the size of the land they owned (Table 4.1.2). The findings were supported by Lymchai *et al* (1998) and Lyimo *et al* (1999), who found that the human population increases the more fragmentation of the 'Kihamba' was taking place, leading to smaller farm sizes owned by men compared to the previous generation, especially in the southern slopes of Mount Kilimanjaro. For instance Marangu, Mamba, Mwika, Kirua Vunjo and Kilema wards with population density had reduced the land holdings to less than 0.5 and 1 hectare. Free grazing was no longer possible and even pasture establishment was quite limited. Therefore the land was not enough for further fragmentation to other sons. Meanwhile they were required to buy land in other places where land is vast for example in regions like Lindi, Katavi and Ruvuma whose their human population densities are 13, 15 and 22 persons per square kilometre respectively (URT, 2013).

Table 4.1.2 Land Satisfaction

Category	Frequency	Percentage
Yes	25	25.0
No	75	75.0
Total	100	100.0

Source: Research data, 2013

4.2.8 Land for Sale

The findings showed that 96 percent of the respondents had no land for sale in the area studied, on the other hand, 4 percent out of the total respondents had land for sale as per table 4.1.3, this implies that a greater number of respondents had no land for sale, due to the small size, the land they possessed (0.5 hectares) and inheritance factors which did not allow them to sell the land which they inherited, they preferred to keep it as represented in smaller percent, rather than selling it to their clan relatives, if there was a great demand to do so. In lowland areas land was not much scarcer than highland areas, small portions could be in a land deal.

Table 4.1.3 Shows Responses on Land for Sale

Category	Frequency	Percentage
Had land for sale	4	4.0
Had no land for sale	96	96
Total	100	100.0

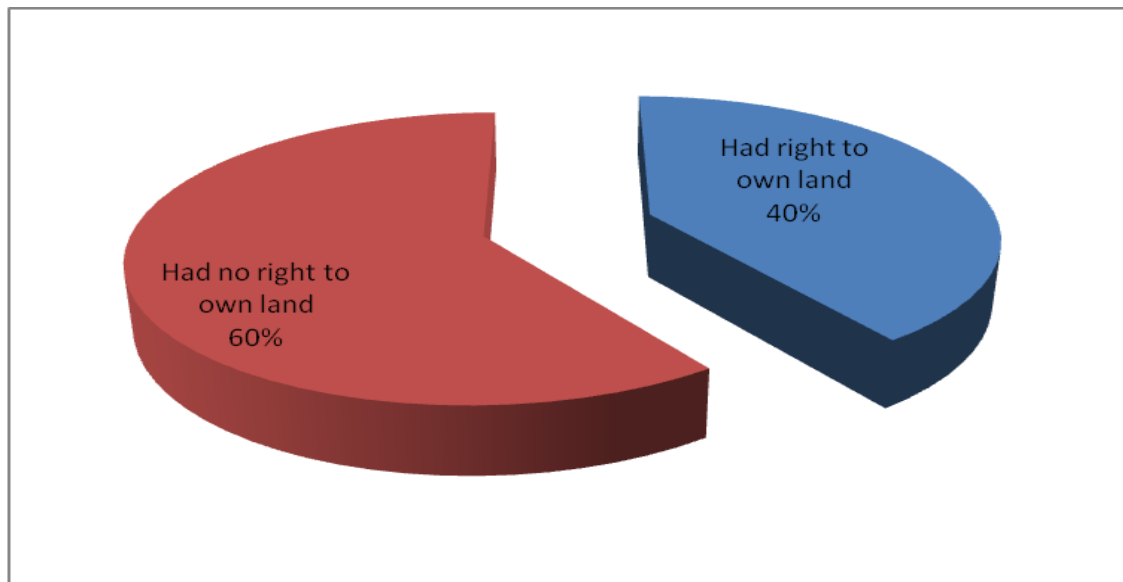
Source: Research data, 2013

4.2.9 Women Land Rights and Tenure

Women in Chagga's tradition were not allowed access to *Kihamba*. The findings show that, 40% of the respondents, agreed that women had rights to inherit/own land, some of the respondents answered that *"everyone have an equal chance to inherit/own land regardless of the gender differences"*, while 60% of the respondents disagreed that women had no rights to own land according to the Chagga's traditions, as they said that

“women will be married to another family therefore if you give them land, they will have double share, that is why we avoid this”, (Figure 4.1.5). According to World Bank Country Study, (1999) conducted in the Chagga’s areas of Mt. Kilimanjaro in Tanzania; shows that land ownership for the women continue to be regarded as legally useless. They had no right to own land, also as cited by Kevane (2004); from Moore (1986), he found that women had no independent rights to land in the Chagga’s areas of Mt. Kilimanjaro in Tanzania, unless they have money to purchase land completely. Furthermore, the land was inherited to men through customary law.

Figure 4.1.5 Percentage of Land Owned by Women

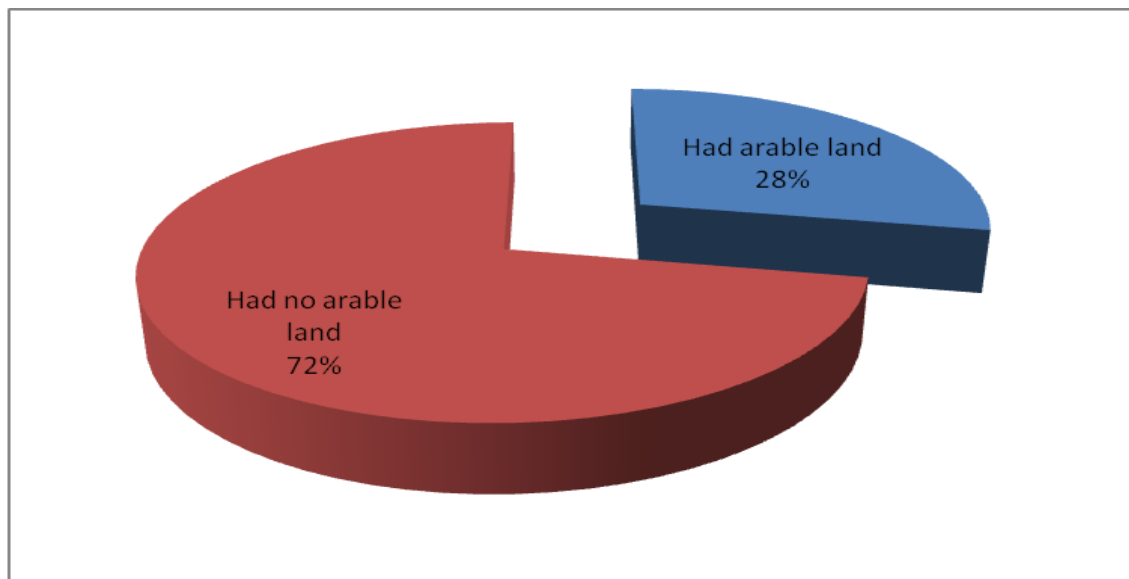


Source: Research data, 2013

4.3 Arable Land

Arable land was a major challenge to Chagga’s inhabitants. Only 28% of the respondents had arable land, while the majority (72%) of the respondents had no arable land as shown in figure 4.1.6 and land size for agriculture in table 4.1.4. This means the greater number of people suffers, by not acquiring land for cultivation. This reduced food and cash crop production. In critical cases this attributed to famine and hunger and lack of employment to farmers/peasants and thus the cause of poverty in the community.

Figure 4.1.6 Percentage of Arable Land



Source: Research data, 2013

Table 4.1.4 Land Size for Agriculture

Category	Frequency	Percentage
0.25-0.5 ha	2	2.0
0.5-1 ha	8	8.0
Above 1 ha	19	19.0
They didn't have	71	71.0
Total	100	100.0

Source: Research data, 2013

4.3.1 Relationship between Dense Human Population and Land Scarcity

A number of respondents agreed that there was a relationship between land scarcity and population density. The findings revealed that 95 percent of the respondents said, densely populated areas experienced a reduction of land sizes, while five percent of the respondents disagreed that there was no relationship between population density and land scarcity (table 4.1.5 as supported by photo in figure 4.1.7 and table 4.1.6 which shows population density and land size in each ward in Moshi District Council). Soini (2002) supported the fact that; the increase of human population growth leads to the

scarcity of land, because of the expansion of land uses and sub-divided between the sons of the family. The scarcity of land also limits the further fragmentation to the coming generation, and that was why the upper people in Moshi District Council had no land for large scale agriculture but depends on lower land areas where land was not very densely populated. However, due to the expansion of development, land in lowland areas becomes quite expensive compared to the previous years. As reported by Sevaldsen (1997), that a number of people were becoming involved in non-agricultural activities as a livelihood strategy because of difficulties in agriculture as a resulted of land scarcity.

Table 4.1.5 The Relationship between Dense Human Population and Land Scarcity

Category	Respondents	Percentage
Yes	95	95.0
No	5	5.0
Total	100	100.0

Source: Research data, 2013

Figure 4.1.7 An Image of Densely Populated Settlement of Marangu East



Source: Imagery ©2013 Digital globe, Map data ©2013 Google

Table 4.1.6 shows human population density and land size in each ward of the Moshi District Council, the density is high where human population is greater and the land size is low, while intermediate density depends on the classification of human population density according to (Antonsich, 2007). Generally, human population density in Moshi District Council was high and land was a scarce resource. There is no land for further agricultural expansion.

Table 4.1.6 Moshi District Council Showing Human Population Density and Land Size in Each Ward

S/N	Ward	Land size in (Hectares "Ha")	Land size in Sq.km	2012 Population Data	Population Density (per Sq.km)	Class of population density
1	Mwika South	6121.18	61.2118	19,645	321	Intermediate
2	Mwika North	1957.97	19.5797	21,177	1082	Densely populated
3	Mamba North	1065.96	10.6596	9,065	850	Densely populated
4	Mamba South	1220.32	12.2032	10,060	824	Densely populated
5	Marangu East	2811.01	28.1101	23,734	844	Densely populated
6	Marangu West	1833.63	18.3363	18,976	1035	Densely populated
7	Makuyuni	8512.34	85.1234	22,442	264	Intermediate
8	Kilema North	796.71	7.9671	9,669	1214	Densely populated
9	Kilema South	2517.1	25.171	22,711	902	Densely populated
10	Kilema Central	639.05	6.3905	6,993	1094	Densely populated
11	Kirua Vunjo East	2417.33	24.1733	8,657	358	Intermediate
12	Kirua Vunjo West	2250.81	22.5081	12,840	570	Densely populated
13	Kirua Vunjo South	8950.62	89.5062	19,378	216	Intermediate
14	Kahe	9943.81	99.4381	19,142	193	Intermediate
15	Kahe East	5912.01	59.1201	11,384	193	Intermediate
16	Old Moshi East	1102.03	11.0203	9,528	865	Densely populated
17	Old Moshi West	3605.05	36.0505	8,100	225	Intermediate
18	Mbokomu	2012.07	20.1207	14,606	726	Densely populated
19	Uru East	1829.03	18.290	14,781	808	Densely populated
20	Uru Shimbwe	1049.56	10.4956	6,107	582	Densely populated
21	Uru South Mawela	931.96	9.3196	22,904	2458	Densely populated
22	Uru North	1494.37	14.9437	11,081	742	Densely populated
23	Mabogini	6978.2	69.782	28,992	415	Intermediate
24	Arusha Chini/TPC	9614.61	96.1461	13,960	145	Intermediate
25	Kibosho East	1268.64	12.6864	14,148	1115	Densely populated
26	Kibosho Central	1149.948	11.49948	10,258	892	Densely populated
27	Kibosho West	2436.34	24.3634	20,291	833	Densely populated
28	Kindi	3250	32.50	21,391	658	Densely populated
29	Kirima	1219.65	12.1965	10,709	878	Densely populated
30	Okaoni Kibosho	1307.7	13.077	10,446	799	Densely populated
31	Kimochi	2446.18	24.4618	13,562	554	Densely populated
					APD= 731	Densely populated

Source: Modified from Moshi District Council 2008 and Population Census, (2012)

NB. In the following wards their land size data were not available (NA), in Uru South ward at Kimanganuni and Longuo A villages (NA), Marangu East ward in Ashira village (NA), and Kilema South ward in Kilototoni village (NA), (Moshi District Council, 2008).

Note that;

1 Square kilometre = 100 Hectares

Square kilometre is a metric system unit, used mostly in measuring land. It equals to 100 hectares or 1 million sq. meters. The abbreviation is "km²" or "sq km".

Hectare is a metric system area unit and widely used globally in the measurement of land, agriculture, forestry. It equals to 10,000 square meters. The abbreviation is "ha".

(< <http://www.asknumbers.com/>>)

$$\text{Human Population Density} = \frac{\text{Number of People}}{\text{Land area in which they live}} = \frac{\text{People}}{\text{Km}^2}$$

The classification of population density based on Euro stat/European Commission Regions: Statistical Yearbook 2006 page 156.

- i. Densely populated area (>500 inhabitants per km²)
- ii. Intermediate area (500-100 inhabitants per km²)
- iii. Thinly populated area (<100 inhabitants per km²) (Antonsich, *ibid*).

4.3.2 Relationship between Dense and Unplanned Settlements and Physical Infrastructure Construction

Physical infrastructure development in some developing regions such as Moshi Rural areas should be considered by regarding proper settlement planning. In this region unplanned dense settlements is the core factor hampering physical infrastructure development particularly roads, industries, schools, hospitals, moreover, limited land resources slow down their progression. The findings show that 92 percent of the respondents agreed that dense and unplanned settlements affect physical infrastructure development, 7 percent of them disagreed, while 1 percent of the respondents could not answer whether population density and unplanned settlements affect physical infrastructure development.

Table 4.1.7 Relationship between Densely, Unplanned Settlement and Physical Infrastructure Development

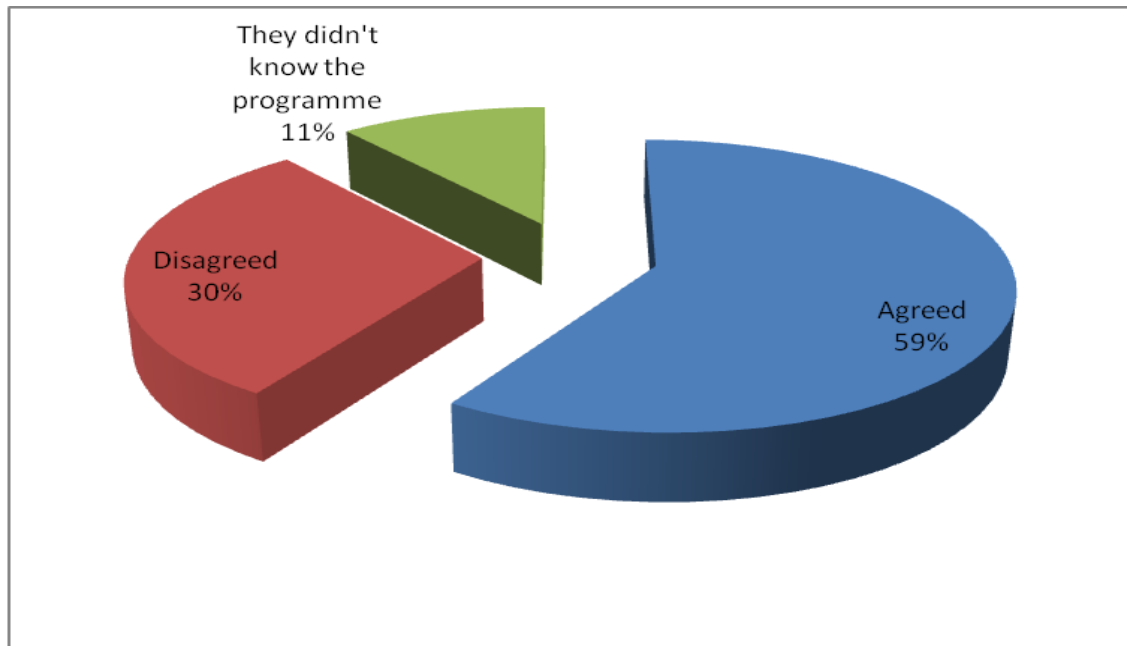
Category	Frequency	Percentage
Agreed	92	92.0
Disagreed	7	7.0
Missing	1	1.0
Total	100	100.0

Source: Research data, 2013

4.3.3 The Role of Resettlement Program

The responses to the resettlement program indicated that 59 percent of the respondents agreed that resettlement program was helpful. The program was meant to encourage people from Kilimanjaro to hold unoccupied land especially in Handeni-Tanga, and Morogoro Regions as planned areas. Also, 30 percent of the respondents disagreed that the resettlement program would not help, simply because they did not want to leave their residential areas and establishing new ones in areas far away from their homeland, they also feared the challenges of the new areas especially malaria and sleeping sickness. While 11 percent of the respondents were not aware and didn't know the program. However, according to Sokoni and Shechambo (2005) in the study of *“Changes in the Upland Irrigation System and Implications for Rural Poverty Alleviation in Ndiwa Irrigation System, West Usambara Mountains, Tanzania”* showed that the Tanzania government had a plan to reduce high human population density in Lushoto District, by attempting to move people from Lushoto to Handeni in the 1980s. Somehow this plan did not succeed, but nevertheless there has still been a significant rural-urban migration from Lushoto to urban areas. However, with the increasing life difficulties in urban areas, most of migrants from Lushoto were returned home, with an aim of placing them in an agricultural land, but the land scarcity was the key challenge.

Figure 4.1.8 Responses to whether Resettlement Program was Helpful



Source: Research data, 2013

4.3.4 High Human Population Density and Land Degradation

According to the knowledge of the respondents who offered their answers on how population density affects the land degradation, was as follows 82 percent of the respondents viewed that due to high human population density, people caused deforestation for settlement preparation and agricultural activities although they used small area they had for small gardens occupied with banana and coffee trees together with zero grazing due to land shortage. All these led to land degradation in terms of soil erosion to those who cultivated in steep slopes, as shown in figure 4.1.9. Land degradation was also affected by quarrying activities like digging for sands, gravels and stones as supported by 5 percent of the respondents, on the other hand, people engaged in these activities because they had no other work. However, 13 percent of the respondents didn't know if population density affects land degradation. This happened due to their level of understanding. Though, the larger number of the respondents agreed that densely human population affects land degradation as presented in table 4.1.8. Furthermore, according to Soini, (2002a) on his study entitled *“Livelihoods on the Southern Slopes of Mt. Kilimanjaro, Tanzania: Challenges and Opportunities in the Chagga Home Garden System”* the results show that, densely populated had led

disappearance of ecological systems, the evidence is the southern slopes of Mt. Kilimanjaro which covers the part of the Moshi District Council. Recently, land use change analysis showed a vast expansion of agricultural production over marginal land downward the slopes, extending further into the uncultivated land, has caused the disappearance of land vegetation, this is due to the clearing of vegetation (forest and natural bush) resulting to ecological disappearance and degradation.

Table 4.1.8 Responses to How Densely Settlements Affects Land Degradation

Choices	Respondents	Percentage
Deforestation for settlement and agriculture	82	82.0
Quarrying activities	5	5.1
They didn't know	13	13.3
Total	100	100.0

Source: Research data, 2013

Figure 4.1.9 Cultivation in Steep Slopes Leading to Soil Erosion



Source: Field survey, 2013, taken at Mrimbo-Kirimeni in Mwika South

4.3.5 Response to Housing Planning and its Importance

The evidence showed that generally there was no housing planning in rural areas of the Moshi District Council. 94 percent of the respondents agreed that there was no housing planning, while 6 percent of the respondents went astray saying that; there was housing planning in some areas, as they mentioned “*Njia Panda ya Himo*”. On the question of the importance of housing planning, the results show that the majority of the respondents (98%) agreed there was an importance of housing planning while 2.0% of the respondents viewed no need for housing planning. However, countries like Singapore have made a vital consideration in housing planning due to high human population density of 5,900 persons per sq.km, which is considered as one of the most densely human populated countries in the world, and it’s due to the scarcity of land (Zhu, 2006). Though Tanzania generally has no high human population density, some

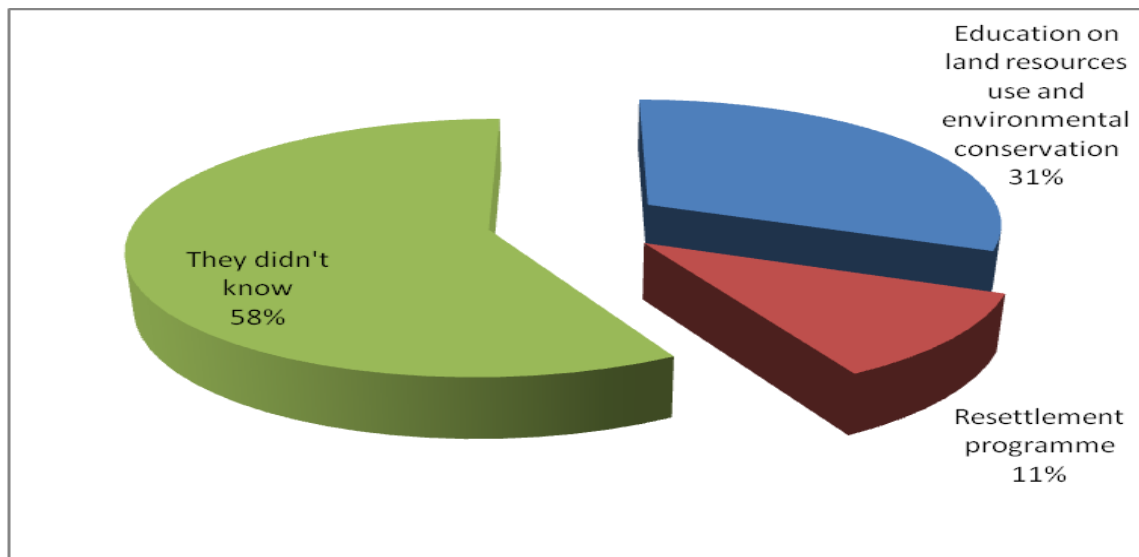
areas do experience this challenge including Zanzibar, Dar es Salaam, Mwanza, and Kilimanjaro, (URT, 2013). Therefore housing planning is an importance paramount for the future generations.

4.3.6 Strategies used by the District Authority to Reduce Land Resources

Challenges

The study findings showed that 31% of the respondents suggested that education on land use and environmental conservation particularly land resources were the strategies used by the district authority to reduce land resources challenges. 11% of the respondents viewed the resettlement program as a strategy used by the district authority to reduce the challenges of over utilization of land resources while the majority of the respondents (58%) in the study area didn't know if there was any strategy used by the district authority to reduce land resources challenges, and this cover larger percent of the sample taken, as it is indicated in figure 4.2.

Figure 4.2 Strategies Employed by District Authority to Reduce Land Scarcity

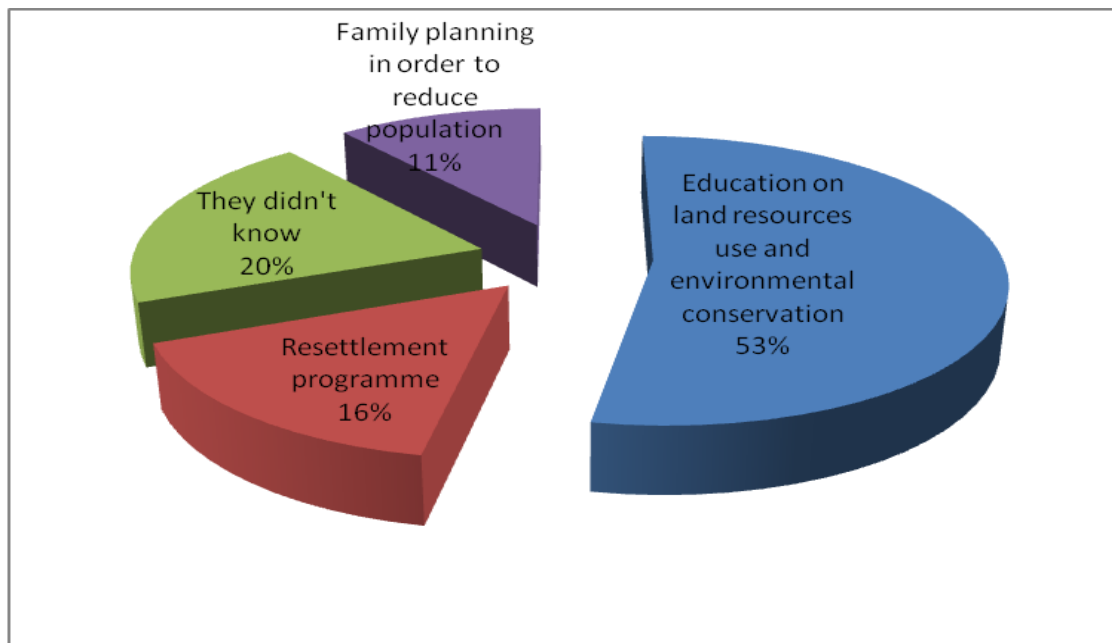


Source: Research data, 2013

4.3.7 Proposed Measures to Reduce Land Challenges

The assessment shows that 53 percent of the sample taken, viewed that education on land use and environmental conservation are methods to be used in order to reduce land challenges, 16 percent of the respondents supported the views that, resettlement programs should be emphasized in order to reduce land challenges, and 11 percent of the respondents also supported the views on family planning in order to reduce human population growth, while 20 percent of the respondents didn't know what should be done in order to reduce the challenges over land resources. This implies that most of the people questioned offered their views while the rest didn't know; this was due to low level of their knowledge (as it was presented in figure 4.2.1. The findings were in line with the study of Sokoni and Shechambo (2005) who also indicated a project that was under way to reduce land challenges under a German-Tanzanian partnership known as the Soil Erosion, Conservation and Agroforestry Project (SECAP). This project also had gained power because of the challenges of human population, the declining of agricultural productivity and its incomes and depletion of natural resources. The aim of this project was to combat problems of land degradation and overgrazing caused by increasing land pressure, human population densities and disregarding land conservation systems. The long-term aim was to ensure sustainable ecological development, improvement of; the living standards of the dwellers surrounding ecological systems and the viability in their adaptive land use system, boosting the economy in the countryside, improving land resources by decreasing degradation, and last but not least improving the conservation of ecosystems.

Figure 4.2.1 Proposed Measures to Reduce Land Challenges



Source: Research data, 2013

CHAPTER FIVE

CONCLUSION, RECOMMENDATIONS AND POLICY IMPLICATIONS OF THE FINDINGS

The aim of this study was to assess the “**High Human Population Density and its Impacts on Land Resources**” in Moshi District Council, Kilimanjaro-Tanzania. The conclusion of this study is as follows.

5.1 Conclusion

Moshi District Council-Kilimanjaro Region in northern Tanzania is one of the most densely populated areas in Tanzania with 273 people per square kilometre and limited land resource of 1,713 square kilometres, while a high human population growth dominating in the area with an average household size of 4.2 (<http://www.nbs.go.tz>), which on the other has impacts on land resources, causes by the reduction farm sizes to about less than 0.5 and 1 hectare per person by Lymchai *et al* (1998) and Lyimo *et al* (1999), land degradation which is caused by cutting down trees that is used for the expansion and preparation of settlements, and cultivation in slope areas. Conversely, others are engaged in quarrying activities in the mountain areas causing soil erosion. However, this was due to the unemployment of a large number of people, who obtained their daily bread by shrinking the natural resources especially land resources as justified by Soini, (2002), that population density has led disappearance of ecological systems, evidence from the southern slopes of Mount Kilimanjaro (which covers part of the Moshi District Council).

The recent land use change analysis, shows the expansion of agricultural production that is extending even more along the marginal land downward the slopes, into the uncultivated land, has resulted in the disappearance of land vegetation due to the clearing of forest and vegetation that is used for the preparation of farms. Additionally the extreme division of natural bush and land vegetation to the sons of this region has also led to ecological disappearance.

Moreover, 82 percent of the respondents viewed that due to high human population density, people caused deforestation for settlement preparation and agricultural activities, it is concluded that land degradation is a serious problem in the study area, this is supported by Hoffmann (2000) who explained that the agricultural expansion and consequent land degradation processes; i.e. overgrazing and deforestation as experienced in the Southern Slopes of Mount Kilimanjaro and West Usambaras in Lushoto District, explains why land degradation occurs in relation to population density.

Despite the shrinking of agricultural productivity caused by population density, land scarcity and degradation, while agriculture still remains the backbone of Tanzania. The number of people focusing on it has catapulted, this includes even the ones living in the rural areas with no/low education. All these challenges bring a long life sufferings e, particularly starvation, unemployment and poverty. Some people even go as far as engaging in criminality such as; selling of local brews/illicit spirit, and drugs/marijuana/marihuana, like “*gongo*” and bang/hemp plant respectively. They do it in order to survive, on the other hand its more-or-less a compensation for unemployment and life difficulties. Others have migrated and are now living in Tanzania towns and cities. Some of them become maids/female servants or male servants, and those who are less fortunate and with a bad etiquette, even risk their lives by engaging themselves in prostitution and robbery activities.

5.2 Recommendations and Policy Implications on High Human Population Density

The study recommends that family planning education and campaign should be strengthened in Moshi District Council, so as to reduce human population pressure over land resources and consequent poverty in the study area. The use of mass media and other strategies should be accessible to the public, so as to facilitate family planning by counselling men and women to use contraceptives, in order to prevent unexpected pregnancy. Family planning can also improve the status of poor Chagga’s families. It would also be a big help to the poor women who on the other hand would be able to keep the birth rate low, and by doing so they would be able to manage and care for their social needs, including education and health services.

The district should re-mobilize, re-encourage and sensitize people to move on unoccupied/vast land especially in the Handeni District in Tanga Region or to establish employment opportunities that will attract people to settle and work in these suggested areas. The effectiveness and the continuous practice of these methods will lead to the reduction of people from densely populated areas.

Furthermore, the district should ensure sustainable interrelationships between human population, ecological systems and resource utilization as stipulated in the National Population Policy (2006) chapter four.

5.3 Recommendations and Policy Implications on Land Resources Constraints

Moshi District Council under land development office should ensure effective land surveillance in measuring land distances, locating property boundaries, land mapping and planning of land resources use such as agricultural, forestry, settlement, grazing land and business. This will reduce land conflicts and other land constraint issues like land degradation. However, when planning land use, the following points should be taken into consideration; the planning of land under the rights of indigenous people and their communities, and the planning of protected land and private property rights.

The district agricultural officers should provide practical education on the use of available arable land, not only in an optimal and in a proper utilization but also through sustainable agricultural practices. Finding a solution that would meet present and future needs of the people, when it comes to food and cash crops and in order for the ecosystems function well, conservation of land resources should be ensured. This in one way or another would increase the annual harvests and the food shortage situation caused by land scarcity would also be restored.

Furthermore, the district should rebuild ecosystems by putting more emphasis on reforestation particularly in eroded areas. This will help to mitigate land erosion caused by cultivation on steep slopes.

Moreover, the district should practically emphasize the implementations of laws and policies on how land should be used in the best way possible and the sustainable

management of land resources. Every person should be given education on land and land resources use and sustainable management. These educational programs can be sub-divided under the wards and village officers. The government should also create mechanisms to facilitate the active participation of all concerned, mainly people at the local level, in decision-making on land resources use and management.

The district should ensure equitable distribution of land and access to all citizens according to the National Land Policy of 1997 page number 5.

According to the National Land Policy the researcher suggests that the government should respect the land ownership of the small holders (i.e. Peasants and herdsmen who are the majority of the population in Tanzania) and observed and secured in statute (As per objectives of National Land Policy of 1997 page number 5).

The district land officers should ensure serious land use intensification by emphasizing traditional ways to conserve land resources i.e. use of manure instead of chemical fertilizers. Furthermore, settlement planning is very important particularly in rural areas, and even though this may not be achieved, hence, it may cause land constraints such as; conflicts, shortage and poor physical infrastructure development, but it is worth a try.

5.4 Recommendations for Further Studies

Further studies should concentrate on the following issues:-

❖ The high human population in Moshi District Council and land is a limited resource. How to sustain the continuous expansion of agricultural activities and the majority of dwellers depend on farming activities. “Therefore, what are the compensations or other employment opportunities to enable this community”?

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7.0 APPENDICES

APPENDIX I: QUESTIONNAIRE

MZUMBE UNIVERSITY

Institute of Development Studies

Master of Science in Environmental Management

Questionnaire Prepared for Sample Households

A questionnaire to be responded by selected households in Moshi District Council-Kilimanjaro Region

Introduction

The questionnaire is prepared for an academic purpose for the fulfilment of Master of Science Degree in Environmental Management (MSc ENV). The objective of the study is to assess High Population Density and its Impact on Land Resources in Moshi District Council-Kilimanjaro Region.

Your response is very important for the success of the study. Hence, you are requested kindly to give your response by selecting your answer from the alternative choices also to fill the gaps in demanding questions.

I would like to thank you for your cooperation.

Part One: General Information on Household Members

Please choose your answer among the given choices and fill the blank in the question demands

Ward _____

Village _____

1. Sex a) Male b) Female

2. Respondent's Age

a) Below 18

b) Between 18 and 35

c) Between 36 and 60

d) Above 60

3. Marital status

a) Single (b) Married

c) Divorce (d) Widow (e) Widower

4. Educational background

a) Illiterate b) 1-7 Standards c) 1-4 form d) 5-6 form e) Diploma

f) Vocational Training g) First degree and above

h) Write if any other

5. Number of people per household

a) 2 b) 3

c) 4 d) 5 e) 6

f) More than 6

6. Respondents' Job

a) Civil servant b) Private sector

c) Jobless d) Peasant.

e) Write if there is any other _____

Part Two

Information Related to the Study Topic

7. Do you own land?

a) Yes,

b) No

8. Please indicate land size you have.

a) Below than 0.25 acres

b) Between 0.25 to 0.5 hectares

c) Between 0.5 to 1 hectare

d) More than 1 hectare

e) I don't have

9. Do you have enough land for your household?

a) Yes,

b) No

10. Is there any female who owns land in your household?

a) Yes

b) No

Please explain _____

11. Do you have enough area for sale?

a) Yes

b) No

12. If the answer from question number 11 is 'Yes' what the size of land?

a) Below than 0.25 acres

b) Between 0.25 to 0.5 hectares

c) Between 0.5 to 1 hectare

d) More than 1 hectare

e) I don't have

13. Is there available land for agriculture?

a) Yes

☐

b) No

14. If the answer from question number 13 is 'Yes' what the size of agricultural land?

a) Below than 0.25 acres

b) Between 0.25 to 0.5 hectares

☐

c) Between 0.5 to 1 hectare

d) More than 1 hectare

e) I don't have

15. Does densely populated affects land scarcity?

a) Yes

☐

b) No

Please give reasons _____

16. Does densely and unplanned settlement affects physical infrastructure development?

a) Yes

☐

b) No

17. Does the resettlement program reduce high population density in Moshi District Council?

a) Yes

☐

b) No

c) I don't know the program

18. How high population density affects the land degradation?

a) Deforestation and agricultural activities

☐

b) Quarrying

c) I don't know

19. Is there housing planning in your village?

a) Yes

☐

b) No

20. Is there any important to have housing planning

a) Yes

☐

b) No

21. What are the strategies were used to solve the land scarcity/population density constraint issues?

a) Education on land conservation

☐

b) I don't know

c) Resettlement program

22. What do you think should be done to reduce the changes over land shortage?

a) Provision of education on land use and conservation

b) Encouragement of resettlement program/redistribution of new land

c) Family planning

☐

d) I don't know

Thank you for your cooperation

MZUMBE UNIVERSITY
Institute of Development Studies
Master of Science in Environmental Management
A Questionnaire to be filled by the Department of Population and Land in Moshi
District Council- Kilimanjaro Region

A Questionnaire Prepared for the Population and Land Department of the Moshi District Council to assess the study of high human population density and its impact on land resources.

Introduction

This questionnaire is prepared to gather information about the High Population Density and Land Resources in Moshi District Council-Kilimanjaro Region. Therefore, all information you provide determines the analysis result of the research. The response of your department is set confidently. The purpose of the research is for an academic reason (for the fulfilment of Master of Science Degree in Environmental Management (MSc ENV). I would like to express thanks to you for your collaboration.

Name of the individual filling the questionnaire

Date

Position

Signature.....

Interviewer.....

Signature.....

Please provide your choice among the given choices and fill the blank in the question demands

1. Have you ever been conducted survey on land distribution over the Moshi District Council?

a) Yes

b) No

2. How many average land size distributions per household?

a) Below than 0.25 acres

b) Between 0.25 to 0.5 hectares

c) Between 0.5 to 1 hectare

d) More than 1 hectare

e) Indicate if any other

3. How many sizes of farmland cultivated by household each year

a) Below than 0.25 acres

b) Between 0.25 to 0.5 hectares

c) Between 0.5 to 1 hectare

d) More than 1hectare

e) Indicate if any other

4. What are the factors cause low production of food and cash crops in Moshi District Council?

a) Low rainfall, poor agriculture mechanization, and land shortage

b) Poor agriculture mechanization, land scarcity and less population

c) Land shortage, low rainfall and low price

5. Mention wards with high population density in Moshi District Council

.....

.....

.....

6. Mention wards with land scarcity in Moshi District Council

.....

.....

.....

7. Does high population density affect land scarcity?

a) Yes

☐

b) No

8. Does high population density cause land conflicts?

a) Yes

☐

b) No

9. If the answer for question 8 is Yes, Indicate the areas experiencing land conflicts in Moshi District Council

.....

.....

10. Is the population density against land available in the Moshi District Council increasing or decreasing?

.....

.....

11. Do densely settlements affect road construction?

a) Yes

☐

b) No

12. If the answer for question 11 is Yes, What the Moshi District Council does in order to reduce densely settlement/population?

.....

.....

13. Does the resettlement program reduce high population density in Moshi District Council?

a) Yes

b) No

14. What do you think should be done to reduce the challenges over land shortage?

.....

.....

15. What are population statistics of Moshi District Council from 2003-2012 based on projection and population census?

Table 7.1 Human Population Density and land statistics of Moshi District Council from 2003-2012 based on projection and population census

Years	2003	2006	2009	2012
Population				
Area (Km ²)				
Population Density/Km ²				

16. Complete the following table about tons of food crops produced from 2008-2012

Table 7.2 Tons of food crops produced from 2008-2012

Crop	Year				
	2008	2009	2010	2011	2012
Maize					
Beans					
Banana					

17. Please fill the table below for size of basic population and land data in Moshi District Council

Table 7.3 Basic Population and Land Data on Moshi District Council

Area Type	Size
Land area	
Total Population	
Population Density	
Population Growth p.a. 2002-2012	
Average household size	

18. Please fill the table below on size of land against type of land use in Moshi District Council

Table 7.4 Types of Land Use in Moshi District Council

Type of Land	Area
Smallholder cultivators	
Large-scale agriculture	
Grazing land	
Forests and Woodland	
Other Land	
Arable Land	

19. Is there housing planning in Moshi District Council?

a) Yes

☐

b) No

Please mention the areas

.....

20. Is there any important to have housing planning

a) Yes

☐

b) No

21. What are the strategies were used to solve the land scarcity/population density constraint issues?

.....
.....

Thank you for your cooperation