

**LAND USE PLANNING IN THE ARID AND SEMI-ARID AREAS-
A CASE STUDY OF NGUU SETTLEMENT SCHEME IN
MAKUENI DISTRICT.**

BY

MILCAH NGINA MUENDO

Bsc. Surveying (Honours), University of Nairobi

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS (M.A) IN
URBAN AND REGIONAL PLANNING IN UNIVERSITY OF NAIROBI**

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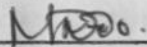
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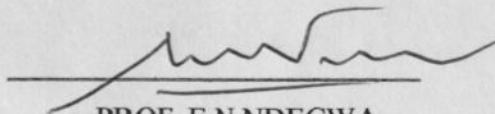
DECLARATION

This is my original work and has not been presented for a degree in any other University



MILCAH NGINA MUENDO
Candidate

This thesis has been submitted for examination with my approval as the Principal University Supervisor



PROF. E.N NDEGWA.
Supervisor

DEDICATION

This thesis is dedicated to my mum Kangwelele, my husband Mutua and sons Mathuva and Kilonzo.

I thank them all for their encouragement, support and kindness all the years of my study. They all had something special to offer.

ACKNOWLEDGEMENT

I wish to express my sincere gratitude to the Department of Urban and Regional Planning, University of Nairobi for offering me a scholarship that enabled me to pursue this course.

Great thanks to my supervisor who found time to attend to my work. His exceptional academic persuasion, patience, devotion and constant scholarly guidance enabled me complete this work. I feel indebted to the entire staff and students of the department of urban and regional planning whose cooperation and constructive criticism enabled me to bring my work to this standard.

Thanks to all friends who in one way or another contributed to the successful production of this work. To all who participated and showed interest in my work, may God bless you all.

ABSTRACT

Land constitutes the most important economic, cultural and political issues in Kenya today. Approximately 80% of Kenya's population lives in the rural areas having agriculture, which relies directly on land for their livelihood. For many years Kenyans living in the rural areas have experienced problems of unplanned settlements, low agricultural productivity, inadequate infrastructure and community services and increased environmental degradation.

Land subdivision and resettlement in arid and semi-arid areas have been undertaken without due consideration to the economic units of land that can support family units, provision of infrastructure and facilities in the schemes and the possible negative environmental consequences. This study considers the process of land subdivision and resettlement in Nguu Settlement scheme in Makueni district, a former ranching farm which was subdivided into small plots. The area is considered a low potential area with low rainfall, high temperatures which lead to low crop yields and occasionally crop failure.

The study identified small farm units of 1 to 4.5 hectares as opposed to the recommended 50 hectares as a constraint to increased productivity. Most of the settlers come from high potential areas where, due to rising population the land has become inadequate for household livelihood. The settlers who have come into Nguu settlement scheme have brought with them technologies which are not suited to the low potential areas. Inappropriate technologies combined with poor climatic conditions make the living standards of settlers low. Infrastructure and facility provision in new settlement schemes is inadequate as communities take time before they can organize themselves to provide the services that they need. Facilities that existed in the ranch before the settlers moved in were vandalized before the community could take control over such facilities. The natural environment of the semi arid area is a fragile one and the high densities of land use have caused high rates of environmental degradation.

New policy guidelines have to be put in place to reduce environmental degradation and high levels of poverty. Appropriate technologies for the ASALs are needed and aggressive environmental conservation measures adopted by the settlers. It is recommended that new technologies suitable to the ASALs be adopted. The settlers should also accept other means of livelihoods so as to minimize the dependence on agriculture.

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LIST OF ABBREVIATIONS

MLS-Ministry of Lands and Settlements

ALDEV-African Land Development

MLS-Ministry of Lands and Settlements

DFRD-District Focus for Rural Development

KRDS-Kenya Rural Development Strategy

CBO-Community Based Organizations

NGO-Non-Governmental Organization

DANIDA-Danish International Development Agency

FAO-Food and Agriculture Organization

BSTID-Board on Science and Technology for International Development

KARI-Kenya Agricultural Research Institute

WCED-World Commission on Environment and Development

SPSS-Statistical Package for Social Scientists

KRB -Kenya Roads Board

GIS-Geographic Information System

DDO-District Development Officers

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Land is a very important natural resource on which many human activities are carried out. It is the most important indispensable possession of a human being since it provides space for shelter, food and wealth. Over the span of human history, man has drawn most of his livelihood and much of his fuel, clothing and shelter from the land. Land is a resource of primary importance in the economy of any given country. The use to which land may be put is equally diverse. It is useful in many different ways and perhaps may be better regarded a resource base rather than a resource itself. It has often been said that land is the basic natural resource, man's habitat and living space.

Together with its uses land is a very important issue in the human settlements. It is also essential because all other factors of production can only be assembled on land. As a result, decisions on land use must be considered very seriously as they create long-term effects that are not easily reversed. Land has been a matter of life and death, of survival or starvation.

Land, unlike other factors of production is almost in fixed supply, while the demands upon it seem to be always increasing as economic activities and population growth occurs. Land is fixed in location such that its value is closely interrelated with the activities being pursued within and nearby a specific piece of land. Pollution, for example, from adjacent land uses will reduce land value while adding improvements to neighbouring land will sometimes benefit land values despite the fact that in both cases the land in question has not itself changed in character or use. Planning is thus necessary to avoid decisions being made merely by landowners alone, who often make decisions based on short-term considerations based on the benefits they expect to reap from the land at the expense of the public good at large. Such unplanned land often results in potentially random intermixture of uses and lack of protective mechanisms against wholesale changes to cherished landscapes or strategically important land use.

Land use planning often discourages certain land uses which would be incompatible with holistically determined land uses, achieve greater efficiency in the use of land resources in an area, reduction, elimination of certain hazards and preservation of desired elements of the environment.

Rural land is regarded important for a number of reasons. It represents the space and resource base for food production and so becomes an essential component in the political discourse over the strategic need for agricultural self-sufficiency and economic necessity through export of primary products from rural land. Rural land comprises a major spatial constituency for outdoor recreation when provided with proper access, facilities and sound management. That the use to which land is put is a concern to man is, therefore, not surprising. In Kenya, land is considered an important asset to own with every individual striving to own a piece of land irrespective of its size and potential. It is also noted that land has also frequently been at the center of struggles over its use and control some involving physical aggression and war, others more subtle means.

About two thirds of the population in developing countries lives in rural areas. In 1980, the total population in developing countries, excluding China, was 211 million, approximately one half of the world's population. About 72 % of this population lived in rural areas. (Habitat, 1981). Rural development is therefore a major element in the development of these countries.

Rural development, according to World Bank is a strategy designed to improve the economic and social life of the rural community (World Bank, 1991). Rural development may also be seen as a series of quantitative and qualitative changes occurring among a given rural population and whose converging effects indicate in time a series in the standard of living and favorable changes in the way of life. (Ibid). Rural development is still one of the vehicles through which the livelihood of the people, particularly in developing countries can be improved. Rural areas, which are largely agricultural have a four fold role national development namely; provision of food, provision of jobs, provision of raw materials to industries as well as providing

foreign exchange through tourism and exports of agricultural produce. In Kenya, the development levels of our rural areas are therefore a reflection of the overall national development efforts.

Rural under-development will, to some extent, contribute to urban problems, as the rural residents will tend to move to urban areas in search of jobs and other social amenities. Although rural settlements in developing countries might be considered organized at community level, most of them are deficient in the organizational capabilities necessary to exploit local resources fully; and making such resources to fetch competitive prices at the national and the international market. Farming represents without doubt the most widespread elements in rural resource use. (Clorke, 1985). The general low level of agricultural production stands out as the hindrance to enhancement of incomes in rural areas. This is because agriculture is the main activity and the major income earner to the rural folk. Consequently, when agricultural production continues to decrease, this often causes a food crisis in some areas as is currently the case in Kenya.

Kenya today faces a real crisis in national economic growth and in food production. The average growth in GDP declined from about 6.6% in the second half of the 1960s to 4.1% in the 1980s and below 1.0% in 2000, falling far below the current average population growth of 2.2%. Income and inequality has worsened while social indicators such as the employment rate are alarming. It is estimated that about 53% and 49% of the urban and rural population respectively live beneath the poverty line; with the highest incidence of poverty being found in the ASAL parts of the country ((Kenya, 2002).

1.1 Settlement schemes in Kenya

The land problem in Kenya started during the colonial period. Many Kenyans were left landless after European settlers alienated land for European settlement during the colonial period while others were pushed to the African reserves which had a

considerable part of uncultivable land. This created a landless and poverty stricken peasantry. It was this peasantry which agitated for land reforms in the 1950s. The agitation was not just a political and security question, it was also an economic one. Soon, after independence in 1963, the government started a policy of africanization of land previously reserved for European settlement. Large European farms were bought and split into small holdings with the objectives of settling landless families.

Settlement schemes have been used in different countries like Bangladesh and Indonesia for various reasons. The two outstanding reasons advanced for settlement scheme establishment are economic development and political solutions. According to Mbithi and Barnes (1974), the Kenya government started settlement schemes for four reasons; first to manage rapid and orderly transfer of land from European settlers to Africans without a drop in agricultural production, secondly to reduce the number of landless and unemployed Africans in more densely populated areas in Kenya highlands, thirdly to replace European owners of medium size farms with Africans small holder and fourthly to facilitate the introduction of better farming methods into a large section of African farmers.

In June 1963, the department of settlement in the ministry of lands and settlement (MLS) was formed and took over the functions of land redistribution from African land development (ALDEV) department. By 1965 settlement programmes were taking place in 5 of 8 Kenyan provinces. By 1968, the number of holdings had increased from 3728 in 1965 to 32651 in 1967 as shown in Tables 1-1 and 1-2.

Table 1-1: Acreage and No. of holding in settlement schemes by province in 1965

Province	Settled Acreage	No. of Holdings
Western	102,610	4,713
Nyanza	48,272	2,318
R/Valley	153,210	4,326
Central	413,807	14,127
Eastern	18,536	432
Total	736,435	25,979

Source: Kenya, Department of Settlement: 5 year review and Annual Report on the state of settlement schemes, 1965.

Table 1-2: Growth and number of settlement schemes and No. of holdings from 1963-1968

Province	1963	1963	1968	1968
	Schemes	Settlers	Schemes	Settlers
Riftvalley	13	1613	33	5350
Western	1	402	19	7712
Nyanza	1	54	13	3320
Eastern	1	246	8	1638
Central	13	1416	50	14737
Total	29	3728	123	32651

Source: Kenya, Department of Settlement: 5 year review and Annual Report on the state of settlement schemes, 1968

The Department of Settlement came up with several types of settlements. The first type was the high density schemes which were designed for the landless and unemployed with little or no incomes. The second category was the low density scheme with larger land holdings and was meant for people with higher incomes. These were the farms referred to as 100 acre farms and plots. This category was farms located in the high potential agricultural areas divided into 100 acre farms surrounding a home that would attract a single buyer. The buyer was to raise 10% of the cost of the farm and also raise a total working capital of K\$500. The third category of settlement scheme was the Ol Kalou salient settlement scheme. This scheme comprised 19538 acres of land. The fourth type of settlement scheme was the large scale cooperative farms in Sotik and Machakos areas where farming was on co-operative basis. Fifth were the assisted owners and other individuals' farms where the department of settlements helped 140 assisted owners to purchase 229 large scale farms (Kenya, 1969).

The objective of all the settlement schemes was to provide subsistence and loan payments together with a given net income figure from a consolidated holding. (Nottidge and Goldsack, 1966). The planning of settlement schemes was intended to ensure that where better land utilization could be obtained by planting separate cash

crops and subsistence areas, this was facilitated but where conditions were dry, the government policy of consolidation was applied to have group ranches. It was a basic objective of all schemes that gross production in the scheme areas should be at least maintained at their higher levels though it was appreciated that farming enterprises involved could be altered.

For the purpose of planning the settlement schemes, the term subsistence was applied separately to high and low density schemes. In the low density schemes, subsistence was budgeted at K\$40 per family, a figure given by the Kenya National Advisory Council. The council argued that with such a family budget that amount of money was sufficient to supply the basic nutritional and material requirements of a family. For the high density schemes a standard acreage of 2 was set aside for the production of food crops. To help meet family subsistence requirements all budgets incorporated the keeping of at least one cow to ensure that milk was available for domestic consumption.

The exercise of planning the large scale farming units was essentially one of organizing a suitable co-operative to take over the ownership from a single owner. Other types of schemes were the assisted owner schemes which were based on willing buyer/willing seller basis. For this type of land transfer authorities were concerned with financial brackets of potential land buyers. This type of transaction was easier to finance through existing financial institutions.

Another type of settlement was the Squatter settlements. Squatter settlements in Kenya are as a result of spontaneous movement of potential landless and unemployed persons who occupy land for which they have no legal title for the purposes of establishing residence and/or cultivation. Squatting became a critical problem in Kenya after 1912-1925 labour laws which encouraged Africans, already displaced or experiencing population pressure due to European settlement, to settle on European land as labour tenants. Subsequent reversion of the attractive labour tenant conditions in 1925 did not significantly reverse the movement and settlement of squatters on European farms. In 1947 it was estimated that there were a total of 202944 squatters in the country, and

200,000 in 1969, after some of the squatters had been absorbed in the resettlement programme (Mbithi, 1975).

The history of settlement in the semi-arid areas of Makueni District dates as far back as the turn of the century, when Akamba traders took advantage of the development of the railway line and railway stations infrastructure. Settlement was constrained by harsh climatic conditions, tsetse fly and wildlife and government prohibition. As the Akamba population in the high potential areas grew, and land degradation set in, the Akamba intensified their struggle to increase access to land outside the Akamba Reserve. The Government could not, however, entertain such an idea for fear that it would only lead to demand for more land. The protests peaked around 1932 when Akamba marshalled 187 complainants to testify to their loss of land and cattle before the Kenya Land Commission in Machakos (Tiffen *et al.*, 1994). The degraded status of land in the 1930s partly convinced the Government of the need to do something, and the Land Commission recommended that the Crown land of Yatta Plateau, Makueni, Emali and Kikumbulyu should be converted to African Reserve land for use by the Akamba of Machakos District. In 1937 Maher estimated that 100,000 ha were available for settlement in Kikumbulyu Location (Maher, 1937: 258 quoted in Gichuki, 1991).

Makueni settlement scheme, under the ALDEV programme was started in 1948, for the purpose of settling retired Akamba soldiers and landless people from the high potential areas of Machakos District. The settlement was well planned and implemented. The exercise started with initial planning, bush clearing for tsetse fly control and infrastructural development. The main infrastructural developments were; road infrastructure, consisting of roads linking the area with Machakos town and the Nairobi-Mombasa highway, and an access road to each settler's homestead and; water infrastructure consisting of dams and boreholes.

The Government screened the applicants, as those eligible had to be landless Akamba people. The settlers were allocated 12-20 hectare (30-50 acres) of land per family, depending on the land quality assessed in terms of soil texture and stoniness. Grazing

land was to be adequate for 8 cows and 40 goats. New settlers were shown their property boundaries and given six people to assist them in the initial bush clearance. The settlers were also assisted with initial cultivation of three ha (8 acres) by tractor, and the construction of appropriate soil conservation measures. Early rates of settlement were slow, due to the harsh environmental conditions partly induced by the drought of the early 1950s, dense vegetation, wildlife, tsetse fly and water scarcity (Rostom and Mortimore, 1991). By 1956, the Makueni Settlement Scheme had settled 1,476 families (ALDEV, 1960).

Settlement in Kibwezi was encouraged from 1915 onwards by employment opportunities provided by Dwa sisal plantation and other estates. Mbithi and Barnes (1975) reported that in 1927, the colonial government evicted the Akamba people living around Ngulia, Kibwezi, after declaring the area to be part of the Crown lands. These people moved to the Ngwata and Chyulu Hills areas. Ngwata means literally 'land that is acquired'. Those who went to Ngwata were moved again in 1933-36, as the area was declared Crown Land and made a Game Reserve. Part of the land was allocated to Kathekani lime factory. Eviction was enforced by strict rules and regulations. Any African caught in this area was accused of trespassing and severely punished. A few people remained behind and became poachers or obtained employment at the railway station or the Kathekani mining company.

At the dawn of independence, there were high expectations that the Government would provide land to all landless people. In 1961, the people displaced from Ngwata in the 1930s started trickling back. They were joined by adventurers from Kalama, Ukia, Mukaa, Kangundo and Nzau areas of the old Machakos District and by squatters evicted from the Chyulu Hills (Chyulu hills is a gazetted water catchment area. (Mbithi and Barnes, 1975). In 1965, the Government declared the area around Ngwata to be County Council land designated for squatter settlement. Each new settler was given 20 ha (approximately 50 acres). A committee of 10 members appointed by the District Commissioner was charged with the responsibility of land allocation.

Settlement schemes have been used in Makueni district as a strategy for settling the landless and of easing the perennial squatter problem in the district. The hunger for land has also been used by politicians to gain political mileage by getting directly involved in the land resettlement and distribution process. The settlement schemes that have been created in Makueni district since it was carved out of Machakos district in 1992 are Kibwezi, Masongaleni, Kiboko “A”, Kiboko “B”, and Nguu which is the subject of this study. The land areas occupied by these settlement schemes are as shown in Table 1-3 below. Other schemes underway; include Kiboko “C”

Table 1.3: Settlement Schemes in Makueni District Since 1992

Settlement Name	Area (Hectares)
Kibwezi	98
Masongaleni	1700
Kiboko “A”	980
Kiboko “B”	1200
Nguu	16147

Source: Kenya, department of settlement, 2004

As table 1-3 shows Nguu settlement scheme is the largest settlement scheme in Makueni district. It is larger than all the other settlement schemes whose combined acreage adds up to 3978 hectares against Nguu’s area of 16147 hectares.

1.2 Problem Statement

Currently, land resources are clearly under stress; 16 percent of arable land is degraded and the percentage is increasing (FAO, 1997). Traditional systems of land management are either breaking down or are no longer appropriate, and the management and technology needed to replace them is not always available. The primary reason for this situation is the increasing demands placed on land by the unprecedented rate of population growth and the effects it induces. Externalities related to global change are also becoming a constraint to land use.

FAO concluded that by the year 2000, 64 countries would not be able to support their populations from land resources alone using production systems based on low inputs (FAO, 1983). Land is becoming scarcer as a resource, and this is particularly true of land available for primary production of biomass or for conservation related purposes. Competition for land among different uses is becoming acute and conflicts related to this competition have become more frequent and more complex.

Although the rate at which population is increasing has slowed since 1980, the increase in actual numbers is currently higher than at any time in the world's history. Additions will average 97 million persons per year until the end of the century and 90 million per year until AD 2025. Ninety-five percent of this increase is expected to take place in developing countries. Present figures indicate that by the year 2050 Africa's population will be three and a half times its present level, and by the year 2150, almost five times. (Ibid) The previous hundred years has seen great advances in the technology of production, such as the development of more productive crop varieties and the extension of irrigation and fertilizer use. Nevertheless, it is becoming more difficult for technological progress to keep up with the rising demands generated by population growth.

Continuing land degradation and increasing numbers of people living in poverty are among the symptoms of the current pressure on land resources. To date, the world's response to the two challenges of satisfying human needs and maintaining the integrity of global ecosystems has been less than successful. The lack of an integrated planning framework for land has historically been compounded by poor management strategies. People in rural areas are continually faced with the difficulty in practice of achieving the multiple goals of "increased production", "raised living standards", "resource conservation" and "food self-sufficiency".

In Africa, internal migrations have frequently been influenced by rural population pressure as rural densities have increased and placed stress on resources. African societies have sent pioneers to settle on new lands and seek fresh economic opportunities. Until recently, unoccupied areas and opportunities were almost

unlimited. This is no longer the case as new migrants are now constrained by political and ethnic boundaries, inhibited by new land tenure systems, confronted by overcrowded rural areas, yet driven by unprecedented motivations to migration rooted in the geographical theme of population resource relationships.

After independence the Kenya government allocated land in the former white highlands while the low lying marginal areas were left for grazing, ranching and wildlife. Groups of people were also encouraged to practice cooperative and company farming by the government. In 1975, sessional paper No.14 on Co-operative Development Policy for Kenya was published and the government stated its continued recognition of co-operatives as vital institutions for mobilizing resources in the rural areas. Large-scale farming was seen as a strategy for rural development, which could deliver the rural population from poverty. The government availed credit facilities to any group of people that planned to buy land as a way of supporting such initiative.

Farming cooperatives and companies had been formed in the then Machakos district ranging from coffee farming in the highland areas such as Mbooni and group ranches in the lowland areas around Kibwezi and Mtito Andei now in Makueni district. European farmers had during the colonial era established ranching farms in lowland Makueni, which were later, bought by groups of local residents under cooperative movements. Nguu ranch was one of these cooperative societies which practiced large scale cattle ranching.

Due to population pressure and the subdivision of large scale farms fuelled by the major change in the policy framework where the government withdrew from operations of cooperative societies and land buying companies, the lowlands earlier seen as marginal areas and mostly occupied by government land, and ranches were turned into resettlements. After members settled on their pieces of land problems arose as settlement densities increased, people introduced new land uses on the land, and infrastructure and community facilities became inadequate. There were conflicts as different groups of people sought to use the countryside in the pursuit of different goals and competition between rural resources users sought to meet what are often

inherently incompatible goals. The lowland environment was fragile, while the settlers aim was to have increased food productivity and better living standards. Squatters settled on subdivided land before bona fide members settled on their land, causing a further problem of conflict in land uses.

Decades of land settlement and population growth in the highlands was supported by rich soils and good rainfall but over time population pressure has taken its toll. This has led to migration to the marginal areas. A study carried out by Mbithi P. in 1975, in Kibwezi and Mtito Andei in the then Machakos district established that the very dense population of highland Machakos was redistributing itself in the drier marginal parts of the district namely Makueni, Makueni South and Yatta. Once settled in lower areas, migrants apply upland technology in ASALS. This mal-adaptation is detrimental to the environment. Crop failure has led to serious food shortages and dependence on the government for relief. Recent famines have drawn attention to the hazards of living in these regions.

The population in Makueni District continues to increase while the land remains constant. The increasing population continues to stretch the limited infrastructure and community facilities. Existing facilities are located far away such that the settlers have to travel long distances to access them. Much time is spent on searching for such facilities causing poverty levels to remain high as the local residents remain with little time for economically productive activities.

Makueni district, particularly the low-lying areas are classified as Arid Semi Arid Areas (ASAL) areas. The physical environment which is characterized by limited/erratic rainfall and low soil fertility is a limiting factor in agricultural production in ASAL areas. The general lack of easily available technologies adaptable to ASAL conditions represents another set of limiting productive factors. Plant varieties, farming systems, water conservation technologies suitable to the ASALs have therefore to be developed. Lack of infrastructure and commercial services also affects the implementation of projects as well as constraining increase in production by choking the smooth flow of inputs required from supply centres outside

ASAL areas and marketing of output destined for national and export markets. A growing population, uncontrolled use of land and inadequate infrastructure has contributed to deprivation and starvation. The current land use and farming practices are not sustainable and may not support the next generation.

1.3 Research Questions

The research questions that the study seeks to address include:-

1. What were the types of land use before and after subdivision of Nguu ranch settlement scheme of Makueni district?
2. What is the adequacy of infrastructure services in the subdivided settlement scheme?
3. What are the economic problems experienced by the communities settled at the settlement scheme?
4. What is the effect of the current land use on the natural environment?

1.4 Objectives

1. To identify land use patterns before and after subdivision of Nguu Ranch settlement scheme in Makueni district.
2. To investigate the infrastructure services adequacy and spatial distribution in the settlement scheme.
3. To find out economic problems experienced by newly settled communities of the in the settlement.
4. To investigate the effect of the changing land uses on the natural environment.
5. To recommend policy and planning measures to guide subdivision and settlement pattern in large farms and settlement schemes.

1.5 Hypotheses

1. There has been no change in land use and settlement patterns in the settlement scheme
2. Human Settlements within the Scheme are well supported by necessary infrastructure and other basic services.
3. Small-scale crop farming methods practiced in the former large-scale farm have not caused environmental degradation and reduced productivity.

1.6 Justification of the Study

Planning attention has been focused upon matters of urban blight; deprivation and renewal while the social and economic problems of the countryside have received minimal consideration. A lot of literature has been written about land tenure systems in Kenya, rural development strategies and land reforms; little attention has been given to settlement schemes as regards subdivision procedures and planning for public utilities and other essential amenities in rural areas. Since the majority of the Kenyan populations (80%) live in the rural areas it is important that adequate and accommodative planning is introduced in these areas. The current urban growth rate of 5% simply means that rural-urban migration and urbanization does not alleviate the rural population growth problem and does not relieve the increasing strain on rural resources which an increasing population implies.

Studies indicate that increased population in high potential rural areas has led to gradual rural-rural migration to the ASAL regions. The study will show the importance of proper planning during subdivision into small parcels and resettlement in the ASALs, planning for new land uses and the benefits of proper land use planning to the future residents of these areas.

1.7 Scope of the Study

The study will be limited to settlement schemes where land has already been subdivided and settled in arid and semi arid areas specifically in Makueni. The study focuses on the area formerly covered by Nguu ranching society and now subdivided into 3818 plots of about 10 acres each. The study will examine the suitability of the land in Nguu ranch to the current use and densities. It will also examine the effect of man's activities on the physical environment and adequacy and distribution of infrastructure and community facilities within the area. The effect of settlement on the environment is limited to the physical environment.

1.8 Methodology

1.8.1 Introduction

This part discusses the methodology employed during this study, describing tools and procedures that have been followed in conducting the study. This study is based on data obtained from literature review and fieldwork. Fieldwork techniques employed include direct observation, administration of household questionnaires, interview schedules with government officers and community leaders; photo and map interpretations. The study was based on the standard social research process.

The research was carried out in stages. The first stage was to collect data, both published and unpublished from library sources both within the university libraries and outside. The purpose of such literature search was to gather background information on the broad area of the topic and find out what other researchers have done in this area. Library sources are also important in providing details of the study area to be supplemented by field information. This was done by reading and internalizing, sketching and drawing to scale, photocopying and downloading from the Internet. Literature review was used as a guide in preparing field research instruments, particularly in the choice of options in close ended questions. Thus data was collected by both primary and secondary means.

ANALYTICAL FRAMEWORK

Research Objective	Questions	Types of data	Techniques for analysis	Expected results
1. To identify land use patterns before and after subdivision and resettlement in Nguu settlement schemes in Makueni district	<ul style="list-style-type: none"> • What was the land use type before subdivision and resettlement? • Who owned the land? • How was the management of the land? • What was the cause of the change of land use? • What was the criterion for allocation of land? • How was the land acquired? • What is the main occupation of household members • How many pieces of land does an individual own? • What is the plot size? • What is the land tenure system? • Do you have a title? • What are the main economic activities on the land? • Would you consider land suitable for your needs? • What is the trend of land uses? 	<ul style="list-style-type: none"> • Subdivision plans and No. of plots • Average land sizes • Population census data • Reports of former ranching society and its operations and activities • Economic activities in the area. 	<ul style="list-style-type: none"> • Literature review on past trends of population dynamics • Photographic interpretation • Map reading and interpretation • Analysis of past land uses • Computation of percentages 	<ul style="list-style-type: none"> • Changing Land use patterns in Nguu settlement scheme
2. To investigate the	<ul style="list-style-type: none"> • What methods are used for 	<ul style="list-style-type: none"> • Roads classification 	<ul style="list-style-type: none"> • Maps 	<ul style="list-style-type: none"> • quality and well

<p>infrastructure services adequacy and spatial distribution</p>	<p>wastewater disposal?</p> <ul style="list-style-type: none"> • What are the sources of water? • How is the water transported? • How long does it take to reach the water point? • What are the main problems in the water sector? • What is the location and condition of schools? • What is the location and condition of health facilities? • What is the location and condition of community facilities; library, worship Centres, entertainment and cattle dip if any 	<ul style="list-style-type: none"> • Maps • population and demography • Questionnaires • Number and spatial distribution of infrastructure and community facilities. 	<ul style="list-style-type: none"> • District infrastructure and community facilities reports (obtained from record of relevant government departments) • Frequency analysis 	<p>managed infrastructure and facilities</p> <ul style="list-style-type: none"> • Fairly spatially distributed infrastructure and facilities.
<p>3.To find out economic problems experienced by newly settled communities of the settlement scheme</p>	<ul style="list-style-type: none"> • What is the occupation of the household members? • What is the monthly income level of the household? • What amounts of money is spent on basic necessities? • What is the condition of the main dwelling unit? • What is the some of fuel used for cooking and lighting? • How much is earned from the 	<ul style="list-style-type: none"> • Main economic activities • Yields per unit • Prices of farm produce • Nearest markets for farm produce • Methods of disposal of farm produce • Profit margins for major crops • Accessibility and distribution of market centres. 	<ul style="list-style-type: none"> • Graphs and charts • Descriptive statements by residents • Frequency analysis • Cross tabulations of incomes/expenditures 	<ul style="list-style-type: none"> • Increased productivity of the land • Diversification of economic activities • Improved

	<p>farm annually?</p> <ul style="list-style-type: none"> • What is the monthly income of the household? 	<ul style="list-style-type: none"> • No. and nature of conflicts arising from various resources use. 		
<p>4.To investigate the effect of the changing land uses on the natural environment</p>	<ul style="list-style-type: none"> • What are the forms of environmental degradation? • What are the causes of land degradation? 	<ul style="list-style-type: none"> • Photography • Relief/weather patterns • Agro-ecological zones • Farming methods used as degradation prevention methods • Level of bush clearing for agriculture 	<ul style="list-style-type: none"> • Photographs • Literature review • Agriculture reports • Descriptive analysis 	<ul style="list-style-type: none"> • Protection of the environment for future generation. • Farming methods aimed at reducing soil degradation
<p>5.To recommend policy and planning measures to guide future subdivisions and settlement patterns in ASALs areas</p>	<ul style="list-style-type: none"> • What is the government policy on subdivision and settlement in the rural areas • What do the statutes state; the Agriculture Act Cap 318, Land Control Act 302, Physical Planning Act Cap 286? 	<ul style="list-style-type: none"> • Analysis of policy and statutes • No. of institutions involved in management of land Makueni district • Community awareness levels • Community suggestion and recommendations 	<ul style="list-style-type: none"> • Study and Comparison of the different policies 	<ul style="list-style-type: none"> • Better planning alternatives • Improved policy implementation • A better institutional framework for managing land use in the rural areas

1.8.2 Methods of data collection

The type of data required in research influences both the method of collection and the instruments utilized. In this study both primary and secondary data was collected. Secondary data was collected from published research findings, government documents and journals. Primary data was obtained from the field by way of standard questionnaires, direct observation and photography. The data needs, their sources and methods of analysis were established in a framework as shown in the analytical framework.

1.8.2.1 Secondary data

Secondary data collection involved reviewing relevant literature on relevant government policy guidelines, development of settlement schemes in Kenya, agriculture and rural development and land use planning experiences in ASAL regions in different parts of the country. Primary data was acquired through administration of questionnaires, direct field observation and photography.

This approach lends itself to qualitative rather than quantitative analysis. The sources of secondary data were the National Development plans of 1966-1970 up to 2002-2008. Other government publications reviewed were sessional papers that guide policy implementation in the country. Among the policy papers reviewed were sessional paper No. 10 of 1965, African Socialism and its Applications to Planning in Kenya, sessional paper No. 1 of 1986-Economic Management for Renewed Growth, the paper upon which structural adjustments were implemented, and other publication by the ministry of lands and settlements. Other government publications that were reviewed were various relevant statutes i.e. Physical planning act, agriculture act, district development plans, and various land use acts and policies. In order to understand the creation and operation of settlement schemes, reference was made to published references. Various statutes i.e. the physical planning Act, agriculture act, land control act among others were reviewed.

The secondary method of data collection has several advantages. First, it enables the researcher to access data and information that cannot be measured in the timeframe of the study and it is cheap as compared to field data collection.

1.8.2.2 Primary Data

Primary data collection was done in two stages, i.e. reconnaissance and the main field survey. A reconnaissance survey was undertaken in the study area as a familiarization tour of Nguu Ranch settlement scheme, the study area. The survey enabled the researcher to assess the feasibility of the proposed questionnaire, its suitability and estimated time and cost require for the fieldwork.

The Main survey consisted of asking questions to a representative population sample of the target population. A total of 60 standard household questionnaires, various key government departments and for people who witnessed the sub divisions in the settlement scheme were administered. The design of the questionnaires was deliberate to meet the objectives of the study. Photography, observations and existing maps complemented the use of questionnaires to strengthen the survey. Interview method was used to administer the questionnaires with separate notes being taken wherever the researcher felt that extra information relevant to the survey was availed during the study. Administration of the household questionnaire was done by way of interviews.

One of the major advantages of interview method is its flexibility. Interviewers were able probe for more specific answers and repeat questions when the response indicated that the respondent misunderstood. Persons who cannot read and write could still answer questions in an interview, others who were not willing to spend their energy to write were glad to talk. It was also possible to record time, data and special conditions at the time of interview so that one could assess their influence on the results during data analysis. Family members over 18 years were chosen as respondents and where such a member was not available the household was skipped to the next.

1.8.3 Research Design

1.8.3.1 Sampling method

To select a representative sample, a topographic map at a scale of 1:50000 and a Registered Index Map (RIM) at a scale of 1:5000 were first studied. The choice of sample was based on randomness, which implies that each household in the settlement scheme had an equal probability of being selected. The goal of probability sampling is to select a reasonable number of subjects, objects or cases that represent the target population. Systematic random sampling was used to select the samples. The method involves giving a number to every subject or member of the accessible population, and determining the interval of selecting the subjects.

Proper systematic random sampling could not be done for several reasons. After doing reconnaissance in the study area it was discovered that boundaries were not well marked on the ground; furthermore, the settlement process was intertwined with political allocations resulting in some people being allocated several plots. There were squatters on the farm, whose settlement pattern was not consistent with official boundaries. This meant that the plots as they appear on the subdivision plans could not be used as a basis for sampling. For this reason, the method was modified in the field. Households were randomly selected in each administrative location from a starting point; a market centre or an administrative centre such as the chiefs or assistant chiefs office; selecting each fifth household along clearly defined access roads from the starting point.

The second type of questionnaire was administered to people who were officials of the ranching society at the time of its operation before the settlement scheme, to show how the co-operative operated, what land uses, what settlement patterns and what infrastructure facilities existed at the time of subdivision. This questionnaire was designed to find out how the co-operatives were run, what led to subdivision and the subdivision process. Purposive sampling is a non-probability sampling technique that allows a researcher to use cases that have the required information with respect to the

objectives of the study. Cases of subjects were therefore handpicked because they are informative or they pose the required characteristics.

Government officials; the District Physical Planner, the District Surveyor, the District Adjudication Officer and the District Agricultural Officer gave information concerning how subdivision was done in settlement schemes in the district, the resettlement process and agricultural methods in these areas by way of Interview Schedules.

1.8.4 Data Analysis

The process of data collection was followed by data analysis and presentation. Data analysis entailed organizing, summarizing, crosschecking, and entering data into the computer and analysis to obtain the required information. SPSS, excel and manual techniques were used for data analysis. Qualitative analysis for data that cannot be coded and data that is easily analyzed qualitatively was done. Excel was used to summarize and present data in descriptive form in tables, pie charts and plates. SPSS was used for quantitative analysis while GIS was used for spatial analysis and to indicate and map out all relevant information on a base map.

1.8.5 Study Limitations

- ❖ The area is expansive and a lot of time was taken moving from one place to another. This meant that only a few questionnaires could be administered in a day.
- ❖ There were incidences when the household head was away and any other member of the family who looked knowledgeable was interviewed. If there was none the immediate neighbouring household was chosen.
- ❖ Cultural factors highly influenced the field survey. Within the Kamba community, which is dominant in the study area the man is the household head. The women were hesitant to fill questionnaires without the knowledge of the men arguing that land matters were sensitive and could only be handled by men.

- ❖ The real household incomes and expenditures were difficult to establish as respondents were seen to be taking long to recall figures and with no records to refer to.
- ❖ Makueni is a new district. Information about the study area and the district in general is scanty. Since inception the district has also undergone many administration boundary changes thereby making available data un-continuous.

1.9 Definitions of Terms

Land ownership – refers to the right of use or abuse of land, property or estate; the measure or extent of these rights or ownership of land by holding a title deed or lack of it.

A Land-use Policy is essentially an expression of the government's perception of the direction to be taken on major issues related to land use and the proposed allocation of the national land resources over a fixed period of time. It has a production and a conservation component.

Community – members of the public within whose geographical area is covered by former co-operatives land.

Subdivision – division of something that is already divided. Since any existing parcel of land must necessarily be regarded as a division any further division of it can be termed as a subdivision.

Land uses –exploitation of land for agricultural, industrial, residential, recreational or other purposes are activities that are permanently/ or persistently Sited/located on a particular identified piece of land.

Land-defined in law as any ground, soil or earth regarded as the subject of ownership, including trees, water, buildings added by man, the air above and the earth below.

An ecosystem - an ordered and highly integrated community of plants and animals, together with the environment that influences it. Ecosystems work through the

harnessing of the sun's radiant energy by green plants, and the transfer of this stored energy through a food web of grazing and carnivorous animals. The structure of an ecosystem at any one site or at any one point in time is a function of many interacting variables such as climate, soil, and topography and management history.

Land use planning - the systematic assessment of land and water potential, alternatives for land use and economic and social conditions, in order to select and adopt the best land-use options. Its purpose is to select and put into practice those land uses that will best meet the ideas of the people while safeguarding resources for the future. The driving force in planning is the need for change, the need for improved management or the need for a quite different pattern of land use dictated by changing circumstances.

Strategies- These refer to deliberately designed courses of action or disposition by actors intended to respond to any set of conditions (natural resource issues).

Sustainable Development- This refers to the process of development that will care for the needs of the present communities without compromising the interests of future generations.

Drought- failure of the rains so great that crops also fail

Famine-hunger and /or starvation resulting from a lack of food.

1.10 Organisation of the Thesis

This Thesis is organized in five chapters, chapter one gives an introduction to the study. It also gives a detailed exposition of the methodology used while carrying out the study. The chapter includes the statement of the problem, study objectives, assumptions and limitations, justification of the study, sampling frame and sampling method used, types and sources of data and methods of data analysis.

Chapter two gives selected literature review about rural development policies in Kenya since independence, Settlement Schemes in Kenya and rural development. This chapter also gives an outlook of the rural development strategies and experiences from other countries such as Israel, Tanzania and China.

The third chapter gives a detailed background of the study area. Issues like the physical location of the study area, the physical characteristics of the area, climate and agro ecological zones are explained in this chapter. Of importance are the transportation routes that link the study area to other parts of the district and the country as a whole. This makes it possible to assess the existing potential and the weaknesses of the study area.

Data analysis is dealt with in chapter four. The data shows the relationship between various variables such as population increase, land sizes, household incomes and expenditures. The chapter also gives a critical analysis giving the policy implications of the field findings.

The fifth and final chapter gives a summary of research findings, recommendations and conclusions of the study. The study concludes that the land sizes cannot support the current households using the present technologies. It is on this basis that the research recommends that new way of income generation and technologies adaptable to the ASALs be adopted. Finally, there are the appendices for the questionnaires.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Subdivision and resettlement on large agricultural farms and unsettled lands is one of land reform programmes that have been seen in many countries as vital to economic and social progress. Such reform programmes, when effected, have often affected not only land ownership but also land use. Large farms subdivision and formation of settlement schemes have been Kenya government programmes to resettle the rising population. Population growth has necessitated migration in the country, both internal and external.

Soon after independence the government initiated several continuing programmes to assist Africans to take over large farms in the former white highlands through government guaranteed loans. Most Africans could not raise funds for deposit to be considered for loans, so they usually teamed up into groups and collected money raising enough deposits to earn them loans, the state came up to assist the cooperatives to acquire land under management teams after independence, this is how land buying companies and co-operatives societies with huge land assets were formed. In 1975, Sessional paper No. 14 on Co-operative Development Policy in Kenya was published and the government stated its continued recognition of co-operatives as vital institutions for mobilizing resources. At the time there were 996 active co-operative societies with a membership of 664,000 and a turnover of 691 million Kenya Shillings, most of which were large scale farming companies and cooperatives.

In Africa, internal migrations have frequently been influenced by among other factors rural population pressure. As rural densities have increased and placed stress on resources, African societies have sent pioneers to settle new lands and seek fresh economic opportunities. Until recently, unoccupied areas and opportunities were almost unlimited. This is no longer the case new migrants are now constrained by political and ethnic boundaries, inhibited by new land tenure systems, confronted by overcrowded

rural areas, yet driven by unprecedented motivations to migrates rooted in the geographical theme of population resource relationships.

Because both population and resources are complex and dynamic subsystems that are in interaction, it is difficult to understand these components separately and to quantify their interdependence. Population pressure is the weight or land use activities on the areas resource base by the areas inhabitants, intensified by resource removal to the outside (exports and lessened by additional supplies provided from the outside (imports).

Although population densities in low and medium potential areas of eastern and northern Kenya are sparse compared to high potential areas, the economies of these arid and semi arid regions give reason for concern. The Eastern plateau forelands are having an increasing number of migrations from highland areas. Rights to land in the medium and low potential zones (ASALS) are not so zealously guarded and therefore spontaneous unregulated colonization is possible.

Once settled in lower areas, migrants try to apply upland penetrations and technology to ASALS. This mal adaptation is detrimental to the environment. Crop failure has led to serious food shortages and dependence on the government for relief. Recent famines have drawn attention to the hazards of life in these regions. Another pressure problem reflecting land scarcity is rural squatting.

2.1 Environmental Conflict in the ASALS

Dry areas can be subdivided into extremely or hyper arid and semi arid zones. In the former water is all but absent and the land generally devoid of human habitation. The dominant climate features are a long dry season with short but often intense wet season. The wet season lasts about 5 months, generally beginning in December and ending in April. The mean annual rainfall is between 500 to 800mm.

The semi arid zones are those where absence or scarcity of rain is the first natural obstacle and where the main challenge to man is the effort required to supply water. The dry parts of the world are centered on the tropics, comprising large parts of Africa, North and South America, India, Pakistan and the Middle East. More than 80% of the total is located in Africa, Australia and America alone. Arid and semi arid lands occupy 1/3 of the earth's surface and support a population of 700 million people. Much of this land area and many of the people are in developing countries, especially in Africa, South America and central Asia. The most serious marginal land problem is that of the arid and semi-arid land. It is here that the lack of sufficient water in addition to a high salinity level in the soil are the most overriding restraints to man use of land.

The ecological instability of arid and semi-arid environments is closely linked to the local hydrological flux and balance between water surplus and water deficit. Vegetation degradation is an ecological phenomenon whose wide ranging phenomenon has recently began to receive the serious attention of governments, organizations, and individuals the world over and has been a subject of discussion in many United Nations and IGAD conferences. Most of the earths arid land have become desert since the dawn of civilization in the world. In 1977, UNEP estimated that on the southern edges of the Sahara alone, as much as 650,000 sq. km of land once suitable for agriculture and grazing had become desert in a period of 50 years.

Arid and semi arid areas are characterized by irregularity in occurrence and intensity of rainfall. The arid zone is not only characterized by meagerness of precipitation in annual average but also by uncertainty as to when and in what amounts rain will fall. A prolonged cessation of rain during the rainy season will result in the withering of young plants an expression of the irregularity of precipitation. This irregularity is the deviation from the annual average. The average annual deviation in temperature is also high.

Water related problems in arid lands are numerous and some of the most acute environmental concerns have a direct association with the water balance. The World Bank, for example, cites ground salinity in arid lands as one of the major environmental problems confronting mankind today. Such areas of conflict are as much a direct

consequence of poor water management strategies as they are of lack of water resources. Indeed, many of the key hydrological concerns are extricably associated with man manipulation of the natural environment in places where ecosystems are delicately balanced. The present situation is best paraphrased with the words "where most water is needed, least is available"

Areas under potential danger cover one fifth of the land surface of the Earth, threatening the livelihood of over 16% of the world's population (Routledge, 1992). Those at risk are those most inadequately prepared to minimize the potential environmental damage. Factors such as lack of finances, little or no technological support, inability to perceive the threat to livelihood and inadequate strategies for minimizing the risk; all work to compound the problem.

In the absence of man, arid zone problems associated with the water balance are virtually absent, the natural environment functions satisfactorily within an order determined by low frequency, low intensity water inputs. It could be argued that, as is all too frequently the case with environmental issues, difficulties only appear when a human population disrupts the natural arid zone ecosystem. This most clearly manifests itself when people inhabit marginal areas where the availability of usable natural water is precariously balanced between surplus and deficit. In years of plenty supply exceeds demand; in years of drought demand outstrips supply.

It is perhaps strange to consider problems associated with runoff or overflow in the arid zone against a background of limited water sources. However, the intensity of individual storm frequently results in large volumes of water moving across the land surface. The environmental problems created by large volumes of surface water are considerable and include soil stripping, sediment redistribution, falling crop yields and damage to manmade structures. Added to this is the fact that in many areas, effective management and conservation practices either are not used or have not been successful and the scale of the problem is further magnified.

During and after heavy rainfall flash floods will pass down dry rivers or wadi beds producing a wall of water and peak flow conditions. The speed with which floods develop is a consequence of ground infiltration rates and an absence of vegetation to retard moving water. When rainfalls, a resulting flood peak can travel a considerable distance and even traverse areas where precipitation is absent. The environmental problems in these rain free areas are exacerbated because there is no warning of approaching surface water.

Associated with moving water are accelerated erosion, transport and deposition of sediment. Precipitation impacting and water moving across the ground surface have the capacity to entrain large quantities of soil and other material. Important rainfall parameters in determining the magnitude of erosion are drop size, drop distribution, the angle and velocity of impact with the ground surface. Properties of the ground such as material particle size, the angle of slope play an equally important role. Clay and silt particles, for example, are transported more easily than sand particles.

The nature of human activity can greatly affect erosion rates. Increasing population demands in marginal areas under agricultural production exacerbate erosion. Uncontrolled grazing by livestock rapidly destroys natural vegetation and increases ground surface leaching due to the compaction effects of large herds of animals. On a global basis soil erosion is particularly serious in dry tropical regions and is therefore a major problem in many developing countries. While soil erosion is an integral part of natural denudation processes, human activity, especially injudicious agricultural practices, has greatly accelerated natural rates of soil erosion affecting not only areas from which soil is removed but also areas which it is deposited.

In the medium and long-term, the overriding concern associated with runoff, soil erosion and sediment movement is the period of time required for new soil to develop. The resource is non-renewable in terms of the human lifetime scale. While shifting cultivation and nomadic practices are inherently conservation oriented, the trend towards permanent cultivation and settled herding over the years has led to widespread environmental change. In some cases land has become so degraded that it is

agriculturally worthless. Removal of the natural vegetation by overgrazing and over cropping has resulted in nutrient depletion, widespread soil erosion and desertification.

Desertification and aridisation involve all the processes that culminate in a reduction of the effective moisture content of the soils and thus cause a decrease in biological productivity. This leads to spread of desert like conditions of low biological productivity to dry lands outside previous desert boundaries. Desertification, therefore, is the long term degradation of dry lands, resulting either from overuse by man and his animals or nature's causes such as climatic fluctuations. It leads to loss of vegetation cover, loss of topsoil by wind or water erosion, or loss of useful plant production as a result of salinization or excessive sedimentation associated with sand dunes, sand sheets or torrents. The problem of desertification has been brought to public attention by the mass media that have brought to the attention of the global community the loss of life, especially in the Sub-Saharan Africa.

During his evolution, man has moved from being a simple component of an ecosystem to becoming a dominant force within it. Through cultivation humankind has replaced stable ecosystems with associations of his own devising. Traditional economic frameworks based on hunting and gathering, dry farming and rangelands occupy the greater part of the arid zone. Rangeland is uncultivated land that will support grazing and browsing animals. Rangelands are primarily semi arid lands where other uses such as agriculture are not economically feasible but they may also include areas that have in the past and may in future be used for cultivation or forestry. Semi arid lands have suffered greatly from attempts at ranching.

The destruction of the original woodland cover, long continued overgrazing and frequent burning has practically removed the original deep rooted vegetation. As a result the vegetation has diminished in productivity and has become more open, bare soil being exposed between the plants. The original range is capable of supporting cows but as it becomes depleted it supports mainly sheep and finally goats and camels. The deterioration is evidenced by a thinning of the vegetation and an increase in the proportion of unpalatable or harmful species. Areas of previously good grazing have

become stretches of loose pebbles and bare ground and ever increasing amounts of water are lost in runoff. The effects of grazing on the ecosystem are illustrated in figure 2-1.

This discussion may create a false notion that all the descriptions of climate are negative, i.e. with regard to human live, lack of water and unreliable precipitation, lack of moisture etc. yet these are also climate elements that may not be negative. For instance, the long hours of sunshine during most of the year may be tuned into a source of attraction for tourism and recreation for the population of adjacent humid and sub humid regions, which can travel easily. Vacant and unpopulated spaces constitute choice areas for experiments that require wide spaces. The research on radiation and observation of artificial space objects are particularly convenient in the condition of clear skies that prevail in the arid zone.

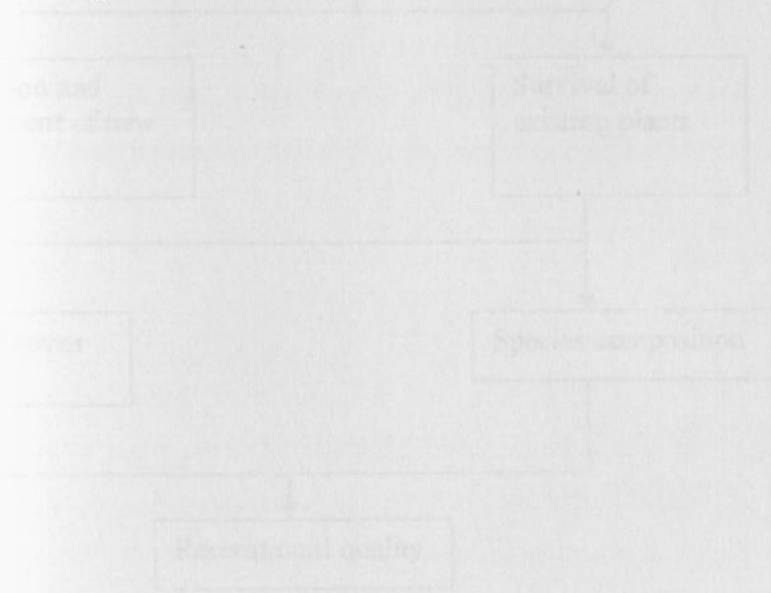
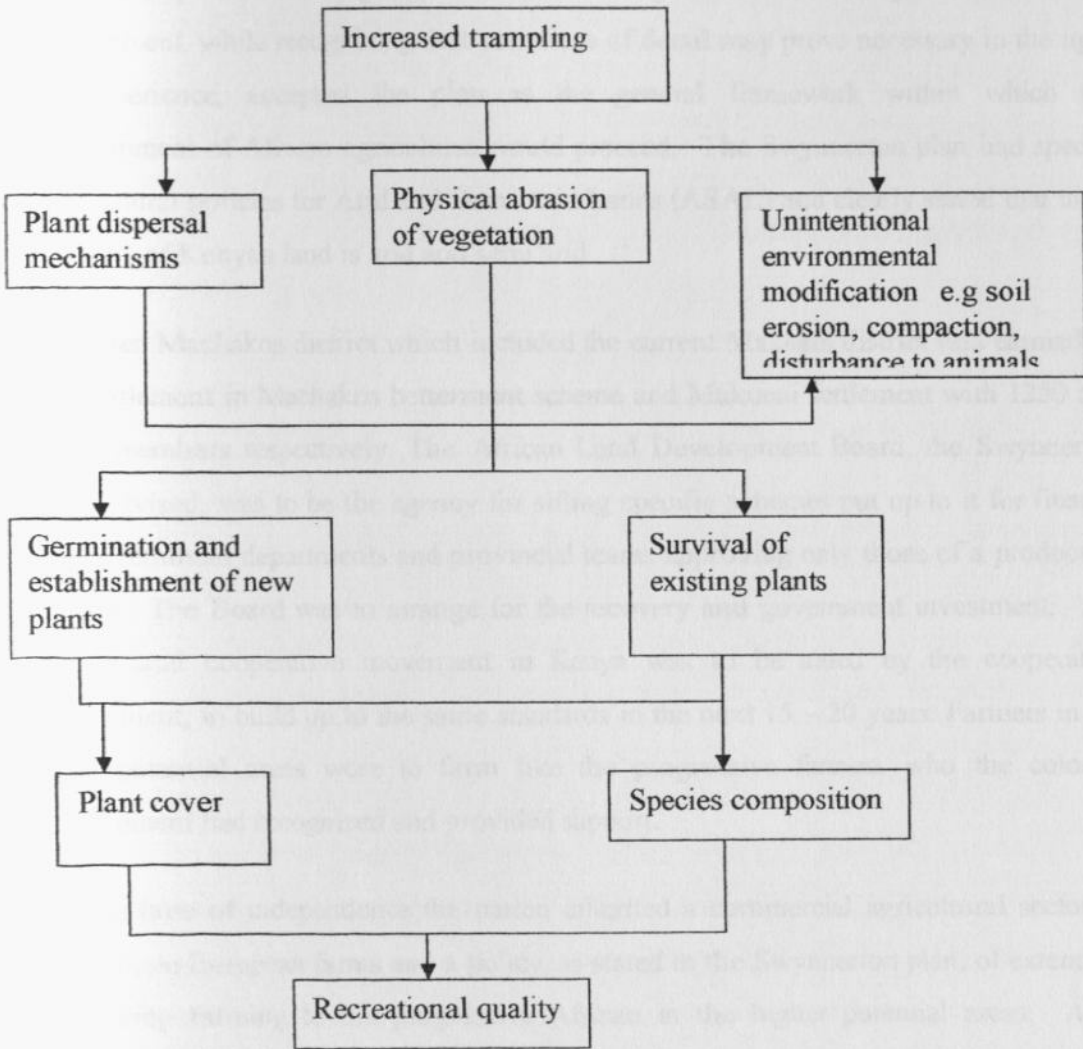


Figure 2. Trampling and Environment, 1986

Figure 2-1: A model to show the effects of trampling on an ecosystem.



Source: Slater F. People and Environments, 1986

2.2 Kenya's Rural Development and Agriculture Policy since Independence

The first agricultural plan for Kenya was the Swynnerton plan in 1955; named "A Plan to Intensify the Development of African Agriculture in Kenya." The Kenya government, while recognizing that variations of detail may prove necessary in the light of experience, accepted the plan as the general framework within which the development of African agriculture would proceed. The Swynnerton plan had special agricultural policies for Arid and Semi Arid Lands (ASAL) and clearly stated that three quarters of Kenyan land is arid and semi arid.

The then Machakos district which included the current Makueni district was earmarked for settlement in Machakos betterment scheme and Makueni settlement with 1250 and 2000 members respectively. The African Land Development Board, the Swynnerton plan advised, was to be the agency for sifting specific schemes put up to it for finance by government departments and provincial teams approving only those of a productive nature. The Board was to arrange for the recovery and government investment. The agricultural cooperative movement in Kenya was to be aided by the cooperative department, to build up to the same standards in the next 15 – 20 years. Farmers in the high potential areas were to farm like the progressive farmers who the colonial government had recognized and provided support.

At the time of independence the nation inherited a commercial agricultural sector of large scale European farms and a policy, as stated in the Swynnerton plan, of extending cash crop farming to the progressive African in the higher potential areas. After independence, in 1965 another planning policy paper, the famous sessional paper no. 10, "African Socialism and Its Applications to Planning in Kenya" was written. The paper stated that every form of organization would be utilized in the agriculture sector including national farms, cooperatives, companies, partnerships and individual farms. Cooperatives and companies were to be utilized where large-scale methods of production or marketing were needed. Progressive Africanization of ownership, the paper stated, would be provided through settlement schemes and increasingly through

schemes that permitted the gradual change from European to African ownership and increased domestic savings.

The paper further stated, "The need for discipline in implementing agricultural development is apparent, and appropriate legislation and implementation of existing legislation to ensure that those few who refuse to cooperate in a major cooperative farming scheme are made to do so or lose their land. It should be established that priority in future should be given to producer cooperatives formed by people such as workers and squatters already employed on the land. Such priority could be enforced by having credit facilities made available to such groups as against individuals willing to buy the land."

According to the paper, a national land use policy was to be created and physical planning extended from the towns and cities to districts and rural areas. Conservation of water supplies and productive land through the maintenance of forests, wind breaker and proper methods of land cultivation and prevention of fire and flood must be actively promoted by the government and the people to be fully informed and their cooperation ensured. A major policy recommendation was to ensure public and cooperative sector growth to embrace a large enough section of our economy to establish a socialist basis for future development. Emphasis was to be given to the development of agriculture in former African areas through land consolidation, registration of titles, development loans, cooperatives and extension services. Agricultural land would not be sold to non-Kenyan citizens unless approved by the government while priority would be given to producer cooperatives in making future agricultural development loans.

By 1974, Kenya had approximately 1,540 large-scale farms and estates, including cattle ranches, coffee, tea and sisal estates, occupying about 500,000 hectares of land (Mbithi, 1974). In 1975, sessional paper no. 4 Cooperatives Development Policy for Kenya was published and the government stated its continued recognition of large scale farming as vital for development of the country. This was echoed in the first and second national development plans in the country. The third national development plan (1974-1978) stated, "Cooperatives will be encouraged when they will afford greater efficiency.

Where resources, especially credit and managerial capacity are in short supply, and can be provided most economically for larger units of production then they shall be provided as so. Cooperatives will also be encouraged in commercial businesses and large scale production in new farms and ranches.”

The first real attempt by the government to decentralize planning came into effect in 1974 when District Development Officers (DDOs) were appointed to coordinate district plans. During the rest of the 1970s minor measures were taken to further the drive towards decentralization. It was the District Focus for Rural Development (DFRD) strategy launched in March 1983 that pushed decentralization into the heart of Kenya's rural development policy. Its main purpose was to allocate resources more equally amongst poor regions, and the regions were encouraged to submit proposals for funding. This reform meant to delegate the central government responsibilities down to the District level hence its name, the “District focus”

The DFRD has contributed little given the poor performance of the agricultural sector for the last quarter century. Development funds seldom reach the district in their full amount, and as a result individual projects are left with no supportive budget. Decision-making on development project planning and implementation has not effectively reached the district level. The target beneficiaries, the poor and the vulnerable, are still largely excluded from direct involvement in the process of project design and implementation. The projects are therefore seen as government rather than community projects.

The most important factor, which has contributed to the lack of progress in DFRD strategy, is the real or at least perceived weakness of governance in general. Lack of power on the part of local communities resulting in continued dominance by the state in almost every aspect of development, combined with the ever shrinking financial base, have all contributed to the crisis concerning the DFRD.

In the third national development plan, also, the government stressed the need for further intensification of agricultural production in high potential, high altitude areas.

The plan recognized that concerted efforts were required to raise the utilization of the resource potential of marginal areas. The dual theme is stressed also in the fourth national development plan (1979-1983), in which a central objective is the alleviation of poverty by offering income earning possibilities and providing for basic needs in nutrition, health, education, housing and other social services. In this context renewed emphasis is placed on the need for varied production and improved socio-economic conditions in the semi arid areas. Thus the government from independence encouraged large scale farming as a major strategy for national development particularly in the rural areas.

In the 1980's there was a major change in the policy framework in the country, necessitated by the changing economic environment. Due to economic difficulties, the government encouraged private sector participation in the economy and management of cooperatives and company farms. This was clearly stated in sessional paper no. 1 of 1986 – Economic Management for Renewed Growth. This sessional paper echoed the governments long terms development strategy, liberalization of the economy and set out policies, strategies and measures to be followed in the process of liberalization. Large scale cooperative farms and company farms were to be operated as private entities with the aims of making profits with no government support in terms of finances or personnel. The new relationship between the government and the cooperatives and companies were stated in sessional paper no. 6 of 1996 – Cooperatives in Liberalized Economic Environment. The future role of the government was to be that formulating policy and coordination.

In the sixth national development plan (1989 – 1993) dry land farming systems for the ASALs was emphasized with continued development and demonstration of low cost outlays of technical packages through an accelerated farming systems development. In the 1994 –1996 national development plan, the government through its ministries was to assist in making available the means of exploiting the important production potentials of ASALs resources, thereby contributing significantly to income, employment and food security.

The 1997 – 2001 national development plan whose theme was industrial transformation in the year 2020 emphasized on industrial development. It however stated, “To achieve full potential, cooperative societies must become more efficient through an independent strengthened agricultural sector and autonomous management. The use of low cost and appropriate technical packages is key to improved dry land farming.” It thus emphasized on privately managed large-scale farming and use of locally available technologies if economic gain was to be achieved.

In the year 2001, the Kenya Rural Development Strategy (KRDS) was established and its vision was presented as “sustainable and equitable rural development for all”. In comparison with the DFRD of 1983, what is more notable in KRDS is its stronger emphasis on empowerment of the rural beneficiaries, the need to strengthen budget execution to ensure that resources are reaching communities, combating corruption, and participation of the private sector, NGOs and Community Based Organizations (CBOs). KRDS recommended changes in the government structure so that district officers are accountable to local level government for the development, implementation, and funding of development initiatives.

The current national development plan (2002-2008), whose theme is Effective Management for Sustainable Economic Growth and Poverty Reduction focuses on sustainable development and raising of the living standards of the people. The plan recognized the ASALs as ecologically fragile and susceptible to frequent droughts, which impact negatively on social and economic conditions of the inhabitants. The government aims to develop these areas through development of water harvesting techniques and exploitation of surface and groundwater sources. Institutionalization of effective drought management measures including early warning systems, improvement of infrastructure such as roads, health facilities and telecommunications; and strengthening local institutions including other groups are to manage community based resources such as rural water supply systems and natural resources.

The first ASAL policy in Kenya was formulated in 1979, with motivation from the National Sessional Paper on development based on African socialism of 1965. While

the 1979 ASAL policy attempted to address some of the issues, it had its weaknesses, for example, the ASAL “voices” were lacking and the policy formulators put emphasis on technical issues such as land degradation; irrigation and the need to find solutions to the nomadic pastoralism “menace” and other practices. The policy had a technical solution to problems that were social and political. Under this policy framework, attempts were made to settle pastoralists in irrigation schemes, group ranches and other alternative land use systems. In 1992, it was realized that not much was being achieved and the policy was then revised based on the lessons that had been learned earlier. More than 10 years later, it is now recognized that the 1992 draft policy has been overtaken by events and requires major recasting to make it relevant to the current situation in the ASALs.

The 1992 ASAL development draft policy had its inadequacies. First, the revision placed heavy emphasis on drought contingency planning and the involvement of communities and local institutions in the design, preparation and implementation of projects, but lacked a holistic approach to development of the pastoral people themselves. Development is about people. Second, the policy was not adequately supported with political goodwill and the allocation of sufficient government resources to result in any significant improvement in the social economic welfare of the people. It was never passed through Parliament and transformed into an Act upon which government decisions and allocation of resources would be made. The policy was thus a “dry” technical document that was not backed with resolve to address issues in the ASALs;

Another shortcoming was that, it did not contain a coherent vision of what the ASALs should have been 20 years later. It lacked “the oil that would grease the wheels” - government commitment and strategies to implement and was largely based on the technical analysis of issues rather than focusing interventions on people’s lives and livelihood strategies; Fourth, the policy was largely put together by officers in one government ministry (the Ministry of ASAL Development and Wastelands at the time) and was thus highly sectoral in approach and lacked the much needed sector wide consultative process among all stakeholders. Fifth, the policy failed to address the rising

human population and land tenure issues clearly; it did not adequately analyse and outline what was required for social and human capital development, including gender equity, which are important elements of a sustainable development strategy.

Kenya's policy guides recognized the need for a strong agricultural economy. It was, however not specific on how management of marginal areas would be done to make them more productive. Policy analysis and implementation systems were weak, as the institutional framework remained highly centralized. Programmes such as the DFRD and KRDS emphasized the need to have decision-making and rural project financial management taken to the district level. Financial management was never taken to the districts and decisions were taken at the central government level making project implementation very slow. The result has been that projects have been left uncompleted while Kenyans continue to pay back loans used to fund such projects which have brought no benefits with them.

2.3 Experiences from other countries

2.3.1 Rural Development Strategies in Tanzania

2.3.1.1 Ujamaa movement in Tanzania

Tanzania in eastern Africa became an independent nation in 1961, when it was known as Tanganyika. Its political leader Julius Nyerere, a confirmed socialist, was elected president in 1962. "Ujamaa Vijijini" or rural socialism was Tanzania's unique approach to rural development. As much an ideology as a program the concept of Ujamaa was worked out over a number of years in the writings of Julius Nyerere, Tanzania's first president and crystallized in the Arusha Declaration of 1965. Central to this was the belief that the traditional African extended family represents an indigenous form of socialism. An associated view, which saw enterprise and private property as foreign institutions that are without deep roots in Tanzania and a faith that Tanzania could be developed along socialist line within the framework of its unique social and cultural heritage.

The explicit vision of Ujamaa was thus a nation of communal farm units based on equality, cooperation and non-exploitation. As Nyerere described these communities "a group of families will live together in a village, and will work together on a common farm for the common benefit. Their houses will be the ones they built for themselves out of their own resources, their farms will be owned jointly and its produce will be their joint property. The activities of the villages, and the type of production they undertake, as well as the distribution of crops and other goods they produce, will be determined by the village members themselves in other words, we shall have up to date and larger version of the traditional African family"

With the Arusha Declaration, the sole political party, the Tanzania African National Union (TANU) and the government reaffirmed their commitment to Ujamaa and began to delineate the specific steps to create a socialist society. The formation of villages was to be based on population. Where families were scattered, peasants were encouraged to move into a central Ujamaa village. In areas marked by pre-existing village settlements, villagers were encouraged to alter their community along Ujamaa lines. Initially most Ujamaa villages would contain both private and communal plots, with the former to be gradually phased out as the local residents; the Ujamaa became better equipped to handle cooperative agricultural production.

Since the Arusha Declaration 1967 up to 1970 the growth of Ujamaa villages was impressive. Between 1970 and 1972 the number of registered villages increased from 1196 to 5556 while membership as a percentage population increased from 4.3% - 15.3%. The village settlement scheme, a high cost program for establishing cooperative farms on origin land, however, suffered from too little farmer participation and too much bureaucratic control. By 1971, however, it had become apparent that the goals of Ujamaa were not being achieved as rapidly as hoped. Part of the reason was that the existing administrative procedures and structures were inadequate to handle the implementation of Ujamaa villages. Decisions from central government took too long to reach the field personnel and often overlooked local resource endowment and environmental factors. A greater percentage of the settled villages, 90 percent of the were classified on Stage I villages i.e. without significant communal productive activity.

The villages were concentrated in the poorest areas of the country while the economically more developed parts had not made much progress in farming in Ujamaa Villages.

In 1972, the government responded to development concerns by decentralizing the administration of its rural development program, reducing the authority of the sectors ministries, granting TANU wider powers to implement its policies and giving the prime ministers office an important role in coordinating the overall Ujamaa strategy. But after more than 20 years of independence, it became clear that the centralized government had failed to deliver promised economic prosperity to Tanzania.

Tanzania's socialist policies took a particularly heavy toll on its ability to produce export commodities. The production of sisal shrank from 226,000 tons in 1970 to 47,000 tons in 1983. Because of shrinking export incomes, and the need to import food, very little foreign exchange was left to pay for other needed imports - raw materials, machinery, fuel, and spare parts. As a result of these shortages, only 25 per cent of industrial capacity could be used, and the lack of fuel and spare parts for motor vehicles caused a virtual breakdown in transportation. Without transportation, food surpluses produced in the countryside very often were left to rot. Electricity production, railway transportation, and telephone communications were also hard hit.

By the 1980s, the Tanzanian economy had collapsed. After a visit to Tanzania in 1982, a Norwegian radio commentator offered the following description: "On days when bread was delivered to the stores, people had to line up for hours. Even commodities like soap, toothpaste, salt, flour, cooking oil, batteries and bandages were lacking. People starve, and starving people get desperate. When I visited Tanzania in 1974 many things were lacking, too, but people still had optimism and enthusiasm. They listened to President Nyerere: If they worked harder, the future would be better. Now the President's calls have lost their magic; people are resigned. The brutal truth is that the policy of President Nyerere has completely failed ... The Tanzanians are unable to manage the many state enterprises, and today production is only 30 per cent of its volume a few years ago."

It can be said that Julius Nyerere's socialist policy in Tanzania failed. His proposal that production systems and teams be based on the existing local family setups the "ujamaa" is an indicator that traditional organizations alone cannot be used as bases for national development. Tanzania's organizational structure was not comprehensive enough to successfully manage the socialist system. Any government requires a large financial base and a properly established administrative structure to run a communal system successfully.

2.3.1.2 Intensive Crop-Livestock Systems in Semi-Arid Central Tanzania

The original population of the dry plains of central Tanzania mainly subsisted on hunting and gathering. Invaders of 18th and 19th century who brought cattle with them found that the more open parts of the area were well suited for pastorals. The natural grazing areas were gradually extended by means of burning, and traditionally settlements were isolated.

Most of the inhabitants of central Tanzania are agro-pastoralists, dependent on agriculture for subsistence, but maintain herds of cattle, and small livestock for social, capital and security purposes. In many households livestock also play a major role as suppliers of manure and protein. The staple crops of the region are maize, millet, sorghum, cassava, sweet potatoes and groundnuts. Earlier, the dominant type of arable agriculture within the area under farming was shifting cultivation. This is often replaced by rotational bush fallowing also increasing areas of permanent cultivation. The patent livestock carrying capacity of the areas is low. According to recent surveys the area is greatly over stocked, leading to overgrazing and destruction of the grass sward by trampling cattle. Destruction in grass cover and the upper soil layer have led to extensive soil erosion.

Many factors make land degradation a serious problem in semi arid Tanzania. Rainfall is occasionally inadequate for the crops grown and often ill distributed, falling in intense storm with immense eroding power. Over the last few decades uncontrolled overgrazing and unsuitable cropping systems had resulted in severe land degradation

and was leading to total ecological collapse. In addition, larger populations are now concentrated in or near villages or where water supplies are ample and flies absent, leading to drastic local over exploitation. In fact the semi-arid areas represent the last tracts into which the population is now expanding under the pressure of rapid growth and decreasing availability of land in the surrounding, more fertile areas.

A variety of highly productive small-scale, intensive mixed farming systems have evolved in the humid and sub-humid tropics. This is exclusively in areas of high population density where agricultural holdings had become too small to support traditional farming practices. Similar systems, based on stall-fed improved dairy cattle, have also developed in the high potential areas of Africa, such as the central highlands of Kenya and on the slopes of Mt. Kilimanjaro in Tanzania. However, such systems, are virtually non-existent in semi-arid, low potential regions, are now also developing in central Tanzania, in low rainfall areas (500-700 mm) where agro-pastorals had been the dominant agricultural form.

The start of the Dodoma Region Soil Conservation (HADO) project in the early 1970's did not achieve the expected results, and so in 1979 and 1986 two of the most severely affected areas, in total over 2,000 sq.km, were closed to all grazing livestock, which involved the eviction of around 140,000 cattle, goats, sheep and donkeys. This resulted in problems of child malnutrition and declining crop yield due to reductions in soil fertility, and so in 1989 a decision was passed to allow back confined (stall-fed) dairy cows on a limited basis, and provided that a number of preconditions had been met.

One of these conditions was that only improved cows would be allowed, but due to shortages of suitable animals this rule was relaxed in 1993 and farmers were allowed to bring in their best milking zebus from adjacent areas. In 1995 over 450 farmers had joined the scheme, with over 600 cows, around 75% of which were local zebus, which were progressively upgraded by crossing with F1 bulls. Average milk yields came to around 8 litres per day from improved cows, and around 3 litres from the zebus, much higher than expected (Ogle, 1995).

It was anticipated that dry season feed supply would be a major constraint, but studies have shown that dry season yields are only around 10% lower than for the rainy season. Farmers do not consider dry season feeding to be a real problem, and cited their main feed sources as wild legumes, weeds and grasses, Elephant grass (grows on river banks) and Makarikari grass (planted to reduce erosion on slopes), Maize Stover, sugar cane tops, sweet potato and pigeon pea vines etc., Leaves of *Leucaena leucocephala* (introduced) and *Sesbania* spp (both wild and planted), Sunflower cake (by-product of artisan oil extraction) and maize bran.

The problem of overgrazing had to be tackled in central Tanzania but on the other hand a balanced diet had to be made available for the settlers. Appropriate technology was seen as the solution. This was employed by bringing in high milk producing cows and planting drought resistant fodder crops some which had been growing in the area for a long time.

2.3.2 The Chinese Agricultural Economy.

China is a unique country, a very large country, in fact the largest in the world in terms of population and domestic market. The Chinese agricultural economy was based on the commune as the basic unit of production. A Chinese commune is not a large agricultural cooperative but a composite unit of local government, which encompasses the whole range of economic, social, administrative and political functions for the rural community. Its essential purpose is to organize and mobilize the rural production, to develop their land and other resources in order to meet their essential needs on the principle of self-reliance while at the same time reducing social inequalities and creating a rural society based on justice and equality. The commune coordinates, supervises and guides all activities of production teams and production brigades but discharges supplementary functions, which are beyond their capacity or scope. The commune enjoyed a big extent of decentralization and authority in performance of its essential functions. The commune and its consistent unit were free to decide the best

use of their land, water and human resources and how to distribute, gain and invest their income.

The people's communes were created in 1958 by merging the advanced cooperatives with the lowest administrative units traditionally called Hsiangs or Townships. The size of the commune varied enormously depending on the density of population in a particular area ranging 80,000 – 600,000 people. A commune was divided into a number of production brigades, which were further subdivided into production teams. A production team often consisted of a natural village or cluster of homes with 20, 40 or 40 families or 100 – 200 members cultivating 10 – 40 hectares depending on population density in relation to the available land. The production brigade coordinated the annual production plans of the teams on the basis of quarters assigned by the commune to undertake investments and development activities on a scale that is too large for the production team.

Therefore, from the point of view of relation to the land, in China, up to 1978, we had that around 86% of the rural population were small farmers (private plots), at a near subsistence level, undertaking cooperative farming (collective land). The rest, 14% were landless peasants with the status of wage earner and self-employed. (Aziz, 1978)

The reform movement of the 1980s and 1990s has engendered debate over a number of issues in China: how much inequality in personal wealth can be tolerated in pursuit of economic development without completely forsaking the communist or socialist vision of the 1949 revolution? How can there be adequate development of economic freedom without commensurate political freedom? The 1989 demonstrations in Tiananmen Square were a reflection of these unresolved tensions. Many Chinese now question whether the communist government has, as it claims, made any change in the traditional pattern of government in China, which was, and remains, hierarchical and paternalistic.

Economic planning was being personalized. The peasants are assigned portions of communally owned land to work with communally owned implements, and their earnings will depend on their work, the first principle of Marxist socialism. This system

ends time wasting paper work and individual squabbles connected with the post harvest share out of grain and other basic products in the commune system. This system led to the free market system has helped revitalize agricultural production in China as peasants work harder and are better off. Collective obligations, such as working on infrastructure projects still remain and payments for work done are made via work points.

Chinese policies can be grouped into four categories of land reform (1949-1954), collectivization-communization (1955-9), capital formation for agriculture (1960-1975), and the alteration of terms of trade between agriculture and industry in favour of agriculture and the peasants. The first set of policies redistributed wealth and income from the rich to the poor eliminated the former ruling classes and, by so doing raised both peasant consumption and rural savings. The second set of policies raised output in rural areas by encouraging better utilization of labour supply. The third set further boosted agricultural output by increasing capital goods and other inputs available to this sector and by establishing small industries almost everywhere in the countryside. Finally, throughout most of the period, the terms of trade were steadily turned in favour of the peasants by raising the prices paid by the state for agricultural products and lowering the prices of many goods purchased by the peasants. (Maxwell, 1979).

The rural industrial sector in China, consisting of state owned relatively large enterprises and collectively owned smaller companies, employs approximately 18million people. This would amount to 36 percent of the total industrial sector in China but a third of this would be transferred back to agricultural work at peak season.

Today, china has a mixed economy, of both socialist and a capitalist nature. In the early stages of Chinese ownership of land, the first important factor in the Chinese approach to rural development was its ability to mobilize the unemployed and under employed labour force for improving the land. Building dykes and dams, digging irrigation channels, constructing roads and simply cultivating the land more intensively were some of the strategies to improve agriculture. The second important factor to the success of Chinese commune is its ability to diversify the rural economy, first within agricultural sector to forestry, fisheries and livestock and then small industries based on

local materials. The third important feature of the system is its progress in improving the knowledge and skills of the rural population.

The system of rural education and training was geared to educating and training the rural population for work within the commune. This is different from education in other developing countries where the aim of education is considered to be white-collar jobs in the cities. The planning process begins in every commune after the middle of each year, based on a review of last year's performance and the next years work plans. The organizational changes outlined above are not solely responsible for China's higher yields. Improved technology has had an equal if not greater impact. Development farming technology is often complex. Using more chemical fertilizer, for example, involves a manufacturing process somewhere else, knowledge, techniques and money for purchases as well as a soil type capable of benefiting.

The system of communes provides a very effective mechanism of local planning in accordance with the simple philosophy from bottom up and from top down. Chinese policy makers realized that some enterprises are best managed privately. Today China has a mixed economy, private and communal.

One notable achievement of the Chinese communes is that all available manpower in the country was put to use. With the exception of the very young, sick and elderly, nearly all of China's 800 million rural populations can be regarded as contributing to agricultural work. (Slater, F, 1986)

Because of this, huge developments such as dams, irrigation systems, e.t.c. which contribute highly to the nation's economy were constructed with minimal machinery inputs. Nations having high population growth such as China's should learn from its innovative ways of feeding the ever increasing population. As Jack Westoby writes in his paper on forestry, the Chinese have: challenged the "point of no return". They have shown that rivers can be tamed, wind and water erosion halted, land rehabilitated, deserts made to bloom again. Moreover they have shown that all this can be done

without multi million dollar loans, without battalions of professional foresters, without arrays of earth moving equipment.

Cooperative farming has been tried again and again as demonstrated in the Tanzanian case above, for example, but nowhere else, it seems, has it been successful in increasing productivity and stabilizing rural society as it has in China. Some techniques and emphases of Chinese development may be applied in different social systems, but the experience is not transferable as a whole because Chinas road to development began in guerilla warfare, and is evolving in a changing human environment.

The political and economic differences between China and the study area are so vast such that the two regions can be said to belong to two analytical universes, but the differences serve an important theoretical purpose. The two regions are similar in that more than 80% are agriculturalists and continue to depend upon farming as their basic means of economic livelihood. Chinese academics and policy planners insist that Chinas recent experiences demonstrate that it is possible, on the basis of agricultural development alone, to provide a major and rapid improvement in the material conditions of peasant smallholders who constitute an overwhelming percentage of the total population. The only absolute vital and indispensable ingredient in bringing about improved agricultural performance is the introduction of a system of economic incentives that reward individual producers for increased production. One basic lesson from China's experience is clear; the performance of the agricultural sector is absolutely fundamental in development of an agriculture based economy. Before China could enter into a long term process of economic growth it had to formulate and implement a program of massive reform of its agricultural policies and practices.

2.3.3 Land Use Planning In ASAL Regions of Israel

Globally 40% of the land surface is dry land, while 90% of Israel is dry land. Yet Israel is the only country in the world where the desert is receding due to innovative research and state-of-the-art management and development programs. Israeli expertise, however,

remains largely restrained due to political boycott and myopic strategies of countries with expanding desertification areas. Rarely does one find a country so small with landscapes so varied as in Israel. In this tiny country of just under 21,000 square kilometers, it takes a few hours to drive from the snow-capped mountains in the north to arid desert expanses in the south. (Gideon, 1979)

For a long time Israel has been considered a dynamic and innovative laboratory for the planning and development of arid zones. A small country with limited resources, pressed by immigration movements, Israel has traditionally viewed its desert regions as prime sites for expanded settlement. For the past few decades, arid zones throughout the world have been growing at an alarming rate, both in terms of population expansion and physical development. Policy makers, planners and developers have been looking for answers for the unique problems, which are introduced by the stressed climate of arid regions.

The Israeli ideology is based on the need to create a strong nation through diversified employment, with agriculture as the basis for a healthy economy and for the evolution of new social values. Other development ideologies have been preservation of land suitable for agriculture, uniform distribution of population throughout the nation, creation of new settlements, especially new rural settlements in underdeveloped regions.

Agriculture is by far the major user of water, with an average 69% over the world, followed by industry, with 23%, and domestic use (cities) with 8%. Yet agriculture is also the sector which presents the lowest return on investment and the highest level of wastage and, in situations of competition, sees its share reduced to satisfy the needs of industries and cities. The strategy for water resource use became the most important strategy in the development of arid zones in Israel and was tied to the national policy for comprehensive water control. The strategy includes the maximization of control over runoff in order to enrich groundwater sources. The goal was to reduce evaporation to store the runoff water then use it for agriculture. Another strategy was to recycle water, especially that carrying sewage, improvement of water consumption methods such as those used in agriculture by adopting greenhouse agriculture and drip irrigation. Despite

the policy that new rural settlements should depend on its immediate local resources, there were many settlements established into which water was brought in containers from far distances.

Since Israeli planners were directed by the Zionist ideology, which was strongly oriented toward rural life, they considered village and agricultural development a major strategy important in its own right. Experiments were successful with vegetables such as beet, which can be irrigated using a limited amount of water, short season vegetables which adjust well to dry climates. Afforestation also became part of the agricultural activity in order to reduce soil erosion.

Despite their deep ideological commitment to agriculture, Israeli planners and policy makers realized that agriculture was of a most risky nature and the occupation of rural settlers should be diversified to include non-agricultural jobs in order to establish a healing economic base. An economic analysis of agriculture indicated that it was economically unsound. Some light manufacturing work was developed and non-agricultural enterprises such as carpentry, auto repairing, printing and wool weaving were initiated. A major part of the general and comprehensive employment strategy was to explore any possible job opportunities, which could support an increase in the regions population.

The storage of water from winter to summer results in substantial loss due to evaporation, infiltration and leakage. The solution was to use this water immediately for supplementary irrigation of rain fed winter gain crops in areas with marginal rainfall. Another form of utilization of rainwater was to infiltrate and enrich a subterranean aquifer, later pumped out of shallow wells and used for irrigation of summer crops.

The major source of water in the Negev (Israel's desert area) has always been surface runoff of winter rains directly by intercepting and concentrating the water trickling off the slopes before that water reaches the natural creek beds and accumulates to form a flood or indirectly trapping or diverting the natural floods often they have formed. The water is collected and stored in cisterns which are artificially constructed reservoirs

filled by directing surface flows during rainstorms. To minimize evaporation each cistern is given only two openings, one for water to enter and one for water to be withdrawn.

Re-vegetation with drought resistant perennial fodder plants increased animal carrying capacities and was useful in overcoming grazing problems in the critical period of the annual cycle and severe droughts. In planning for arid zones in Israel, development policies did not initially incorporate requirements for maintaining environmental quality. Some efforts to incorporate geological sighting into planning in the arid areas and dead sea areas have, however, been successful.

In Israeli's experience in the arid zone, of conveyance of water into the arid zones, the adjustment of farming patterns of arid zones ecology and the foundation of an economic, institutional framework for resource management and development, the third was the most difficult undertaking, writers have commended. Israel has been successful in its efforts to reclaim marginal areas for agricultural use, particularly the deserts.

2.4 Land Tenure and land subdivision

Traditional African tenure all over Kenya varied in accordance with the socio-economic nature of each group or tribe. To every community in Kenya land carried a special emotional value, which was reflected by the intricacy of the land tenure system; various degrees of communal ownership existed over land and individualized ownership was rare. British colonial administration introduced private and trust land ownership systems in Kenya, which allowed them to own land and give parts to colonial settler farmers. After independence land transfer for white settlers to Africans started.

The government initiated several continuing programmes to assist Africans to take over the large farms in the former white highlands through government guaranteed loans on deposit of some money. Most Africans could not raise funds for deposit to be

considered for loans and usually teamed up into groups, collected money raising enough deposits to earn those loans; this is how land companies and co-operatives formed.

The Swynnerton plan stated "sound agricultural development is dependent upon a system of land tenure which will make available to the African farmers a unit of land, a system of farming whose production will support his family at a level, taking into account preliquisites derived from the farm, comparable to other occupations. He must be provided with such security of tenure through an indefeasible title as will encourage him to invest his labour and profits into the development of his farm and as well enable him to offer it as security against such financial credits as he may wish, to secure from such sources as may be open to him."

In his book, *Land Ownership, Planning Speculation*, Aritho, (1980) noted that mankind has been faced with the perennial controversy over whether individuals can have absolute rights to property in land to the exclusion of others. Clorke P. J. and Park, C. (1985) in the book "Rural Resource Management" noted that the countryside is a veritable battleground in the allocation of resources, both natural and human between competing demands. Furthermore, Clorke and Park say, agriculture can create conflicts within the countryside in a variety of ways, such as pollution from disposal of agricultural waste products, destruction of important wildlife habitants, impacts on landscape beauty. Conservationists say that prosperous farming communities can best protect land by coexistence and compromise. Therefore harmonization of interests between conservation, forestry and agriculture are both possible and viable.

In the 1984-1988 National Development Plan, the government stressed its aim of making sure that land utilization is optimized. To achieve these landowners had to be given some incentives so that they are encouraged to invest on land. The government, therefore, spearheaded the system of free ownership of land. This was to be done through subdivision of land and finally issuing of title deeds to individuals.

Ogolla (1986) in his study noted that land is the most indispensable possession of human beings and provides the basic needs of people in terms of space for shelter, food

and wealth. He notes this as the reason why land ownership in Kenya is a source of considerable sentiment, social prestige and economic power.

Ogolla (1986) noted in his study that in order to facilitate individual ownership and utilization land has to be subdivided, demarcated and assigned to individuals. He found out from his study that the process of subdivision and registration of land today is very lengthy and noted that the practice could be made shorter. He argued that though it is generally agreed that subdividing land into very small parcels makes land less productive, people want security of tenure they need titles. He also noted, from his study that after land-buying companies subdivided their land, shareholders wanted to take advantage of the relatively ignorant average citizens who formed the majority of membership. At time bogus individuals would form land-buying companies, which would disappear with money belonging to members. On other occasions farms purchased would have legal liabilities attached to their titles leaving shareholders to pay large mortgages and other dues.

Subdivision of companies land was delayed, as most company owned farms were bought around 1968 or about the same time and they probably had not finished paying their loan requirement before they can be allowed to subdivide their land as noted by Macoco, a registered Surveyor in an interview. Macoco further noted that by the time members repay their loans, which they now pay in bulk in an attempt to get permission for subdivision, they have no money to engage professionals to subdivide their land. Kimani, D. of Survey of Kenya also noted that Directors were exploiting farmers for their own benefits hence they were reluctant to subdivide and have, on the same occasions, succeeded because of illiteracy of their shareholders.

In his book on land use David and Hudson (1980) said that it is patently obvious that land has also frequently been at the centre of struggles over its use and controls, some involving physical aggression and war. A major result of population pressure is the development of less agriculturally suitable land much of it characterized by fragile ecological systems. Increased human population in the marginal areas is characterized by increased livestock production in grazing land, softening of the soil, rejuvenating

fallow periods in cultivating land, introduction of agricultural practices which are not always suitable for the environmental conditions leading to deterioration of the natural resources of marginal areas. He went on to say that functional relationship between land ownership and the environment status spell out the fate of the farmers both in economic gain and political growth.

In future before any subdivision is made attempts to establish the most liable land sizes economically should be a priority if gainful small-scale agricultural development is to suffice. The government should take a leading role in advising any persons involved in sub-division and consequently control the number of people that can be settled in one particular ecosystem. Agricultural land use planning and policy decision making remains fragmented among a number of government agencies having both divergent spatial visions of the future of the marginal lands and widely varying interpretation of the role of the marginal lands and widely varying interpretation of the role of the state in agricultural land use management and planning:

2.5 Rural Development and the concept of Sustainable Development

The first questions to be asked about development are simple: what kind of development? Development for whom? Development has been conventionally defined and measured by the enjoyment of material goods, which does not add up to a great measure of human happiness even in those few parts of the world who have experienced it. Today, the only form of development which can command general support is one that emphasizes the well being of man in the widest sense and that which emphasizes welfare rather than wealth (World Bank, 1991).

The concept of rural development has proved to be elusive as witnessed by many definitions in use. There is, however, a broader agreement on appropriate objectives for rural development than what it is. The primary objective should be to improve the quality of life of the rural poor. Improvement of quality in life must ensure adequate food, employment, health, habitat, as well as recognizing the need for self reliance, a

minimum degree of security, participation in decisions that affect oneself and ones family and a sense in life and work, including the opportunity to be creative. (UNDP, 1979)

In the 1950's and 1960's it was thought that cooperative and company farming could serve to revolutionize rural areas and improve the general standard of living of country dwellers. A report published in 1975 on a series of studies on "rural cooperatives as agents of change" stated that "a major conclusion is that rural cooperatives in developing areas today bring little benefit to the masses of the poorer inhabitants of those areas and cannot be generally regarded as agents of change and development for such groups." Inevitably, the introduction of a new institution, such a cooperative, has effects; many being beyond those envisaged by the innovators and may not serve to improve the quality of rural life unless specific characteristics of that area are considered in establishing such institutions. The use of land has to be seen from the point of view of contribution to rural development and to the national economy as a whole.

The notion of sustainable development was introduced in the 1980s. Despite the importance of the concept of sustainable development in current policy and scientific debates, there is still no single definition which is shared by all stakeholders. Sustainable development is on one hand closely allied to the resilience of the environmental systems to anthropogenic disturbances, while on the other hand it involves societal concerns such as poverty and equity. UN conferences after the introduction of the concept emphasized the idea. The outcome "agenda 21" is an attempt to translate the concept of sustainable development into an international action programme.

Since 1987, when the Brundtland Commission, World Commission on Environment and Development (WCED) defined sustainable development as meeting the needs of the present, without compromising the ability of future generations to meet their own needs, many different definitions have been proposed. While it is interesting to devise theoretical concepts of sustainable development, it is more difficult to determine what

needs to be done to achieve it. Sustainable development means sustaining human well-being over time. An essential corollary of this statement is the requirement that actions taken now which are likely to have negative repercussions on future human well-being be associated with a concrete form of compensation for the future. Since capital provides the means for the achievement of well-being, many experts of sustainable development agree that this compensation implies the transfer of capital stock from current to future generations. The issue of sustainability therefore translates into providing future generations with at least as much capital per capita as the current generation has (Serageldin, 1995).

The concept of sustainable development highlights the need to simultaneously address developmental and environmental imperatives. A strong emphasis on environmental assets in interpreting sustainable development is reflected in terms such as "environmental sustainability" or "ecological sustainability". In this ecological frame of reference, human economic activity and social organization are considered as subsystems that operate within a larger but finite ecosystem.

Rural communities are usually less motivated to participate in development projects unless they perceive that the benefits arising from these projects will flow directly to them without much consideration of future generations. One of the principles of Stockholm declaration of 1972 was that "man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of quality that permits a life of dignity and well being and he bears a solemn responsibility to protect and improve the landscape for present and future generations and environmental management implies sustainable development."

2.6 Condition of Infrastructure and Marketing of Local Produce

The quality of infrastructure and the distance of markets for farm produce will affect the profits that can be derived from such produce. Assuming that farm produce from Nguu settlement scheme will be sold in urban areas such as Nairobi, transportation can be

taken to show how infrastructure affects marketing systems. A well known model concerned with the influence of urban markets and transport costs upon farming was developed over a hundred years ago by Von Thunen.

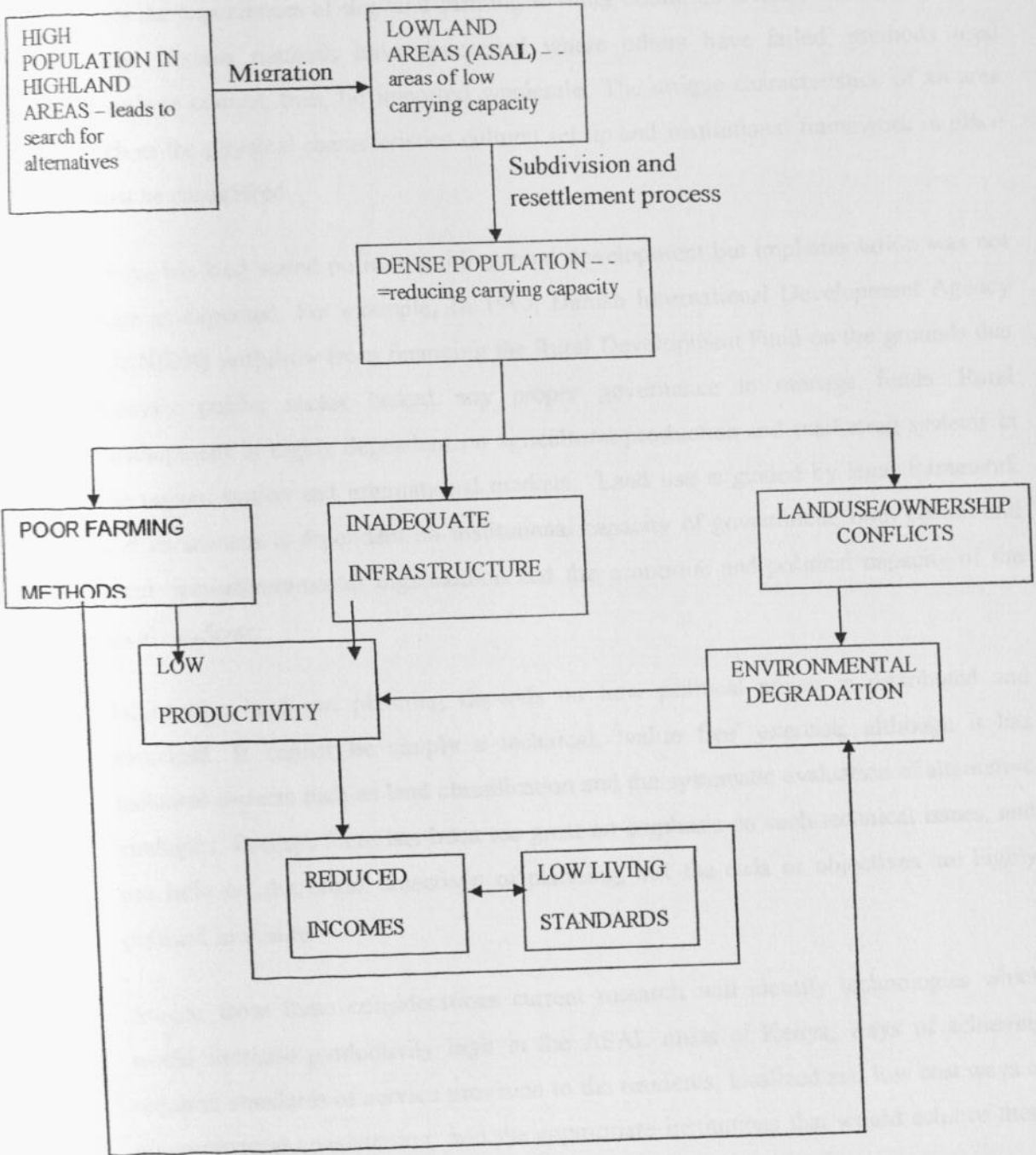
Von Thunen assumed the existence of an area of land [an isolated state] in which one central city was the only market for farm produce. This land area was assumed to be perfectly uniform in respect of relief, climate, soil fertility etc so that production costs per hectare for any particular crop were everywhere the same. Also, the transportation costs for the crop increased steadily in proportion to distance in any direction from the urban market. The farmers of this uniform plane sent their produce to the central city and all received the same price for one hectares production of any crop. These farmers all aimed to make the maximum possible profit but it is clear that farmers near the city would make bigger profits than those further away because their transport costs would be smaller.

The cost of taking produce to the market for settlers in Nguu settlement scheme is high as markets are far away from the area. Further more the existing infrastructure such as roads is poor thereby making transportation costs high.

2.7 Conceptual Framework

Agricultural production is not the only remedy to rural development; services e.g. infrastructure and marketing systems should be considered as properly planned roads make it easier for collection of produce and storage facilities enhance food sufficiency and security. Much of the worlds farm produce is transported from farming areas to be consumed by people who live in urban areas. Hence farming is bound to be influenced by the location of these urban markets and the transport facilities that are available.

Figure 2-2 Conceptual Framework (Low Productivity Model)



Source: Researcher, 2003

2.8 Conclusion

From the experiences of dry land farming in other countries certain lessons have been learnt. Certain methods have succeeded where others have failed, methods used elsewhere cannot, thus, be imported wholesale. The unique characteristics of an area such as the physical characteristics cultural set up and institutional framework in place must be considered.

Kenya has had sound policies guiding rural development but implementation was not done as expected. For example, In 1995, Danish International Development Agency (DANIDA) withdrew from financing the Rural Development Fund on the grounds that Kenya's public sector lacked any proper governance to manage funds. Rural development is highly dependent on agricultural production and marketing systems in the region, nation and international markets. Land use is guided by legal framework and its success is dependent on institutional capacity of government, both central and local, non-governmental organization and the economic and political capacity of the local residents.

Ultimately, land use planning depends on how political power is distributed and exercised. It cannot be simply a technical, 'value free' exercise, although it has technical aspects such as land classification and the systematic evaluation of alternative strategies. Perhaps there has been too great an emphasis on such technical issues, and too little on the broad objectives of planning, but the ends or objectives are highly political in nature.

Arising from these considerations current research will identify technologies which would increase productivity high in the ASAL areas of Kenya; ways of achieving required standards of service provision to the residents; localized and low cost ways of environmental conservation; and the appropriate institutions that would achieve these objectives.

Adequate research has not been emphasized in Kenya's development strategy. Our society cannot continue to be based on ideas which are as rooted in the past as those of

Adam Smith or Karl Marx. These ideas have shaped the present, but the time has come to improve on them. The assumptions are no longer the same, the touchstones are not material wealth but well-being, the total fulfillment of mans potential and full exercise of human rights. We are living at a time when new discoveries in science and their technological applications offer more and more all over the world. Instead of contributing to human fulfillment and the improvement of life, development, sometimes appears to cause a lot of new problems without solving old ones immediately.

Geography of the area

The study area is all that piece of land known as Ngao Rural Sub-township situated in the District of Malindi. Malindi District is one of the twelve districts that the county comprises. It borders Kapata District to the West, Taita Taveta to the East, Kilifi to the East and Mombasa District to the North. The District has a coast line of 33° South and Longitude 37° 10' East and 37° 30' East. The District covers an area of 14,400 km².

The study area is described as a low potential region suitable for the main trading, cash and subsistence crops, pastures, timber, culture and fish raising. Cotton is the dominant cash crop grown in the area.

Administrative, geographic and physical description

The study area is situated in the Ngao Sub-township which is one of the twelve districts in Malindi province. It borders Kapata District to the West, Taita Taveta to the East, Kilifi to the East and Mombasa District to the North. The District has a coast line of 33° South and Longitude 37° 10' East and 37° 30' East. The District covers an area of 14,400 km² with the width of the coast ranging from 100km at its north end less than 200km in the south. Malindi District is described as a low potential region for the main trading (District Development Plan). The study area covers sections of Ngao, Malindi and Mombasa divisions. The study area borders Malindi District to the coast. The study area covers an area of 1000 ha. The location of the study area is as shown on maps 1-1, 1-2 and 1-3 below.

CHAPTER THREE

PHYSICAL SETTING OF THE STUDY AREA

3.0 Introduction

This chapter gives a detailed background description of the study area in terms of its location, size, administrative units, population distribution, structure and density, socio-economic factors and main physiographic and natural conditions critical to the development of the area.

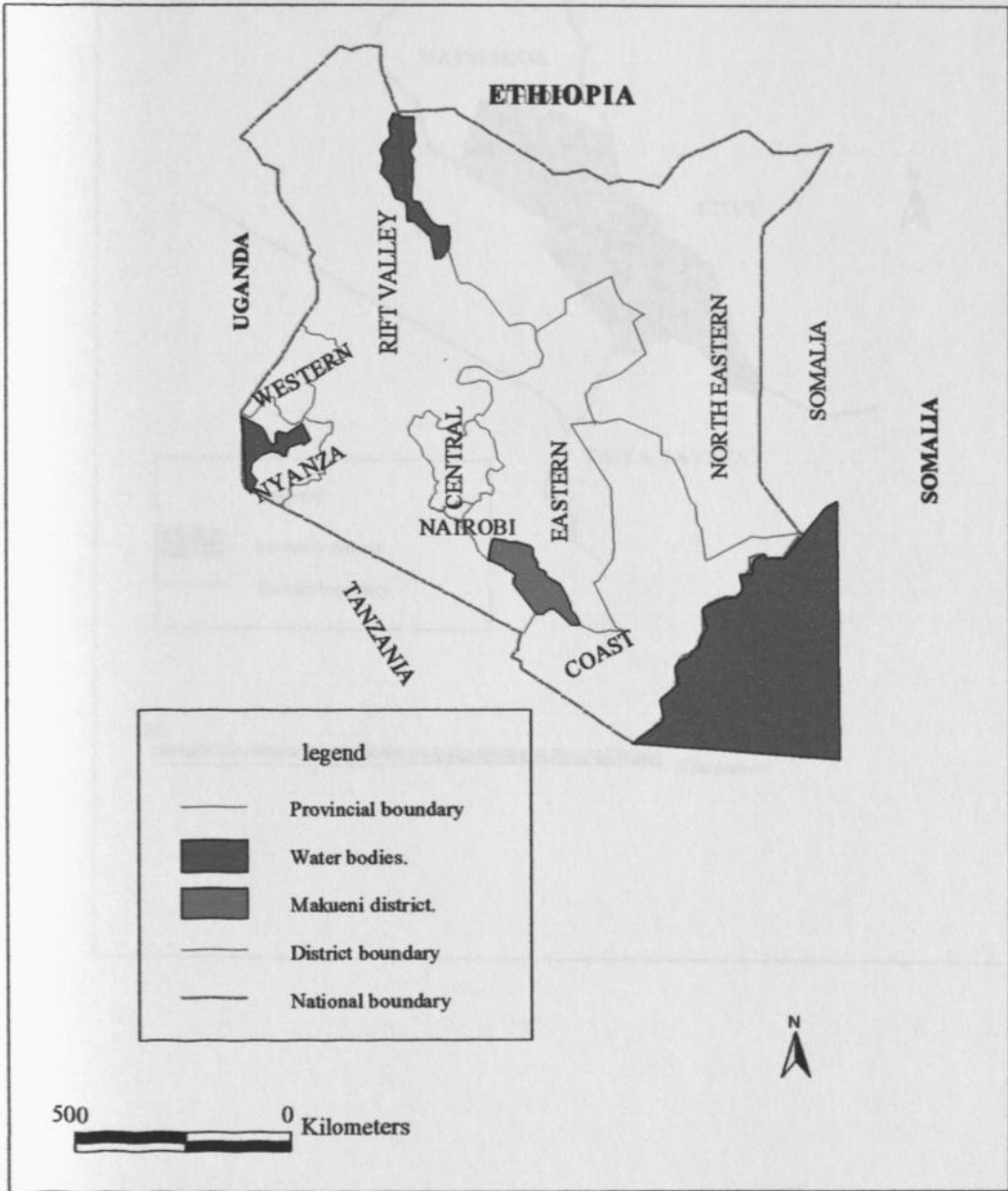
The study area is all that piece of land known as Nguu Ranch Settlement Scheme in Nguu Division of Makueni District. Makueni district is one of the twelve districts that form the eastern province. It borders Kajiado district to the West, Taita Taveta to the South, Kitui to the East and Machakos District to the North. The district lies between latitude $1^{\circ}35'$ south and longitude $37^{\circ}10'$ East and $38^{\circ}30'$ East. The district covers an area of $7,440\text{Km}^2$.

The study area is classified as a low potential region suitable for livestock rearing, maize, and sorghum, pigeon peas, beans, cotton and sun flower. Cotton is the predominant cash crop grown in the zone.

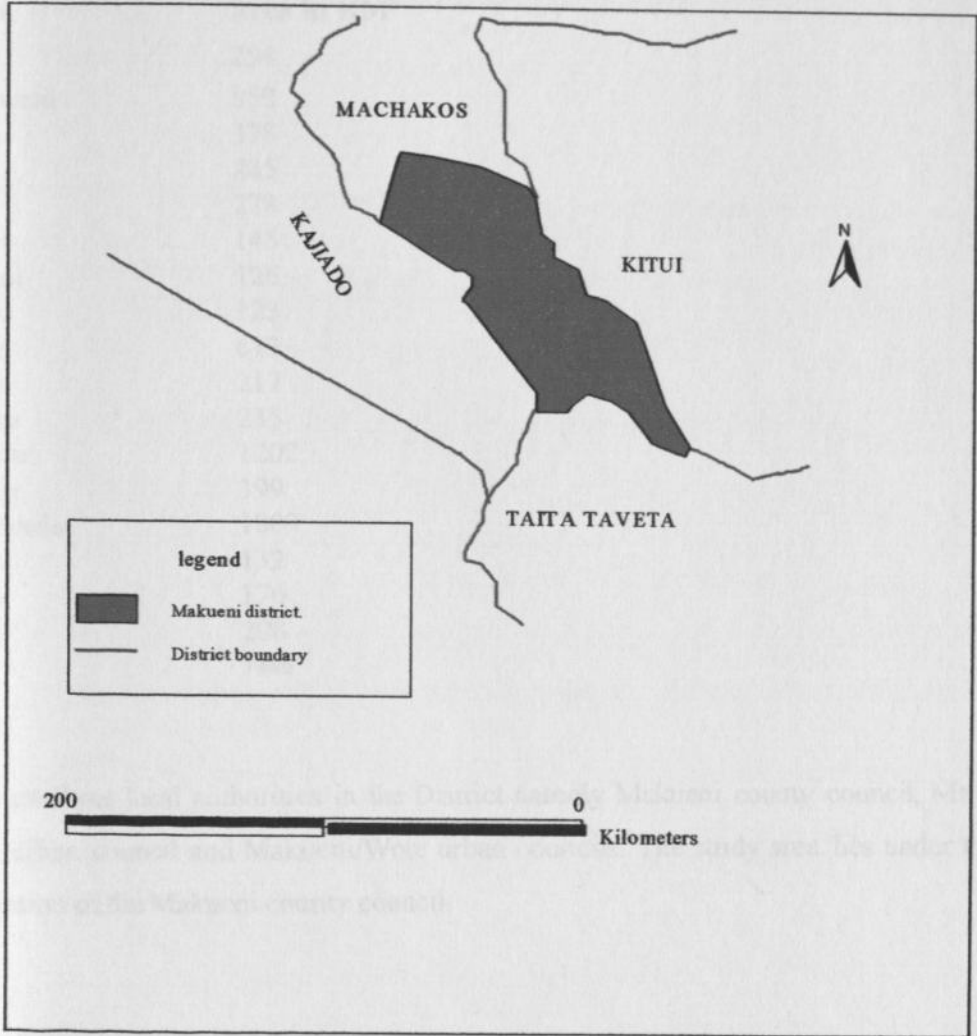
3.1 Administrative, geographic and physical description

Makueni district was carved out of the larger Machakos district in 1993 following a presidential directive. It is one of the twelve districts in eastern province. It borders Kajiado district to the west, Taita Taveta to the south, Kitui to the east and Machakos district to the North. The district lies between latitude $10^{\circ}35'$ south and longitude $37^{\circ}10'$ East and $38^{\circ}30'$ East. The District covers an area of $7,440\text{Km}^2$ with the width of the district ranging from 100Km in the north and less than 20Km in the south. Makueni district is classified as ASAL due to the little rainfall received (District Development Plan). The study area covers sections of Nguu, Mulala and Matiliku divisions. The study area borders Makindu division to the south. The study area covers an area of 161.47km^2 . The location of the study area is as shown on maps 3-1, 3-2, and 3-3 below.

Map 3-1: Makueni District in the National Context.



Map 3-2: Makueni District in the Regional Context.



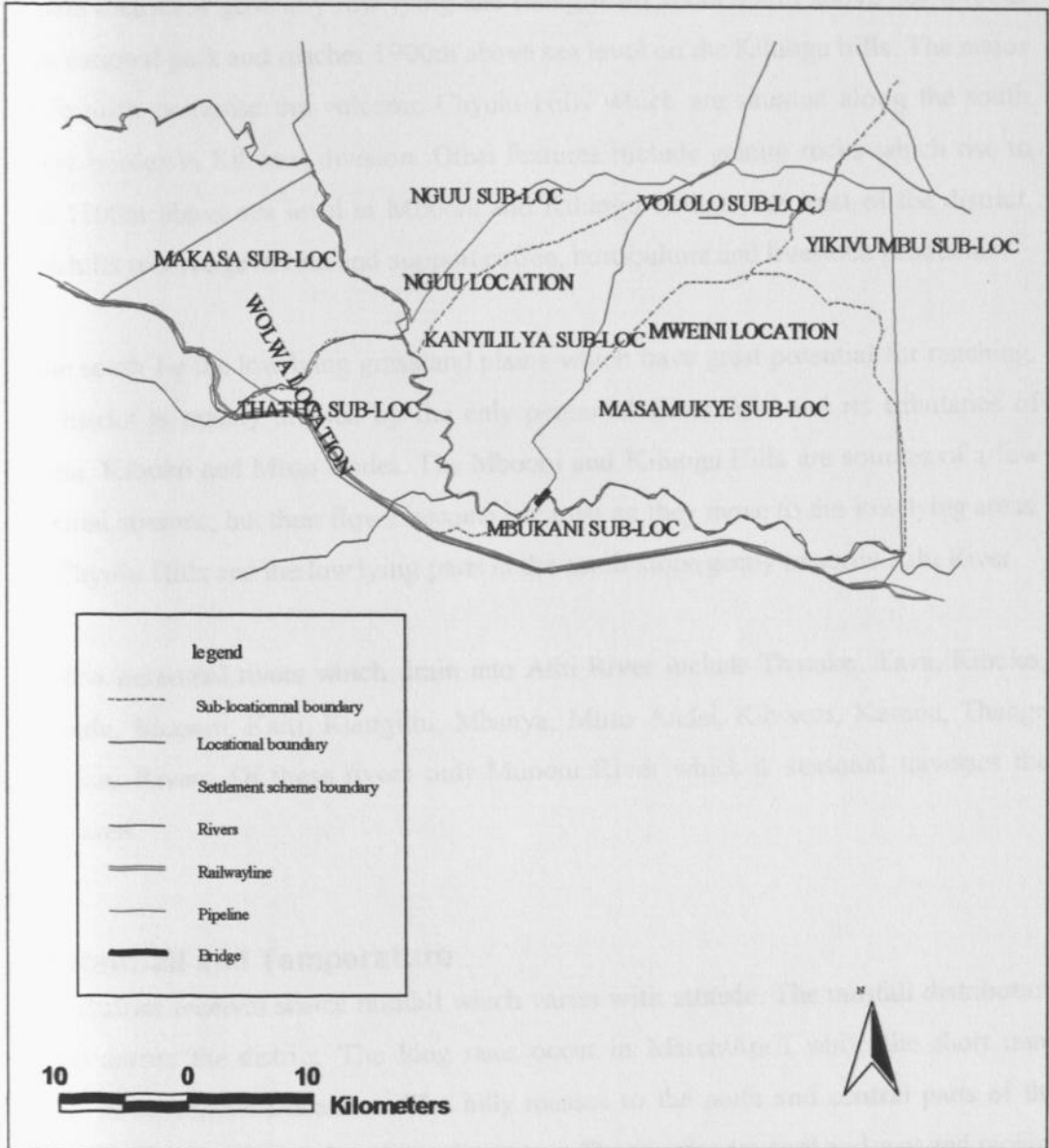
The vast divisions are situated in the low potential areas and are sparsely populated. The smaller divisions are situated in the high potential areas of the district and have higher population densities.

Table 3.1: Area of the District by Divisions.

Division	Area in KM²
Wote	254
Kathozweni	859
Kalawa	378
Kisau	285
Kaiti	278
Mbooni	145
Tulimani	126
Kasikeu	123
Kilome	613
Mulala	217
Matiliku	235
Makindu	1202
Kibwezi	399
Mtito-Andei	1809
Mweini	132
Wolwa	176
Nguu	208
Total	7440

There are three local authorities in the District namely Makueni county council, Mtito Andei urban council and Makueni/Wote urban councils. The study area lies under the jurisdiction of the Makueni county council.

Map 3-3: Location of Nguu Settlement Scheme



3.2 Relief and Drainage

Makueni district is generally low lying and rising from about 600m above sea level at Tsavo national park and reaches 1900m above sea level on the Kilungu hills. The major land features comprise the volcanic Chyulu Hills which are situated along the south western border in Kibwezi division. Other features include granite rocks which rise to about 1100m above sea level in Mbooni and Kilungu Hills to the west of the district. These hills receive good rain and support coffee, horticulture and livestock production.

To the south lie the low lying grassland plains which have great potential for ranching. The district is mainly drained by the only perennial River Athi and its tributaries of Kambu, Kiboko and Mtito Andei. The Mbooni and Kilungu Hills are sources of a few perennial streams, but their flows become irregular as they move to the low lying areas. The Chyulu Hills and the low lying parts in the south slope gently towards Athi River.

The few perennial rivers which drain into Athi River include Thwake, Tava, Kiboko, Makindu, Muooni, Kaiti, Kiangithi, Mbanya, Mtito Andei, Kibwezi, Kambu, Thange and Uani Rivers. Of these rivers only Muooni River which is seasonal traverses the study area.

3.3 Rainfall and Temperature

The district receives scarce rainfall which varies with attitude. The rainfall distribution varies across the district. The long rains occur in March/April while the short rains occur in November/December. The hilly masses to the north and central parts of the district influence climate in surrounding areas. These areas are cool and wet and receive 800mm – 1200mm rainfall per year whereas the low lying areas are hot and dry and receive 200mm-900mm rainfall per year.

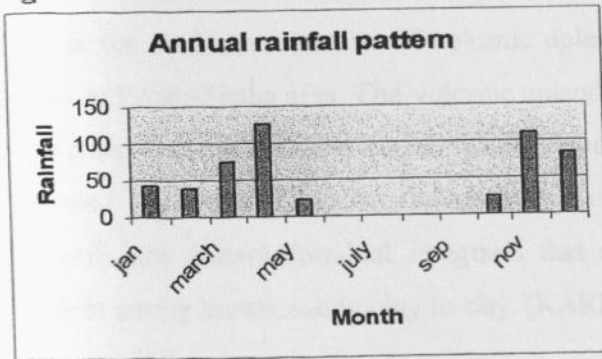
Most of the district experiences high temperature during the day and low temperatures at night. During the dry season between May and October, extreme heat is experienced in low lying parts of the district while the high attitude checks experience cool

temperatures. The high temperatures experienced in the low lying areas cause high evaporation.

Table 3-2: Monthly rainfall data for Nguu settlement scheme:

Month	Rainfall
January	43
February	39
March	76
April	128
May	22
June	0
July	0
August	0
September	0
October	2
November	111
December	84
Total	505

Figure 3-1: Annual Rainfall Pattern in the Study Area.



Source: Simba Railway station-Altitude 1036m -years of recording 45

Surface water is scarce in the district. It is mainly derived from rivers, springs and dams. It is only Mbooni and Kilungu hills that have good surface water supplies. Other areas with high potential for surface water are Luani, Kitondo and Chyulu Hills. The

Athi River provides a perennial source of water along its course. Irrigation for horticulture crops takes place along the Athi and in the seasonal Kibwezi River.

Groundwater is not uniformly distributed due to varying rock formations. In terms of ground water potential, the area around Chyulu hills has more potential, due to volcanic bed rocks. Other areas underlain by metamorphic rocks such as Kalawa and Makindu have low yields. Boreholes in Kasikeu, Kibwezi, Mtito Andei have good yields though the water is saline. Potential for minor irrigation exists along rivers and streams like Thwake, Kambu, Kiboko and Kibwezi. Emali and Sultan Hamud towns have tap water originating from Nol-Turesh springs in Mt. Kilimanjaro.

3.4 Geology and soils

There are three main soil types in the district. The red clay soils occur on the hill masses and some parts of the low land. Sandy soils are mainly in the central parts of the district. Black cotton soils are found in the southern divisions of Kibwezi, Makindu, Mtito Andei and some parts of Kilome.

Soils in the study area consist of volcanic uplands and plains and occur in the area known as Emali-Simba area. The volcanic uplands actually comprise isolated or groups of rounded hills surrounded by undulating landscape. North East of these uplands, elongated volcanic plains occur, which are the remnants of Pleistocene basalt springs. The soils are Acrisol-Ferralsol integrates that are well drained, deep, dark reddish brown to strong brown, sandy clay to clay. (KARI, 1996)

3.5 Vegetation

The general vegetation type of Makueni district is of Savanna grasslands. The district has five gazetted forests namely Mbooni, Kilungu, Kibwezi, Nthangu and Makuli which cover a total of 15,297.8ha of which natural forests cover 12,550.3ha and forest plantation cover 3,047.5ha. The common three species are Cyprus and pine and several indigenous trees. (Ibid)

3.6 Agro-Ecological zones

The district can be divided into three agro-ecological zones. These are the high potential zone (mz) medium potential zone (LM3, LM4, LM5) and low potential zones (LM5, LM6, UM6, UM5). The LM6 zone which covers most of the lower parts of Wote, Kathonzweni and Kalawa division is suitable for millet growing and livestock rearing

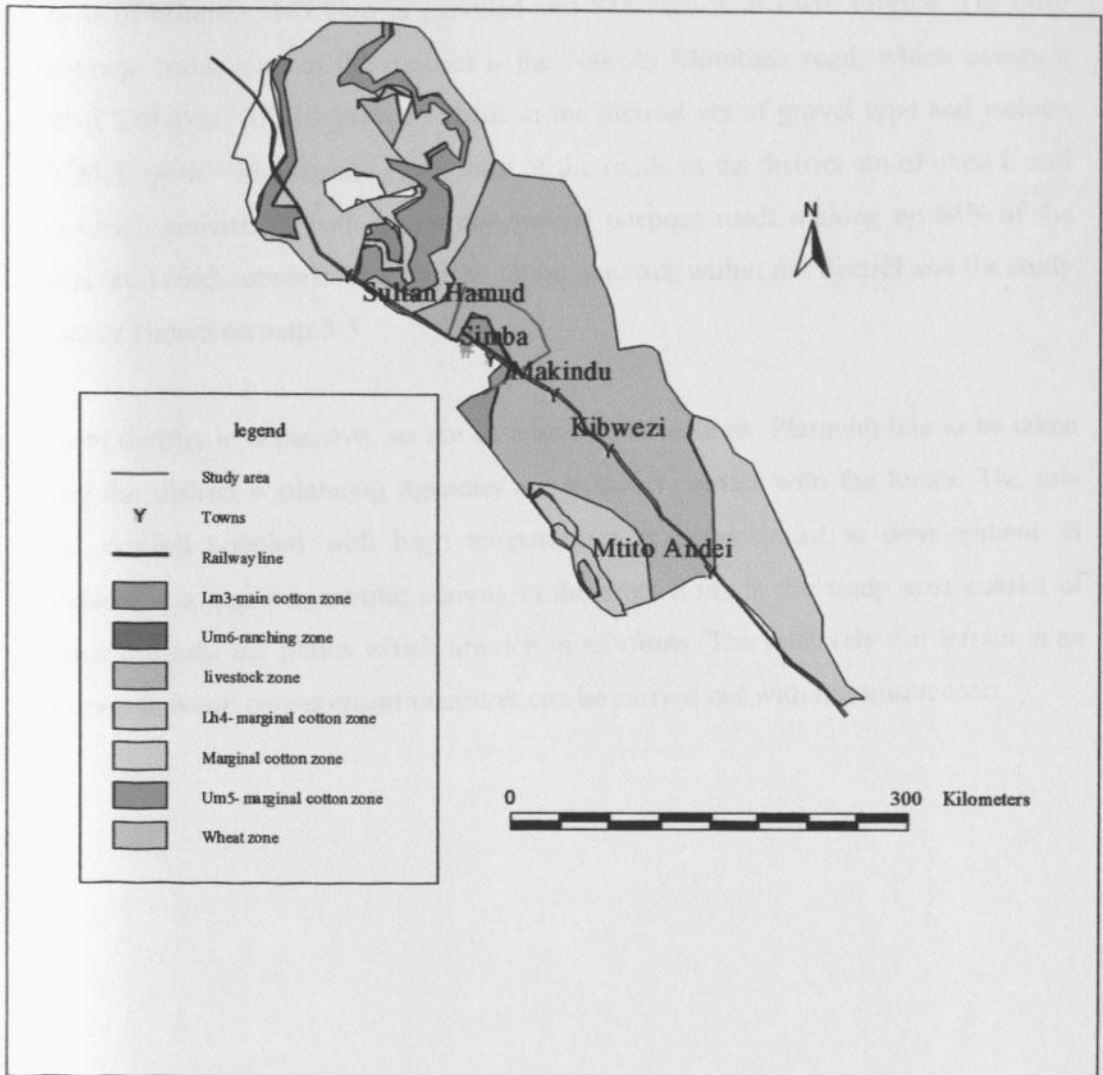
High potential zones; LM2 cover 19.3% of the district and are characterized by hill masses of Mbooni and Kilungu. The main land use activities in this zone are coffee, maize, peas, citrus fruits, growing and forestation. The medium potential zone LM3, UM3, LM4 and UM4 are found on the lower slopes of hills. Crops grown in this zone are: - coffee, maize, cotton, beans, pigeon peas, sunflower, sorghum and fruits. The third agro ecological zone is the lower potential LM5, LM6, UM6 covering 56.5% across Wote and Matiliku where livestock rearing, livestock sorghum, Maize, pigeon peas, beans, cotton, sunflower and forests. (Jaetzold and Schmidt, 1981). The agro-ecological zones of the district are as shown in map 3-4.

3.7 Population size and growth

Social and cultural systems contribute significantly to the process of development. The population of Nguu settlement scheme is predominantly the Kamba community. It demonstrates uniform cultural values.

The district had a population of 636,994 in 1989. According to the 1989 census the population in the district was growing at a rate of 3.09% per year. Migration in the study area is associated with population increase and the Kenya government policy of settling the population. Most of the migrant are from high potential areas within and outside the district.

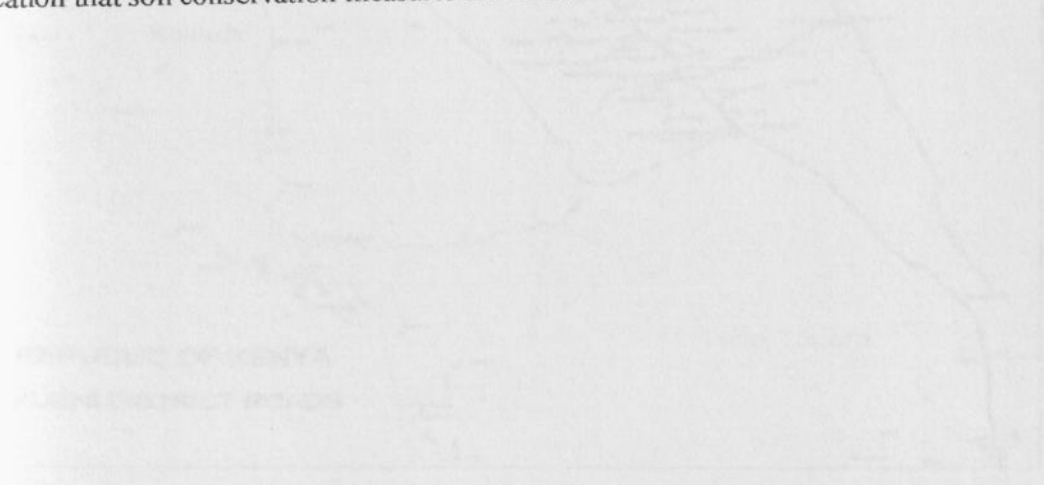
Map 3-4: Agro-Ecological Zones (Makueni District)



3.8 Transport and communication

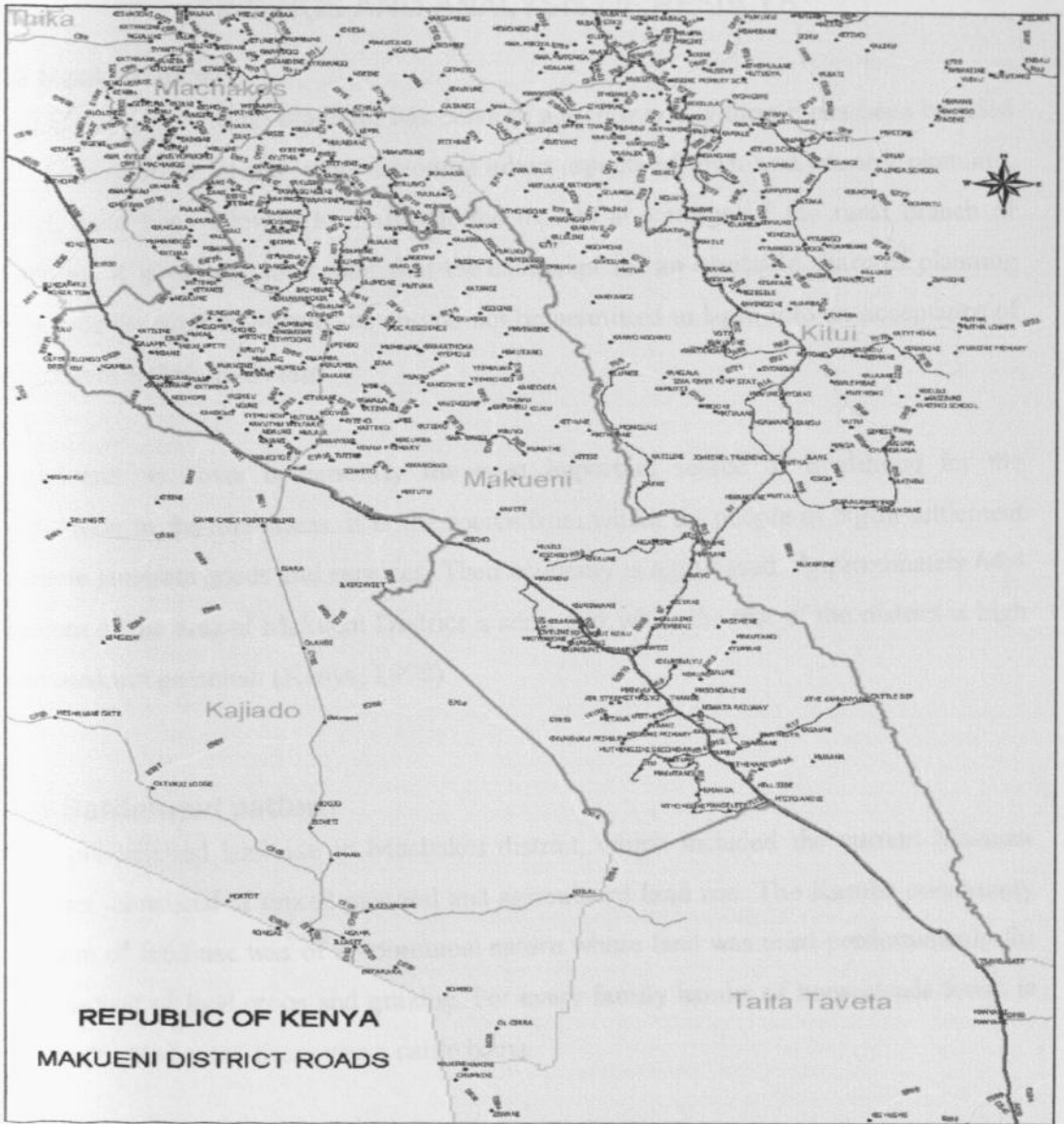
The district has a total of 1,593km of classified and unclassified roads, out of which 271km is of bitumen, 447.9km is graveled and 874.1km is of earth surface. The only international trunk road in the district is the Nairobi-Mombasa road, which covers a length of 220.4km. All the primary roads in the district are of gravel type and include Emali-Mukuyuni – Muumandu road, most of the roads in the district are of class E and above which consists of both minor and special purpose roads making up 64% of the districts total road network. The transportation network within the district and the study area are as shown on map 3-5.

Makueni district is expansive, so are its administrative units. Planning has to be taken beyond the district if planning agencies are to be in contact with the locals. The low annual rainfall coupled with high temperatures is a constraint to development as agriculture is a major economic activity in the area. Soils in the study area consist of volcanic uplands and plains which are rich in nutrients. The relatively flat terrain is an indication that soil conservation measures can be carried out with minimum costs.



Source: Ministry of Roads and Public Works

Map 3-5: Classified Roads--Makueni District



1:594,025

Source: Ministry of Roads and Public Works.

CHAPTER FOUR

FINDINGS AND ANALYSIS OF RESULTS

4.0 Background

Paul Cloke notes "Rural planning has come of age. For a long time it has been branded the 'poor relation' of the more favoured urban aspects of town and country planning, which have been allowed to dominate the morale and image of the rural branch of planning. It is equally important that the campaign for an equitable share of planning resources for rural environments should not be permitted to lapse into an acceptance of the current imbalanced state."

Land and its cover is currently the most important source of livelihood for the population in the rural areas. It is the source from which the people of Nguu settlement scheme generate goods and services. Their economy is agro-based. Approximately 64.4 percent of the area of Makueni District is semi-arid while the rest of the district is high and medium potential. (Kenya, 1998)

4.1 Settlement pattern

The pre-colonial land use in Machakos district, which included the current Makueni district, consisted of mixed pastoral and agricultural land use. The Kamba community system of land use was of a communal nature where land was used predominantly for cultivation of food crops and grazing. For every family hamlet of homesteads found in the cultivated areas, there was a cattle boma.

The land use and land ownership transformation that occurred in the colonial period had the effect of reducing population growth, in terms of absolute figures and rates. Population pressures coupled with subdivision of large scale ranches into small farms initiated a great wave of immigration followed by a rapidly spreading settlement process. Small holding soon became the main land use and drastically transformed the land use system and exerted **great** influence over the manner in which natural resources were managed. The human settlements report (1978) indicated that there was a shift of

rural population from the densely settled areas; to the hitherto less densely populated medium and marginal potential lands due to population pressure.

Land in low potential areas was subdivided into small units' equivalent to those in high potential areas. Mbithi (1974) noted that "Medium quality soils with 20"-25" (600-750mm) rainfall per annum unless irrigated, is strictly for quality ranching. Subsistence may be gained from 50 hectares under good management". The recommended rate for semi arid rangelands is 3.5-5.5 ha/LU where an LU is equivalent to an animal weighing 250kg live-weight. The maximum recommended density is therefore 0.3 LU/ha. (Jaetzold and Schimit, 1981). The government also recommended 62.5 acres for a single household as shown below:-

Table 4-1: Theoretical and Actual Carrying Capacity: Machakos District Zone (1972)

Zone	Acreage
High Potential	10
Medium Potential	17.5
Low Potential	62.5

Source: Land Potential Statistical Abstract 1972

In the 1970s land holdings were large with the majority having over 25 acres as a study by Matingu in 1974 revealed.

Table 4-2: Land Acreages for Migrants in Makueni (1974)

Size (acres)	Percentage (%)
14-May	5
15-24	16.66
25 and above	78.34

Source: Matingu, 1974

Field survey revealed that 45% of the settlers held 3 hectares (approx. 10 acres) and below, 26.7% held between 3.1 and 4.5 hectares (between 10 and 15 acres), while only

28.3% had over 4.5 hectares. In 1974 the percentage of households having less than 14 acres was 5% while in 2003 the number having less than 14 acres was 71.7% out of which 45% had below 10 acres and 26.7% had 11-14 acres. In 1974, 95% of the households had 15 acres out of which 78.34% had 25 acres and above while in 2003 only 28% of the households had 15 acres and above.

Table 4-3: Plot sizes in the study area

Size (acres)	Percentage (%)
0-10	45
14-Nov	26.7
15 and above	28.3

Source: Field Survey, 2003

Before subdivision and resettlement the settlement pattern was nucleated with one major settlement and a few labour lines distributed over the ranch. The main settlement was at the highest hill in the ranch which housed the ranch management, labourers and cattle bomas. This settlement was complete with huge water tanks to hold rain water collected from huge flat boulders with water being distributed to individual houses through a network of metallic pipes; car parks and garages for repair of vehicles. The water was also used for watering animals in the ranch. Another settlement was at Simba town just along the railway line. Alongside this settlement was water pump to pump water from Thuti River, a cattle dip, cattle watering trough and some shops. Other settlements were labour lines at Matutu accompanied by a cattle dip and two boreholes. Another minor settlement was at Mukame wa Mbeu at the northern side of the ranch where there was a borehole.

By the time of subdivision and resettlement in 1994, there were sparse settlements coming up at the eastern sides of the ranch. Squatters had invaded the farm and some had settled there as early as 1985. The invasion was due to population pressure from the eastern part of the ranch which was under spontaneous settlement as early as 1965. The survey revealed that the earliest settlers were in Vololo and Yikivumbu sub location where they are squatters up to today and that they possess the biggest sizes of land as

shown on the table below. The settlement patterns in 1962, 1974 and 2003 are as shown on Maps 4-1, 4-2, 4-3 respectively.

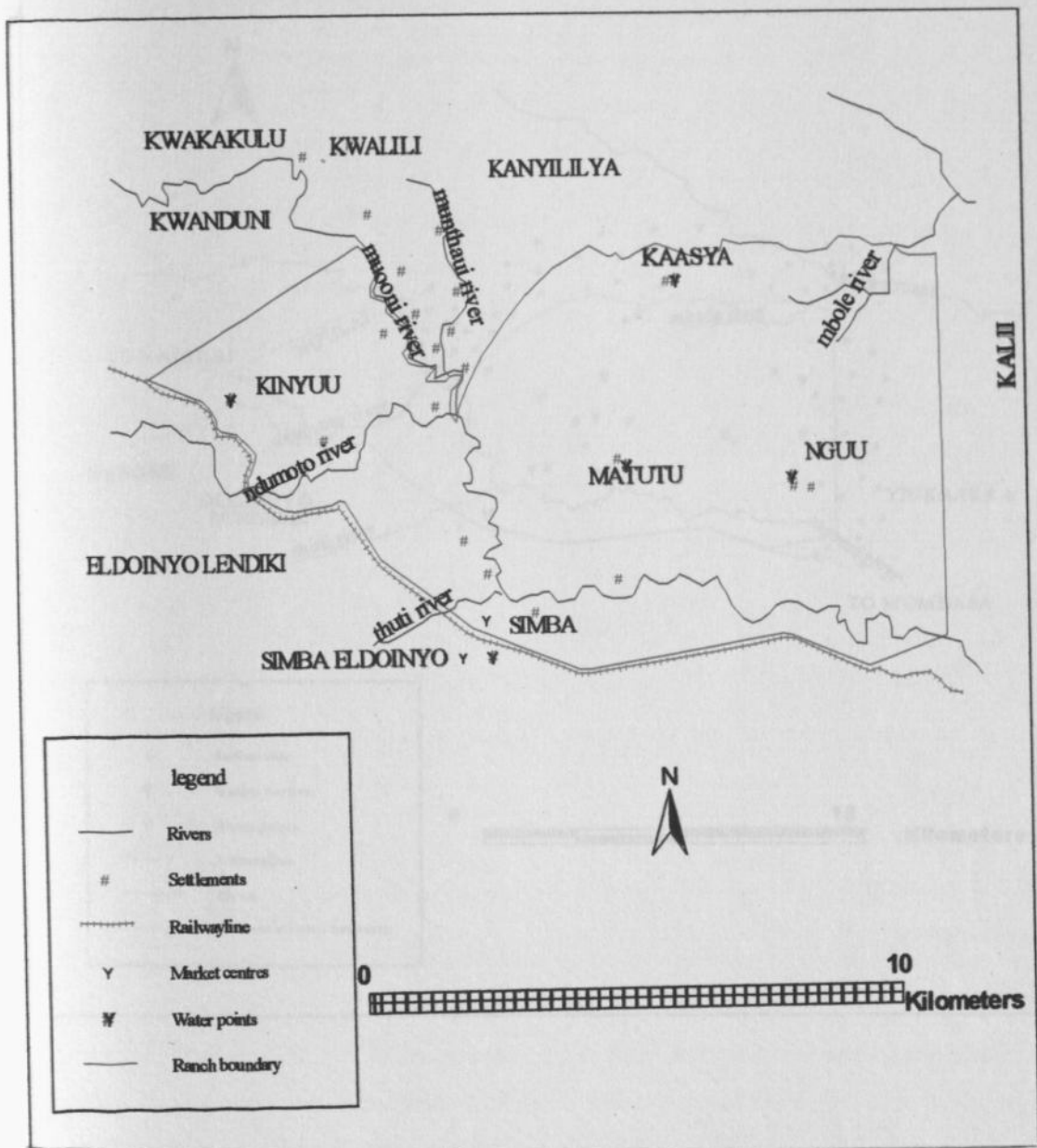
Table 4-4: The relationship between locality and plot size (ha)

locality * what is the plot size Crosstabulation

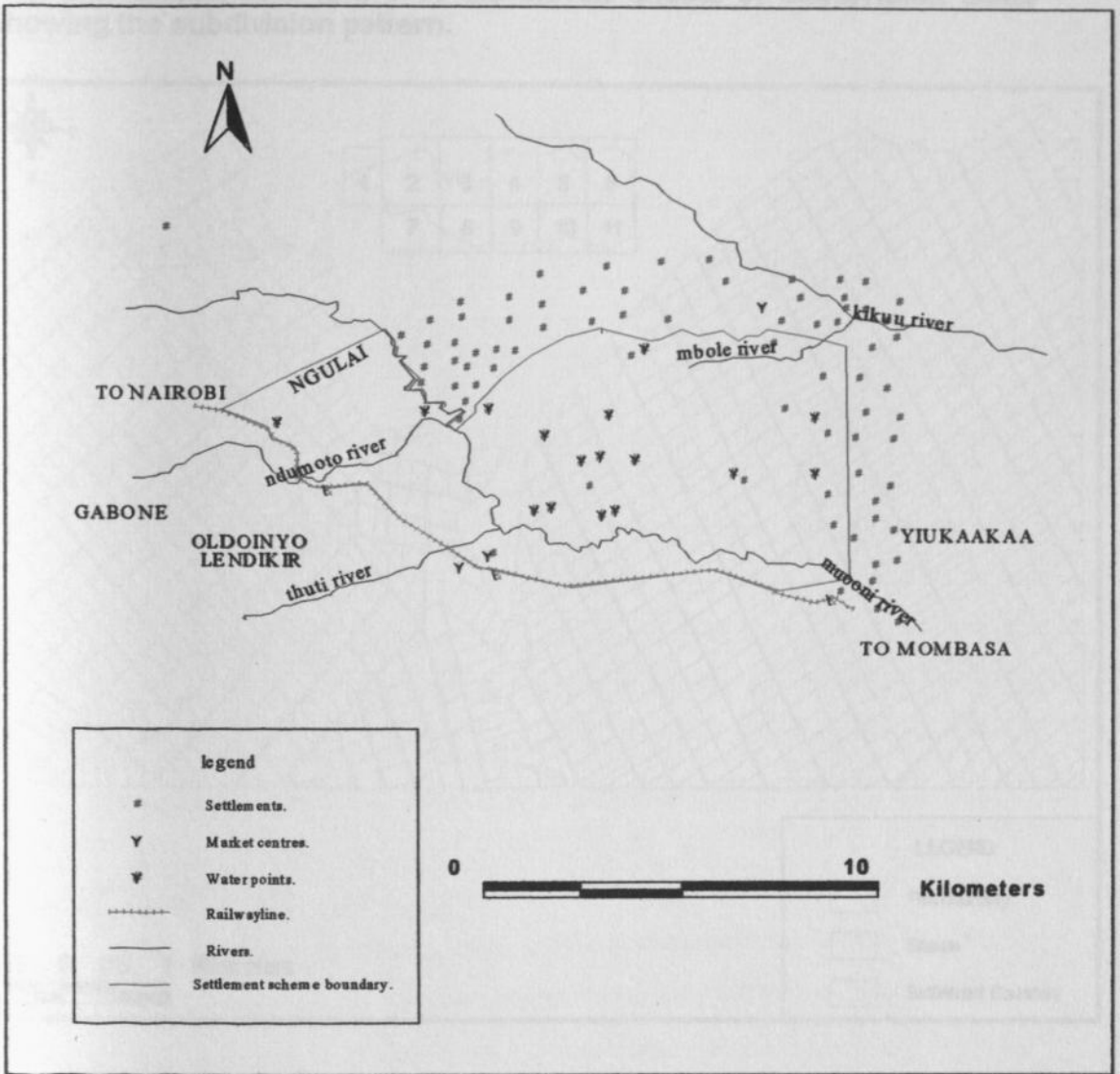
Count		what is the plot size			Total
		0-3	3.1-4.5	over 4.5	
locality	masamukye	7981	3991	1985	13957
	vololo	5986	3992	9971	19949
	mbukani	6001	5991	1995	13987
	kanyililya	7993	3993	3994	15980
	thatha	5985	5994	1996	13975
	makasa	7988	1994	1995	11977
	nguu	9990	3997	3992	17979
	yikivumbu	2000	1988	7956	11944
Total		53924	31940	33884	119748

Source: Field Survey, 2003

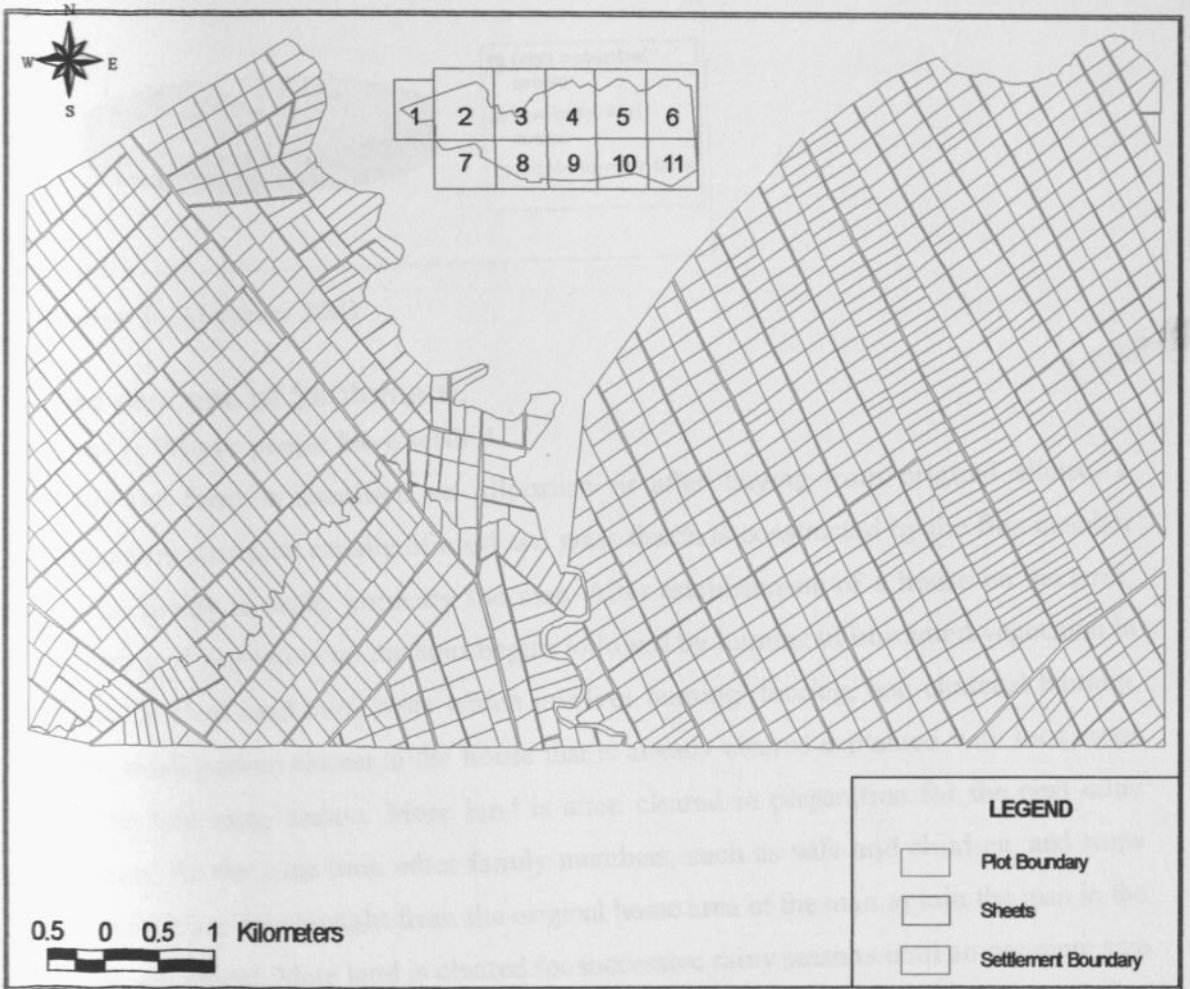
Map 4-1: Settlement pattern in 1962



Map 4-2: Settlement pattern in 1974

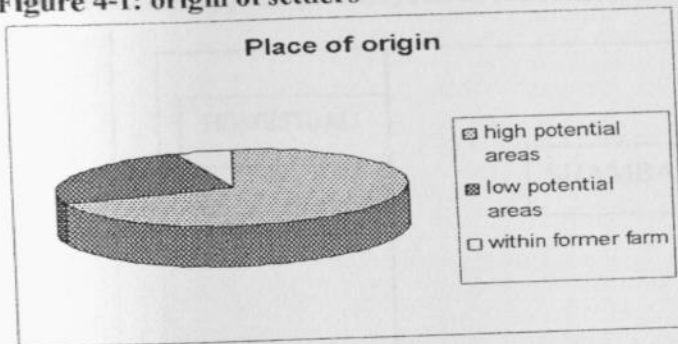


Map 4-3- Sheets 2, 3 and 4 of the eleven sheets of subdivision plans showing the subdivision pattern.



Following the subdivision of the large scale ranch into small scale farms, the area has undergone very rapid population growth. A great percentage of the settlers, 70%, came from high potential areas and introduced land use practices that are not suitable for the dry areas of their new settlements. Another 25% came from other low potential areas and 5% had moved from one part of the farm to another.

Figure 4-1: origin of settlers



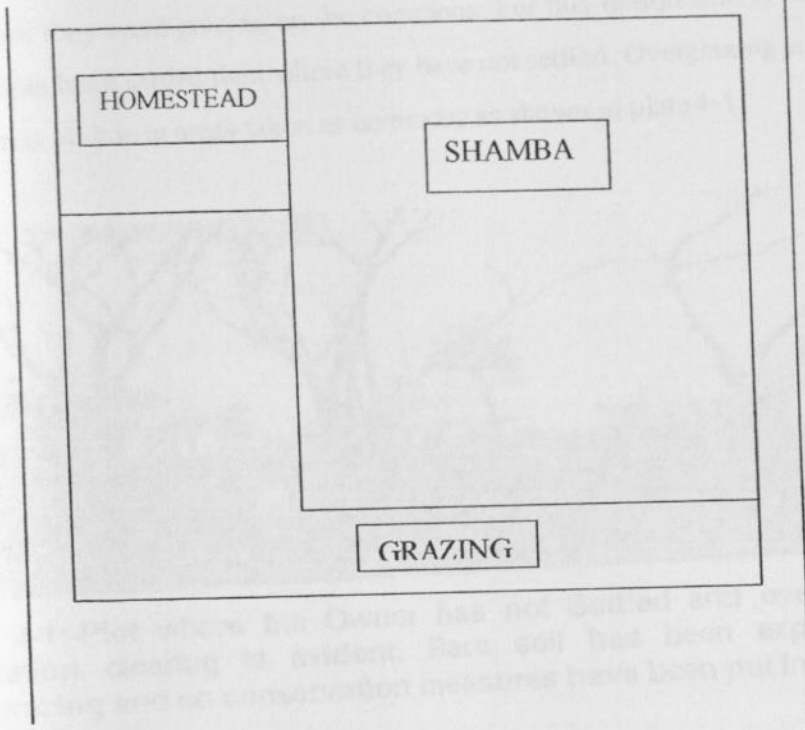
Source: Field survey 2003

The process of Settlement.

Case 1: Where people have settled.

After the farm is identified on allocation or after buying from original allottee, a temporary structure, usually of mud and grass thatch is constructed by the first member of the family to settle, normally the man. After establishment of a house on the farm, clearing of vegetation on the land begins followed by burning of unwanted vegetation in order to clear land from pests which involves burning, fencing, and charcoal burning. The small portion closest to the house that is already cleared is planted with food crops in the first rainy season. More land is often cleared in preparation for the next rainy season. At the same time other family members, such as wife and children, and some livestock are now brought from the original home area of the man to join the man in the new settlement. More land is cleared for successive rainy seasons until an optimum size is achieved. Generally the Shamba ie the area planted with crops takes two thirds of the whole farm. The homestead normally takes one eighth of the land while grazing takes the rest. A more permanent living structure may be built at this stage using locally prepared bricks with galvanized iron sheet roofing. Galvanized iron sheet roofing is not only used as a means of collecting/harvesting rain water, it is also an indication of a sense of ownership of the newly acquired land. The farm layout is shown as below:-

Figure 4-2: A Typical plot Layout in the settlement scheme



Source: Field survey 2003

The entrance to the homestead which comprises the dwelling houses, the cattle boma, granaries and a toilet is from an access road. After several years of settlement in the area, the land proves to be too small to sustain activities of the family especially grazing and charcoal burning as a means of supplementing family income. At this stage the family begins to graze on areas where other land owners have not settled with several families grazing their livestock on such land unsettled plots become a commons.

Case 2: Where People Have not settled

People who first settled in the area use neighbours plots for grazing, charcoal burning, and for collecting firewood. Neighbours are taken as commons with everyone trying to benefit as much as possible with some people fencing off other peoples land so that they can use them in exclusion of all others. The result is that the land is overgrazed as people begin to grazing here when it rains between the months of November and May. By June the land is so overgrazed that no more grazing can take place. The people now

take their livestock back to their pieces of land which they have preserved over the period when they were grazing on the commons. For this reason land is more degraded where people have settled than where they have not settled. Overgrazing and clearing of vegetation is visible in areas taken as commons as shown in plate 4-1.



Plate 4-1:-Plot where the Owner has not Settled and overgrazing and vegetation clearing is evident. Bare soil has been exposed due to overgrazing and no conservation measures have been put in place.

As a result of the increase in human population, demands on natural resources have grown and conflicts arise where the demand is higher than the available resources, as is the case of land for cultivation and scarce surface water. High population growth coupled with a rapid process of land use transformation led to a great increase in demand for water and cleared land for settlement.

4.2 Infrastructure and Community Facilities

Infrastructure quality and distribution has an effect on the cost of production and marketing overheads of locally produced goods. The level of service provision affects the productivity levels of the residents in given area. Poor infrastructure will increase the cost of farm inputs thereby increasing the unit cost of production. Transporting farm produce to markets outside the area of production where they can get good prices becomes costly when infrastructure is poor. Residents cannot get good prices for their goods as prices cannot compete with the same produce from other parts of the country where infrastructure is better. The time taken to reach centres that offer essential

services affects the productivity of a population resident in an area. This is because time which should have been used for economic activities is spent searching for these services. Inadequate services such as health and educational services make the standards of living low for the population in these areas.

A strategy to boost agricultural production through improvement of incentives on the cost side needs to give priority attention to the improvement of rural infrastructure both in social overhead capita, including service structures and institutions, and grid infrastructure. Ahmed and Rustiga (1985) examined marketing margins from studies in Nigeria, Sudan, Malawi, Kenya and Tanzania, on the one hand, and India, Bangladesh, Indonesia and the Philippines on the other. They found that marketing margins were on average twice as high in the African cases, and that 40% of the difference between the African and Asian examples was due to transportation alone

Pastoralism provides direct employment and livelihood to over 3 million Kenyans, with the value of the livestock resource base in the ASALs currently estimated at about Kshs. 70 billion. (Muriuki, 2001). The local market for beef for example still heavily relies on livestock from Ethiopia, Tanzania and Somalia due to poor livestock marketing systems. The marketing of hides and skins has been allowed to decline despite the fact that in 1988 hides and skins exports ranked fourth in foreign exchange earnings for the country. (Abdi Umar, 2000)

High population growth coupled with a rapid process of land use transformation led to a great increase in demand for facilities and cleared land for settlement. The population of the study area is calculated from population densities of the sub-locations covered by the study area.

Table 4-5: Population Densities in the Study Area.

Sub-location	Density(persons per sqKM)
Makasa	10
Mbukani	73
Thithi	55
Vololo	44
Yikivumbu	62
Mweini	53
Nthungui	61
Masamukye	20
Mukame wa Mbeu	24

Source: CBS, 2000

The average population density in the study area is 45 persons per sq KM. considering the area covered by the settlement scheme is 161.47 sq KM (16147 hectares) the total population in the study area was 7266 in the 1999 population census. The density is well below the districts average of 97 persons per sq KM.

Using the formula for population estimates over a period of time:-

$$P_n = P_o (1+r)^n$$

Where P_n is the projected population in n years

P_o is the base population

r is the current population growth rate

Making r the subject of the formulae:-

$$r = [(P_n/P_o)^{1/n} - 1] * 100$$

The growth rate for Makueni district currently is obtained as 16.4% as the 1989 total population was 169,288 and the 1999 population was 771,545. The growth rate is well above the national growth rate of 2.4% per annum.

Table 4-6: Population Projections for the Study Area.

Year	Total Population
1999	7266
2004	15526
2035	1720294

Source: Field survey 2003

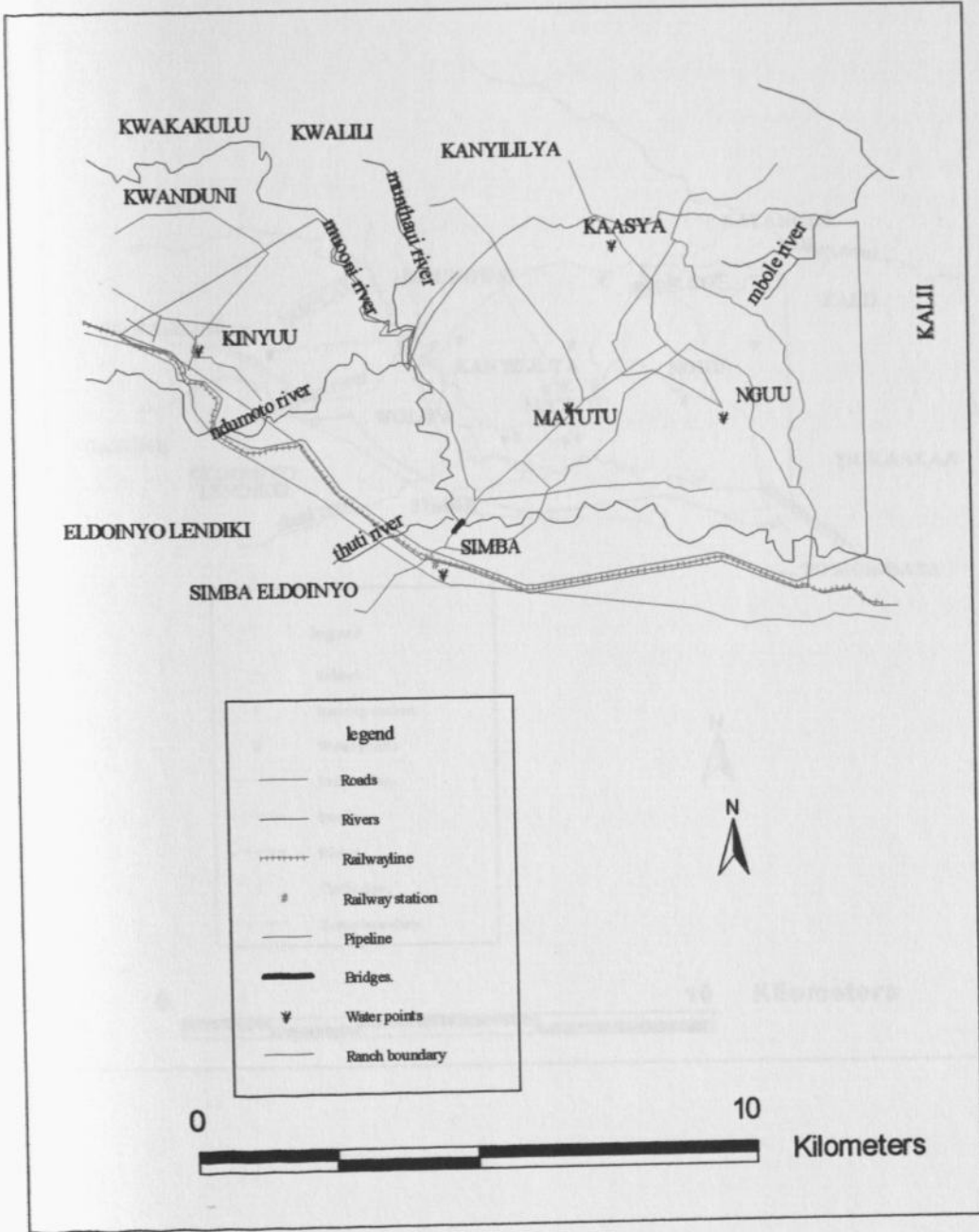
Table 4-7: The inter-censal growth rate for eastern province

Year	1969-1979	1979-1989	1989-1999
Growth Rate	3.5	3.3	2.1

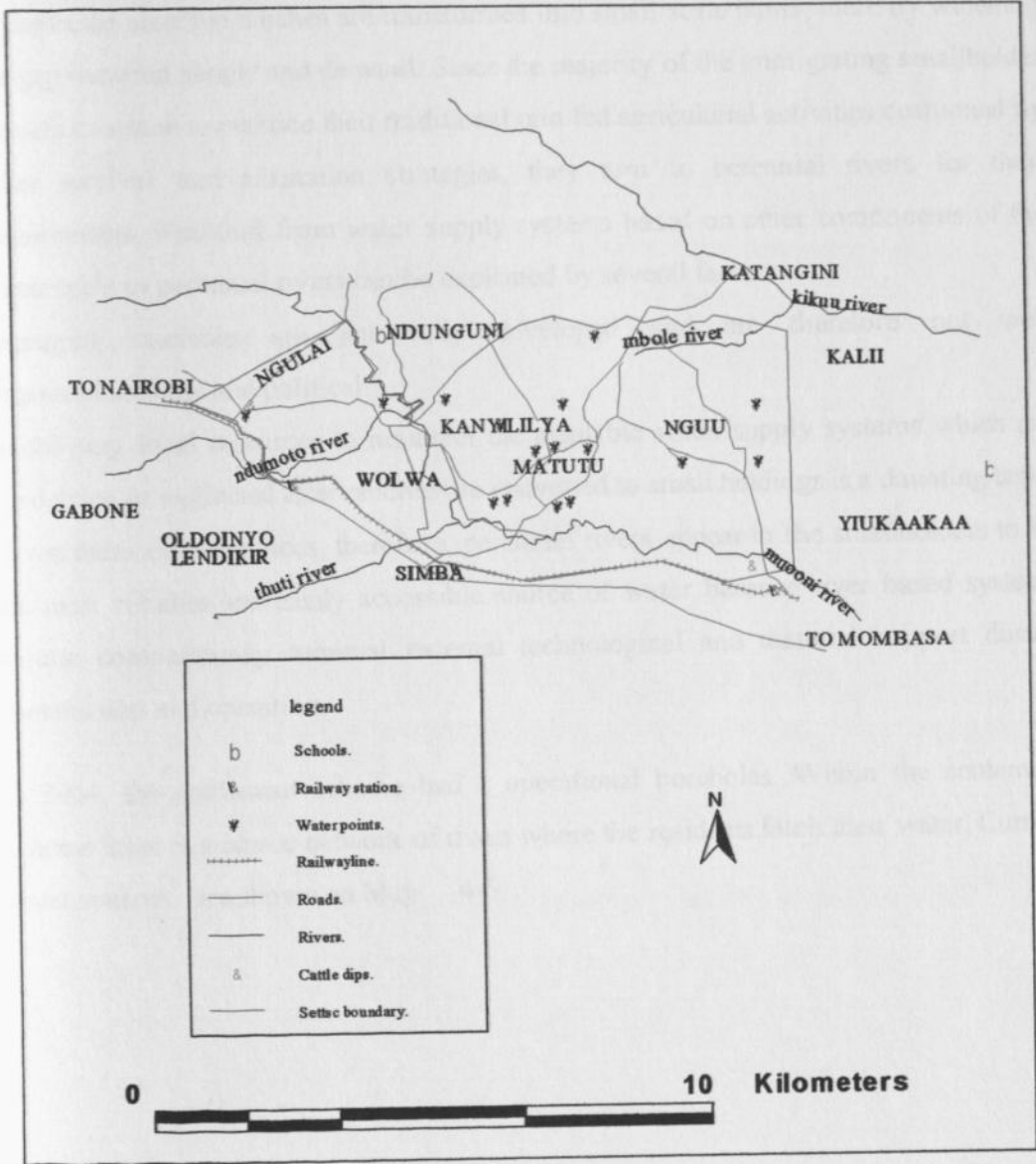
Source: CBS, 2000

Water facilities were well distributed throughout the farm before resettlement and were used for watering animals and for domestic use. There were two water tanks, one at Nguu hill, and another at Ngulai for rainwater storage and a pump house along Thuti River to enable cattle use water away from the river. The ranch management had taken the initiative to construct a causeway to help in crossing Muooni River during the rainy season. The entire farm was accessible by a series of access earth roads that could be used by range rovers, which would assist the management in monitoring their activities within the farm. There were a total of 3 boreholes, 8 waterholes all well distributed on the farm. There were three cattle dips, well distributed on the farm. The distribution of these facilities is shown on Map 4-4 and 4-5.

Map 4-4: Infrastructure and Facilities in 1962



Map 4-5: Infrastructure and Facilities 1974



Many of the water supply systems such as boreholes and dams were either vandalized or neglected after the ranches are transformed into small scale farms, there by widening the gap between supply and demand. Since the majority of the immigrating smallholder farmers continue to practice their traditional rain fed agricultural activities cushioned by other survival and adaptation strategies, they turn to perennial rivers for their requirements. The shift from water supply systems based on other components of the water cycle to perennial rivers can be explained by several factors:-

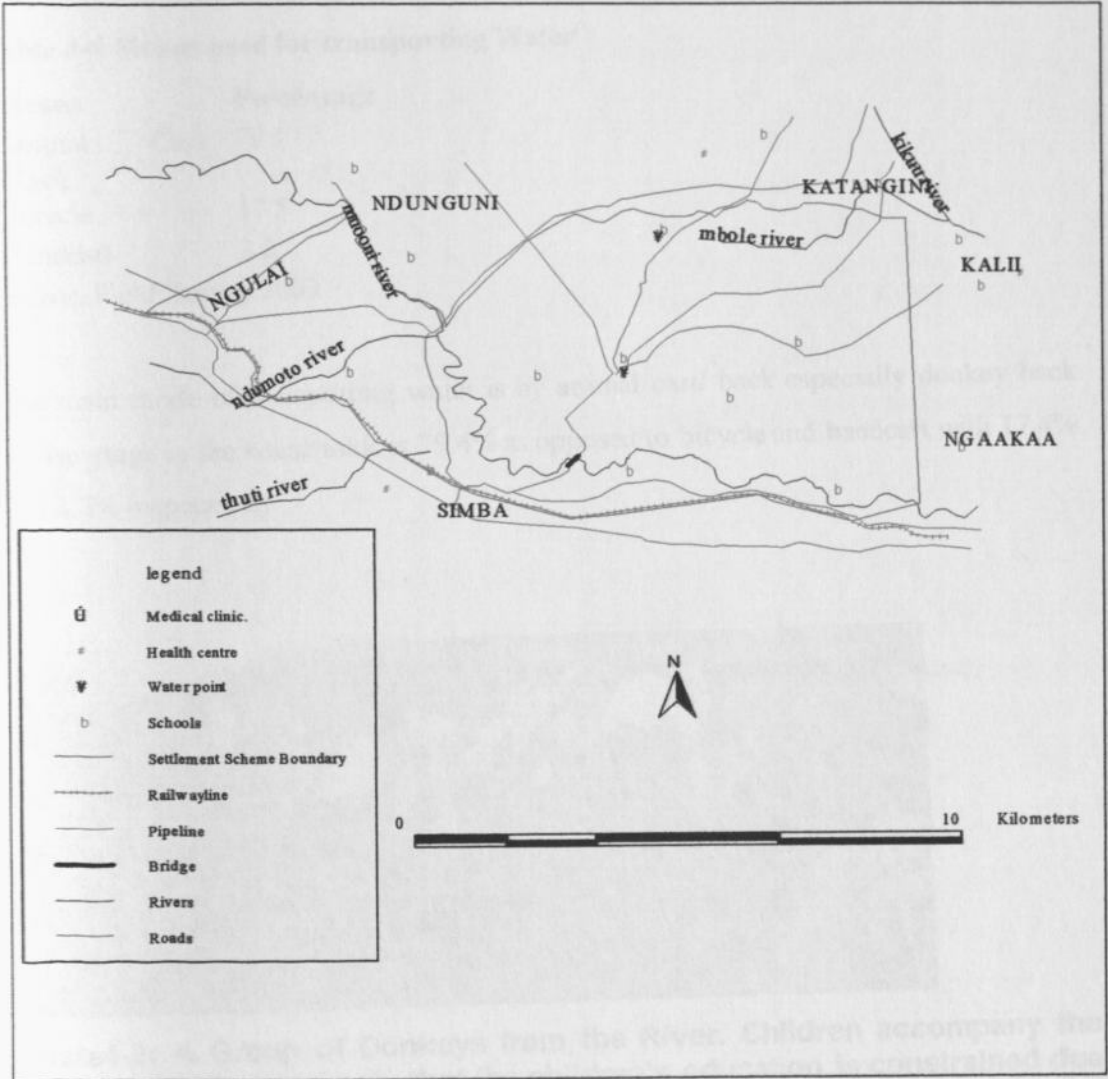
-emerging societies are not fully developed and are therefore not well organized socially and politically.

-mobilising local resources to maintain the available water supply systems which are vandalized or neglected after ranches are converted to small holdings is a daunting task.

Given these circumstances, therefore, perennial rivers appear to the smallholders to be the most reliable and easily accessible source of water because river based systems require comparatively minimal external technological and material support during construction and operation.

In 2004, the settlement scheme had 2 operational boreholes. Within the settlement scheme there is a scarce network of rivers where the residents fetch their water. Current water sources are shown on Map 4-6.

Map 4-6: Infrastructure and Facilities in 2003



The Kenya Needs Assessment report (1999) identified Nguu Division as the worst affected as concerns water resources in Makueni district.

Table 4-8 Means used for transporting Water

Means	Percentage
Animal Cart /Back	79.4
Bicycle	17.5
Handcart	3.2

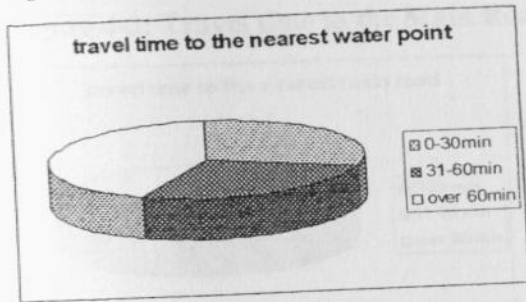
Source: Field Survey 2003

The main mode of transporting water is by animal cart/ back especially donkey back whose usage in the households is 79.4% as opposed to bicycle and handcart with 17.4% and 3.2% respectively.



Plate4-2: A Group of Donkeys from the River. Children accompany the donkeys. This may imply that the children's education is constrained due to the scarcity of water.

Figure 4-2: Travel time to water sources



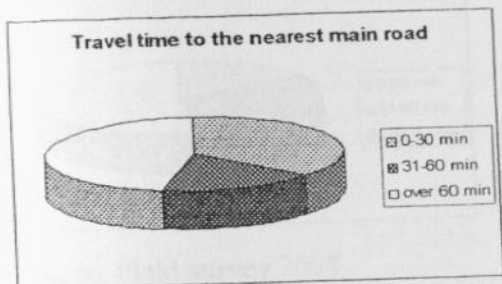
Source: field survey 2004

Out of the total population 43.3% take 60 minutes or more, 26.7% and 30% take 31-60 and 30 minutes or less to reach the nearest water point. The implications of such a long distance to the water point is that a grown up person may spend their day just fetching water without having time for any productive activity.

There are a total of 10 primary schools in the study area. Of the school going population, 63.3% take less than 30 min to reach the nearest primary school, 28.3% take 31-60 minutes while 5% take over 1 hour to reach the nearest primary school. Distribution of primary schools in 1974 and 2003 is as shown on maps 4-5 and 4-6 respectively. There is no single secondary school inside the settlement scheme while the physical planning handbook states that there should be a secondary school for a catchment population of 3500. Thus for the current population of 15,526; there should be four secondary schools. There is no single public medical facility in the settlement scheme and residents use facilities outside the settlement scheme and a one privately operated clinic within the settlement scheme.

Out of the population that travels 46.6% take over 1 hour to reach the main road, a road where they can get public transport means to other parts of the country.

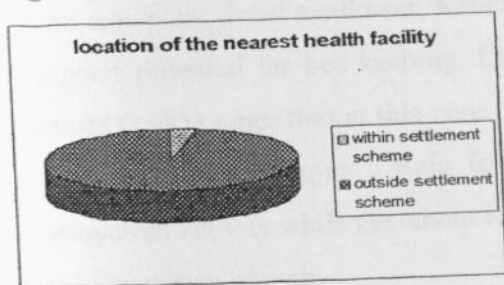
Figure 4-3: Travel time to the Main Road



Source: Field survey 2004

A majority of the residents, 96.7% of the residents used health facilities outside the settlement scheme, while 3.3% used facilities within the settlement scheme. There is no single public medical facility within the settlement scheme with only several private clinics operated in the market centres.

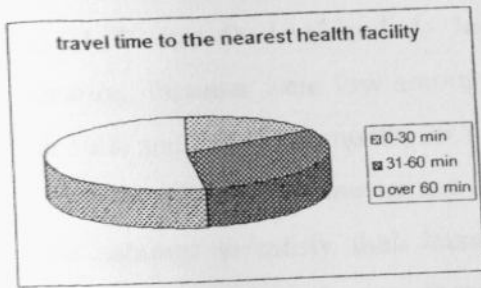
Figure 4-4: Location of health facilities



Source: Field survey 2004

Accessibility to health facilities is poor and 51.7% of the population take over 1 hour to reach the nearest health facility, 31.7% take 31-60 minutes while 16.7% take less than 30 minutes.

Figure 4-5: Travel time to health facilities



Source: Field survey 2004

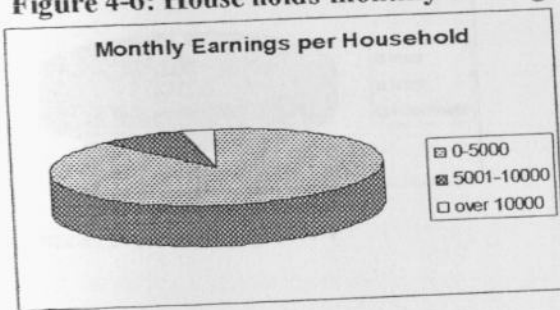
4.3 Socio-Economic Status

Settlement schemes as institutions have not fully succeeded in translating economic opportunities into reality for the settlers nor have they included full participation by them. (Harbenson, 1967). Nguu settlement scheme is within the LM5 and LM6 agro-ecological zones (Jaetzold and Schmidt, 1981) LM5 is known as the livestock millet zone and is suitable for growing of bulrush millet, dwarf sorghum, black and green grams, cowpeas, dwarf sunflower, Katumani maize, cotton and pigeon peas; pasture and has good potential for bee keeping. LM6 is the Lower Midland Ranching Zone and Jaetzold (1981) notes that in this zone "No rain fed agriculture is possible except with runoff catching techniques." Rain fed agriculture is therefore non-promising as an employment activity while the labour force will continue to increase drastically with the rapid population growth.

Before subdivision, the main economic activity was ranching under the then Nguu Ranching Cooperative Society which by the time of subdivision and resettlement had 1600 members. Ranching was well organized and due to economies of scale, marketing was easily done by the ranch management. After fragmentation, marketing of farm produce has been through middle men who exploit the farmers. A sack of maize has been going for Ksh.800 while a mature cow is bought for around Ksh.10000 with a goat going for as little as Ksh.300.

Of the adults living in the area, 28.3% had no education, 35% had primary education, and 31.7% had O- level and A- level while only 5% had university and tertiary education. Incomes were low among the residents as 65% of the households earned Ksh.5000 and below per month, 26.7 earned Ksh.5001-10000, while 8.3% earned over Ksh.10000. The low income earners cannot diversify their investments as they use their basic earnings to satisfy their basic needs. For such education levels and natural conditions in the area, to earn these incomes the residents must be a hard working society.

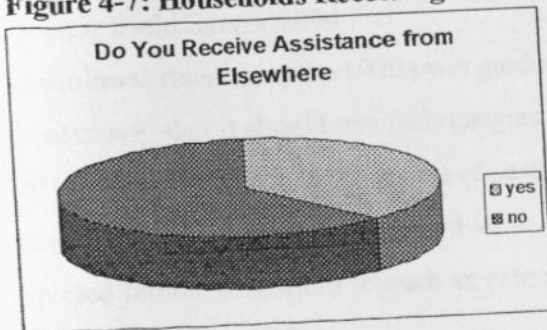
Figure 4-6: House holds monthly earning



Source: Field Survey 2004

There were strong economic links with households where the population originally migrated from with 38.3% of the residents receiving assistance from their relatives left their original homes while 61.7 did not receive any assistance.

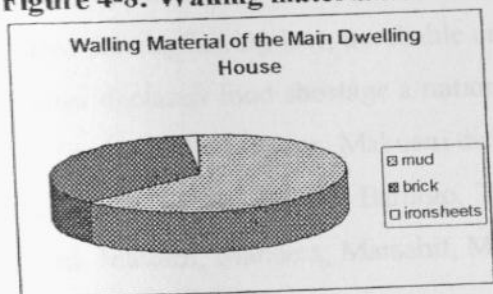
Figure 4-7: Households Receiving Assistance



Source: Field Survey 2004

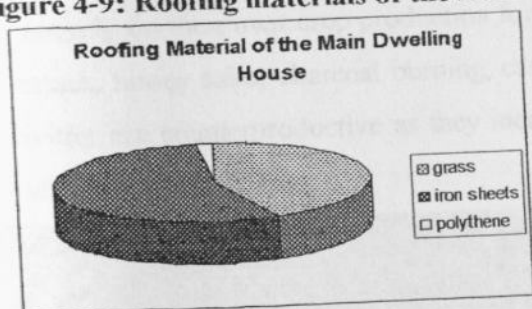
The use of mud as the main walling material in the area is an indicator of the incapability of the residents to purchase or make the more expensive materials such as bricks. Iron sheets are used by 55% of the households as the main roofing material, another 43.3% have used grass and 1.7% used polythene. The higher percentage in the use of iron sheets is because grass has become scarce due to environmental degradation that in most cases it is not readily available.

Figure 4-8: Walling materials of the main dwelling house



Source: Field Survey 2004

Figure 4-9: Roofing materials of the main dwelling house



Source: Field Survey 2004

Agricultural research in the 1970s was guided by the view that research in Africa should be adaptive, that it should use technologies and varieties available elsewhere. This has not worked well, especially because of pests and diseases. Kenya's food shortages have become so much a part of the world view, television, newspapers and magazines have depicted famine conditions to such an extent that starvation is now a widely known and discussed feature of life.

The main occupation in the area is farming as shown in the table 4-10. Farming activities are carried out in a fraction of a year due to the nature of the rain season and the fact that farming here is dependent on rainfall. This means that for about 6 months, from May to October when the rains return, the farmers remain idle leading to unemployment and sometimes seasonal migration to the towns. The main activity on the farm is subsistence farming as the farmers priority is food for consumption. Inadequate subsistence production occurs when the rains fail or become irregular, for example, the October- December rains which intensified in January after the crop had failed thereby having low, unreliable crop yields. When the president of the Republic of Kenya declared food shortage a national disaster and launched an international appeal for food in July this year; Makueni district was identified as one of the hard hit districts alongside Tukana, Kwale, Baringo, Tana River, Garissa, Ijara, Isiolo, Kajiado, Kilifi, Kitui, Malindi, Mandera, Marsabit, Moyale, Mwingi and Samburu. (Daily Nation, July 14, 2004 pg4)

Seventy percent of the agricultural production is from the short rains. Most households do not rely on their own crop production for their food. Sources of cash include sale of livestock, honey sales, charcoal burning, casual labour and remittances. Some of these activities are counterproductive as they increase the likelihood of drought and worsen its effects when it strikes.

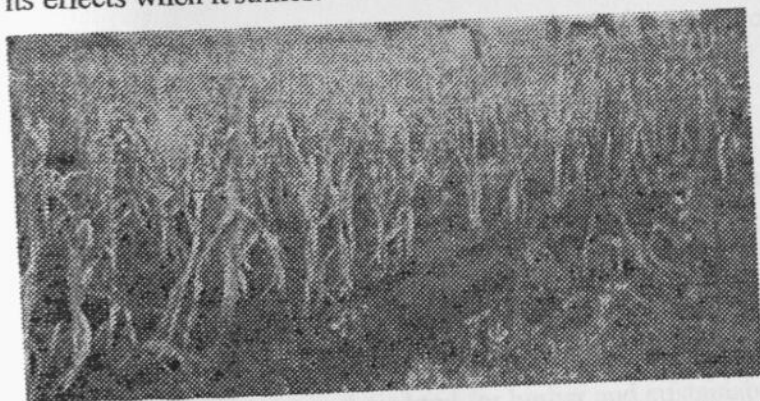


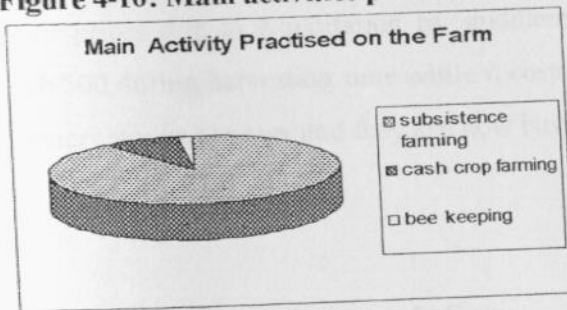
Plate4-3: A Maize Crop that has failed due to Rain failure when it was almost bearing fruit.

Table 4-9: Occupation of Households Head

Occupation	Percent
Farmer	63.3
Casual Labourer	18.3
Permanent Employment	18.3
Total	100

Source: Field Survey 2004

Figure 4-10: Main activities practiced on the farms



Source: Field Survey 2004

According to ILO report 1 hectare of high potential land is roughly taken as equivalent to 5 hectare of medium potential land or 100 hectares of low potential land. In summary, of the total land area in Kenya, no more than approximately 1/6 can be classified as having high to medium potential agricultural land suitable cultivation. The remainder can only sustain various degrees of commercial ranching or nomadic pastoralism. (Ministry of lands, 1978)

Land conflicts, whose extent and character differ constrain sustainable land use and may undermine rural development. Experience shows that attempts to mobilise small holder farmers to invest in sustainable land use often fail when land conflicts are not sorted out well, and when there is no feeling of land security. Crop producers are often more willing to invest in their land for higher and sustainable production when they are sure to use it for a long period and hence benefit from their investment.

Due to the unreliability of rainfall most of the men have left their homes to search for employment elsewhere leaving the women to take most of the household responsibilities. Women become responsible for child care, food preparation, cooking and cleaning in addition to their work in the fields and their care of live stock. Men have to go out of the village to look for money for their families needs. The women then assume full responsibility of the household chores.

Marketing of farm produce during bumper harvests is poor and farm produce fetches poor prices due to exploitation by middlemen. 1 bag of maize goes for as little as Ksh.500 during harvesting time while it costs Ksh.1800 during the dry season when the farmers stocks are over and they are now buying from the markets.

4.4 Environmental degradation.

Land use changes are generally conscious, volitional responses by humans or human societies to changes in biophysical or societal conditions. It is a response indicator, therefore, reflecting how and to what extent society is responding to meet its changing needs and goals or to adapt to changing environmental conditions. This does not exclude the possibility that some land use changes may, in turn, constitute a driving force for changes in the state of the environment. That is in the very nature of the complex causal network (not a simple causal chain), including a number of feedback loops, that is society's relationship with its environment.

Currently, land resources are clearly under stress; 16 percent of arable land is degraded and the percentage is increasing (FAO, 1997). Traditional systems of land management are either breaking down or are no longer adequate, and the management and technology needed to replace them is not always available. The primary reason for this situation is the increasing demands placed on land by the unprecedented rate of population growth and the effects it induces.

Given the natural factors limiting successful application of rain fed agriculture, and given the population increase resulting from continued immigration, the question of the struggle to survive among smallholder immigrants becomes one of paramount importance. Survival and coping strategies e.g. charcoal burning and illegal water obstructions, have generally led to resource degradation in the areas affected. Over millennia, people have become progressively more expert in exploiting land resources for their own ends. The limits on these resources are finite while human demands on them are not. Increased demand, or pressure on land resources, shows up as declining crop production, degradation of land quality and quantity, and competition for land.

4.4.1 Climatological Indicators

Climatological influences on land degradation may be direct or indirect. From the data maps of annual, monthly and seasonal variability of climate have been generated and can be used to indicate hazard, drought and extreme rainfall events. Rainfall indicators are those related to frequency and probability of drought and those related to rainfall occurrence of above and below normal rainfall anomalies and other extreme rainfall events.

Temperature indicators are the mean maximum; minimum and range of air temperatures close to the ground influence the rate of desiccation of the soil and vegetation. The same parameters are also influenced by the energy balance of the land surface and will therefore; respond to changes of existing or potential hazard of land degradation

4.4.2 Soil Erosion Indicators

Water erosion is soil erosion resulting from surface water runoff and is one of the most important and easily recognizable indicators of land degradation There are four major parameters that influence land degradation ;rainfall erosivity, soil erodability, slope of the land and soil cover.

Experiences show that wind erosion is a problem during the dry season, particularly in the dry lands receiving less than 600mm of annual rainfall and with sparse vegetation. It is therefore common in the study area during the dry season. A majority of the residents 66%, of the had identified water erosion as a cause of land degradation, 25% identified vegetation loss while 9% identified wind erosion as cause of land degradation.

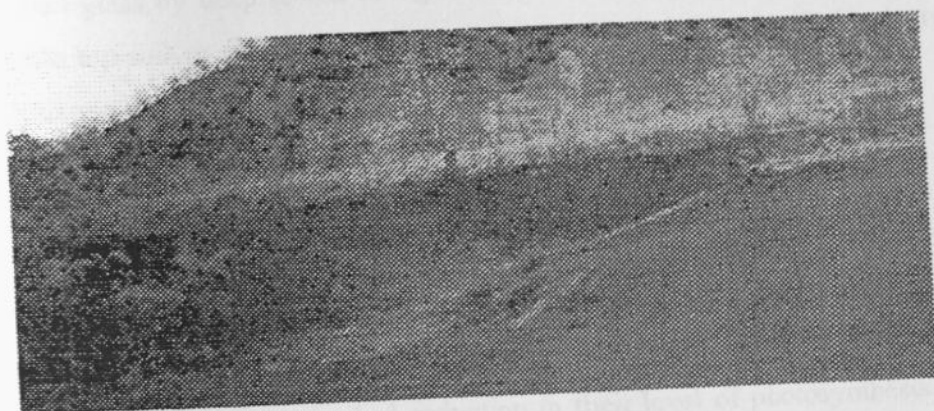


Plate 4-4: Gully Erosion caused by Rain Water

Wind erosion is a major contributor to soil erosion especially during the dry season



Plate 4-5: Wind Erosion caused by Donkeys on a Loose Soil Path. The donkeys use this path everyday causing large volumes of soil loss every year.

4.4.3 Vegetation Indicators

The abundance, productivity, species composition and canopy structure of natural vegetation are valuable indicators of land quality and hence the extent and severity of land degradation. Undesirable chemical changes in the soil: acidity, salinity or alkalinity is often indicated by disappearance of un-adapted plant trees. Replacement by shallow rooted grass by deep rooted drought tolerant trees and shrubs would indicate loss of fertile top soil or serious loss of water holding capacity because of a decrease in soil depth as a result of erosion.

Heavy grazing may be detrimental. Excessive trampling when conditions are dry will reduce the size of soil aggregates and break up plant litter to a point where they are subject to degradation processes. Trampling, by puddling the soil surface, can accelerate soil deterioration and erosion as infiltration capacity is reduced. Heavy grazing can kill plants or lead to their marked reduction in their level of photosynthesis. In addition, when relieved of competition from palatable plants or plants liable to trampling damage, resistant and usually unpalatable species expand their cover. Selective human harvesting of woody plants for construction or fuel has a negative effect on vegetation. Grass was used as the roofing material by 43.3% of the population, 55% used iron sheets while 1.7% used polythene. In many areas, households are traveling long distances in search of thatch grass. Mud which was used by 63.4% of the population, which must be accompanied by strong wooden posts as the walling material, 35% use brick while 1.75% use iron sheets. Wooden posts used in the construction of houses take long to mature hence their common use may make certain species distinct.

Modern influences and needs including education, health has lead to financial stress which leads to more exploitation of vegetation resources. Food shortages have forced people to turn to charcoal production as a source of income from which they can buy their food as well as for other basic needs.

Overgrazing in what the residents have taken as the commons has lead to vegetation loss and later to the Tragedy of the Commons. The tragedy of the commons develops in

this way: Picture a pasture open to all, it is to be expected that each herdsman will try to keep as many cattle as possible on the commons. As a rational being, each herdsman will try to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to me of adding one or more animals to my herd? The positive component is a function of the increment of one animal. The negative component is a function of the additional grazing created by one additional animal being a function of the overall effects of overgrazing by all the herdsmen.

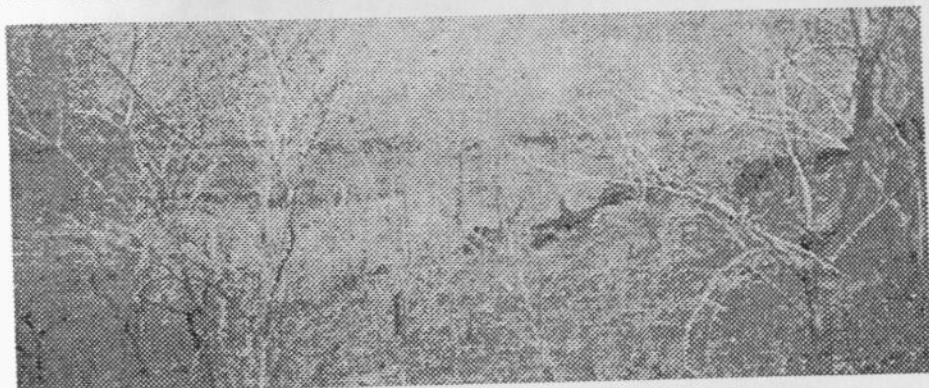
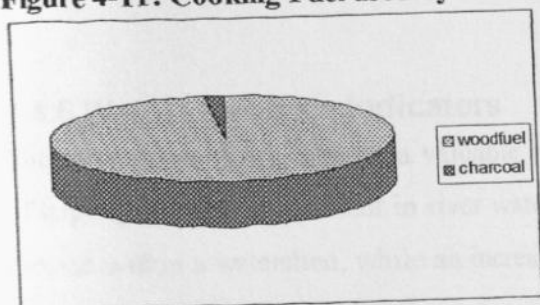


Plate 4-6: Bare Soil Due to Loss of Vegetation. Soil is exposed to Further Erosion by Wind or Water.

4.4.4 Fuel Wood Indicators

It is estimated that the majority, 70%, of Kenyans live in the rural areas and are entirely dependent on fuel wood as the source of energy for cooking and warming houses. The study showed that 98% use firewood as their main source of cooking fuel while the rest, 2% used charcoal as their main source of cooking fuel.

Figure 4-11: Cooking Fuel used by the Households



Source: Field Survey 2004

The ASALs are also a main source of large quantities of charcoal used in the urban areas. Residents have been burning charcoal to earn a living and according to the residents' charcoal from the area is regarded as superior by town residents. Middle men have been exploitative and are purchasing a sack of charcoal at Ksh. 100.

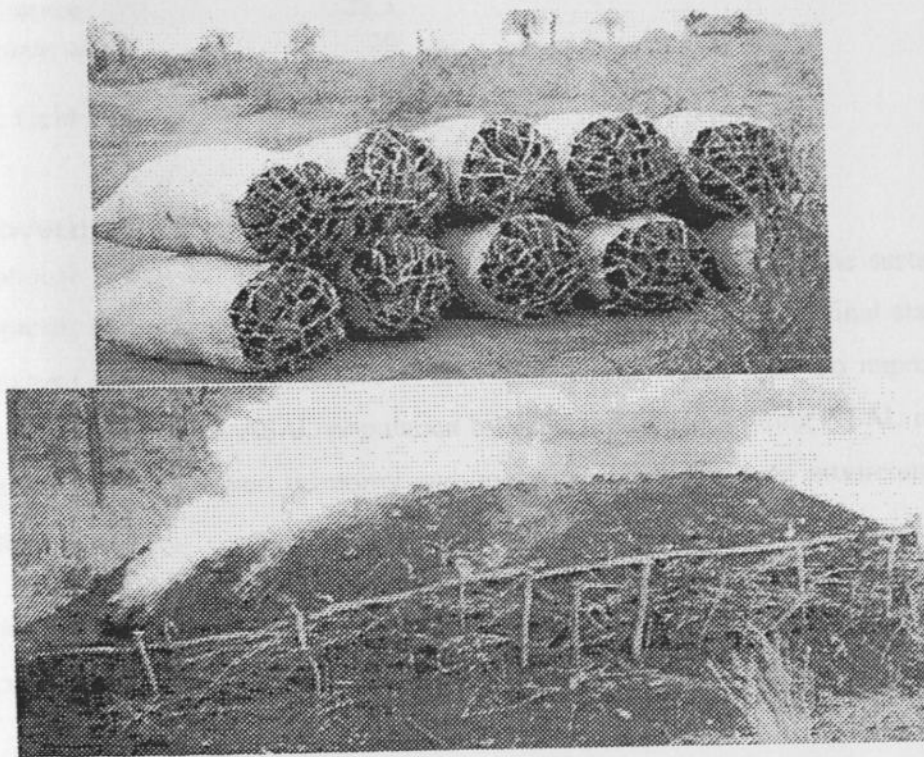


Plate 4-7: Sacks of Charcoal displayed on the roadside so as to attract middlemen while Charcoal burning continues. Note the Background vegetation from which the charcoal is made.

4.4.5 Water Resource Indicators

The state of water resources is a valuable indicator of land quality. Thus, the presence of large quantities of sediment in river water is usually the first visible indicator of soil erosion within a watershed, while an increase in frequency and height of flood peaks in stream flow is an indicator that the water infiltration rate is decreasing as a result of soil compaction or loss of technical farm development in the ASAL {ground cover.}

Salty water was identified by 54.7% of the residents as one of the problems in the water sector.

Table 4-10: Problems Experienced in the Water

Problem	Percentage
salty water	54.7
long distance	25.3
inadequate water	20

Source: Field Survey, 2003

4.5 Government Policy on the ASALs

The national policy on ASALs is outlined in the national policy for the sustainable development of the arid and semi arid lands of Kenya which is in its final stages of development (draft 4). The objective of the ASAL policy is stated as 'To improve the standard of living of the ASAL population by appropriately integrating ASAL into the mainstream of the national economy and social development in an environmentally sustainable manner'.

The following statements constitute the Government's policy guidelines for the development of the Arid and Semi Arid areas over the next 10-15 years:

Interdependence with non-ASAL areas: The Government understands that there exists a symbiotic relationship between the economies of the ASALs and those of the other parts of the country. It is not possible to realize effective economic growth in the rest of the country if the ASALs are not developing simultaneously. For example, the pastoral areas produce livestock and livestock products demanded in the non-ASALs while higher rainfall areas produce crop-based products demanded in the ASALs. In recognition of this fact, the Government will facilitate the development of strong linkages between the ASAL and non-ASAL economies by developing communication infrastructure such as telephone services, the road network and information sharing networks that will provide easy access to the ASALs and closer interaction between people in terms of trade, tourism, cultural values and general development;

Substantial investments required to tap the potential in the ASALs: The ASALs have enormous resources, ranging from human capital, wildlife, minerals, livestock, etc. and these, with proper policies and development approaches, could be significantly improved to provide a basis for improved lives and livelihoods in these areas and to contribute more to the country's economic recovery and growth. The Government recognizes that the solution to underdevelopment, the high incidence of poverty among ASAL populations, household food insecurity, declining natural resource base, insecurity and the high vulnerability of ASAL communities to disasters such as droughts and floods is in addressing the root causes of structural poverty and long-term societal vulnerability to disasters and livelihood shocks. In view of this, the Government will adopt a long-term development approach in the ASALs as opposed to implementing discrete short-term donor-funded relief and development projects that are often triggered by disasters such as droughts and floods.

Providing an enabling environment: The Government will provide an enabling environment for development. However, it is the responsibility of the communities themselves to chart out their own development agenda because they know what is best for them. Together with development partners, the Government will provide support by making substantial investments in "public goods" and infrastructure such as the improvement of the road network, communication systems, the elimination of insecurity and livestock thefts and the provision of appropriate basic social services in water, health and education sectors. In addition, appropriate policy reforms will be instituted in order to safeguard the benefits that accrue from investments at the local and community levels.

The role of communities in ASAL development: Participation of communities and beneficiaries in the identification, planning, implementation and evaluation of all kinds of development assistance projects is essential to ensure that they take on the full control and responsibility of activities and pursue them on a sustainable basis. Participation does not necessarily restrict itself to beneficiaries of development projects and/or local communities. These groups should indeed be involved in the identification

of felt needs and strategies for implementation. However, the concept of participation has to be extended to other actors as well. In its broadest sense, a development programme has four potential client groups i.e. beneficiaries/local communities, the private sector, civil society, including non-governmental organizations and government. Depending on the scope of the particular project, participation of these client groups should be guaranteed during project planning and implementation, in order to achieve sustainable development. The Government will encourage the participation of communities in programmes that affect them. This will be done through improved local governance and decentralized planning to ensure that decisions on programmes and resource allocation are made at the lowest feasible level (e.g. village level) in order to enhance ownership and sustainability of programme activities by communities.

Decentralized planning: There is need to decentralize development planning to the grassroots level in order to improve community involvement, participation and a sense of ownership of programmes that are meant to benefit them. The Government will support and facilitate reforms that will enable appropriate decentralization, both in terms of planning as well as disbursement of resources meant for communities. This is because there is evidence that such decentralised decision-making and planning mobilises social capital, puts communities in the lead role, empowers them and enhances transparency and accountability. The use, for example, of community-based civil institutions provides an effective vehicle for rural development and will obtain maximum Government support.

Livelihood diversification: The Government recognizes the importance of livestock in the lives and livelihood systems of pastoralist and agro-pastoralist communities. Pastoral and agro-pastoral production systems currently make the best use of natural resources in the rangelands, other factors not withstanding. While these production systems are not perfect and have considerable scope for improvement and for diversification to include aspects such as herd diversification, irrigated agriculture, mining, fishing, eco-tourism, cottage industries etc., the Government will continue to support pastoralism and agro-pastoralism as viable production systems that currently

provide livelihoods and employment for millions of Kenyans. Improvements in this sector through interventions in water provision; grazing and rangeland management; animal health; genetic improvement and marketing will be supported in order to improve productivity. However, economic diversification will be explored and supported in aspects such as: processing animal by-products like hides and skins; introduction of other livestock such as poultry and beekeeping; ostrich farming; game cropping and domestication and the introduction of camels in areas not previously rearing them.

In addition, most of the wildlife related tourism is in the semi arid and arid districts but it is all dominated by the hotel industry. County Councils receive part (part of) the entrance fees to parks and rent from lodges, but not much of this trickles down to individual households. Neither does it empower them in economic terms to get engaged in tourism related business. Campsites, walks and tour guiding, community-run wildlife conservation sites etc. will be encouraged in order to improve income sources and strengthen community-based natural resource and wildlife management capacities. On the other hand, sustainable mineral extraction such as titanium mining in Kwale, coastal region, will be encouraged and the government will ensure that local communities adequately benefit from such activities.

The principle of equity in development: The ASALs are inhabited by more than 25% of the country's human population and have one of the highest incidences of poverty in Kenya. It is the Government's intention to ensure that the ASALs are not disadvantaged in terms of national resource allocation and that they receive the adequate attention they deserve, both in terms of the provision of basic services such as education, health and water and with regard to wealth and employment creation such that these can enhance economic recovery. This will be promoted in a gender-sensitive fashion.

Local institutional and organizational development: There is need for continuously and systematically stimulating and supporting processes in which individuals, households and groups organize themselves around certain common interests or problems, for which they, based on their own analysis, want to find solutions.

Organizations and institutions form an important tool and source of power for ASAL communities, in which they can work systematically toward pursuing their long-term goals. Strengthening traditional institutions and building on them is a key priority. The Government will support the growth and development of community-based organisations such as pastoral associations and farmers' co-operative unions in order to mobilise much needed community-based institutional capacity, social and economic capital necessary for the development and growth of the ASAL economy.

Improving ASAL land tenure and land use policies: Clarifying resource tenure is a fundamental part of ASAL development. Nomadic pastoral livelihood systems are a rational response to life in an environment where resources are scarce and highly variable between seasons and years. Pastoralists move, not out of preference but out of need for water and pasture for livestock. Private individual tenure of pasture and large water sources is not viable in such circumstances, since each privately owned pasture or water point might have plentiful resources one year but none the next. State tenure and management has a poor record for ecological efficiency, equity and management standards.

Financial services for ASAL communities: It has been argued that the cash economy is not well developed in the ASALs. But the large capital investment a household herd represents, the high risk and high returns associated with it, and the high level of involvement of most pastoralists with the market, suggests that financial services have a key role to play in ASAL development. The Government will support programmes that seek to offer financial services to ASAL communities by encouraging the development of appropriate financial products and management procedures. Insurance schemes that seek to buffer production against specified environmental hazards such as droughts or floods will be encouraged. Mechanisms that support the participation of specific ASAL community groups e.g. pastoral associations, herder groups, agro-pastoral farmer groups etc. in taking responsibility for negotiating, managing and paying back on behalf of their members, etc. will be encouraged.

Reducing vulnerability to natural hazards and food insecurity: The Government will employ effective measures through its national disaster management framework in order to ensure that lives are not lost and that livelihoods are not devastated.

4.6 Land Use Statutes

(i) The Agriculture Act (Cap 318)

The Act defines agricultural land as “all land that is not within a township”. This means that all land which is not declared for any other use is agricultural land.

(ii) Crop Production and Livestock Act (Cap 321)

This Act regulates the quantity of land that could be utilized for food crops or livestock; what types of crops to be grown in which areas. It further urges agricultural land owners to cease growing a particular type of crop in a certain area; encouraging the most appropriate type of crop to be grown in the right areas, reducing livestock numbers to a level appropriate to the area in order to give the farmer maximum returns while safeguarding environmental conservation.

(iii) Water Act (Cap 372)

This law serves to ensure that certain water catchments areas are protected and that such areas are declared as water catchments areas. It protects water intended for domestic use from pollution.

Physical Planning Act (Cap 286)

The Act applies land planning regulation to all areas. Where these regulations apply, no person shall carry out any development in the interim planning area except with the consent of the Local Authority.

Land Control Act (Cap 302)

This Act gives unquestionable powers to the government to acquire any persons land for public utilities such as schools, hospitals, roads etc. Where such compulsory acquisition of land is made, the law requires that prompt and full compensation be paid to the owner.

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The relevance of all these legislation land use particularly in settlement schemes is limited in one way or another. First the general legislative schemes tend to give sectoral regimes of law for the regulation of a particular activity or for the utilization and exploitation of one particular resource. This makes inter-resource utilization and planning difficult. Second, most of the legal instruments merely provide a framework of, making legitimate decisions. A framework of compulsion and obligation to take decision is lacking. The provisions on protection, preservation, conservation, management and proper utilization of land are scattered into various statutes. Their implementation falls under different ministries/ departments which causes some conflicts of interests while implementing some of the statutes.

The government has been slow in policy implementation of policy. The sessional paper no 10 of 1965; "African Socialism and its Applications to Planning in Kenya" stated that a national land policy was to be created and physical planning extended from the towns and cities to districts and rural areas. other strategies adopted by the government such as the DFRD and the KRDS also emphasized on decentralized planning but weakness in governance in general and lack of power on the part of local communities has been noted as the most important factor which has contributed to lack of progress in the DFRD strategy. The sixth development plan (1989-1993) highlighted on ASAL development emphasizing that development and demonstration of low cost outlays of technical packages through accelerated farm developments would be done in these areas. In the current national development plan (2002-2008), the government aimed to develop ASAL areas through development of water harvesting techniques and exploitation of surface and ground water sources. Implementation of these policies requires many years to have a noticeable change. It took China 25 years to have economic changes during its four phases of land reform i.e. from 1945-1975. The current ASAL development policy paper is well thought and presented. If well implemented, the livelihoods of people living in the ASALs in Kenya could be improved.

There has been uncoordinated development of infrastructure in the study area making it expensive. For infrastructure to have greatest impacts in an area it has to be developed first in certain points then spread later to other areas.

There is a lot of soil erosion particularly gully erosion in the area an indicator that there is a lot of water going to waste. This water could otherwise be stored in dams and used for irrigation particularly rain fed assisted agriculture. Settled cultivation and herding without conservation measures has led to increased vegetation loss. Re-vegetation with drought resistant perennial fodder crops increased animal carrying capacities in Israel. These can also help in prevention and control of soil erosion.

Experience from Julius Nyerere's socialist approach in Tanzania showed that existing local family setups and local organizations alone cannot be used as a basis for national development but need to be supported by government administrative structures. The people's communes of China were created by merging advanced cooperatives with the lowest administrative units of government. The community in the study area is well organized in women groups (known as *Mwethya*), men groups and in some parts village development committees which development agencies could work with to make community participation a success.

The high population and the high population growth rates can be used positively; in construction of the much needed community facilities and infrastructure that will in turn support agriculture and marketing of produce. The Chinese were able to mobilize their unemployed and underemployed labour force to put up infrastructure such as dykes, dams irrigation channels and construction of roads. Because of this huge developments can be constructed with minimal machinery and financial inputs. The system of rural education was also geared towards educating and training the rural population for work within the farming unit, the commune.

Farming is the main economic activity in Nguu Settlement Scheme and the country in general. Water conservation and improved consumption methods such as maximization of control over runoff to enrich ground water sources; adopting green house agriculture and drip irrigation which utilize minimum water have been used in Israel. The Israelis succeeded in planting vegetables such as beet which are irrigated using a limited amount of water and planting short season vegetables which adjust well to dry climates. Technology such as using chemical fertilizers has been noted as a major contributor to the agriculture economy in China.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter consolidates conclusions from research findings and puts forward policy recommendations that can be adopted to guide subdivision and resettlement in ASAL areas; and to improve the living standards of rural communities living in these areas. Finally it draws an integrated conclusion about the study. This chapter emphasizes on policies as part of the fabric of social struggle and the outcome as well as a cause of historical developments.

5.1 Summary of Findings

This section gives a summary of research findings based on the objectives of the study stipulated in chapter one and with reference to data analysis in chapter four.

The first objective set out to identify land use patterns before and after subdivision of land in Nguu Ranch settlement scheme in of Makueni district. The land use changed from a single ranching establishment operated by a management to small scale farming. In 1974 only 5% of the settlers in the district had plot sizes of less than 14 acres compared to 71.7% to date; 95% had 15 acres and above compared to 28.3% to date. These changes were necessitated by population pressures in the high potential areas.

The second objective was to investigate the infrastructure services adequacy and spatial distribution in the settlement scheme. Infrastructure and services are deficient with settlers traveling for long distances to access these facilities. Some of the facilities such as public health facilities and secondary schools are completely lacking in the settlement scheme.

The third objective was to find out the economic problems experienced by newly settled communities of the in the settlement. The settlers continue to experience low living standards as their expectations of high food production from what they perceived as large land sizes as opposed to what they had in high potential areas have not been met. It can therefore be said that settlement schemes have not transformed their main purpose of economic growth in their respective areas into a reality.

The fourth objective was to investigate the effect of the changing land uses on the natural environment. The ecosystem found in the semi arid area is a fragile one. Before subsistence settlements are established the ecological balance is usually stable due to minimal disturbances. The study found out that the natural environment is drastically changing and is being negatively affected by settlements and their accompanying activities.

5.2 Conclusions

People in rural areas are continually faced with the difficulty in practice of achieving the multiple goals of "increased production", "raised living standards", "resource conservation" and "food self-sufficiency". Most of the farmers in the settlement scheme are struggling for subsistence due to a decline in agricultural productivity. The most salient factors which have lead to this are population increase due to natural increase and immigration, and the poor climatic conditions.

Farmers strive to make ends meet by adopting various other methods of income generation. The performance of the agricultural sector is hampered by low incomes due to poor prices and poor productivity. This is as a result of poor policy guidelines as far as pricing and rural enterprises is concerned. Lack of capital and poor climates have taken toll upon the quality of farming. Land degradation has taken place due to poor farming methods and a weakness in community initiatives to conserve the environment.

5.3 Recommendations

The fifth objective was to recommend policy and planning measures to guide subdivision and settlement pattern in large farms and settlement schemes. This section gives recommendations that make residents of Nguu settlement scheme achieve social and economic development. Proposed strategies and policies are supposed to be integrated and carried out concurrently so as to have a measurable impact in areas of application.

- **Macro-economic policies**

Since 80% of the country's population live in the rural areas and depend on agriculture for a livelihood, the government should adopt and implement a broad based rural development strategy. This shall involve implementation of the ASAL policy draft with increased and relocation of public spending in social sectors especially education, health, and employment creation programmes in ASAL regions. Health sector spending should be towards health centres, which will take services to the people as opposed to hospitals. Private initiatives should be appreciated through a well-designed framework to operate clinics and dispensaries in rural areas. The government can support education particularly secondary education by giving a hand in construction and provision of teachers, materials and equipment. The government should strive to achieve a macro economic policy, which is more specific to the ASALs and supports rural development. The current national development plan (2002-2008), whose theme is Effective Management for Sustainable Economic Growth and Poverty Reduction focuses on sustainable development and rising of the living standards of the people. The plan recognized the ASALs as ecologically fragile and susceptible to frequent droughts, which impact negatively on social and economic conditions of the inhabitants. The government aims to develop these areas through development of water harvesting techniques and exploitation of surface and groundwater sources. Institutionalization of effective drought management measures including early warning systems, improvement of infrastructure such as roads, health facilities and telecommunications; and

strengthening local institutions including other groups are to manage community based resources such as rural water supply systems and natural resources.

As the national policy on ASALs stated that "Kenya will not achieve sustained growth in the national economy as long as the ASALS (which comprise 80% of the country) and their enormous resources are not factored into effective national planning and development". There is a general understanding by the government that ASALs have their contributions to the national economy if well managed but the methodology on how to achieve this is lacking.

- **Food security**

The sharp increase in food prices during the dry period and drought year and the sharp decline during harvests implies a clear lack of management of food reserves. While the government should eliminate the monopoly enjoyed by NCPB in cereal marketing there should be an effort to develop alternative marketing strategies like the use of cooperatives instead of leaving the process to marketing forces as this leads to exploitation of farmers. The government must speed the response to indications of drought greatly improve its critical coordination role among producers, marketing agencies, research and consumers. There should be a well executed strategy of holding food reserves in deficit areas so as to militate possible repercussions of famine. Development agencies on the other hand can make use of already existing community organizations to construct grain storage facilities within the local area.

- **Use of water for Irrigation**

The intensity of rainfall and storm frequently results in large volumes of water moving across the land surface. The environmental problems created by large volumes of surface water are considerable and include soil stripping, sediment redistribution, falling crop yields and damage to manmade structures. Rainwater can be harnessed both for domestic use and agriculture while controlling soil erosion. The strategy for water resource use became the most important strategy in the development of arid zones in Israel and was

tied to the national policy for comprehensive water control. The strategy included the maximization of control over runoff in order to enrich groundwater sources.

The major source of water in the Negev (Israel's desert area) has always been surface runoff of winter rains directly by intercepting and concentrating the water trickling off the slopes before that water reaches the natural creek beds and accumulates to form a flood or indirectly trapping or diverting the natural floods often they have formed. The water is collected and stored in cisterns which are artificially constructed reservoirs filled by directing surface flows during rainstorms. To minimize evaporation each cistern is given only two openings, one for water to enter and one for water to be withdrawn. The goal is to reduce evaporation to store the runoff water then use it for agriculture. Another strategy was the improvement of water consumption methods such as those used in agriculture by adopting greenhouse agriculture and drip irrigation. Drip irrigation uses the least amount of water for irrigation compared to other methods.

The storage of water from winter to summer results in substantial loss due to evaporation, infiltration and leakage. The solution, as applied in Israel is to use this water immediately for supplementary irrigation of rain fed winter grain crops in areas with marginal rainfall. Another form of utilization of rainwater is to infiltrate and enrich a subterranean aquifer, later pumped out of shallow wells and used for irrigation of summer crops.

▪ **Rural Small Scale Enterprises (RSSE)**

Industries in rural areas and small towns which rely on local materials and agriculture for their inputs and markets can create job opportunities in rural areas. The common enterprises in rural areas include brick making, masonry, carpentry, retail, leatherworks, posho-mills and butchery. Development strategies must take account of employment creation possibilities through other rural outlets such as food processing and craft industries and education strategies must therefore provide training in such fields. An education system which helps prepare for employment diversification and the possibility of attaining satisfactory income levels, whether in rural areas or elsewhere, must be at the heart of the development strategy.

The rural industrial sector in China, consisting of state owned relatively large enterprises and collectively owned smaller companies, employs approximately 18million people. This amounts to 36 percent of the total industrial sector in China but a third of this would be transferred back to agricultural work at peak season. Labour that becomes idle during the dry period between May and October could be employed in small scale industries during this period.

▪ **New Innovations**

The Kiboko caves and Nguu rangelands have been cited as having potential for tourism. The top of Nguu hill is ideal for site seeing. These sites can be improved to create employment activities in the area. Other activities such as shooting sites, boarding schools and camps can be useful in linking the area with the outside world. Such activities will take advantage of land which can be obtained relatively cheaply and the hot to warm climate in Nguu settlement scheme.

▪ **Intensification of Land use**

The majority of households have less than 4.5 hectares. The effect of declining land sizes is low productivity hence poor living standards. A possible type of intensification is to have officials' advice farmers on the right time of planting, type of seeds, type and amount of fertilizer, and the appropriate type of breeds for the area. Another type of intensification is where the two planting seasons are taken as two different planting seasons. This requires research and production of new types of seeds that are early maturing and weather resistant crops. Agricultural practices such as mulching can be practiced with an aim of both retaining moisture in the soil and stepping up soil erosion. External production inputs and services fertilizer, credit and extension advice also stimulate production. In some countries, the problem of providing inputs and extension to scattered, small scale producers has been overcome by giving farmers responsibility for this task, through their own organizations.

In the sixth national development plan (1989 – 1993) dry land farming systems for the ASALs was emphasized with continued development and demonstration of low cost

outlays of technical packages through an accelerated farming systems development. If this is implemented production levels could improve. In the 1994 –1996 national development plan, the government through its ministries was to assist in making available the means of exploiting the important production potentials of ASALs resources, thereby contributing significantly to income, employment and food security.

The Swynnerton plan stated “sound agricultural development is dependent upon a system of land tenure which will make available to the African farmers a unit of land, a system of farming whose production will support his family at a level, taking into account preliquisites derived from the farm, comparable to other occupations. He must be provided with such security of tenure through an indefeasible title as will encourage him to invest his labour and profits into the development of his farm and as well enable him to offer it as security against such financial credits as he may wish, to secure from such sources as may be open to him.”

Re-vegetation with drought resistant perennial fodder plants increased animal carrying capacities and was useful in overcoming grazing problems in the critical period of the annual cycle and severe droughts.

▪ **Availability of credit facilities**

There is a need to design special programmes that would enhance the capacity of credit to rural farmers and entrepreneurs. For the farmers to increase their productivity there should be an external injection of credit both in cash and in capital. Material loans can include seeds and marketing services, while cash credit schemes can be designed in conjunction with local banks which can recover their money from farm produce.

▪ **Price stability and price controls**

Minimum prices should be guaranteed for agricultural commodities particularly livestock by government having control on the activities of middle men who exploit the farmers. The government has to set minimum prices as well as the range within which the prices will fluctuate. While setting this certain conditions have to be considered; e.g.

the cost of production of the commodities, the prices at the consumer markets. Sufficiently attractive prices for production determined by the forces of supply and demand are the key incentive to production.

Low producer prices set by marketing boards and other monopolies depress prices creating, in turn, demand pressures that stimulate food imports and disincentives to local production. The cost of maintaining parastatal marketing boards in the United Republic of Tanzania, for example, was so high that the prices they paid for maize were less than a third of what farmers could obtain in illegal parallel markets. Relaxation of state controls opened the way for large-scale private trading and sharp increases in maize production. In China, the terms of trade were steadily turned in favour of the peasants by raising the prices paid by the state for agricultural products and lowering the prices of many goods purchased by the peasants.

▪ **Community based environmental conservation measures**

Rising population density is one of a number of important preconditions for investment in soil and water conservation measures. This argument is a counter to the often repeated Malthusian view that population growth will inevitably outstrip food supplies, results in environmental degradation, and ultimately starvation or forced migration. The uncertain returns from investment in dry land agriculture and conservation measures in particular mean that formal credit arrangements are unlikely to work effectively. Small scale soil and water conservation does not require major capital investments and therefore there is limited need to mobilize cash.

Conservation of water supplies and productive land through the maintenance of forests, wind breaker and proper methods of land cultivation and prevention of fire and flood must be actively promoted by the government and the people to be fully informed and their cooperation ensured. Nations having high population growth such as China should learn from its innovative ways of feeding the ever increasing population. As Jack Westoby writes in his paper on forestry, the Chinese have: challenged the "point of no return". They have shown that rivers can be tamed, wind and water erosion halted, land

rehabilitated, deserts made to gloom again. Moreover they have shown that all this can be done without multi million dollar loans, without battalions of professional foresters, without arrays of earth moving equipment. Because of this, huge developments such as dams, irrigation systems, e.t.c. which contribute highly to the nation's economy were constructed with minimal machinery inputs. Existing local groups such as women groups (locally known as Mwethya), men groups can partner with development agencies to take advantage of the food for work programmes.

It can be said that Julius Nyerere's socialist policy in Tanzania failed. His proposal that production systems and teams be based on the existing local family setups the "ujamaa" is an indicator that traditional organizations alone cannot be used as bases for national development. Tanzania's organizational structure was not comprehensive enough to successfully manage the socialist system. Any government requires a large financial base and a properly established administrative structure to run a communal system successfully.

- **Empowering local communities.**

According to sessional paper no. 10 of 1965 "African socialism and its applications to planning in Kenya", a national land use policy was to be created and physical planning extended from the towns and cities to districts and rural areas. This policy was never implemented properly and it is still viable. Lack of power on the part of local communities resulting in continued dominance by the state in almost every aspect of development, combined with the ever shrinking financial base, have been cited as having contributed to the crisis concerning the DFRD.

In the year 2001, the Kenya Rural Development Strategy (KRDS) was established and its vision was presented its vision "sustainable and equitable rural development for all". In comparison with the DFRD of 1983, what is more notable in KRDS is its stronger emphasis on empowerment of the rural beneficiaries, the need to strengthen budget execution to ensure that resources are reaching communities, combating corruption, and participation of the private sector, NGOs and Community Based Organizations (CBOs).

KRDS recommended changes in the government structure so that district officers were accountable to local level government for the development, implementation, and funding of development initiatives.

- **Use of indigenous knowledge**

The shift to local level planning, appreciation of indigenous techniques and acceptance that there are limits to technological solutions to complex land management problems are undoubtedly a step in the right direction. Generally, smallholder farmers, new settlers or nomadic livestock owners have their own ideas about adequate use of land resources. Particularly in settlement areas with traditional arable farming and livestock-keeping societies, the experience and knowledge collected over time manifest themselves in the impressive diversity and adaptation of land use systems. Concerned communities are capable partners in development not only through contribution in cash, kind and labour but also in the wealth of indigenous knowledge and experience regarding the use of natural resources available to local communities. Such knowledge can constitute a conceptual basis upon which appropriate responses can evolve for more sustainable management of the natural resource base.

The indigenous knowledge is an important potential when the development of technical aspects or agreements and decisions on land use are being discussed. In addition to a lack of a common vocabulary, especially concerning the environment, a major problem is the different interpretation of the ecological context by the experts educated in the West and the local population. Experiments were successful, in Israel with vegetables such as beet, which can be irrigated using a limited amount of water, short season vegetables which adjust well to dry climates.

- **Improved infrastructure**

Lack of infrastructure discourages production. Infrastructure improvements include expansion of transport networks, storage facilities, agro-processing industries and markets. Ideally, communities should initiate, manage and maintain a large part of infrastructure from their own resources.

- **Service centre strategy**

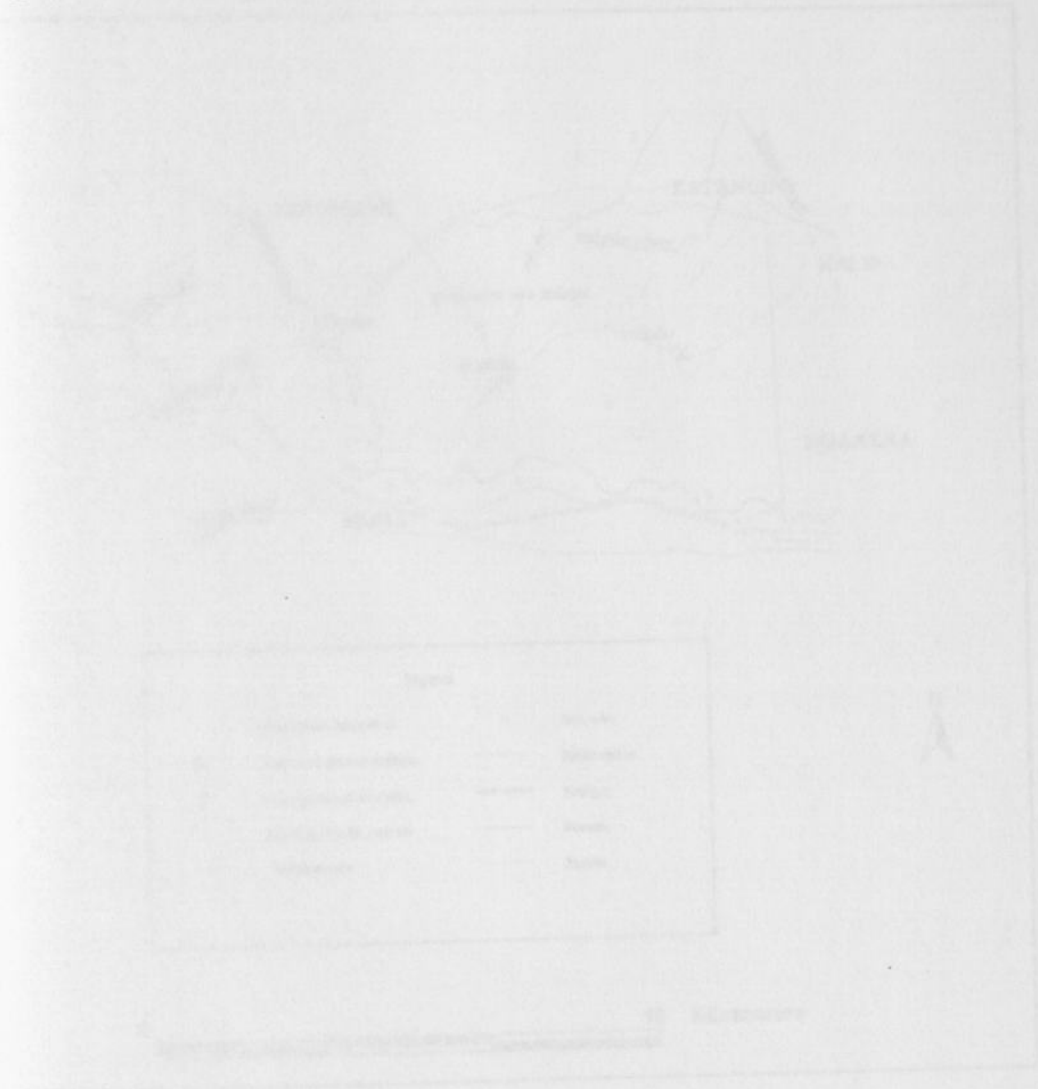
Larger populations should be concentrated in or near villages or where facilities can be provided cheaply, leading to drastic reduction in the cost of services. Taking a 'strategic geographic approach' to planning and implementation in the study area would be more cost effective. This would reflect on current trade networks, transport corridors, service centers, water points, local economic resources, concentrations of skill sets, zones of insecurity etc and examine the current logic of the ways in which the ASAL area interacts with itself, with the highlands and with the neighboring markets.

The approach would identify areas where meager government and donor resources could then be deployed with greater effectiveness than simply responding to emergency situations or the most promising technology or even according to greatest need but not necessarily absorptive capacity. Such an idea draws on the era of area-based Integrated Development Programmes popular in the 70's but which proved to be too complex, centralized and resource intense, as well as geographically limited.

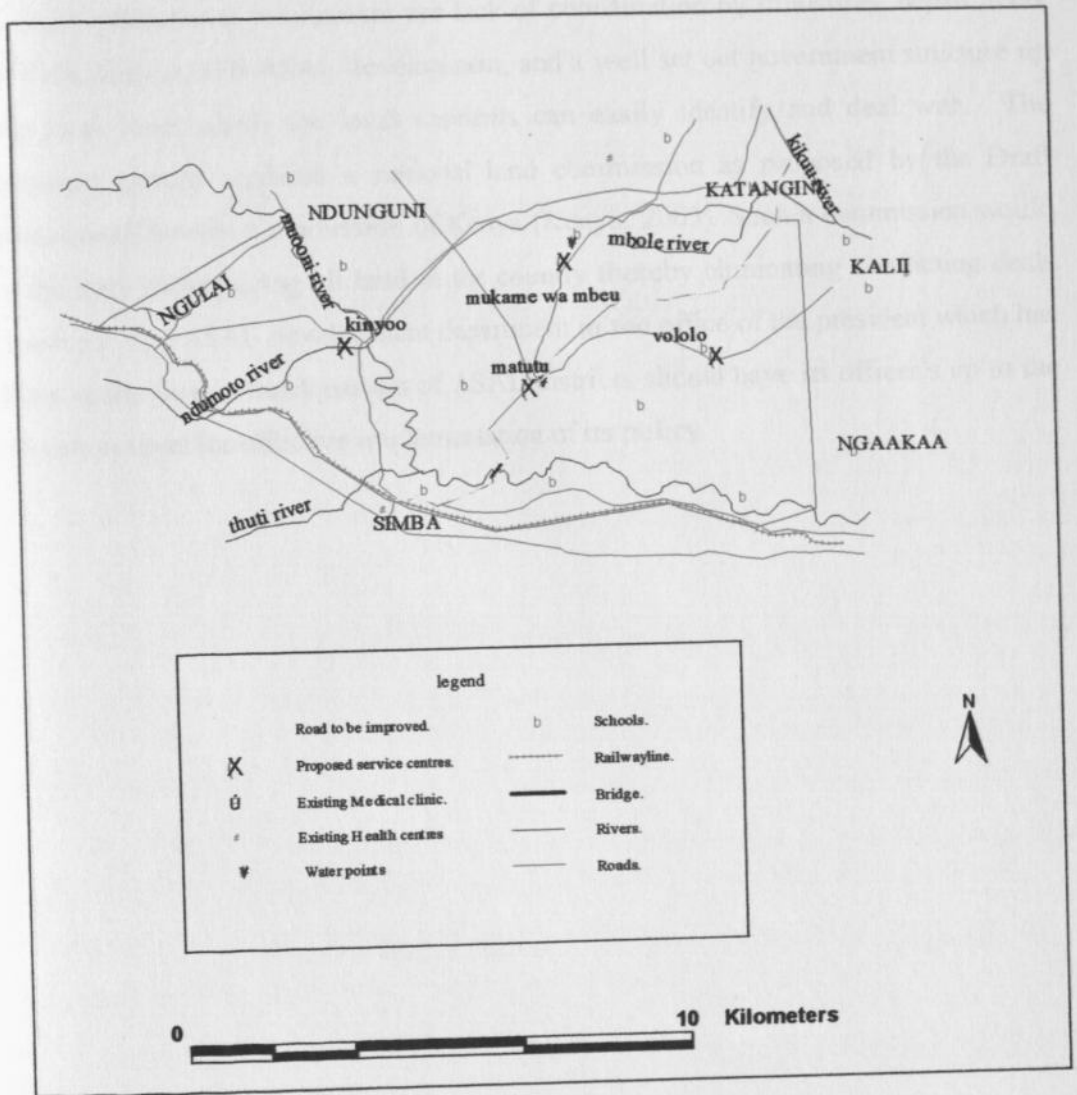
What is proposed is rather an identification of the most promising entry points in the area to serve as service centres. These are essentially about location of, water, transport, markets, services etc and build the capacity of local agents with a higher level of education and/ or experience to assist their fellows in skill development. Other services to be concentrated in these centres would include marketing, credit provision, formal education, veterinary services, stock rebuilding through dry season fodder enclosures based on water harvesting, dry land gardens based on solar pumping for low cost drip irrigation etc. Initial centers for service delivery are already existing market centres and are located as shown in map 4-5 below.

The existing road from Simba along Mombasa road (A109) through Matutu to Katangini (E705) should be upgraded to class B road to join Mombasa road. This will open up the area to the rest of the country. Having a class B road will enable the area to benefit from

Kenya Roads Board (KRB) funds as 53% of its funds is allocated for Making and repairing class A and B roads.



Map 5-1: Proposed Service Centres and Road to be upgraded.



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APPENDICES

APPENDIX I

HOUSEHOLD QUESTIONNAIRE

Survey on "Land Use Planning in Arid and Semi Arid Areas-A case study of Nguu Settlement Scheme in Makueni District." In this survey we are going to ask some questions about your opinions on issues touching on this topic. Your answers will be treated in confidence. The information provided in this survey shall be used for this study, and not for any other purpose.

PART A: IDENTIFICATION

- (a) Respondents name (optional)-----
- (b) Interviewers name -----
- (c) Date-----
- (d) Location/Locality-----
- (e) Questionnaire No-----

PART B: HOUSEHOLD DETAILS

1. When did you settle here? -----
2. What is the size of the household? -----
3. Do you own the farm?
 - i. Yes
 - ii. No
4. Does the household head live on the farm?
 - i. Yes
 - ii. No
5. Where was the household head born? -----
 - i. Within former cooperative farm
 - ii. Within district
 - iii. Outside district

6. Details on members of household

Household Member	Relationship with HH head	Sex	Age	Tribe/Race	Level of Education	Occupation

7. What is the monthly income level of the household?

- i. 1000 and below
- ii. 1000-5000
- iii. 5001-10000
- iv. 10000 and above.

8. How much do you spend on the following?

Item	Expenditure per month
Food	
Fuel	
Clothing	
School Fees	
Health	
Transport	
Others (specify)	

9. Condition of the main dwelling home

No. Of rooms	Kitchen	Sitting Room	Bedroom	Store	Toilet/ Bathroom	Walling material	Floor finish	Roofing material

10. Sources of fuel

- i. Firewood
- ii. Charcoal
- iii. LPG
- iv. Paraffin
- v. Others (Specify)

PART C: LAND USE

11. How many pieces of land do you own? -----

12. What is plot size (hectares)? -----

13. What is the land tenure system?

- i. Freehold
- ii. Trust land
- iii. Government land
- iv. Others (Specify)

14. How did you acquire this land?

- i. Purchased
- ii. Inherited
- iii. Allocated
- iv. Others (Specify)

15. Do you have a title deed?

- i. Yes
- ii. No

16. What is the present value of the land? -----

17. What are the main economic activities?

- i. Subsistence farming
- ii. Cash crop farming
- iii. Livestock farming
- iv. Others (specify)

18. How much do you earn from the farm annually

- i. 1000 and below
- ii. 1000-5000
- iii. 5001-10000
- iv. 10000 -20,000
- v. Over 20,000

19. Do you have any other source of income?

- i. Yes
- ii. No

If yes how much do you earn?

- i. 1000 and below

- ii. 1000-5000
- iii. 5001-10000
- iv. 10000 -20,000
- v. Over 20,000

20. Would you consider the land suitable for your needs?

- i. Yes
- ii. No

Explain -----

21. Is this piece of land under any ownership/user conflicts?

- i. Yes
- ii. No

If yes explain -----

PART D: INFRASTRUCTURE AND COMMUNITY SERVICES

22. What methods do you use for wastewater disposal?

- i. Septic tank
- ii. Pit latrine
- iii. Others (Specify)

23. Where do you get your water?

- i. River
- ii. Borehole
- iii. Water Vendors
- iv. Piped
- v. Roof/ Rain Catchment
- vi. Others (Specify)

24. By what means do you carry water?

- i. Animal cart
- ii. Handcart
- iii. On back
- iv. Motor vehicle
- v. Others (Specify)

25. How long does it take to reach the water point?

- i 1-30 minutes
- ii 31-60 minutes
- iii 61-90 minutes
- iv Over 90 minutes

26. What problems do you experience in water sector? -----

26. Please fill in the table below

Infrastructure/ Service Type	Facility/ Name	Location		Travel time	Key Problems
		With former farm	Outside former farm		
Main road					
Minor road					
Secondary School					
Primary School					
Nursery School					
Health facility					
Library					
Worship					
Sports					
Entertainment					
Shopping					
Cattle Dip					

27. Do you have any other comments? -----

Appendix II

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

Survey on "Land Use Planning in Arid and Semi Arid Areas-A case study of Nguu Settlement Scheme in Makueni District." " In this survey we are going to ask some questions about your opinions on issues touching on this topic. Your answers will be treated in confidence. The information provided in this survey shall be used for this study, and not for any other purpose.

Questionnaire for District Adjudication Officer (Makueni District)

(Please support your answers with relevant data and documents)

Respondents name (optional) -----

Date-----

How long have you worked in the district-----

1. What is the role of the district Adjudication Officer in subdivision and resettlement in settlement schemes in the district?-----
2. Would you say that settlement schemes in the district have achieved their objectives? (Explain)-----
3. What was the cause of land use change from ranching to a settlement scheme in this area.-----
4. What was the criterion for allocation of plots to individuals in Nguu Settlement Scheme?-----

5. Were any payments to be made on allocation of plots in Nguu settlement scheme? How much and how? -----
6. How would you describe the progress of Nguu settlement scheme? -----

7. What would you identify as the major challenges in initiation and management of settlement schemes in the district? -----

8. What would you identify as the major opportunities in settlement schemes and land use in general in the district? -----

Appendix III

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

Questionnaire for District Agricultural Officer (Makueni District)

Survey on "Land Use Planning in Arid and Semi Arid Areas-A case study of Nguu Settlement Scheme in Makueni District." In this survey we are going to ask some questions about your opinions on issues touching on this topic. Your answers will be treated in confidence. The information provided in this survey shall be used for this study, and not for any other purpose.

(Please support your answers with relevant data and documents)

Respondents name (optional)-----

Date-----

How long have you worked in the district-----

1. What is the role of the district agricultural officer in subdivision and resettlement in settlement schemes in the district? -----

2. Has agricultural production been steady in the district? Explain any variations-----

3. Which is your concerned land uses in the district? -----

4. What has been the agricultural land use policy in the district? -----

5. How has it changed over time and what has this caused these changes? -----

6. What can you say about immigration and population increase in the district? ---

7. What can you identify as the major ecological constraints in the district and in Nguu Settlement Scheme? -----

8. What was the land carrying capacity in the area before subdivision and resettlement? ---

9. How has this changed after subdivision and resettlement? -----

10. What can you identify as the causes of this change? -----

11. What can you identify as strategic policy interventions that can improve agricultural production and productivity in the district in general and the ASAL areas specifically? -----

Appendix IV

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

Questionnaire for County Council of Makueni (Town Clerk)

Survey on "Land Use Planning in Arid and Semi Arid Areas-A case study of Nguu Settlement Scheme in Makueni District." " In this survey we are going to ask some questions about your opinions on issues touching on this topic. Your answers will be treated in confidence. The information provided in this survey shall be used for this study, and not for any other purpose.

(Please support your answers with relevant data and documents)

Respondents name (optional) -----

Date-----

Position of respondent-----

How long have you worked in the district-----

1. What is the role of the county council in subdivision and resettlement in settlement schemes in the district? -----
2. How many settlement schemes are in the district? (Please list them)-----

3. How is government land allocated to individuals within the county council? -----

4. What are the bodies charged with allocation of land, what are their responsibilities and their membership? -----
5. Are there any problems encountered in land allocation within the county council? -----

6. What other land related matters do you experience as a council in the district? -----

7. What do you consider to be the solution to these problems? -----
8. What are your future plans concerning land matters for the district in the next 10-15 year? -----
9. What are the major sources of incomes in the county council? -----

10. What other opportunities are available as sources of income for the council? -----

APPENDIX V

UNIVERSITY OF NAIROBI

DEPARTMENT OF URBAN AND REGIONAL PLANNING

Questionnaire for former Members of cooperative society.

Survey on "Land Use Planning in Arid and Semi Arid Areas-A case study of Nguu Settlement Scheme in Makueni District." " In this survey we are going to ask some questions about your opinions on issues touching on this topic. Your answers will be treated in confidence. The information provided in this survey shall be used for this study, and not for any other purpose

1. When was the ranching society formed? -----
2. What were its objectives/ aims/ purposes? -----

2. How large was the farm? -----
3. When was the farm subdivided to its members? -----

5. What caused the subdivision of the farm? -----

6. What was the role of the members in the subdivision? -----

7. What was the membership of the co-operative society before subdivision? -----

8. Who arranged for subdivision? -----
9. How was the society resolved? -----

10. What are your views about land holding co-operative societies? Should they be encouraged in future or not? -----

11. What would you recommend as the suitable procedure for dissolution of land holding co-operative societies -----
