

**The Effect of Pastoral Settlement on the Use of
Rangeland Resources in Olturot Area of Marsabit
District, Northern Kenya.**

A Practicum Submitted to the
Faculty of Graduate Studies of the University of Manitoba
in Partial Fulfilment of Requirements for the Degree,
of Master of Natural Resources Management.

By
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THE EFFECT OF PASTORAL SETTLEMENT ON THE USE OF
RANGELAND RESOURCES IN OLTUROT AREA OF MARSABIT DISTRICT,
NORTHERN KENYA

BY

ISAAC KAMAU WAMUGI

A practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in
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ABSTRACT

Pastoralists in Northern Kenya are experiencing rapid socio-economic and political changes due to intrusion of modern technology and other factors beyond their control. As a result, they are switching from a nomadic to a more sedentary way of life, a change which leads to transformation in the physical management of the rangelands as well as profound alterations in the customs and behaviour of social groups. This, in turn, leads to the failure of traditional systems, relied on in the past for sustainable use of the range resources.

The intent of this study is to examine how pastoral settlement and recent water development, have affected the utilization of natural grazing resources in Olturot area, Northern Kenya. The strategy included: review of historical information; inventory of resources distribution, allocation and limitations; and recommendation of a necessary course of action.

A descriptive research approach was employed in collecting facts and figures. The methods applied were field survey, interviews using questionnaires, informal discussions and secondary data sources.

Results indicate that pastoral settlement has been influenced by the opportunities created by projects based in the area, presence of pasture and water and the group security resulting from such settlement. These factors are favourable to the pastoralists objective of livestock wealth accumulation. As a result of the settlement, there is a more intensive use of the grazing land around the settlement area, while extensive areas, which could be used seasonally are not used. Over-grazing and direct human activities on the vegetation were found to be the leading cause of environmental deterioration around the settlement site. There is wanton destruction of young trees during construction of livestock enclosures, while regeneration of the remaining stumps is limited by livestock browsing. Consequently, grazing lands around Olturot cannot sustain long-term livestock productivity. The vegetation types do not favour continuous use, a situation which is leading to breakdown of the pastoral/ecosystem viability.

Based on the findings in this study, recommended actions to mitigate and prevent negative environmental impacts include: conservation of resources; control of resources use; diversification and modification of economic activities; and strategic resources allocation. Long-term solutions include: research, education and training; coordination and consultation within institutions; appropriate land policy; and sustainable development in natural resources management. The success of any approach to remedy the problems requires a comprehensive policy programme. The Government should play a major role of defining appropriate policy framework to approach arid lands development, for the benefit of the nation and the arid lands inhabitants.

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LIST OF ACRONYMS

- CIDA - Canadian International Development Agency (Hull, Quebec, Canada).
- GOK - Government of Kenya.
- IPAL - Integrated Project in Arid Lands (Marsabit, Kenya).
- KARI - Kenya Agricultural Research Institute (Nairobi, Kenya).
- NALRC - National Arid Lands Research Centre (Marsabit, Kenya).
- NRI - Natural Resources Institute
- TLU - Tropical Livestock Unit (250 kg. Liveweight).
- UNESCO- United Nations Educational, Scientific and Cultural Organization
(Paris, France).
- USDA - United States Department of Agriculture (Beltsville, Maryland, USA).

CHAPTER 1

INTRODUCTION AND METHODS

1.1 PREAMBLE

The arid and semi-arid lands, commonly referred to as rangelands, make up about 80% of the total surface area of Kenya. Most of these areas are used for livestock production and wildlife management. For the semi-arid lands, increased food demand due to human population increases has influenced the encroachment of cultivation on the more productive soil types. However, extensive areas remain under livestock production and wildlife management.

There has been considerable investment in livestock production in semi-arid areas through development of ranches (private, group, and cooperative). For the arid lands, areas used for livestock production have remained under traditional land-use management. Since livestock rearing in these areas is not often done for economic reasons, it has been a very difficult production venture to modernize.

In the past, nomadic pastoralism has dominated the land-use in Northern Kenya. In practice, nomadic pastoralism revolves around the availability and distribution of pastures and water, the possession of livestock and the supply of human labour. Human labour and livestock are mainly dependent on the capability of a household, and are thus possible to regulate. Pastures and water are unevenly distributed and are more dependent on the erratic and usually

unreliable rainfall regimes occurring in the arid areas. As a result, pastoralists move regularly to maximize utilization of these important range resources.

Pastoral production systems reflect a complex attempt to balance coexistence of man and animals in a fluctuating environment characterized by little rains and few natural resources. To effectively utilize pasture and water, pastoralists keep diverse livestock species. The main livestock types kept by pastoralists of Northern Kenya are: camels, cattle, sheep and goats. They also keep a significant number of donkeys, which are used for drawing water and moving household belongings.

Camels and goats are mainly browsers. They get most of their feed requirement from twigs and leaves of shrub and trees with camels utilizing the upper forage layers and goats using the lower forage layers. Cattle and sheep are mainly grazers and get most of their feed requirement from herbs, dwarf-shrubs and grasses. During the dry periods, browsing for forage becomes important, as most grasses, dwarf-shrubs and herbs are dried up or eaten up by the animals. Due to their mouth anatomy, cattle are unable to browse adequately while sheep are able to obtain significant amount of forage by browsing. Cattle are thus the most limited in exploiting the forage resources.

Different water requirements among species and periods between watering makes it possible for pastoralists to graze in areas far from water sources. Camels are capable of utilizing areas furthest from water, sheep and

goats can use moderate distances and cattle use areas near water points. Using this strategy in the production system, pastoralists are able to capitalize on the different water and forage requirements for the different livestock species. Consequently, a more efficient use of forage and water resources is maintained in a traditional pastoral livestock/ecosystem set-up.

Each household has its own animals, but they use the grazing lands communally. This discourages individual efforts for improvement, development and control of grazing resources. Any water and structural improvement on communal grazing lands undertaken so far is through funding from the government, non-governmental organizations, international aid agencies and various charitable organizations.

In Northern Kenya, water resource development has dominated other development activities in pastoral grazing lands. This development approach is based on the notion that many watering points are a means of spreading the grazing load and rationalizing the way land is used. Water development has, in turn, had a significant impact on traditional use of rangeland resources, especially the season and time spent on specific grazing areas. Provision of water in the rangelands has created an imbalance between animals, grazing land and watering points, particularly in the absence of any plans for improvements, maintenance and management of the pastures.

Considerable social changes have also occurred within different pastoral

groups inhabiting Northern Kenya rangelands. Notable changes include pastoral sedentariness in several settlement centres. Pastoral sedentariness results in changes in rangeland resource use. This study examines how pastoral settlement affects the use of resources. The focus is on Olturot, an area of recent pastoral settlement and water development activities. This case study represents the type of common resource management problem occurring in recent settlements distributed across the extensive arid areas of Northern Kenya.

1.2 STATEMENT OF THE PROBLEM

The most common environmental problems found in arid areas are degradation of natural vegetation cover, severe soil erosion, depletion of water supplies, and a number of environmentally related health problems (Speece and Wilkinson, 1982). Deterioration of arid land resources is characterized first by loss of vegetation cover, followed by soil degradation through erosion and compaction. This deterioration is at times a human-induced phenomenon aggravated by climatic conditions.

During the last 50 years or so patterns of land-use have significantly changed in arid lands of Africa. Historically, the Olturot area was mainly a wet season grazing area. It was mainly used during this season because there was (is) abundant water for livestock during the rainy season. The dominant supply of water for livestock and human use was in the form of surface water, collecting on surface ponds for a short period of time during and after the rains.

From 1976 to the present, pastoral household settlement has occurred in this region.

The beginning of pastoral settlement in Olturot corresponds with the establishment of a livestock research sub-centre by IPAL/UNESCO in 1976. There are active efforts by the Governments and international aid agencies to develop arid lands in Kenya, but a substantial portion of this development has continued to have adverse impacts on the environment. In Olturot, recent development (1989/90) of water wells and modification of an existing one has resulted in an increase in year round human activities around the settlement centre.

Establishment of permanent or semi-permanent household camps (manyattas) around permanent water points results in the degradation of the land around them. The community involved end up cutting down trees and large shrubs to construct livestock enclosures (bomas) and to build their living abodes. The situation is complicated by the tendency of the pastoralists to shift the boma sites regularly within a locality, as a way of controlling livestock pest accumulation (internal and external animal parasites like flukes and ticks). This regular localized shifting increases the harvesting pressure on available trees and large shrubs, since pastoralists tend to cut fresh material rather than using old materials from previously used bomas.

When the location of a manyatta is within reach of a certain borehole or

well, the pressure on the rangeland is with respect to that given water point. With time, continued harvesting can result by pastoralists cutting all harvestable material within a relatively big radius from the settlement site. The absence of trees and shrubs and the added trampling by livestock leads to localized, degraded areas around permanent water points and settlement sites. These seriously degraded areas around settlement and watering points and, as a result of these human activities in the arid areas, are referred to as human-made deserts (Lusigi, 1981).

Recent settlement in Olturot has disrupted the previous grazing pattern practised in this area. The area is now grazed irrespective of the season. The traditional system relied on in the past can no longer be considered as a viable option in sustainable use of the land and the range resources around this area. New management options are necessary to supplement the traditional system. The existing traditional capabilities of controlling and managing the resources cannot cope with the changes in the land-use system, and also the social and political changes occurring in pastoral areas. As a result, pastoralists continue to destroy their natural resource base, simply to survive, while trying to adjust to changes in their traditional systems. Political problems coupled with adverse climatic conditions have compounded the problems of the arid lands. The financial and institutional help from international communities common in earlier days, is becoming more difficult to secure due to the world economic

problems.

The circumstances mentioned above have resulted in an urgent need to have management plans especially around watering points, based on how much they can supply. These plans should deal with the existing and expected problems. This can only be accomplished if the problems are correctly identified and the causes are clearly understood. To achieve this, it will be important to understand the current circumstances and also have reliable data. Data is useful in modelling plans which are compatible with limitations imposed by rangeland resources. This study was designed to address the challenges of the existing and expected resource management problems in Olturot, and to provide solutions on how to solve them. The focus is on the current and potential environmental situations while taking into account the historical perspective.

1.3 OBJECTIVES OF THE STUDY

The primary purpose of this study was to examine how pastoral settlement around Olturot, coupled with recent water development, has affected the utilization of rangeland resources in time and space. The specific objectives were:

- i) to determine the background of individual households before they settled, and the main reason(s) for their settlement in Olturot;
- ii) to inventory the past and present water resources and relate this to the

- current land-use of the area;
- iii) to depict the damage caused to tree and large shrub resources during construction of livestock enclosures and the damage caused by livestock on the vegetation;
 - iv) to investigate if there are any forage and water resources' limitations which currently affect use of the range around Olturot; and
 - v) to recommend remedial actions necessary to accomplish sustainable rangeland resources use, and to suggest appropriate development policy for this area.

The intent of these objectives were to answer some basic research questions.

1.4 FUNDAMENTAL RESEARCH QUESTIONS

The central research questions were:

- i) why do pastoral communities, known to have practised nomadic pastoralism from time immemorial, change to sedentary and semi-sedentary pastoralism?;
- ii) whether pastoral settlement results in sustainable utilization of resources in the short and long term?; and
- iii) what role should the Government and development aid agencies play in introducing an environmental dimension to solving the problems in light of the changing land-use practice occurring in arid areas?

The research is intended to respond to the above considerations. The answers are an essential guide in development of new resource management systems. The aim was to define appropriate solutions to solve the existing and expected resource management problems for Olturot area and other areas having similar or related problems. To achieve the objectives of this study and address the above questions, it was necessary to collect information on the pastoral community based in Olturot, and the way they use the resources. The people who live in an area and use its resources, possess valuable knowledge about the land. Their past experience and traditional knowledge is a useful guide in development of new systems with their judgement and skills making a significant contribution. Since people are the key to solving their own problems, it was necessary to tap the knowledge and skills of the pastoralists.

1.5 METHODS

The primary approach used in this study was descriptive involving literature review and a field study conducted in Olturot area. A questionnaire was used to collect information on household background, livestock owned, grazing patterns and related issues affecting the day to day activities around Olturot (section 1.5.1 & Appendix 2). Secondary sources of information (libraries, government offices, and development agencies) were extensively used to acquire data on climate, vegetation types and distribution, and past development activities. To maintain consistency and adhere to the subject

matter, the information was collected using guidelines shown in Appendix 3. Informal discussions with some of the household groups and technical people working in arid areas offered valuable information on general issues of the area.

1.5.1 HOUSEHOLD SURVEY

It was established that by the end of 1991, 42 households were living in Olturot. In June, 1992, only 32 households were living in Olturot. Ten households had moved to other areas due to security problems (cattle rustling) which affected the area prior to and during the time of this study. Out of the 32 households, 29 were interviewed.

For each household, one person (household head) was interviewed. Each person interviewed answered the same series of questions concerning where they used to live before coming to Olturot and past and present resources' use strategies. Information on their livestock was recorded. Questions relating to use of resources in general were also asked. After establishing the areas where the community graze their livestock, site visits were conducted to assess the vegetation types and damages caused to tree and large shrub resources as the pastoralists move from one place to another.

1.5.2 VEGETATION RESOURCES

Secondary sources of information were used to determine the types and distribution of vegetation in areas where the households graze their livestock.

The description is based on studies conducted by Herlocker, 1979; Lusigi, 1984; Lusigi *et al.*, 1986; and Schultka, 1991.

To gain an understanding of the vegetation attributes of some of the areas used, a paced transect method was used in selected areas. This method was developed in United States and approved by the USDA in 1970, as a quick method designed to determine the amount of ground cover and vegetation species composition of an area. Eight transects were run to aid in understanding the vegetation species composition of some key areas. These areas were located on major vegetation types of the most frequently used sites. The transect lengths were 100 m long and replicated three times in each area sampled. The information collected along each transect was not used in the vegetation description but was helpful in understanding the classification adapted in the secondary sources used.

1.5.3 DESTRUCTION OF TREES AND LARGE SHRUBS

Although it has been established that the harvesting of trees and large shrubs for livestock enclosure construction is a major contributor to vegetation resources' destruction, there is no documented simple method of measuring the actual damage after pastoralists have cut the needed material. Lamprey (1981) estimated the damage to the ecosystem by calculating the total live biomass of harvested material for the whole year in case of the Rendille community.

Estimation of live biomass would require one to be present when

pastoralists are cutting the fresh materials or estimate using a destructive sampling technique. Although live biomass would give an indication of the level of damage, there is a need to characterize the damage by site and, more importantly, the harvesting approach in each site.

To depict the extent of this damage, abandoned livestock enclosures were sampled and the total number of branches used counted. A total of 29 sites were sampled. In each site, the stumps of harvested tree and large shrub species were sampled. In this study, a stump was taken to be the remaining piece of the trunk of a tree or shrub projecting from the ground, when some or all the branches have been removed. Information on type of species, number of branches cut from the stump, and number of branches remaining on the stump were recorded.

In cases where livestock enclosures were close to each other, it was difficult to delineate where materials for a specific enclosure were harvested. In these sites, the stumps samples were taken as representing all the enclosures within the area. Efforts were made to sample all the stumps in a site.

1.5.4 WATER RESOURCES INVENTORY

Information on water resources used by pastoralists based in Olturot was collected. This included: type of water source (natural, well, spring, waterhole, piped water, etc.); distance of water source from Olturot centre; reliability of the water source; main users and date of development or

discovery, if not a natural water source. This information was obtained from the pastoralists and from documented sources.

1.5.5 RANGELAND USE

Variable information on rangeland use was obtained from the interviews conducted. Twenty five out of the 29 respondents were able to define the areas in which they graze their animals. Since the local names of the areas where the households graze their livestock are not entered in the official map of this area, the approximate distance from Olturot centre and the direction were recorded. In all cases the areas were also defined relative to the nearest water point or conspicuous topographical feature.

1.6 REPORT ORGANIZATION

This practicum is organized into 4 chapters. Chapter 1 covers the general introduction, statement of the problem, and the methods used to acquire the necessary data. The objectives and fundamental research questions are also outlined in this chapter.

Chapter 2 covers the general description of the study area with emphasis on climate, essential natural resources and the land-use system. This chapter also includes: a review of literature on work done within the study area and other parts of Africa's arid lands, pointing out the information gaps and the need for further research. Issues relating to resources management, e.g., water-use rights, resources distribution, and past development policies, are also

discussed.

Chapter 3 examines pastoral settlement and its impacts on natural resources use, based on the objectives of the study. This chapter highlights the results found from the study and further discusses these results in the context of the perceived problems.

Chapter 4 gives the inference from the study and recommendations based on the study results. To enhance effective implementation of the recommendations, an appropriate policy approach for arid land development is outlined in this chapter.

CHAPTER 2

STUDY AREA AND REVIEW OF RELATED LITERATURE

2.0 INTRODUCTION

This chapter focuses on the general description of the study area and review of literature. Section 2.1 covers information on general study area, climate, available natural resources and land-use around Olturot. Section 2.2 reviews available literature covering the study area and other parts of dry land Africa.

2.1 STUDY AREA

The study area is described relative to its relation with other parts of Kenya and neighbouring countries. Due to the geographic location of the study area, political and economic activities of neighbouring countries influence resources' exploitation.

2.1.1 REPUBLIC OF KENYA

Kenya is located on the East Coast of Africa, neighbouring Somalia to the East, Ethiopia and part of Sudan to the North, Uganda to the West and Tanzania to the South. The association of the study area to the remainder of Kenya and neighbouring countries is shown in Figure 1. The total area of the Republic of Kenya is 580,367 sq. km. The country is roughly bisected by the Equator and extends from approximately 4° N to 4° S and 34° E to 41° E. Of the total area, the land surface constitutes 569,137 sq. km while the rest,

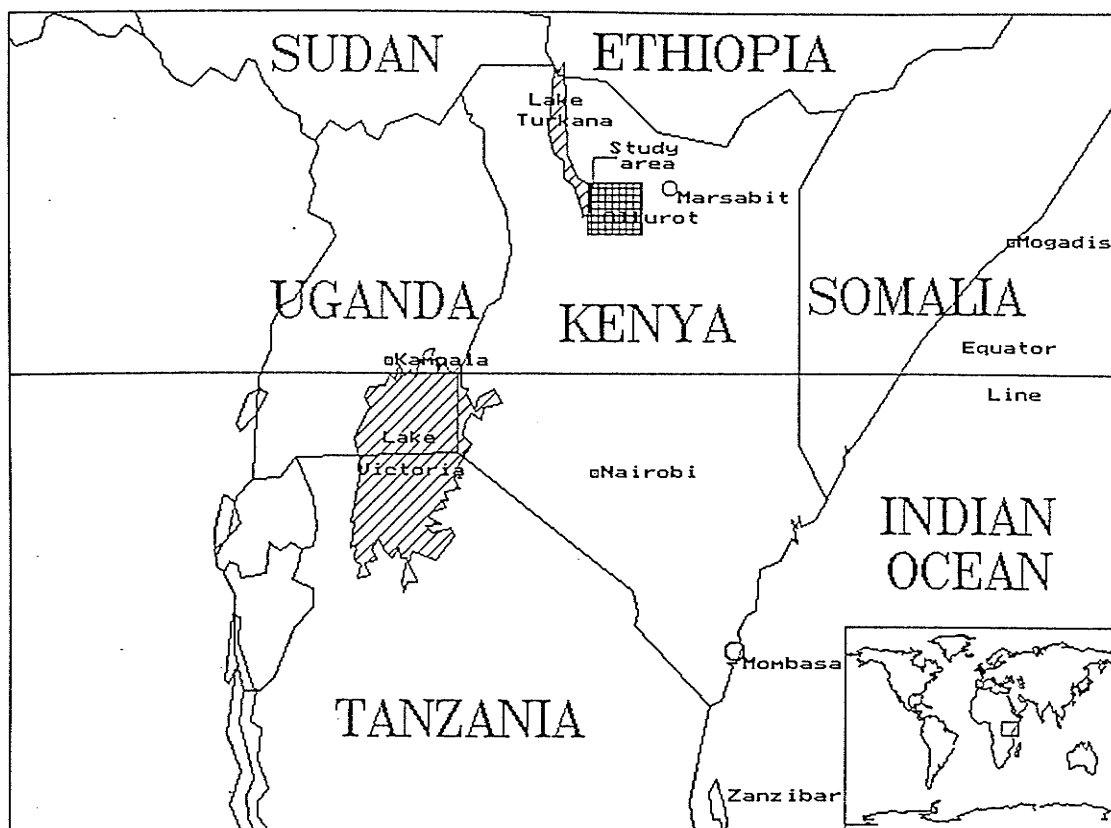


Figure 1: **Map Showing the Location of Kenya and Neighbouring Countries.**

11,230 sq. km, is inland waters. These include Lakes Turkana, part of Victoria, Nakuru, Naivasha, and other smaller lakes occurring in Rift Valley and Coast provinces (Ojany and Ogendo, 1973).

The land surface is spread over a wide variety of topographies, ranging from the sandy semi-deserts of Northern Kenya, the mountainous highlands, the rolling Central plains, the Great Rift Valley, and the Coastal plains along the Indian Ocean coast. Only about 20% of the total surface area can be expected to receive a reliable rainfall adequate for cultivation. These high potential areas support about 80% of the estimated 27 million people, while the other 20% occupy the arid and semi-arid lands, which constitute about 80% of the land surface.

As a result of this population distribution, high rainfall areas occurring around Lake Victoria, the Highland regions, and the Coastal regions are intensively cultivated. Increased population growth has forced people to practice cultivation in semi-arid areas where chances of crop failure are usually high. Despite these encroachments, most of the semi-arid and the arid areas are still used for livestock production and wildlife management. The livestock grazing on the dry plains (arid lands) supports a low population of the largely subsistence pastoralists. On the other hand, the wildlife using the range areas exercise considerable influence, both directly on the vegetation and on the land development programmes, although their population is now much reduced.

2.1.2 OLTUROT AREA

The study area is located approximately 37° E and 37°30' E Longitude and 2°N and 3°N Latitude. The area is one among many settlements distributed in the dry plains of Northern Kenya. Olturot settlement centre is located in South-Western Marsabit district, about 130 km west of Marsabit town and 50 km east of Mt. Kulal. The relationship of Olturot and the adjacent settlement centres is shown in Figure 2.

Olturot is typically an arid to very arid region. It is located in eco-climatic zone V and VI. This classification using moisture index to define zones is used extensively by Pratt and Gwynne (1977) to categorize East African rangelands. The area is currently inhabited by a semi-sedentary pastoral community originally from pastoral tribes occupying neighbouring settlements. All the inhabitants were nomadic pastoralists in the past. The pastoralists usually graze their animals within a radius of about 30 km or more from Olturot centre. The limits of the study area extend to the neighbouring settlements because of the social relationships existing between the groups.

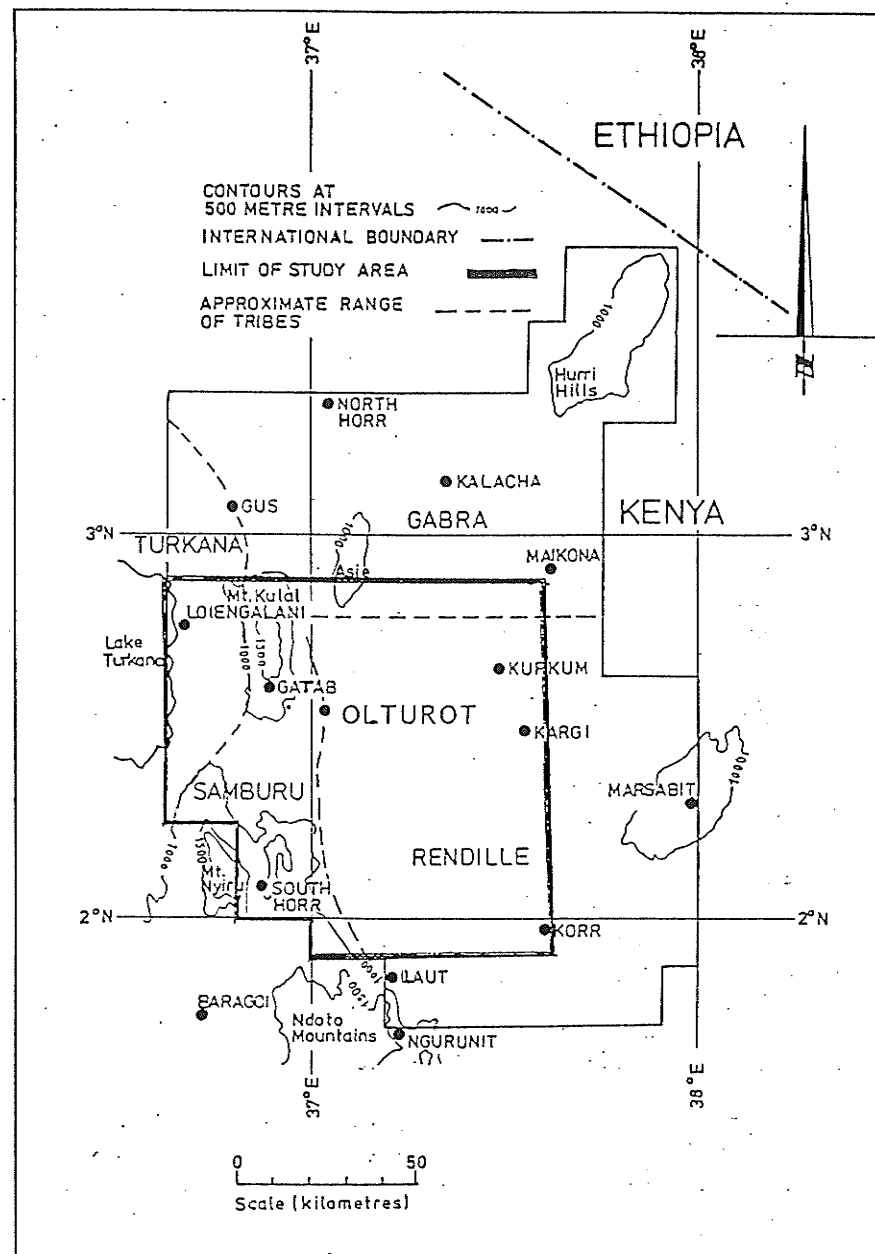


Figure 2: **Map Showing the Study Area and Adjacent Settlement Centres.**

Source: Modified from Lusigi W.J. (Ed.). (1984). Integrated resources assessment and management plan for western Marsabit District, northern Kenya. *IPAL technical report A-6*. Nairobi, Kenya: UNESCO.

2.1.3 CLIMATE IN OLTUROT

Rainfall in Olturot region is bimodal. It is characterized by two rainy seasons, the long rains occurring during the months of March, April and May, and the short rains occurring in the months of November and December. Available monthly rainfall figures for 11 years (1981-1991) show an annual mean of approximately 184 mm (Table 1).

This kind of rainfall distribution results in an extended dry period from late May to October and a short dry spell from late December or early January to early March. Rainfall in this region is highly erratic, unreliable, and shows conspicuous annual variability.

The daily temperatures are normally high. Available data (Table 2) shows an annual mean temperature of 27.8°C (Lusigi, 1984). The data shows a low variability of the yearly diurnal variations of temperatures and hence results from longer periods would not significantly affect the average mean. High temperatures result in high evapotranspiration rates and a consequent negative water balance in this region. As a result, annual plants which depend on rainfall for growth have their growth phase limited to the normally short wet seasons only. Some perennial plants survive by having deep roots thus utilizing water from the ground for growth during the dry seasons. They form a vital component of livestock diets during the dry season.

***Table 1: Monthly Rainfall (mm) in Olturot (1981-1991)**

Year	Jan.	Feb.	Mar.	Apr.	May	Jun .	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1981	0.00	0.00	59.80	0.00	20.70	0.00	1.30	0.00	0.00	8.90	17.20	9.30	117.20
1982	0.00	2.95	2.80	77.50	6.81	0.00	0.00	0.00	0.00	15.25	0.00	89.70	195.01
1983	3.80	22.00	0.00	64.20	3.70	0.00	0.00	1.90	0.00	58.60	0.50	9.30	164.00
1984	0.00	0.00	1.50	31.20	0.00	0.00	0.00	0.00	0.00	5.50	92.30	50.40	180.90
1985	0.00	0.00	43.70	90.90	18.60	0.00	0.00	0.00	0.00	0.35	41.40	0.00	194.95
1986	0.00	0.60	22.40	0.00	0.10	26.30	0.00	0.00	0.00	0.00	28.80	86.60	164.80
1987	5.30	0.00	65.20	51.95	19.30	26.00	17.10	0.00	0.00	0.00	14.70	0.00	199.55
1988	0.00	6.60	34.50	63.15	0.00	0.00	16.05	0.00	0.00	0.00	12.20	54.30	186.80
1989	11.60	1.20	4.00	90.50	12.50	0.00	0.00	0.00	4.00	0.00	73.01	61.60	258.41
1990	0.00	54.02	60.00	80.90	5.20	0.00	0.00	0.00	0.00	14.70	15.40	39.70	269.92
1991	27.50	0.00	0.00	9.40	16.70	0.00	0.00	0.00	0.00	13.59	10.60	12.00	89.79
Mean	4.38	7.94	26.72	50.88	9.42	4.75	3.13	0.17	0.36	10.63	27.83	37.54	183.76

*Source: Compiled from daily rainfall records available from NALRC-KARI Marsabit.

****Table 2: Mean Monthly Temperature (°C) in Olturot (1976-1982)**

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
Temp.	28.4	28.5	28.1	27.4	27.5	27.3	26.8	27.4	28.1	28.9	27.3	27.9	27.8

**Source: Lusigi W. J.(ed), 1984. Integrated Resources Assessment and Management Plan for Western Marsabit District, Northern Kenya. IPAL Tech. Report a-6 UNESCO, Nairobi Kenya.

2.1.4 ESSENTIAL NATURAL RESOURCES

To a pastoralist, the most essential natural range resources are water and forage. Pastoral livestock production systems in arid areas depend entirely on natural pastures. On the other hand, effective access to the pastures depends on the availability and distribution of water. During the dry season water is a major limiting factor. The balance between availability of water and forage distribution holds the key to sustainability of rangeland resources' use in arid areas.

2.1.4.1 WATER AVAILABILITY

There are no permanent natural water sources in Olturot centre. All the natural water comes from the rain falling within this area. Water flows above the surface of the land into the seasonal river beds during the rainy seasons. This flow continues for a few days after the rains. The total number of rainy days becomes important in determining how long the areas without permanent water can be used. Table 3 shows the total monthly rainy days from 1981 to 1991.

During and immediately after the rains, there is seepage of water beneath the sandy surfaces. In places where there is submerged non-porous rocks in the river beds, water is retained and can be obtained by digging in the sands at depths from 3 to 10 feet or more.

Table 3: Monthly Rainy Days in Olturot (1981-1991)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1981	0	0	5	10	4	0	2	0	0	2	4	3	30
1982	0	3	1	12	3	0	0	0	0	9	9	8	45
1983	2	1	0	6	1	0	0	1	0	3	1	2	17
1984	0	0	1	4	0	0	0	0	0	4	11	5	25
1985	0	0	5	8	3	0	0	0	0	1	4	0	21
1986	0	1	6	8	1	2	0	0	0	0	2	3	23
1987	1	0	3	5	2	1	1	0	0	0	1	0	14
1988	0	1	2	8	0	0	3	0	0	0	3	7	24
1989	2	1	4	9	3	0	0	0	1	0	8	6	34
1990	0	2	6	7	1	0	0	0	0	3	3	4	26
1991	2	0	4	3	2	0	0	0	0	5	4	2	22
Mean	0.64	0.82	3.36	7.27	1.82	0.27	0.55	0.09	0.09	2.45	4.55	3.64	25.55

Source: Compiled from 1981- 1991 daily rainfall records available from NALRC-KARI Marsabit

These temporary dug wells were the major supply of water to human and livestock around Olturot until recently (1980's). The wells had a limited recharge potential and dried up as the dry season progressed. In order to increase the recharge potential of such wells, deep wells were dug in Olturot. These wells are semi-permanent and have caused major impacts on the use of forage resources around Olturot.

2.1.4.2 FORAGE RESOURCES

Throughout dryland Africa, natural vegetation is often most dense along seasonal waterways, in floodplains, or in seasonally-flooded depressions. The rangeland around Olturot bears a narrow band of riverine vegetation along the seasonal Balesa river bed. Bordering this unit, the vegetation is characterized by shrubland and dwarf-shrubs occasionally interspersed by annual grasslands. Shrubs and dwarf-shrubs are particularly useful in arid areas because their deep root systems allow them to produce fodder even during the dry periods. The vegetation around Olturot has been described by Herlocker, 1979; Lusigi, 1984; Lusigi *et al.*, 1986; and Schultka, 1991.

Along the riverine range unit, the vegetation is characterized by a conspicuous tree canopy cover dominated by *Acacia tortilis*. Other major trees include *Acacia mellifera*, *Acacia nubica*, *Acacia senegal*, *Acacia reficiens*, *Balanites aegyptiaca*, *Cadaba sp.*, *Commiphora sp.* and *Salvadora persica*.

The dwarf-shrub cover is poor along the riverine range unit and is

dominated by *Indigofera spinosa* and *Dusperma eremophilum*. Other dwarf-shrubs include *Barleria acanthoides*, *Indigofera cliffordiana*, *Salsola dendroides* and *Sericocomopsis hildebrandtii*.

The annual grasses are predominated by *Cenchrus pennisetiformis* and *Dactyloctenium aegyptium*. Other annual grasses include *Aristida mutabilis*, *Brachiaria leersioides*, *Chloris virgata*, *Eragrostis sp.*, *Sporobolus sp.*, *Tetrapogon spathaceous* and *Tragus barteronianus*. The annual herbs include *Abutilion sp.*, *Indigofera sp.* and *Solanum sp.* All these plant species are also a major component in the species compositions of the different range units found around Olturot region. Nonetheless, the riverine vegetation unit is an important forage resource for livestock throughout the year because of its rich diversity of evergreen plants and also the availability of water from shallow wells along the Balesa river bed.

2.1.5 LAND-USE AROUND OLTUROT

The dominant land-use in Olturot area is livestock production. As is common with most other range areas in Kenya, wild animals freely use the range. Localized charcoal burning is now common in Olturot area. There were efforts by development aid agencies in the early 80's to encourage gum collection (extract from *Acacia senegal* used in manufacturing high quality glue and food preservatives). This activity did not gain acceptance due to marketing and other logistic problems. No form of cultivation is practised in this area

because the rainfall is too low to support any cropping and developed water sources cannot sustain viable irrigation.

2.2 REVIEW OF RELATED LITERATURE

This section reviews related literature on rangeland natural resources utilization and management. Issues regarding pastoral land development, rangeland resources use, consequences of pastoral settlement and past rangeland development policies are dealt with. Most of the information is from consultancy reports, journal papers and major reports from work done in arid areas.

2.2.1 DEVELOPMENT AND PASTORAL PRODUCTION SYSTEMS

Over the years patterns of land-use have significantly changed in arid lands of Africa. This can be attributed partly to external influences on communities occupying these areas. The majority of communities which occupy these areas were mainly nomadic and semi-nomadic pastoralists. Over the years, settlement of pastoral communities has continued to occur particularly around watering points and established market centres. In these centres, facilities like health centres, shops, schools and other social amenities are available. The presence of permanent water, mainly mechanical in nature, is a notable characteristic of almost all settlement areas in Northern Kenya.

Timberlake (1987) observed that the rapid increase of deep, permanent

wells in some parts of Marsabit District has encouraged pastoral communities into permanent settlement. Due to the delicate ecology of arid areas and limited water availability, the presence of water in range areas is an important factor which determines the length of time which a certain area can be used. Development of permanent water sources is seen to alter the traditional system of land-use for an area (Dolan,1980).

General effects of water development on land use are reported by Dolan (1980) and Fratkin (1986). They have observed that before development of mechanical water sources in arid lands, areas with permanent natural water sources are generally used more extensively during the dry seasons. Areas where water was seasonal were occupied more in the wet season than in the dry season. Mechanical water sources have resulted in areas around them being used heavily irrespective of season. This has ultimately contributed to the gradual disappearance of pastoral migration patterns in relation to vegetation type and availability of water.

Shlee (1991), while reviewing the land-use strategies of pastoralists of Northern Kenya, points out the need to encourage pastoral mobility rather than gradually reducing it through development intervention. He argues that concentrating livestock in developed areas would ultimately render them unviable while leaving other areas which can be used seasonally unutilized.

In the Olturot area, recent water development has resulted in continued

heavy utilization of vegetation resources in the surrounding range areas. This raises a major environmental issue concerning the future of developing range areas and the trend towards desertification. The Olturot area is reported (Lusigi, 1981) to have been a wet season grazing area in the past.

Controversy over changes in pastoral production systems is not unique to Kenya. Pastoral nomads all over the world are gradually changing. The 1972-1973 Sahel drought which affected Mali, Senegal, Mauritania, Upper Volta, Niger and Chad, had great implications on the future trends of pastoral land development in Africa (Wade, 1974; and Sinclair and Fryxell, 1985). Events during the drought and after, largely changed the perception of governments, development agencies and the international community, not only for the Sahel region, but throughout Africa. During the drought, many animals died due to lack of water. The immediate reaction by the international community was to aid in the development of water sources (mainly boreholes). There was also massive famine relief supplied to the pastoralists.

According to Wade (1974), although this was carried out with the best intentioned efforts of the donors, it was a principle contribution to more destruction of the arid land ecosystem. Some authors (Widstrand, 1984; Sinclair and Fryxell, 1985; and Ellis and Swift 1988) hold the view that human intervention in the delicately balanced ecological zones bordering desert areas have usually been narrowly conceived and poorly implemented. This fact

supports earlier observations by Wade (1974) when he indicated that the key to the pastoral way of life in the arid lands was a remarkably efficient adaptation to the harsh environments. The pastoral migration was highly organized and the timing was carefully calculated to optimize the use of available forage and water.

The effect of mechanical water development in Sahel and other parts of Africa, in turn, made forage to be the major limiting factor on livestock numbers instead of water. Boreholes in arid areas have become the centre of their own little deserts. Breman and Wit (1983) conclude that efforts directed at better pasture and herd management have failed to improve the overall productivity of the herds. These efforts have also failed to stop rangeland deterioration. This failure is attributed to efforts being based on an incorrect understanding of the arid areas, the availability and nature of pastures, and how best they can be used.

One comes to the conclusion that, in the past, the approaches to development of arid areas did not adhere to the principles of sustainable development. Development efforts resulted in changed patterns of land use. These changes in land-use system and settlement of pastoralists have led to a serious environmental crisis in arid Africa. Water development is the single most important factor which has had a significant influence on land-use change.

2.2.2 WATER DEVELOPMENT IMPLICATIONS ON RESOURCES USE

Traditionally, most arid lands in Africa were under common property ownership. In what has become a household concept in resource management, Hardin (1968) pointed out that common property resources are subject to environmental abuse. In most of the arid lands, grazing lands were recognized by pastoralists as public resources available to all stock owners in each community. The same applies to natural water sources. Hand-dug wells, where they occur, are often limited to those who have created the facility.

This type of water right has implications for the means by which individuals gain access to natural resources and also the manner in which these resources are utilized. For example, McCabe (1990) observed that for the Turkana of Northern Kenya, access to land is not restricted to any member of the community, but individual rights to water are restricted when drawn from wells and unrestricted when drawn from natural sources. Due to the existence of such water rights, there are areas in which forage is available during the dry season only to those individuals who have well water rights within walking distance.

Development of mechanical water sources changes the nature of relationships existing between access to forage and water availability (Dolan, 1980). Areas around permanent water sources become available to everyone. Mechanical water sources also reduce the labour requirements during livestock

watering, a critical limiting factor in traditional systems. This encourages pastoral households to accumulate livestock beyond their labour capacity. Increased livestock accumulation leads to increased land degradations which in turn lead to high livestock mortality during dry spells.

As a result of water development, nomads began to concentrate their herds around permanent wells (Wade, 1974 and Timberlake, 1987). Concentrating livestock in these areas render them unviable while leaving other areas unutilized.

2.2.3 CONSEQUENCES OF PASTORAL SETTLEMENT

It is generally accepted that overgrazing is a leading cause of deterioration of arid lands and consequent disappearance of grasses and dwarf-shrubs. Studies done in Northern Kenya show that human activities are also a major cause of land degradation (Lamprey, 1981; Lusigi, 1984; and Lusigi *et al.*, 1986). The trend towards sedentariness has resulted in over-exploitation of woodland and large shrub resources around settlement areas.

Keya *et al.* (1990) and Lamprey (1981) have reported that the need for construction material for livestock night enclosures, fuelwood and building materials has led to wanton destruction of trees around settlements. The main vegetation materials cut are usually thorny *Acacia sp.* Studies reported by Lamprey (1981) estimated that almost 1% of 20,000 sq. km occupied by Rendille pastoralists of Northern Kenya, is a human-made desert. He adds that

about 40,000 tonnes/year of live material are cut for livestock enclosures by a population of about 12,000 people (1981 estimates).

Although the deterioration of the area is alarming, Lamprey points out that about 40% of the 20,000 sq. km was under-utilized or not used at all. This is supported by Lusigi (1983) who indicated that there are large tracts of land which are not used in Marsabit district due to lack of sufficient number of water points, lack of organized grazing management, and lack of public security. These factors lead to the concentration of pastoralists in developed and secure areas.

Intensive use of settled areas throughout the year gives them less time for recovery. This leads to environmental degradation around settlement centres. The problem of land degradation around these areas is complex. It involves the plight of people who are using traditional means to cope with a vast problem that has been caused, to a greater extent, by modern influences. Indications are that traditional mechanisms for coping with ecological crisis around settlement areas have failed (Speece and Wilkinson, 1982). Despite this failure, pastoralists continue to settle in arid areas.

As a result of these failures, Eckholm (1975) pointed out that huge areas of desert like lands were being created far away from the actual edge of the sandy deserts. However, information is spotty even on the current soil conditions in the affected areas, let alone on conditions over a time period long

enough to permit precise scientific conclusions. Information explaining why nomads change to a sedentary pastoral system is also scarce. Consequently, vast undocumented areas exist, having barren like environments from serious damage through overgrazing and harvesting of trees and large shrubs.

Widstrand (1975) acknowledged that there is a considerable body of knowledge in the areas of livestock and range management. The application of this knowledge is often limited by lack of information on human behaviour. Widstrand recommends that straight forward survey work be done to determine existing resources, their use and the response of pastoral communities to on-going programs throughout the arid areas. Causes of failure in most pastoral programs should also be investigated.

Sandford (1982) has pointed out that the problem in livestock development projects in Africa has been a lack of understanding by development agencies of the structure and dynamics of traditional pastoral systems of livestock management. Olsson and Rapp (1991) and Sinclair and Fxyell (1985) have summarized the consequences of pastoral land development. They have observed that migratory pastoralists traditionally lived with their livestock in balance with the vegetation resources. To cope with fluctuating climatic changes, the nomads adapted themselves through high mobility over vast areas.

The balance which was maintained in the past was disrupted by

settlement of nomads. Consequently, settlements have resulted in changes in mobility and hence a change in resource use strategy. Strategies adapted by settled pastoralists are scarcely documented or lacking. So far, available information shows that water development and consequent settlement around watering points have major environmental impacts on arid lands. Despite these known outcomes, development policies and plans continue to recommend water development in range areas.

2.2.4 WATER RESOURCES AND VEGETATION USE IN OLTUROT

Observations between 1976 and 1979 reported by Lusigi (1981) indicates that, in an area of about 14,000 sq. km which included Olturot region, no livestock were observed in about 13 % of this area, while a further 12 % had less than one Tropical Livestock Unit (TLU) per sq. km(1 TLU is equivalent to 250 kg liveweight). The method used was systematic transect sampling using a Cessna 185 as the observation platform. The area was sampled at an intensity of 6% on a 10 * 10 km grid subdivided into 5 * 5 km sub-units. A total of ten surveys were conducted.

By drawing maps of wet and dry season ephemeral variables, together with densities of livestock and household camps (Manyattas) using a computerized map plotter, Lusigi was able to show the areas utilized by animal species during the wet and dry season. He also showed the location of household camps during both seasons. At the time of the survey, no household

camps were observed at Olturot area and apart from camels which used the area occasionally, no other livestock used the area. This observation agrees with Herlocker (1979) who reported that the area was only lightly used. Later studies by Lusigi *et al.* (1986), indicates that the area was moderately and seasonally used.

Studies by Lusigi (1981) and Lusigi *et al.* (1986) show that there was an increase in human activity during the first half of the 1980's. This increase in human activity started to occur before the development of wells for pastoral use. In fact, Lusigi *et al.* (1986) indicated that the area was in good condition. They thus recommended that wells be constructed in Olturot area, a recommendation which was implemented through the development and opening of two wells during 1989/1990 for the pastoral community around Olturot. In their recommendations, they emphasized the need for hand dug shallow wells with limited recharge rates so as to avoid creation of permanent settlements around them.

A technical approach to water development in arid areas is presented by Bake (1983). He created a model for water distribution in South-Western Marsabit district based on water requirements of different livestock species and their wandering capacity. During the dry seasons, sheep and goats need water every third day, cattle are watered every second day and camels are watered every 7-14 days depending on the severity of the dry spell.

Bake (1983) argues that the wandering capacity of the livestock is related to their water needs. Camels can graze up to 40 km from watering point, cattle can graze up to 15 km while sheep and goats can graze up to 25 km. One water point can thus serve a relatively big radius, assuming that it has enough potential to supply all the livestock. It is, however, important to note that overlap of potential areas of grazing relative to watering points increases the danger of environmentally abusing large areas through overuse.

Farah (1990) has advised on the need to consider grazing capacity and spatial distribution of forage resources. Preliminary results from studies conducted by Keya *et al.*² (1990) show some forage limitation to livestock grazers around Olturot, especially during the dry months of the year. In such circumstances, provision of water for humans and livestock without appropriate management strategy would often lead to land degradation. Pugiese and Coulomb (1981) have suggested that water holes should be used to spread the load and rationalize the way land is used. However, a management plan for the water holes based on how much they can supply should be in place to prevent optimum number of animals from being exceeded.

Evidence from scholarly sources show that the problems of arid lands development have been there for a long time. The source of these problems can partly be traced in past and present agricultural development policies in Kenya.

2.2.5 KENYA'S AGRICULTURAL DEVELOPMENT POLICY AND THE RANGELANDS

Agricultural policy development and implementation in Kenya can be divided into two main periods. The first stage involves a period when Kenya was under colonization, while the second occurred after independence. The approach in both periods largely involved development of high potential areas with rangelands being given little, albeit significant, attention.

With respect to pastoral grazing lands, control of resources use during the pre-colonial period was strictly under traditional management systems. The land was under communal ownership, where a group of elders in each community oversaw the use of the grazing land. According to Farah (1990), this resulted in each clan among the pastoralists in Northern Kenya controlling a recognized unit of grazing land.

This system of land resource use was seen by the colonial government as being ineffective. Ruthenberg (1966) had observed that the communal range with unrestricted individual ownership of livestock was seen to be faulty, because neither the community nor the individual concerned themselves over the effects of their actions on the land. This led to the colonial government placing land ownership under the state (held in trust by the local county councils). This, in turn, led to an immediate breakdown of the traditional management system practised in Northern Kenya. According to Farah (1990),

this occurred due to the freedom of access to all grazing and water resources by any clan, especially in developed grazing areas.

It is questionable whether the interest of the colonial government was to develop pastoral livestock production. Widstrand (1975) has pointed out that during the time when Kenya was under colonization, there was an active discouragement of pastoral livestock production to protect the European cattle economy. The government of that time used water development and veterinary programs to encourage pastoral settlements.

Independent Kenya inherited and continued the colonial policies with no change on the land policy in range areas. Besides, the government has continued to rely heavily on foreign donors to finance livestock development programs in range areas. According to Aboud (1986), rangeland projects funded by external agencies were not a success story. The projects did not accomplish their intended objectives because pre-development data were often too inadequate and short-sighted to be useful. Holding the same view as Widstrand, Aboud argues that most rangeland development projects were based on policies aimed at sedentarization of pastoral people to simplify administration, but this resulted in the confinement of large herds in ecologically unviable land units.

There is evidence that the Kenyan government is addressing approaches in development of range areas. The National Livestock Development Policy

(GOK, 1980) recognizes the need to integrate production systems between the arid zones and wetter areas. Drier areas under this policy would concentrate on production of immature stocks which would then be fattened in wetter areas before being sold off. Efforts to implement this approach has been hindered by lack of financial resources, infrastructural development and incompatibility with pastoralists' objectives.

The Kenyan government aims at fully utilizing the arid areas and taking measures to instil proper stocking rates through development of roads and market infrastructures, price and marketing incentives and land tenure reforms away from communal grazing land. The government has indicated the need to involve pastoralists in decision making and rules to enforce natural resources conservation. While the approach sounds okay, there is no documented evidence of its implementation so far.

Gauging from the performance of the policy incentives during colonial and independent Kenya, it is evident that there is a need to change the policy approaches used in the past. We cannot lay the blame of arid lands degradation entirely on the communities. Life in these regions is characterized by encroachment of western technologies and the dominance of the ideology of human-over-nature and all the economic development tactics and strategies that such an ideological stance entails

2.2.6 SUMMARY

From available evidence, it is obvious that past approaches to development of arid lands has not led to sustainable use of the natural resources in the rangelands of Kenya and other African countries. Intrusion of modern factors disrupt traditional systems, leaving the arid land inhabitants with no choice but to increase livestock production, even at the expense of the environment. Past approaches have resulted in a dramatic change in patterns of land use, leading to serious environmental crisis in most parts of dryland Africa.

The patterns of migration in relation to vegetation types and water availability, common in earlier periods have disappeared almost entirely. The communities have also changed to a more sedentary way of life. These changes have blocked the traditional ways that the pastoralists used to deal with environmental variability from year to year. The physical problems of environment degradation are known. Solutions to these problems are not only complex but lacking. There is an urgent need to focus on the socio-economic or institutional dynamics that have contributed to the escalation of the problem.

Solving the problems of arid lands has proved to be difficult in the past. To overcome these problems it is essential to have an interdisciplinary approach, drawing on specific disciplines to formulate a holistic and balanced perspective. Before any solutions are recommended, there is need to have

reliable data on the resources problem. This establishes the need to carry out straight forward surveys to determine current resources use, and investigate the magnitude of the resources management problems in arid areas. Solutions to arid lands' problems can only be recommended if the problem is clearly understood and the causative factors of these problems are properly identified. This case study is aimed at contributing some solutions to arid lands' resource management and use around settlement areas. Information from this study will be part of the necessary data base useful in arid lands resources management and policy development.

CHAPTER 3

PASTORAL SETTLEMENT AND ITS IMPACT ON RESOURCES USE

3.1 PASTORAL SETTLEMENT IN OLTUROT

From the interviews, it was established that settlement in Olturot started around 1977. This corresponds with the beginning of a development project in South-Western Marsabit district. The project had a livestock centre at Olturot. However, two of the respondents indicated that they used to graze around the area from 1973 and 1974 respectively. Informal interviews with these two respondents indicated that other people used to graze their animals in this area during the wet season. This agrees with Lusigi (1981) that the area was a wet season grazing land prior to the current settlement.

All the respondents are pastoralists who were either engaged in nomadic pastoralism or came from other settlement centres around Olturot. They are from Samburu, Rendille or Turkana tribes. Of the 29 respondents, 17 are from Samburu, 11 from Rendille, and 1 from Turkana tribe.

Basically, there were three main reasons why pastoralists decided to settle in Olturot. These reasons are:

- i. household head or member coming to work in Olturot area;
- ii. availability of good pastures and water; and
- iii. presence of other people, clan members or working relatives.

Of the 29 respondents, 7 came to Olturot initially to work, 13 indicated

availability of good pasture and water as being their main reason, while 9 settled due to presence of other people. Presence of other people varied from marrying from households settled in the area to presence of clan members, relatives or close friends.

Although each household indicated one of the above as the reason for settlement, all the 29 respondents admitted that the availability of good pasture and a suitable environment to accumulate livestock was the key factor in selecting this area for settlement. A suitable environment also includes elements which influence human well-being. Major factors include the presence of health facilities, schools, retail shops and church mission activities within the settlement area. Although these elements are a recent development in Olturot area, they play an important role in the pastoral/ ecosystem dynamics. Commodities available from the settlement centre have an indirect effect on the environment. For example, food commodities available from the shops or supplied by relief agencies during critical times compel the pastoralists to depend less on livestock for their survival. This reinforces the pastoralists' ambition of livestock accumulation, which in turn, affects the environment.

Twenty seven of the 29 respondents indicated that they intend to stay in Olturot. However, all the respondents pointed out that security problems could force them to move to other more secure areas. This was not unusual, judging from the events which had occurred in other areas. For example, prior, and

during the time of the survey, Kargi a settlement 66 km from Olturot, was raided by cattle rustlers. There were speculative fears that the rustlers might strike Olturot. In fact, from the informal discussions with some of the household members, fear of livestock rustling was attributed to be the main reason why 10 households had moved to other areas earlier in the year.

Information provided by the respondents indicates that the decision to continue staying in Olturot in the present frightening security situation cannot strictly be made by a single household. As long as all the households felt secure and able to defend themselves, they would continue to stay in Olturot. It was also clear that the presence of KARI livestock sub-centre in the area played an important role in holding the community together and also provided extra security to the community. This sub-centre is a continuation of a IPAL/UNESCO Project started in 1976/77. It is important to note that some of the household members are employed by KARI and deployed in this livestock sub-centre. As long as the KARI centre remains in Olturot, these individuals have to be there. Both KARI and the community have armed guards to provide security.

3.2 WATER RESOURCES

The distribution of permanent and semi-permanent water sources accessible by pastoralists based in Olturot is shown in Figure 3. These sources are either permanent wells, semi-permanent wells, springs and permanent

surface water (Lake Turkana). These sources serve Olturot adequately during the dry season. The semi-permanent wells around Olturot centre are the most recent around this area. They were developed after some community members had settled in this area. Plate 3.1 shows one of the recent wells equipped with a hand pump.



Plate 3.1: **One of the semi-permanent water wells located in Olturot.**

This particular well is 42 metres deep. In a traditional setting, about seven people are required to manually draw water from the well for livestock. The inclusion of a hand pump makes it possible for one person to water the livestock. Table 4 summarizes information on water sources commonly used by pastoralists based in Olturot.

Table 4: Data Summary of Water Sources Accessible by the Community Based in Olturot

WATER SOURCE	LOCATION	TYPE OF SOURCE	USERS	DEVELOPMENT RECORD
KARI wells (2 wells)	In Olturot centre	Semi-permanent wells. (36 and 40 feet deep respectively)	used exclusively by KARI staff and livestock	Dug in 1978. They are equipped with mechanical hand pumps and sealed on top
Olturot public wells (2 wells)	In Olturot centre	Semi-permanent wells (36 and 42 feet deep respectively)	accessible to all pastoralists in Olturot	Dug in 1989/1990. One well is equipped with a hand pump. Both wells have cemented walls and developed stairs to ease drawing of water
Olturot private wells (2 wells)	In Olturot centre	Semi-permanent wells	used by the persons who have created them	Dug in 1987 and 1991 respectively. Typical traditional wells with no modification
Balesa wells (Bwana chafu)	About 7 km from Olturot centre, on Balesa river bed	Semi-permanent shallow wells (4-10 feet deep)	available to all pastoralists in Olturot, Gatab and Kargi who use the area seasonally	Oldest wells around this area. No development on these wells
Elgejeta	About 18 km from Olturot centre, on slopes of Mt. Kulal	Permanent shallow wells (1-3 feet deep)	used by Olturot pastoralists and those based in Mt. Kulal region.	No development
KitiKij	About 20 km from Olturot centre, on Mt Kulal area	Permanent shallow wells (1-2 feet deep)	used by Olturot pastoralists and those based in Mt. Kulal	No development

Nguruset	About 25 km from Olturot centre	Permanent natural springs	Open access water source	No development
Murgusiat	About 30 km from Olturot centre on the foothills of Ol Donyo Mara Mt.	Permanent water wells	Open access water source	No development
Arabel	About 32 Km from Olturot Centre	Permanent natural spring	Open access water source.	The water is piped for 18 km to a trough
Balesa Borbor	About 30 km from Olturot	Temporary shallow wells (5-10 feet deep).	Available to those who create the facility	No development
Anderi and Kulungu	About 50 km from Olturot centre	Permanent natural springs	Open access water source	No development
Sirima springs	About 50 km from Olturot centre	Permanent natural springs	Open access water source	No development
Lake Turkana	About 60 km from Olturot	Permanent salty surface water	Open access water source	Not applicable

Besides the water sources noted in Table 4, pastoralists can access other sources far from Olturot when they move to those areas to graze. They include sources like Falama spring, Kurkum springs and other springs on the slopes of Mt. Kulal. Sometimes the accessibility of a water source outside the home grazing ranges is limited by the community using the area. Therefore, a natural water source might be unavailable to a particular community if it is located in a grazing range of another community hostile to them. Generally, all water sources occurring in areas occupied by Gabra pastoralists are unavailable to Olturot pastoralists, while all water sources occurring in areas occupied by Rendille pastoralists can be available to them depending on the type of the source.

In all pastoral setting in Northern Kenya, when individuals create their own wells, they have rights to the water source and determine who should use it. Most created water sources require a number of people, depending on the depth, to draw the water. Since livestock watering is labour intensive, rights to created water sources are commonly granted along family or clan based relationships. These relationships are particularly important when households temporally move to areas where natural water sources are not available.

3.3 DAMAGE TO VEGETATION RESOURCES

Pastoralists rely on trees and large shrubs to construct their living abodes and livestock night enclosures. Plate 3.2 and 3.3 show part of the settlement site in Olturot while Plate 3.4 and 3.5 show abandoned sites, after pastoralists have moved to new locations. As the photographs show, there is massive use of vegetation materials for construction of dwelling structures and livestock night enclosures. When pastoralists move to new locations, the cut material is left behind.

The size and shape of the enclosures varies. This is expected since a person will construct an enclosure to accommodate the number of livestock owned. The composition of the herds also determines how the enclosure is constructed and partitioned. Generally, the outside fence for each enclosure is circular, with various inside components taking different shapes. To depict the amount of vegetation resources used, total number of cut branches used were counted on 29 abandoned sites. Table 5 shows a summary of branches used in each enclosure. Since it was difficult to identify species of the dry branches, the summary indicates acacia and non-acacia species.

Using the remaining stumps the species of cut branches were identified. They included; *Acacia tortilis*, *A. nubica*, *A. mellifera*, *A. reficiens*, *A. senegal*, *Boscia coriacea*, *Boswellia hildebrandtii*, *Cadaba farinosa*, *C. milabilis*, *Commiphora africana*, *C. flaviflora*, *Cordia sinensis* and *Euphorbia cuneata*.



Plate 3.2: Part of Olturot settlement showing dwelling places and structures (in the foreground) used at night to escape Mosquito bites.



Plate 3.3: A closer view of living abodes and livestock night enclosures adjacent to the dwelling places



Plate 3.4: Abandoned household camp showing remnants of the dwelling places in the foreground and livestock night enclosures in the background



Plate 3.5: A Closer view of an abandoned livestock night enclosure.

Table 5: Number of Branches used to Construct Livestock Enclosures in 29 Sites Sampled

Site	Acacia species	Other species	Total branches
1	529	214	743
2	1321	2	1323
3	520	-	526
4	225	4	229
5	853	-	853
6	674	14	688
7	871	4	875
8	682	16	698
9	376	14	390
10	364	3	367
11	445	-	445
12	196	-	196
13	719	-	719
14	693	-	693
15	256	-	256
16	115	-	115
17	634	2	636
18	127	14	141
19	302	3	305
20	151	-	151
21	484	6	490
22	336	5	341
23	404	114	518
24	359	-	359
25	280	8	288
26	875	12	887
27	369	18	387
28	572	-	572
29	766	1	767

Data from these 29 sites has a mean of 515.7 ± 106.6 branches at 95% confidence level. The high variation displayed by this data is because number of livestock per household varies significantly. Livestock owners thus require different sizes of enclosures to accommodate the number of animals owned. The variation is also affected by the species used. Some plant species have more effective branches than others. The method used to harvest the vegetation resources can either be devastating or supportive to the ecology and hence the environment of the arid areas, depending on the land-use system. Generally, removing some branches encourages secondary growth of the plant. These sprouting twigs and leaves are valuable sources of forage for livestock and wildlife. Plate 3.6 shows an undisturbed *Acacia tortilis* riverine woodland while Plate 3.7 shows a mature *Acacia reficiens* plant. Some people harvest the whole tree stand while others cut only a few branches. Leaving some vegetative material on the harvested stump is important for continued growth of the affected plant. Plate 3.8 to 3.11 show remaining tree stumps of harvested trees. As these photographs show, the effects of harvesting on tree stands range from minimal to destructive state.

To show the damage caused by pastoralists on tree resources, sites around abandoned sites were sampled. Stumps of remaining tree stands were observed and the number of branches cut and those remaining counted. Table 6 shows a summary of various sites by species.



Plate 3.6: Undisturbed young *Acacia tortilis* riverine woodland stand.



Plate 3.7: A Mature *Acacia reficiens* large shrub, a dominant and important source of branches.

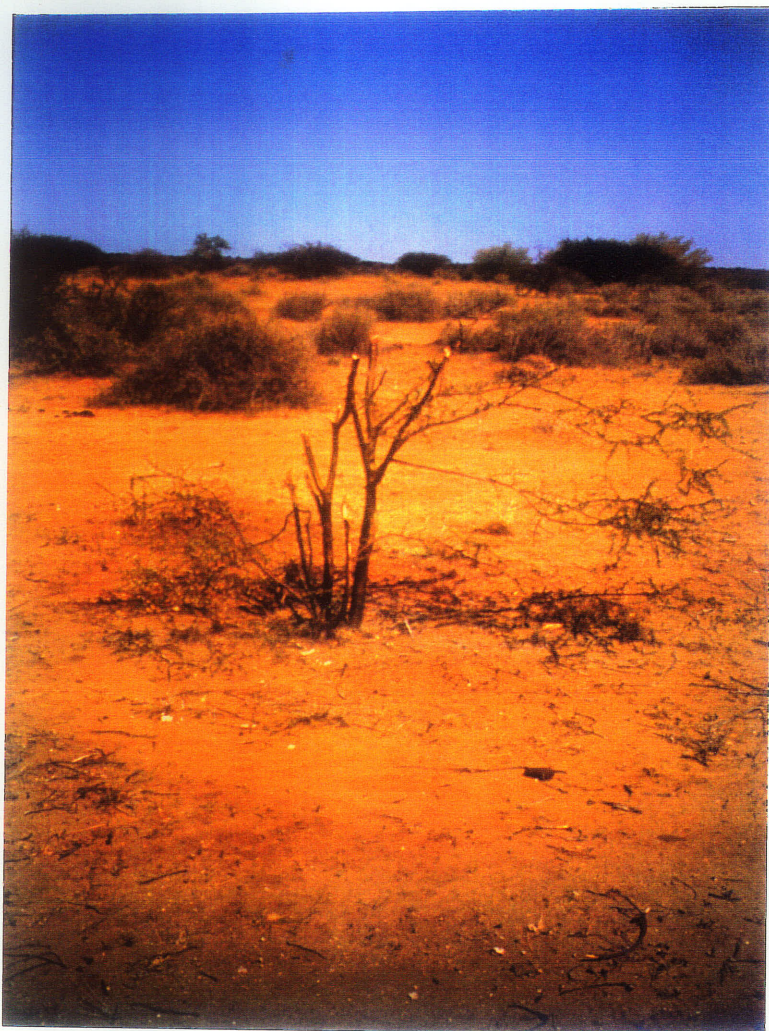


Plate 3.8: *Acacia tortilis* tree stump
with almost all branches cut

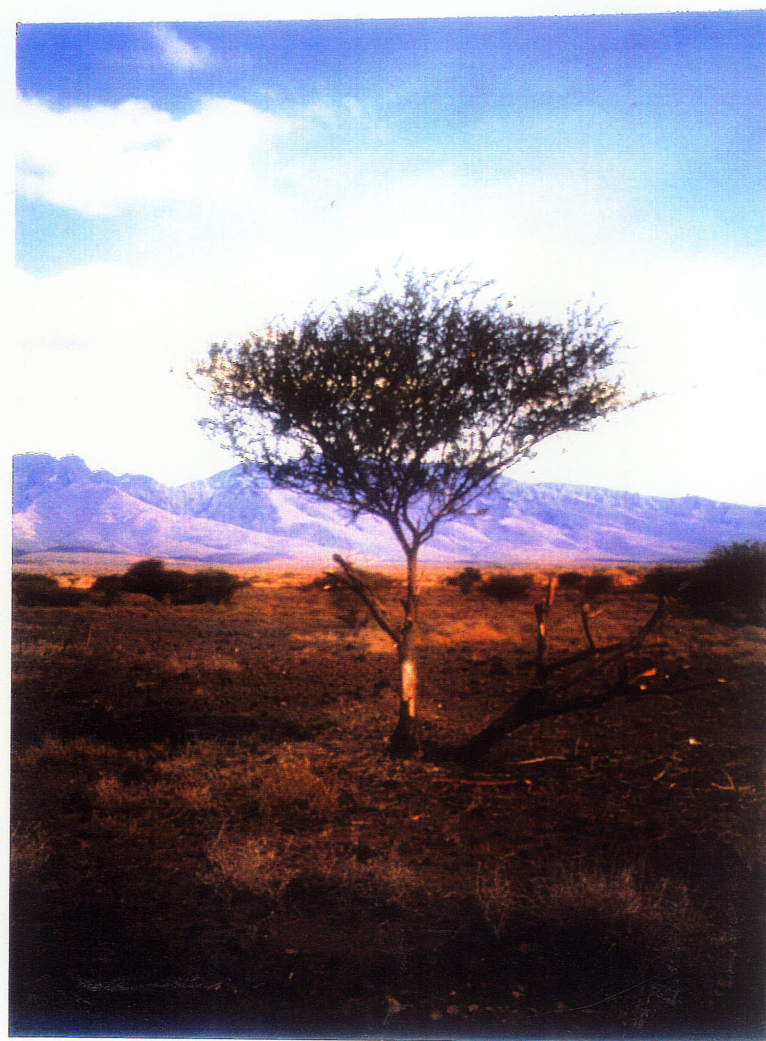


Plate 3.9: *Acacia mellifera* tree stump with
about half of the branches removed



Plate 3.10: *Acacia nubica* tree stump with most of the branches removed.



Plate 3.11: *Acacia reficiens* shrub with only a few branches removed.

***Table 6: Number of Trees by Species Observed and Proportion where at Least One Branch was Spared or all the Branches were Cut**

Site	Species	No. of Trees	At least 1 Branch Remaining	All Branches Removed
1	Acacia nubica	7	4	3
	Acacia reficiens	9	8	1
	Acacia tortilis	17	5	12
	Commiphora africana	4	1	3
2	Acacia mellifera	1	0	1
	Acacia reficiens	1	0	1
	Acacia tortilis	48	13	35
3	Acacia reficiens	1	0	1
	Acacia tortilis	34	10	24
4	Acacia reficiens	1	1	0
	Acacia tortilis	28	8	20
5	Acacia tortilis	31	14	17
6	Acacia tortilis	37	18	19
7	Acacia tortilis	40	18	22
8	Acacia nubica	1	0	1
	Acacia reficiens	1	0	1
	Acacia tortilis	37	6	31
9	Acacia mellifera	11	5	6
	Acacia reficiens	4	2	2
	Acacia tortilis	3	3	0
	Commiphora africana	1	1	0
	Commiphora flaviflora	1	1	0
10	Acacia mellifera	2	1	1
	Acacia reficiens	7	2	5
	Acacia tortilis	8	6	2
	Commiphora africana	3	0	3
11 & 12	Acacia mellifera	3	2	1
	Acacia reficiens	27	9	18
	Acacia tortilis	1	0	1
	Boscia coriacea	3	2	1
13	Acacia mellifera	5	2	3
	Acacia reficiens	25	7	18
14	Acacia reficiens	1	0	1
	Acacia senegal	11	2	9
	Acacia tortilis	19	6	13

15 & 16			
Acacia mellifera	1	1	0
Acacia senegal	2	0	2
Acacia tortilis	10	4	6
Cordia sinensis	3	2	1
17			
Acacia senegal	1	1	0
Acacia tortilis	40	15	25
18			
Acacia tortilis	22	3	19
Boswellia hild.	4	3	1
Commiphora africana	23	6	17
Commiphora flaviflora	1	0	1
19			
Acacia reficiens	29	7	22
Acacia tortilis	2	2	0
20			
Acacia reficiens	16	9	8
21			
Acacia mellifera	8	5	3
Acacia reficiens	9	3	6
Acacia tortilis	12	6	6
Commiphora africana	1	0	1
22			
Acacia mellifera	5	2	3
Acacia reficiens	12	4	8
Acacia tortilis	1	0	1
Commiphora africana	2	0	2
23			
Acacia mellifera	13	4	9
Acacia reficiens	5	1	4
Acacia tortilis	12	3	9
Commiphora africana	1	0	1
24			
Acacia mellifera	9	0	9
Acacia reficiens	12	7	5
Acacia tortilis	9	4	5
25 & 26			
Acacia mellifera	15	2	13
Acacia reficiens	15	5	10
Acacia tortilis	5	2	3
Cadaba farinosa	1	0	1
Commiphora africana	2	2	0
Euphorbia cuneata	1	1	0
27 & 28			
Acacia mellifera	8	2	6
Acacia reficiens	9	0	9
Acacia tortilis	21	8	13
Cadaba milabilis	1	1	0
Commiphora africana	1	1	0
Euphorbia cuneata	1	1	0
29			
Acacia reficiens	22	4	18
Acacia tortilis	8	5	3
Commiphora africana	1	1	0

* All the sites were located within 20 km radius from Olturot centre with the majority of the sites occurring within a 10 km radius.

The table indicates the number of tree species observed, number where all branches were harvested and number where at least one branch was spared. Pastoralists use more *Acacia* than other non-*Acacia* species. In the 29 sites sampled, only two sites had non-*Acacia* species contributing more than 20% of the total branches used. There are three major reasons why there is a heavy utilization of *Acacia* species in livestock enclosure construction:

- i) The presence of stronger and well placed thorns in *Acacia* species make them better in protecting livestock from predators, and also preventing them from breaking the fences and straying away at night.
- ii) The *Acacia* species are readily available due to their wide distribution in the various range types where the community graze their animals.
- iii) The *Acacias* have stronger texture than most other species. They can withstand harsh environments and are fairly resistance to termite attack. They hold the enclosures fences for a longer time than the other species.

These characteristics makes the *Acacias* more preferred during enclosure construction. Only in areas where *Acacia* species are not readily available do pastoralists use other species. They prefer species with thorns in most cases. Some of the cut plant species did not have thorns. It was assumed that they are mainly cut to construct living abodes or to clear the enclosure sites.

With controlled harvesting, environmental damage can be minimized if pastoralists cut only some branches while leaving others to help the plant in

vegetative growth. Table 7 shows a summary of percentage of total tree stumps where all the branches were harvested, leaving the stump without any vegetative material. The percentages are for the sampled trees in each site (calculated from table 6). Although efforts were made to count all tree stumps on site, caution should be taken in interpreting and extrapolating the data because of the tree stumps which may not have been observed.

Table 7: Percentage of Trees Where all Branches were Removed

Site	% completely harvested	Site	% completely harvested
1	51	15 & 16	56
2	71	17	61
3	71	18	76
4	69	19	71
5	55	20	50
6	51	21	53
7	55	22	70
8	87	23	74
9	40	24	63
10	55	25 & 26	69
11&12	62	27 & 28	68
13	70	29	68
14	74		

The data show that in 27 out of the 29 sites, over 50% of the observed tree stumps had all the branches cut. This leaves the stumps with no vegetative material. Plate 3.12 and 3.13 show damage caused to tree stands during boma construction. Although nearly all the plant species cut have regenerative

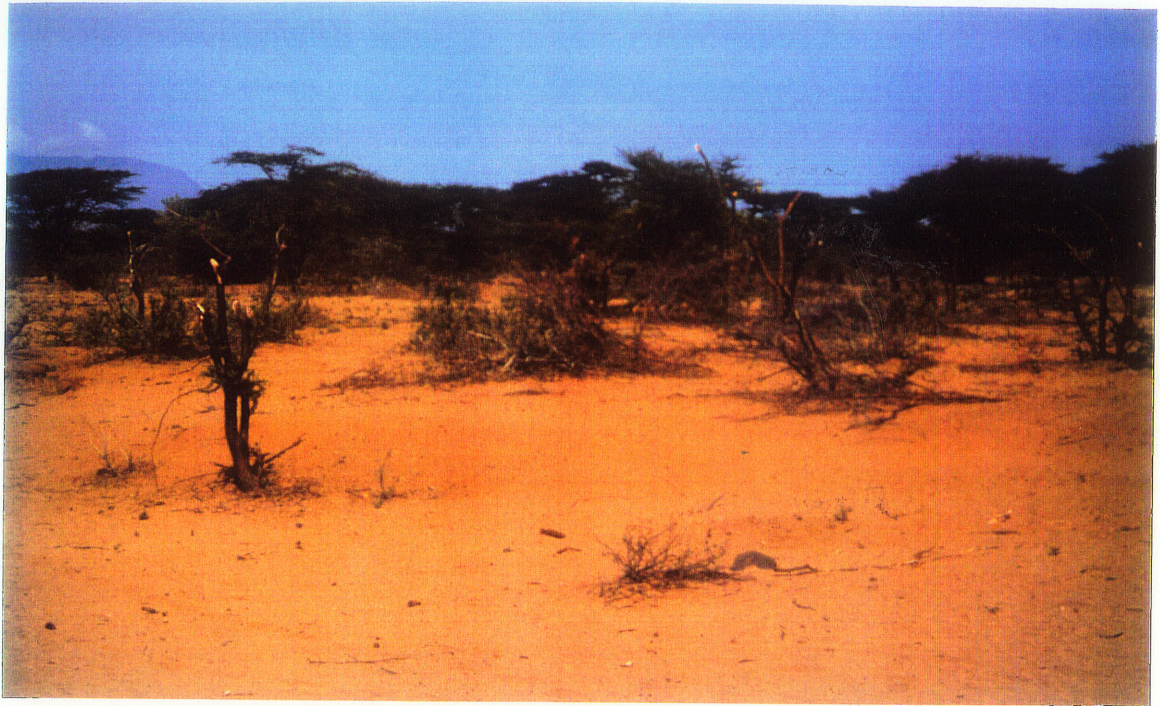


Plate 3.12: *Acacia tortilis* riverine woodland after pastoralists have cut construction materials.



Plate 3.13: *Acacia reficiens* dominated shrubland after pastoralists have cut construction materials.

capacity, harsh environmental conditions after harvesting coupled with browsing of sprouting vegetative material can lead to plant death or stunted growth.

Other destructive use of vegetation include burning of charcoal, roof thatching material and cutting of wood to make crafts. Four households reported that they burn charcoal besides their usual livestock activities while one person indicated that he makes crafts (stools, spear handles, traditional containers). Some pastoralists cut grasses and dwarf-shrubs to roof their abodes to protect them from direct sun and rainfall. From the informal discussions, it was learned that people use the bark of *Acacia nubica* for prevention and treatment of malaria and general malaise.

3.4 RESOURCES USE

The way the community uses the resources at their disposal is based on the concept of home ranges and the distribution of water resources, especially during critical dry spells. A home range is taken as the area over which a community has grazing control. The neighbouring communities recognize this and refrain from using the resources within the other community's home ranges without the consent and goodwill of the recognized owners.

3.4.1 OLTUROT HOME RANGES

The community based in Olturot has an arbitrary grazing range of about 30 km radius from Olturot Centre. Due to an existing mutual relationship with the other communities located at Mt. Kulal, Kargi, South Horr, and to an

extent Korr (Figure 2, page 19), Olturot pastoralists occasionally move to, or near these centres. The same applies to pastoralists from Kargi and Mt. Kulal (Gatab) who occasionally use the Olturot area during the wet season.

However, there is some distrust between Olturot pastoralists and the Gabra tribe, who occupy Gus, Kalacha and Maikona area. Olturot pastoralists thus do not prefer grazing their animals close to these settlement areas. They do, however, share natural water sources at Arabel and on rare occasions may meet at Balesa Borbor area, requiring one community to withdraw from the area.

As a result of these relationships, one can safely assume that Olturot pastoralists can graze their animals as far as Kargi, Korr, South Horr and lake Turkana, but do not move beyond Asie hill. Figure 4 shows the general vegetation distribution in Olturot region. Households based in Olturot have their origins from either Kargi, Korr, Mt. Kulal, Loyangalani, South Horr or other neighbouring settlement areas. These centres are occupied by either Samburu, Rendille or Turkana tribe. The Gabra occupies the North Western part of Olturot area and has long traditions of animosity with the other neighbouring tribes.

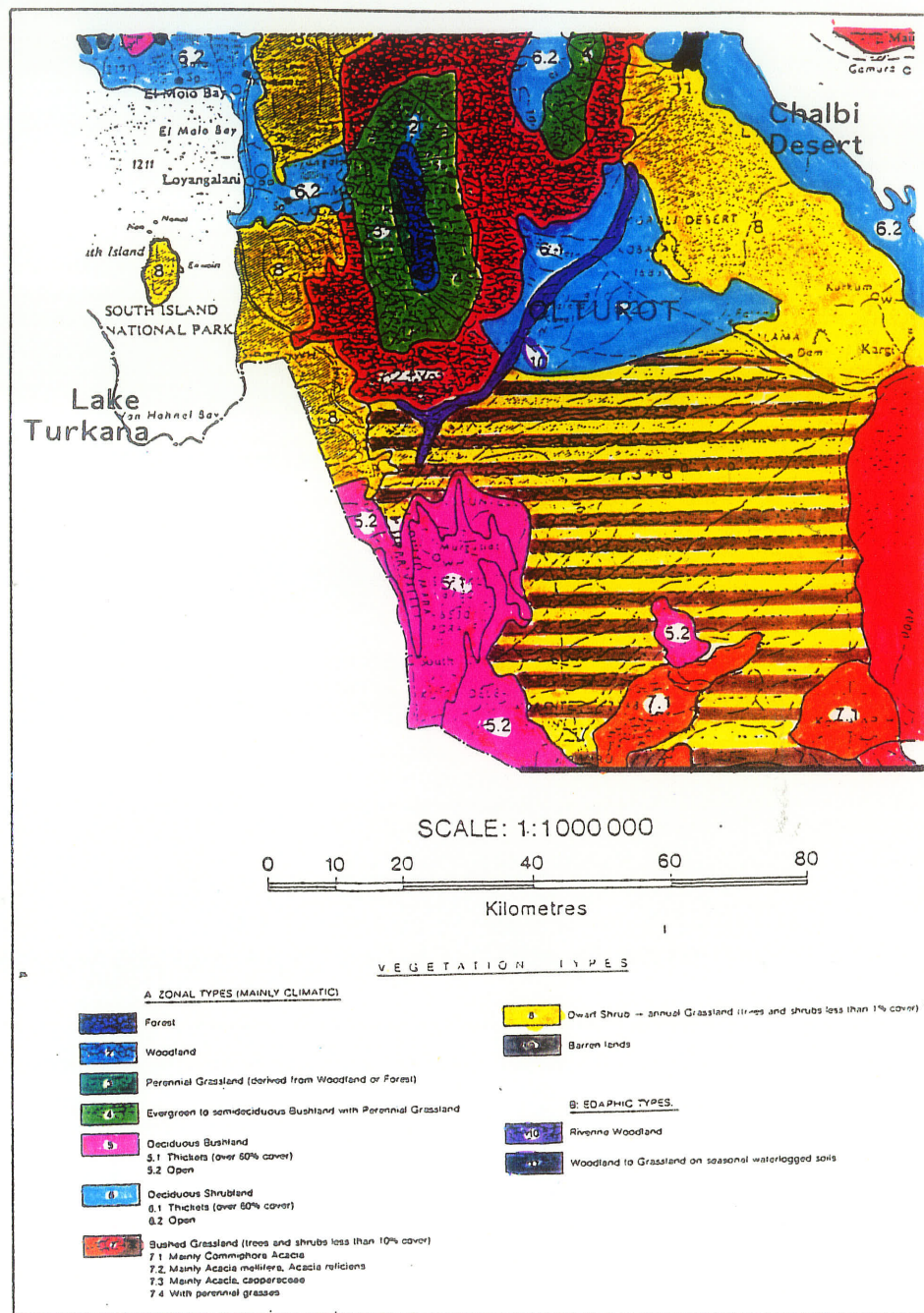


Figure 4: General Vegetation of Olturot Home Grazing Ranges

Source: Adapted from Schultka, W., 1991. Vegetation Types. In: H.J. Schwartz, S. Shaabani, & D. Walther (Eds). *Range management handbook of Kenya*, Vol. II(1), (Map No. 17). Nairobi, Kenya: Marsabit District, Ministry of Livestock Development.

3.4.2 RESOURCES DISTRIBUTION AND THEIR USABILITY

Based on available permanent or semi-permanent water sources, it is possible to conceptualize areas which are deficient in water resources for livestock production. The analysis is based on a model developed by Bake (1983) and used extensively in recommending water development in Marsabit district (Bake, 1991). The Model is based on the water needs of different species of livestock and their wandering capacity. Table 8 shows a summary of the approximate distances used in the model. These distances are based on observations of normal pastoral livestock activities throughout the year.

Table 8: **Wandering capacity, potential walking capacity and appropriate radius of grazing area around watering points for various livestock species.**

Species	*Wandering Capacity	**Potential walking distance	Appropriate radius of grazing from water point
Camels	20 km	40 km/day	50 km
Cattle	10 km	15 km/day	10 km
Sheep & goats	15 km	25 km/day	15 km

* means that species move slowly while continuing with usual browsing and grazing.

** means that animals move without grazing.

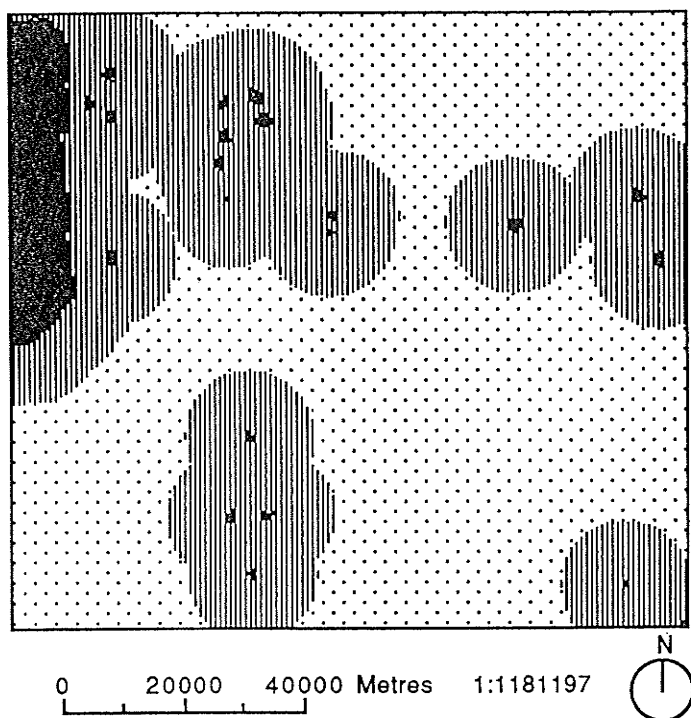
Source: Bake, G. (1984). Water resources and water management in South-Western Marsabit District. *IPAL technical report B-4*. Nairobi, Kenya: UNESCO.

The Table shows the approximate distance covered during normal grazing or when pastoralists are shifting from one grazing area to another in search of new pastures. The approximate radius of grazing from a water point is estimated for each livestock species using these distances.

Pastoralists in Olturot generally graze their animals within a permanent water resource locality. They indicated that areas without permanent water are rarely used even during the wet season when water is not a limiting factor. Thus relatively large areas between Olturot, South Horr, Korr and Kargi is rarely used.

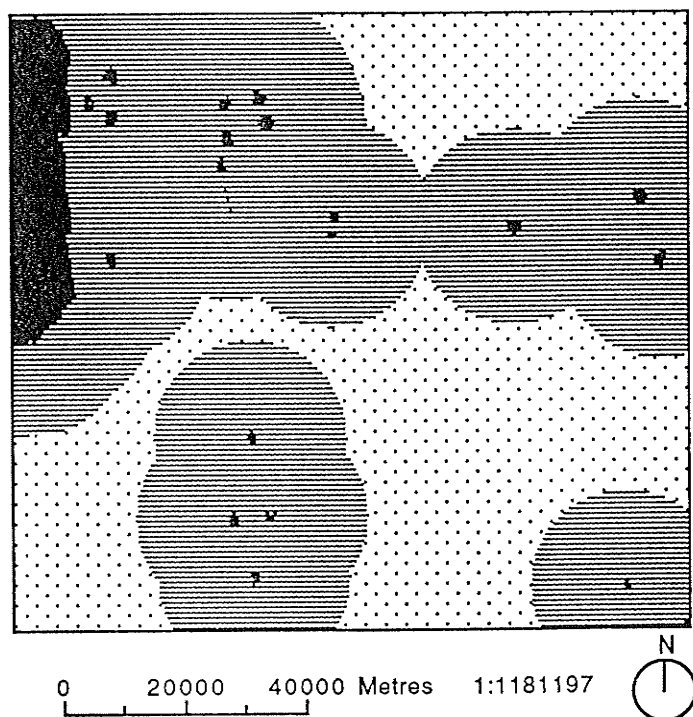
Using distances from the table, the potential grazing areas are displayed by spreading 10 km from a water source for cattle, 15 km for sheep and goats and 50 km for camels. Figure 5 shows areas between Lake Turkana, Kargi, Korr and South Horr with convenient permanent water resources for cattle grazing. From the figure, it can be seen that more than half of this area does not have adequate permanent water for cattle.

Figure 6 shows the same area spread 15 km from permanent water sources. These are areas with convenient water sources for sheep and goats. Although extensive areas still do not have adequate permanent water, the figure shows that sheep and goats are not as limited as cattle in terms of accessible range.



	0	Permanent water sources
	10	Cattle grazing range from water sources
	20	Areas without adequate water for cattle

Figure 5: Areas which can be Adequately accessed by Cattle (areas about 10 km from water source).



	0	Permanent water sources
	15	Sheep and goats grazing range from water
	20	Areas without adequate water for sheep & goats

Figure 6: Areas which can be Adequately Accessed by Sheep and Goats (areas about 15 km from water source).

When the same area is spread 50 km from permanent water sources, no area seems to be limited for camel use. It is, however important to note that range accessibility can be limited by other factors like terrain, dense bush and incidence of animal diseases. Some areas around Mt. Kulal are not accessible to camels due to difficult terrain. Pastoralists also avoid taking animals in some places because they associate the area with deadly animal diseases like trypanosomiasis and anthrax.

There is no formal established grazing pattern for households based in Olturot. They move when necessary, looking for new pastures when they deplete occupied areas. They can stay in some areas for two weeks to two or more months, depending on the forage resources present and water accessible in an area.

Some households never move their animals beyond 15 km radius from Olturot (a day grazing radius) throughout the year. Out of the 29 respondents, 15 indicated that they graze their livestock around Olturot most of the time. Those who graze their animals around Olturot centre throughout the year were found to own mainly small stock (sheep and goats). Occasionally, households with few (1-4) cattle and/or camels were found to combine them with animals of other households and thus reducing the need to move extensively in search of forage. Households with cattle, camels and small stock were found to move more extensively, some indicating that they had used areas about 100 km from

the settlement site. Some respondents indicated that they are beginning to realize that forage around the settlement area is becoming more scarce during the dry season. Eventually, every household will be forced to move more extensively, as the livestock numbers increase around the settlement centre.

3.5 DISCUSSION

3.5.1 REASONS FOR PASTORAL SETTLEMENT

Available evidence shows that settlement in Olturot was a result of a combination of factors. These factors offered conditions favourable to pastoralists, by giving them opportunities to acquire and accumulate livestock wealth. Job opportunities with projects based in this area coupled with availability of pasture and presence of water resources have encouraged pastoralists to settle in Olturot. Evidence from the study shows that the IPAL/UNESCO project played a crucial role in encouraging the beginning of settlement in Olturot. If this project did not locate their livestock centre in Olturot, the settlement would probably not be there while the area would seasonally be used as in the past.

Although authors like Dolan (1980), Fratkin (1986), and Timberlake (1987) emphasize water development as the main factor encouraging settlements, evidence from Olturot tend to show that factors other than water development act as main incentives for pastoral settlement. This is reinforced by the fact that water development has taken place years after settlement began.

In this respect, the IPAL/UNESCO Project and KARI Livestock sub-centre have greatly influenced pastoral settlement in Olturot. Development of water sources, health facilities, schools, shops and other social amenities in settlement centres have been initiated as a way of improving the standard of living for the settled communities.

Through employment, pastoralists get the opportunity to earn money which they invest in buying more livestock and also buy food stuff from shops thus depending less on the livestock. For the pastoralists, livestock is a way of storing their wealth. This is perhaps the most rational option, for an area where life is centred on livestock wealth. Although wealth on hoof has some drawbacks, livestock as capital appreciates through reproduction. Availability of alternative food sources (purchased or from famine relief) reinforces this process of wealth accumulation.

The consequent results of the settlement in Olturot due to a development project's activity in the area establish the need to have environmental impact assessment (EIA) before projects are implemented. The EIA would have established some of the expected negative impacts and mitigation measures.

3.5.1.1 PASTORAL SETTLEMENT AND RESOURCES MANAGEMENT

From a resource management perspective, settlement in arid areas has major short and long term effects on the resources' use. Short term effects include intensive use of forage resources around settlement areas, disruption of

traditional ecologically viable grazing patterns and uncertainty in appropriate patterns of land use. Long term effects include land degradation around the settlement centres and changes in the traditional way of life and hence resource use strategies.

Social changes occurring in settlement centres include diet habits and perceptions. In nomadic pastoralism, households depend on livestock products (mainly milk and blood) for their subsistence which requires little or no cooking. As households settle, people shift from milk dependence to grain (mainly purchased from shops), which requires cooking. Since fuelwood continues to be the major source of energy in arid lands, there is an increased pressure on vegetation resources around settlement centres.

As people settle, they tend to keep livestock with them in the settlement centres. The relationship between people and livestock is complex, and creates a feedback loop system difficult to control. Households confine livestock in settlement areas. This has two major effects on the environment: First, increased livestock concentration on settlement areas leads to over-grazing; and Secondly, increased livestock numbers translates into a higher demand for construction material for livestock night enclosures. This increased demand, together with the demand for fuelwood and building material accelerates the rate of land degradation around settlement centres. Thus, as overgrazing causes disappearance of grasses and dwarf-shrubs, cutting of trees removes the

dominant vegetation in the arid lands. The above effects lead to exposure of the soil to wind and water erosion and ultimately results in land degradation.

Social programs in the settlement centres have also accelerated the problem. Currently church missions provide the bulk of social programs by supporting the day care centre, offering the health services and other incentives (transport, education scholarships, provision of famine relief, individual help etc.). One would expect that in the long-run, increased medical care and provision of famine relief during critical times, and other social factors would lead to an increase in population. A higher population requires a higher livestock number for subsistence. There are indications that increased social amenities (church missions, schools, health facilities, shops, etc.) might encourage more settlement. This would lead to accelerated land degradation. A lower population density has a small and tolerable impact on the environment.

Effects of the community impact on environment are beginning to show in Olturot. This is characterized by the presence of recently exposed areas, increased gulling and signs of wind erosion. These signs are indications of a falling balance between pastoral production systems and ecological conditions around the settlement area.

3.5.1.2 ADVANTAGES OF PASTORAL SETTLEMENT

There are some advantages of pastoral settlement in range areas. A major advantage relates to security of arid land inhabitants. Neighbouring countries (Somalia, Ethiopia, Sudan, Uganda) have had economic and political problems for a long time. This has resulted in increased number of illegal arms especially in the Northern part of Kenya. Sedentariness of pastoralists offer community groups security from cattle rustling. Settlement also makes it easy for the Government to protect the communities. There is currently great dangers for a household to wander in the range alone, lest they be attacked by free wandering illegal aliens.

Settlement also makes it easy for the government to plan community programs aimed at improving the living standards of people occupying rangelands. Around settlement areas, it is easier to organize groups, provide health services, build school(s) for their children and provide basic human necessities, a development which is in progress currently at Olturot. This kind of community organization is a major process of incorporating pastoralists in the country's political and economic systems.

3.5.2 WATER RESOURCES DISTRIBUTION

Taking into account that the rangelands in Olturot can only sustain livestock production for a limited capacity, then the current water resources are adequate. The interpretation of water adequacy is from the user's point of

view, in this case the pastoralists based in Olturot. It includes water for human and livestock use. However, livestock in the arid areas consume large amounts of water while humans use very little comparatively. The number of semi-permanent watering points has increased from one source to more than four sources since settlements began with the potential of further increase if need be. This translates to enough water for human and livestock at the current level of resources exploitation.

While it is evident that water was a major limiting production factor in the past, the balance seems to change to a point where forage resource is now the major limiting factor. Evidence from the study shows that pastoralists who own cattle are forced to move extensively because the forage resources in Olturot are not adequate throughout the year. This situation was foreseen when water development was recommended. But the planners ignored or failed to realise that pastoralists have options to water resources limitation.

Planners thought that by creating shallow wells with limited recharge potential, pastoralists would move to other areas when water becomes limiting. However, pastoralists overcame this limitation by digging more shallow wells. The presence of two private shallow wells in Olturot clearly shows that the principle on which water development was recommended has so far failed. Pastoralists are now not faced with the problem of inadequate water supply throughout the year. They are, in turn, faced with the problem of inadequate

forage resources for their livestock.

3.5.2.1 WATER RESOURCES AND RANGELANDS USE

Currently, there are no patterns of migration in relation to vegetation types and water availability. Pastoralists move when their animals cannot get enough forage. Even if the public wells were to be closed to encourage pastoral movement, those with household labour could dig their own wells and thus continue to stay in the area as long as they deem necessary. Situations where pastoralists create their own water sources in an area where permanent water (mainly mechanical) is provided is common in other settlement centres.

In larger centres like Korr, Laisamis and Kargi, pastoralists have created their own shallow wells, despite the presence of deep boreholes. They do this to reduce their dependency on mechanical water sources. The main reasons why households prefer their own water sources are;

- i) Mechanical pumps frequently breakdown due to over use and lack of proper management and maintenance. To minimize negative consequences on their livestock and the cost required in operation and maintenance of mechanical sources, pastoralists create their own wells;
- ii) The possibility of using created water resources as a public good is foreign to most pastoralists. Most pastoralists like to be independent. They organize livestock production activities along group and clan lines. This form of organization creates a kind of competitive livestock

management system in arid lands.

- iii) Private water wells save livestock owners from queuing for many hours when their livestock are thirsty.

Although Kargi and Korr settlements are thought to have attracted a large number of pastoralists due to presence of boreholes, most pastoralists settled in these centres have created their own wells. They no longer depend on the deep boreholes thought to have been key to their continued settlement.

This scenario leads one to question the rationale of developing water resources in most range areas. The most reasonable argument in support of such development is when one views it as a public service aimed at providing clean water to humans. To date, no development project in arid areas has clearly delineated water development for human use from livestock use. This is because of the complex relationship existing between people and livestock in the rangelands.

3.5.2.2 WATER DEVELOPMENT AND RESOURCES USE RIGHTS

Traditionally, most arid lands in Africa were under common property ownership. Grazing lands were recognized by pastoralists as public resources available to all stock owners in each community. The same applies to natural water sources. Hand-dug wells, where they occur, are often limited to those who have created them (McCabe 1990).

Water development creates some problems in rangeland resources'

management. It tends to make communal grazing land be used as open access grazing land. To the extent that grazing lands are used like open access, an individual is not limited by water resources rights if it comes from a public source. Furthermore, mechanical water sources reduce labour requirements during watering. This encourages individuals to own livestock beyond a number which household labour can support. Thus, water development has tended to aggravate the problems of the arid lands by making it easier for individuals to accumulate livestock, beyond their labour capacity, and without concern for the environment.

3.5.3 VEGETATION RESOURCES EXPLOITATION

The most immediate threat to the environment on arid lands is mainly due to direct human activities on the resources. While over-grazing has been associated with land degradation for a long time, direct human activities on the vegetation is a bigger threat than over-grazing. The demand for materials to construct livestock enclosures, build living abodes, and for fuelwood lead to harvesting of large volumes of trees and large shrubs. Study results show a high tendency to completely remove all the branches from a tree. The vegetation category most affected are the young and growing tree structures (3-5 years old). This category plays a major role of replacing older trees in an ecological system and thus its removal creates an ecological imbalance by eliminating the replacement stock.

Another source of concern on the environment is the practice of charcoal burning around the settlement centre. Charcoal burning involves cutting mature woody trees, a bias that aggravates the imbalance caused by the cutting of construction material . When this is done on a large scale, the ultimate results are large areas devoid of any trees.

Use of the vegetation material for making crafts and the bark of *Acacia nubica* for medicinal purposes does not represent serious threat to the environment for now. However, continued harvesting of the specific plant species can result in their decreased density if more people use them on a continuous bases. This can ultimately result in the species becoming endangered if their use exceeds the ecosystem replacement potential. Use of the grasses and dwarf shrubs for roofing the living abodes does not have a serious impact on the environment, as most pastoralists use animal skins for roofing and preserve the forage for the animals.

Harvesting pressure as a result of need for livestock enclosure material can be minimized if livestock movement is evenly distributed across the extensive rangelands. This would make the harvesting impact tolerable to the environment. The livestock enclosures, if located in different and well spaced sites in each move, would result in harvested tree stumps having ample time to recover.

The problem in Olturot is that pastoralists tend to shift their enclosures

within the settlement area and fail to move frequently to other areas far from the settlement site. Harvested tree stumps are thus not given enough time to recover. Due to the presence of livestock around the settlement centres, regenerating plants are nipped off, thereby stunting their growth.

For each household, the total annual demand of material for livestock night enclosures depends on the number of livestock owned and the number of movements made in a year. The capacity of the environment to satisfy this demand depends on the total demand for all the households. By settling, pastoralists in Olturot have reduced the number of times they move in a given year. The total cumulative material demand for the entire community has been reduced, but the impact on the environment is more serious than in previous situations when pastoral movements were regular. Pastoral activities and shifting characteristics in Olturot shows that this impact is localized in areas around the settlement site.

3.5.4 RANGELAND RESOURCES USE

The existing permanent water resources around Olturot are adequate to support the current livestock number and human population. This is not likely to be so for a long time. Increase in human population and hence livestock number creates a demand for more water. Pastoralists can increase their water resources by digging more wells around Olturot, thus overcoming any water shortage. The end result would be a situation where forage becomes a limiting

factor of livestock production rather than water.

Although it is difficult to determine the proper stocking rate for Olturot region, soil conditions and vegetation cover are good indicators of livestock and human impact on the environment. Observations around Olturot centre show that there is significant impact by human and livestock on the environment. Control of resources use is necessary to minimize long-term negative impacts. While water resources are not evenly distributed, it would be an environmental disaster to provide water resources in areas without adequate water. What is required first is a proper land management system in areas where water is to be developed.

The evaluation on use of resources is mainly centred on human/livestock interactions. There is little consideration on other rangelands uses like wildlife management or non-use values of the range (rare plant species, ecosystem framework, etc.). Major wildlife species occurring in this region include: oryx; zebras; giraffes; grant's gazelles; gerenuk; and ostriches. The population and distribution of these wildlife species is not well documented.

Wildlife species tend to inhabit areas with minimal human activity. It is thus reasonable to assume that areas without adequate water resources act as a wildlife refuge. Extensive areas remain without adequate permanent water for livestock production. These areas hold some wildlife species and should not be considered as idle. The presence of wildlife in such areas is a strong case

against water development as this would further reduce these refuge habitats. In any case, these areas can still be used by livestock during the wet season. Such kind of rangeland-use would preserve the integrity of the ecosystem, a significant step towards sustainable use of natural resources.

3.6 SUSTAINABLE DEVELOPMENT IN A PASTORAL CONTEXT

Development planners are faced with a difficult task of linking development and the environment and thus understanding the impact of human activities on the environment. They are required to direct the effective implementation of development programmes capable of maintaining a dynamic environmental balance, in order to promote the concepts of sustainable development. In substance, development must be able to meet the present needs while preserving the quality and productive potential of the environment, and hence its capacity to meet the needs of future generation.

With respect to grazing lands, sustainable development requires promotion of resource use strategies that are within the bounds of ecological potentials, which the resource users can reasonably desire for the present and for generations to come. There is an upper limit to the use of resources (water and forage) in the arid areas. Sustainability requires that we develop equitable access to the limited resources long before these limits are reached. Furthermore, apart from the problem of availability and distribution of resources, there is the issue of human population increases and the resulting

pressure on the resources. Consequently, the resources must be used rationally to meet basic human needs without destroying the ecological sustainability of the production systems.

Sustainability calls for a rational management of the grazing resources in a way that would meet pastoralists' need for survival and the ecosystem capabilities to meet these needs. This is then incorporated in the socio-economic transformation process of raising the living standards of arid land inhabitants.

3.7 SUMMARY

From the study conducted, the following results were observed:

- i) Pastoral settlement in Olturot is as a result of job opportunities, a favourable environment to accumulate livestock, and security as a result of group settlement. The presence of IPAL/UNESCO Project and KARI Livestock Sub-centre had a major influence (direct and indirect) on the settlement with IPAL/UNESCO stimulating the beginning of the settlement in this area.
- ii) There are abundant water resources accessible to pastoralists based in Olturot. However, the sources are concentrated near the settlements, leaving extensive areas without adequate water especially for cattle and to a lesser extent sheep and goats during the dry season. Camels do not have any water resource limitation.

- iii) There is a cruel destructive harvesting of young trees, especially *Acacia* species, during construction of livestock night enclosures. The impacts of this destruction are more serious around the settlement areas, as the presence of livestock throughout the year repress the regeneration of the affected plants.
- iv) There is an intensive use of grazing resources throughout the year around Olturot while extensive areas are rarely used, mainly due to lack of permanent water most times of the year. This intense use can be partly attributed to lack of strategic grazing pattern where areas without water could be used more during the wet seasons.

CHAPTER 4

4.0 CONCLUSIONS, RECOMMENDATIONS AND APPROPRIATE DEVELOPMENT POLICY FOR ARID LANDS

4.1 CONCLUSIONS

In the past, causes of pastoral settlement have been narrowly defined, with water development being associated with most settlements in Northern Kenya. Evidence from the study conducted in Olturot shows that pastoral settlement is a result of a combination of various factors. There were three major causes of settlement in the area: job opportunities created by projects located in the area; the presence of good pastures; and availability of water were instrumental in encouraging people to settle. As a result, this attracted other people because of group the security offered by such settlements.

There is every reason to conclude that pastoralists settle in areas where opportunities exist for them to be able to acquire and accumulate livestock wealth. These opportunities include wage employment, water resources development and security from livestock rustlers. The initial location of a livestock centre by IPAL/UNESCO in Olturot coincide with the start of the settlement and hence shows that the project was the principal influence in encouraging settlement. The major overriding factor was, however, the presence of good pasture and water for the livestock at the initial stages in the settlement process. Nevertheless, the occurrence of a project base in an area

with good forage and water enhances the process of pastoral settlement.

In Olturot, the presence of KARI Livestock Sub-centre has a major impact on the stability of the settlement. There are no well established social amenities structures (schools, health facilities, shops, etc.). The activities of the KARI centre and the services available as a result, are therefore very crucial to the settlement. Recent church missions' activities and improvement in trade are likely to further stabilize the settlement and ultimately create incentives to encourage more settlement.

Little has been done to influence the productivity of pastures in arid areas. The major influence has been on water resources' development. From the study, it was found that accessible water resources by Olturot pastoralists include surface water (Lake Turkana), developed wells, traditional wells and natural springs. Although water development could influence more settlement in this area, in the past it was not a major supportive factor. This is justified by the fact that there were traditional shallow wells around Olturot since the settlements began. Furthermore, the Balesa wells have been in use for a long time. This shows that the recommendation by Lusigi (1984) and Lusigi *et al.* (1986) on well development was not factually presented. Water development in Olturot only made the resource more reliable, but did not in a real sense create new water sources.

The vegetation types in Olturot region favour a seasonal use to maximize

utilization of all areas. This is because patterns of availability are seasonal and variable, thus requiring seasonal use. On the other hand, availability of more reliable water around settlement sites discourages pastoral migration in search of water. This has resulted in more intensive use of the range around Olturot throughout the year.

From the study, it was found that most of the movement is confined to a radius of about 15 km from Olturot centre. There is also regular shifting of livestock enclosures within the settlement site. This localized shifting has a biological significance in control of livestock pest accumulation. It breaks the life cycles in the pest/host relationship of animal parasites (internal and external parasites). This type of control, in turn, has an indirect implication on vegetation resources' use.

There is a need for construction material every time a household shifts. This is creating a lot of pressure on the vegetation resources around the settlement centre. A particularly disturbing experience is the way pastoralists harvest branches. It has been observed that there is a high tendency to remove all the branches from a tree, leaving the stumps with no vegetative material. Although most of the plants cut have regenerative capacity, their potential to recover from wanton destruction is limited by livestock browsing. Sprouting plants are nipped off by the animals, thus impeding their growth or killing them gradually.

The situation can be corrected through even distribution of livestock across the entire available grazing areas. Evidence from the study shows that large areas between Olturot, Kargi, Korr and South Horr are rarely used or not used at all, due to lack of reliable water for livestock. These areas can be used during the rainy seasons when water is available from temporally surface ponds. This would relieve the areas around the settlement, giving the plants time to recover from extended use during the dry season.

The present use of grazing lands in Olturot area cannot sustain the long-term livestock productivity. Areas around the settlement will be degraded to an extent that they cannot support current livestock numbers, let alone the expected increase in time. There is thus an urgent need to take appropriate actions to mitigate the current trend in land degradation. These actions should tackle the current problem and also aim at preserving the long-term productivity of the range for future generations.

4.2 RECOMMENDATIONS

The foregoing results, discussions and conclusions call for short-term solutions addressing the immediate environmental problems and long-term solutions in order to maintain sustainable use of resources. Based on the study, the following recommendations are proposed. These recommendations are addressed to various government departments and development aid agencies involved in arid land development in Kenya.

4.2.1 REMEDIAL ACTIONS

- i) There is an urgent need to have conservation programmes around settlement centres. Degraded areas should be rehabilitated gradually. It is recommended that plant species of economic values be used to rehabilitate these areas. These include species like *Acacia senegal* for gum arabic production, *Commiphora ellenbeckii* for gum myrrh production, *Boswellia hilbebrantii* for gum frankincense, and plant species known to have traditional values (e.g. medicinal, spiritual, food sources, craft etc.). This would encourage individuals to maintain their own plots around settlement sites, thus enhancing the conservation efforts.
- ii) People should be persuaded not to remove all the branches when cutting construction material. They should leave some vegetative material on the stumps for continued growth of the affected plants. Charcoal burning should also be stopped in arid areas because trees take a long time to mature and play an important role in soil stabilization. Removing these trees exposes the soil to wind and water erosion.
- iii) In settlement areas, pastoralists should be encouraged to build permanent houses. This would reduce movements within settlement sites and hence reduce the demand for construction materials. It would also encourage people to build permanent livestock structures by using stones,

purchasing fencing material, or adapting life fencing techniques.

- iv) Pastoralists should be encouraged to utilize areas without adequate permanent water more during the wet season. This would even out grazing resources-use in all areas and thereby lessen the need to develop new water sources, particularly if proper mitigation effects on the environment cannot be achieved. In effect, water development for livestock use should only be developed where forage resources are adequate and where land degradation can be minimized from development impacts.

- v) Present social and cultural changes in arid lands are taking place with little change in economic/production activities within the pastoralists. There is an urgent need to encourage alternative economic activities particularly around settlement areas to supplement livestock rearing. These alternatives should be more friendly to the environment.

Development programs should encourage alternatives like:

- a). Gum arabic collection where *Acacia senegal* occurs naturally.
- b). Natural honey collection through organized apiary projects around settlement centres.
- c). Fishing activities around Lake Turkana as an alternative to livestock keeping.
- d). Commercial ostrich farming in areas without adequate water for

livestock, as a commercial alternative to livestock production.

- e). Trading activities like retail shops and livestock trading to boost economic activities.

This recommendation is based on the concept of multiple use of arid land resources.

The above recommendations address the most immediate problems facing Olturot and other settlement areas. To enhance sustainable use of resources in the future, it is necessary to have long-term programmes aimed at preventing adverse consequences of development to the environment.

4.2.2 LONG-TERM SOLUTIONS

- i) There is a need to conduct more research in areas of traditional resources management, social changes, traditional ecological knowledge systems, human livestock ratios and impacts of development on arid land communities. Research is also necessary on the interface between traditional systems, modern technology and information based on studies conducted in other parts of the world.
- ii) In future, all development projects and policy programs should be subjected to proper environmental impact assessment (detailing ecological, socio-economic and cultural components) before they are implemented. This would encourage up-to-date inventory of rangeland resources and incorporating of mitigation on effects with negative

environmental impacts. There is also a need for coordination and consultation between various institutions working in arid areas.

- iii) There is a need to review the present land policy as it relates to rangelands in Kenya. The current land tenure system (state land vested in local authority) does not give arid land inhabitants legal basis for proper control of the resources. The Government should review the land policy to give pastoralists more power for control of the resources. However, caution should be taken especially in privatization of arid lands because of the need for ecologically viable production units and the dangers of making some people landless, as has happened in some parts of masai land. Presently communal land ownership remains the most viable option for control of grazing resources in arid areas. On communal grazing lands, there is need to encourage the pastoralists to form village institutions e.g., grazing associations for control of grazing resources. The organized associations should be used to supervise, direct and control natural resources use and advice on development activities. The organizations should also be given a chance to have their own by-laws to safeguard the resources while making maximum use of them.
- iv) There is a need to educate pastoralists on environmental issues and implications of their activities to the environment, the economy and the

global environmental problem. Environmental education should be extended to schools to target future generations. A good education base for a community results in a population with alternatives for livelihood. It also harmonizes transfer of information and technology between pastoralists, research and extension workers.

- v) New settlements should be discouraged, to reduce nuclei human-made deserts that are close to one another. Development and conservation efforts should concentrate on existing settlement areas. In future, people should not be allowed to settle near livestock watering points. This would minimize human activities that leads to land degradation (e.g. cutting of trees) around watering points.

Practical implementation of the recommendations requires an appropriate policy approach. Past approaches in arid lands development have failed despite enormous financial inputs from the government and international aid agencies. The past failures point to the need for a change in the policies. In order to protect the arid environments from further abuse and enhance sustainable use of rangeland resources, the following development policy approach is suggested.

4.3 AN OUTLINE OF DEVELOPMENT POLICY ELEMENTS FOR ARID AREAS

4.3.1 ROLE OF DEVELOPMENT POLICY

The peoples of the arid areas deserve an equal opportunity to national development as other citizens, to improve their living standard and be incorporated in the economic and political system. This can only be achieved if the government pursues a development policy aimed at attaining the national objectives while being compatible with pastoralists' goals.

There must be objectives, strategies and programmes by which decision makers use to manage the system for which they are responsible. This outline deals with the government policy at the national scale. What is presented in this outline is not a solid policy document, but rather the major elements that must be addressed by development programmes designed for arid lands.

Management of rangelands resources at the national scale can only be defined in the context of available information about the state of the resources, the internal and external variables which influence resources use, the values of the societies concerned and the political disposition of the government in power. Acquiring an adequate information base on arid lands resources is itself a complex task. It involves the determination of the resources base and developing a comprehensive and ongoing information updating system of resources use and consumption patterns.

Identification of important variables is not difficult but quantification of their influence upon the resources use is elusive and predictions of the future values and their influences is loaded with uncertainty. Despite the information limitation, the government must develop policies and programmes to achieve desired objectives. They must be sufficiently flexible to take account of inaccuracies and uncertainties of the information base available to them. These policies are further influenced by prevailing political ideology of the government in power and more importantly the nature and extent of regional differences.

4.3.2 IMPORTANT CONSIDERATIONS

At the national level, the government should aim at achieving maximum utilization of her land and other resources. With about 80% of the country classified as rangelands, their contributing to the national economy, particularly in the area of livestock production, is very important. However, Kenya's grazing lands, specifically in the arid areas, occupy a very fragile environment. In such circumstances, improper land use could easily degrade the land and reduce the production potentials. It is thus important that the government pursues a sustainable development strategy on the resources for maximum sustained yield.

Arid land development involves various government departments and development aid agencies with major funding from external aid agencies. To

assemble a competent development policy, policy formulation participants should be drawn from international, national, provincial, district and local levels. Participants role is expected to have considerable variation and could vary from providing information to analyzing the policy issues. Participation is necessary at the earliest stage in policy formulation. Participants should be given appropriate opportunity to express their views without consideration of their social, political or economic status. This manner of involvement would result in balanced views on the policy elements.

4.3.3 PRINCIPAL POLICY ELEMENTS

4.3.3.1 BROAD OBJECTIVES

Arid lands development should aim at the following objectives at the national level:

- i) Improve the living standards of arid lands inhabitants.
- ii) Incorporate the arid land production systems in the national economy.
- iii) Pursue sustainable development approach.
- iv) Conserve the arid land natural resources.

4.3.3.2 STRATEGIES

To achieve the above broad based objectives, the following strategies should be adapted in relation to rangeland developments:

- i) All development projects and policy projects should carry mandatory environmental impact assessment before implementation.

- ii) Development projects should include a strong component of recipients' participation and feedback mechanisms to improve their implementation.
- iii) There should be a strong component of research, education and training in all development projects.
- iv) Development projects should promote efficient production in areas being used instead of opening up new grazing areas. Also, pastoralists should be encouraged to participate in a market oriented economy.

4.3.3.3 APPROPRIATE PROGRAMMES

While broad based development programmes are encouraged, the Government should give preference to programmes with the following components:

- i) Environmental conservation programmes.
- ii) Rural education and extension programmes.
- iii) Research programmes.
- iv) Livestock production improvement and marketing programmes.
- v) Rural infrastructure development programmes.
- vi) Diversification of economic activities in arid areas.

Priority should be given to programmes which address environmental conservation around settlement areas in order to stop further degradation of the arid land resources. This can be enhanced by designing programmes that emphasize on resources conservation and promotion of sustainable use of resources.

4.3.3.4 PROGRAMME ADMINISTRATION AND MONITORING

Programme administration is an area found to be lacking in most developing countries. As a prerequisite to effective programme implementation, development policies should clearly address the organizational structure and hierarchy to carry out programmes. There should be an effective monitoring component to hold projects administrators accountable for their actions. There should be a strong policy requiring development projects to present their monitoring and evaluation techniques and criteria. This should detail stages when monitoring will be undertaken during the project implementation, how it will be evaluated and how they intend to carry out adjustments if need be. It is recommended that monitoring of projects be undertaken regularly by individuals or groups independent from the project administration.

4.4 SUMMARY

This study was designed to address some fundamental research questions, while adhering to the main theme of the objectives, namely the impact of settlement on resources exploitation around Olturot settlement centre. Study results have shown that pastoralists are changing to a more sedentary way of living mainly due to the influence of external factors. This change is necessary since livestock wealth does not have the same meaning for them as it had in the past. Around the settlement area, pastoralists have alternatives to livestock

production which they can pursue for their survival (job opportunities, charcoal burning, and other economic activities). The changes in the production system in arid areas have had major impacts on the environment in the short and long run. However, the critical environmental problems are characterized by the destruction of the natural resource base around the settlement site and consequent breakdown of pastoral/ecosystem viability which was maintained in the past production systems.

The environmental problems occurring in the arid lands cannot be solved by arid land inhabitants due to their financial and technological limitations. They require support from the government and the international aid agencies. The government has a major role to play in developing appropriate policies while the international aid agencies can contribute the financial resources to implement government programmes.

Sustainable development of arid lands depends on adoption of development policies that address the environmental problems occurring in these areas and their causes. These policies should consider the plight of arid land inhabitants, by giving them the attention they deserve. It is recommended that specific development policies in arid areas adapt the outlined approach while emphasizing on the intended objectives.

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APPENDIX 1

GLOSSARY OF TERMS

- Annual:** A plant that grows for only one season or year before dying, in contrast to a perennial, which grows for more than one season.
- Arid:** A climate characterized by little rainfall that cannot support cultivation (receives annual rainfall of less than 200 mm).
- Boma:** A kiswahili term meaning fence of living or dead branches used to enclose livestock or to direct their movements or to protect human settlements from wild animals.
- Browse:** The buds, shoots, leaves and flowers of woody plants which are eaten by livestock or wild animals.
- Charcoal:** (in case of plants)- Amorphous form of carbon obtained by destructive distillation of woody material in a limited supply of air, and mainly used as a fuel.
- Controlled grazing:** Livestock grazing limited to specific areas.
- Ecosystem:** All the plants and animals in a given area and their physical environment, including the interactions between them.
- Erosion:** The wearing away of the land surface by running water, wind, ice, or movement due to gravity.
- Extensive:** Land-use or management spread over a large area when land is plentiful.
- Gully:** A deep, narrow channel cut into the soil by erosion.
- Intensive:** Land-use or management concentrated in small area of land.
- Land-use system:** The way in which land is used by a particular group of people within a specified area.
- Manyatta:** A kiswahili term used to mean the occurrence of livestock enclosure and dwelling places on the same site.

- Nomad:** A person without a fixed location, wandering from place to place in search of pastureland for his flocks or herds, cultivable land or hunting ground etc.
- Pastoral:** Relating to or characterized by the care of grazing animals (sheep, goats, cattle and camels).
- Recharge:** Rainfall or water in rivers, streams, ponds or lakes that seeps down through the soil and replenishes the ground water.
- Regeneration:** Regrowth.
- Semi-arid:** In this study, semi-arid refers to a climate with average annual rainfall of 200 to 900 mm.
- Shrub:** A woody plant that remains less than 10 metres tall and produces shoots or stems from the base.
- Stump:** Remaining piece of the trunk of a tree or shrub projecting from the ground, when some or all the branches have been removed.
- Sustainable Development:** Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development report, 1987).
- Tenure:** The right to property, granted by custom and/or law, which may include land, trees and other plants, animals and water.
- Tree:** A woody plant with one main trunk and a more-or-less distinct and elevated head.
- Woody:** Plants which consist in part of wood; not herbaceous.

APPENDIX 2.

**INFORMATION ON RANGELANDS RESOURCES USE AND
HISTORICAL BACKGROUND OF OLTUROT PASTORAL
HOUSEHOLDS**

Date_____ Enumerator/Recorder_____

Name of respondent_____

Tribe_____ Clan_____

Household (manyatta)_____

Present location of household_____

Site description (to be compiled by the investigator using the guideline included in the proposal)

HOUSEHOLD INFORMATION

1. Origin of household-
2. Origin of parents-
3. Description of former area of origin-

Land-

Climate-

Land-use-

Condition of the land-

4. Was there any form of settlement? (Yes/No)
5. When did the household leave their former area of base?

Why?

6. Why did you decide to settle in this area and not any other area?
7. Who in particular made the decision of moving, and where to settle, among the members of the household?

had you ever occasionally used this area before you settled here?
(Yes/No)

If yes, on which occasions?
8. Are all the members of the family staying here? (Yes /No)

If not why?
9. Do any of the household members work or used to work in this area or a project based in this area? (Yes/No)

If yes when and where in particular?
10. Did the household settle here as a result of any member coming to work in Olturot area or near Olturot? (Yes/No)

Is the member working here now (Yes/No)

If the member is not working here now, why then have you not gone back to your former area?
11. Do you intend to stay here or are you likely to move elsewhere?

If you are likely to move, where and why?
12. What kind of grouping exist and which ones are the most important with respect to land use? (family, extended family, clan, association, collective or any other)

LAND USE PRACTICES

13. Current land use practice-

14. Types of livestock owned by each household-

Livestock species	When you settled here	1990	1991	June 1992
Cattle				
Camels				
Sheep				
Goats				
Donkeys				

15. How is the livestock grazed in the range? (by species or together)

16. How have you been moving your animals in recent past? ie., where do you graze your animals during the dry and the wet seasons? (movement to be recorded for species separately)

a). Sheep and Goats

Area grazed	Period of the year (months)	Watering point used	Season dry/wet

b). Cattle

c). Camels

17. What was this area like when you first settled here?

Land and soil-

Water availability-

Vegetation-

Wildlife-

Land-use-

Erosion features

18. What major changes have taken place since you first came here?
- New settlements
- Water development
- Shops
- Health centres
- Any other development (schools, churches, projects, etc.)
19. What is your feeling about the current use of this area?
20. In your own views, are there any problems in:-
- Water resources?
- Forage resources?
21. If yes what would you recommend to be done?
- Why?
22. Are there any conflicts in resources use between:-
- i) different households?
- ii). Pastoralists and any other agencies or government projects?
23. General observation and any comments on intertribal raids, security of the area, etc.,
- 24 Do settlement offer a kind of security to the community against intertribal raids?. (Yes/No)
- If yes,how does it ?.

APPENDIX 3

GUIDELINES ON COLLECTION OF BACKGROUND INFORMATION.

The guidelines were used in the locality where the where the community grazes their livestock and around the settlement area.

DESCRIPTION OF THE AREA

- Location and local name of the area being surveyed.
- Accompanying transects (record on transect record form).

TRANSECT DESCRIPTION	TRANSECT NO.

LAND-USE SYSTEM: A general description of the major land use system of the area will be given.

SOCIAL-ECONOMIC CHARACTERISTICS

- Approximate area and number of households who use the area.
- Presence of roads and other infrastructure
- Social and cultural organization of direct implication in use of rangeland resources. eg. grazing associations, major annual ceremonies, etc.

FUNCTIONING OF THE SYSTEM

- Resources utilization (general) - indicate whether the vegetation type favours the indicated season of use.
- Patterns of availability, supply, seasonality, variability, etc. (to be inferred from the species vegetation composition)
- Protective and service aspects of the system (indicate whether there is permanent water within the area in question).

SYSTEM DYNAMICS

- Rate of growth/shrinkage over time in terms of area covered and the reason for that (indicate whether there are other recent settlement areas near Olturot).
- Degradation of the system- causes of erosion problems eg. overgrazing, tree cutting, other etc.
- System improvement (if any).

SYSTEM SUSTAINABILITY

- Productivity patterns over time .
- Impact of technological inputs on productivity (note number of water points, and when they were developed).
- Rate of change of the land; capability to sustain production at a certain level.

SPECIAL FEATURES OF THE SYSTEM

- Highlight any outstanding features of the system/practices e.g., management aspects that reduce the rate of degradation, notable success stories from other systems etc.
- indicate special aspects of the system/ practices that warrant detailed follow-up study.

EVALUATION OF THE SYSTEM

- Merits of the system that have conspicuous advantage in its productivity and /or protective functions. Indicate the values of the system in the specific socio-economic and ecological situation where it is currently practised.

WEAKNESSES

What are the salient points of weakness:-

- climate
- ecological
- biological
- socio-economic
- managerial

CONSTRAINTS

- What are the major constraints in the operation of the system:-
 - inherent weakness mentioned above
 - input constraints
 - infrastructure problems including markets, roads,etc.

POTENTIALS

- Reasonable expectations on potential accomplishments under different levels of ecological constraints
- Potentials of appropriate management systems
- Potentials for improvement in the performance of the system

RESEARCH NEEDS

- indicate the general areas of research at the system in order to refine the system to make it more productive.