

AN OVERVIEW OF NATURAL RESOURCES MANAGEMENT
IN MURANG'A DISTRICT, KENYA

By

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ABSTRACT

This study examined the extent of natural resources management in one of the most densely populated districts in Kenya. The nature of land use, land ownership structure, and natural resource management strategies were examined. A theoretical assessment of the natural resources potential was conducted and the relationship between population and land resources was addressed. Possible causes of the major problems in natural resources conservation and development were examined. In addition, possible implications of these problems and opportunities for securing a self-sustaining environment were studied.

The approach followed was partly systematic based on the existing data sources, and partly conceptual, based on intuition and observation of some of the significant factors. The principle methods used were a review of the literature, supplemented with a reconnaissance field trip to the area, communication with people knowledgeable of the area, and the author's own experience and observations.

The study indicated that the traditional practices of natural resources management have been disrupted by the adoption of a more intensive system of land tenure, and other political, social and economic factors. Two main recommendations were proposed: (1) that a viable development

strategy to increase income earning opportunities through the utilization of existing natural resources and local labour resources be adopted, and (2) that top priority be given to addressing the problems of resource conservation and utilization in Murang'a district.

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Chapter I

INTRODUCTION

1.1 PREAMBLE

In the last decade or so, there has been considerable interest shown in the question of the analysis, management and development of natural resources. This interest seems to reflect a growing concern for conservation in the face of rapid depletion of the earth's resources and the impact of natural disasters like droughts, floods, and earthquakes, resulting in widespread famine and destruction particularly in poorer countries of the developing world (Binns, 1984, Ward et al, 1972, Strong, 1972, and Sandbach, 1980). Kenya has been no exception in this regard.

Heavy pressure is being exerted on Kenya's natural resources as a result of a high human population growth rate. In some parts, there are already signs of severe stress. In this country, and in other developing countries where environmental degradation is a serious concern, some of the most critical environmental problems involve the destructive use of renewable natural resources such as vegetation, soil, water and wildlife. Kenya covers an area

of 569,260 km² and has a total population of 16.9 million (Kenya Government, 1981). Of this population, about 87% live in the rural areas and farming has been their traditional livelihood for many generations. With a steady increase in the national population at the rate of 3.6% per year (Kenya Government, 1981), the pressure on the limited good quality agricultural land, forest, water, and wildlife habitat are mounting. The result has been continual conflicts in resource utilization and serious constraints in their conservation and management.

Some examples of problem areas in resource utilization are:

1. The loss of wildlife habitat to cultivation (Foin, 1976).
2. The declining quality of wildlife habitat due to competition with livestock (Stelfox, 1979, and Ottichilo et al, 1981).
3. Increasing rural settlements on steep hillsides and areas only marginally suited for agriculture (O'Keefe et al, 1972). Plates 1 and 2 depict this.
4. Unchecked depletion of forests for industrial and domestic uses, and
5. Excessive soil erosion in many areas.

Despite the prevailing problems, the Kenya Government aims to maximise the use of the limited natural resources to benefit the present population and for future generations.

In achieving this goal, the government hopes to balance the conflicting considerations of preservation of natural resources and the financial goals of economic progress. The latter entails the utilization of natural resources and maximization of agricultural production.

Murang'a district, located in the high potential agricultural area, receives rainfall averaging over 850 mm every year. It also has good quality soils suitable for a wide variety of crops. Murang'a district has a longer history of soil conservation practice than most areas of Kenya. The district is a leading producer of high quality cash crops such as coffee, tea, and pyrethrum as well as a large variety of subsistence crops such as maize, beans and bananas. The population density in the study area is very high, with an average of 262 persons per Km². The average agricultural holding in the district is 0.29 hectares per person.

The increasing pressure on the land to produce has brought about several land use changes that indicate that the supply of agricultural land is lower than the rising population demands. One of the more prominent changes is the expansion of agricultural land within this century. Long term residents of the area recall a time, only two decades ago, when the land was covered in forest. Now, a mosaic of tiny agricultural holdings cover the landscape. Forest patches have become smaller and what remains are often

planted woodlots on personal properties. Areas that were not considered favourable for cultivation in the past, such as steep hillsides and semi-arid areas are now being cultivated. The incidence of soil erosion and other signs of environmental degradation have risen. The hilly nature of the landscape aggravates the soil erosion problem. A significant population of landless and unemployed people, and people operating uneconomic units of land is emerging.

The condition of the natural environment is crucial to the survival of the population in this area. The emerging problem of environmental deterioration is a concern for planners, politicians and the public in general. Most of the problems being faced in this area, may appear to be of local significance at this time. However, as these problems spread, the magnitude of their potential cumulative effect may become of national significance. The pattern observed reflects the direction of change in many high potential districts. In marginal areas of the country, for example, Machakos district, similar processes coupled with drought have resulted in serious environmental deterioration. Urgent measures need to be taken to examine the nature of resource exploitation and preservation and to understand the environmental, economic and social implications of the processes occurring.

A brief description of the characteristics of the study area follows.

1.2 STUDY AREA

Murang'a district lies in the Central Province of Kenya (Figure 1). The district has a reputation for successful small holder mixed farming which concentrates on coffee, tea, pyrethrum, cotton and dairy cattle. The first two crops are also grown on a large scale basis in addition to sisal and pineapple. Murang'a district is located in the high-potential agricultural zone of the country which receives 750 mm to 1000 mm of rainfall or above per year (Ominde, 1971).

Murang'a district is described in the traditional myths as the origin of the Kikuyu. Further reference to this is made in the literature review section in this report. The Kikuyu people, who also occupy the Kiambu and Nyeri districts, originally combined livestock rearing with patch cultivation. Now they live in individual settlements all over the district. They practice mixed cash and subsistence farming and keep livestock.

The total area of the district is 2476 km² with an average population density of 262 people per km² and a total population of 648,333 (Kenya Government, 1981). The population density has increased from 180 persons per km² since 1969 (44530). The major economic activity is agriculture which is a function of altitude, rainfall, and soil characteristics. Several agricultural capability zones which run almost north-south can be distinguished as one

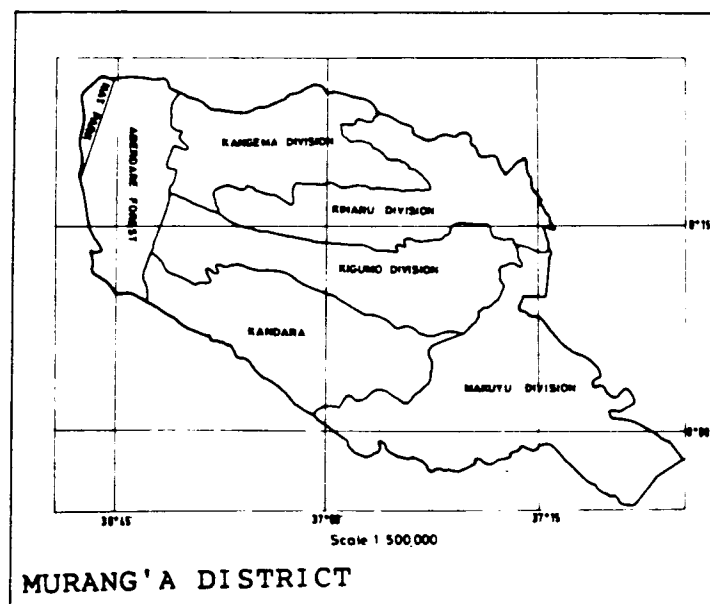
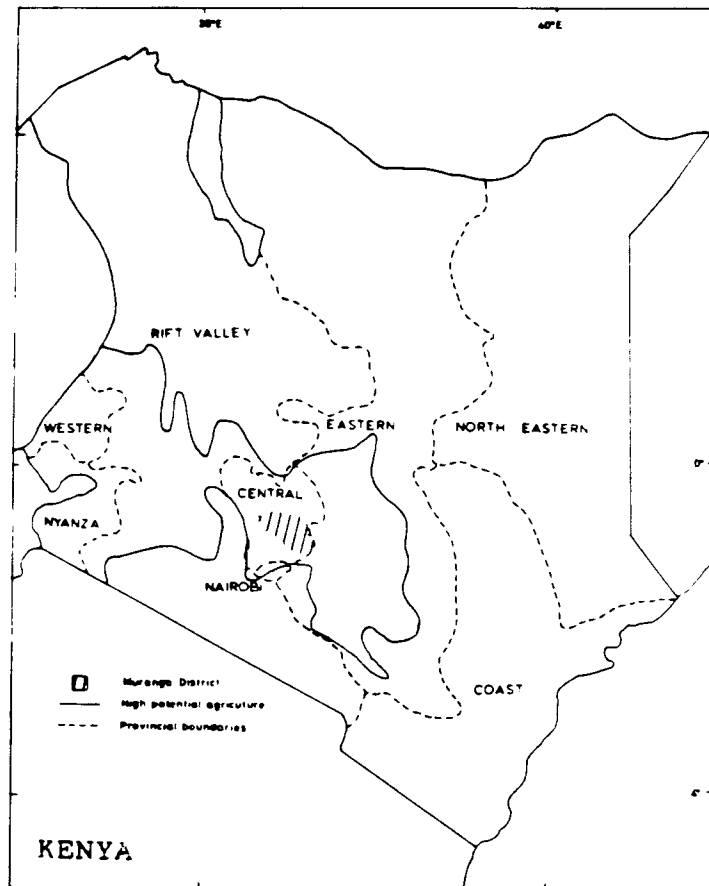


Figure 1: Location of Murang'a District.

moves from the highest area to the west, the Aberdare mountain range eastwards (Figure 5). Jaetzold and Schmidt (1983) have described 10 such zones. Detailed descriptions of these regions is given in the section on natural potential in chapter IV of this report.

The highest area consisting of forest lies about 4000 metres above sea level and constitutes part of the Aberdare National Park. The lower reaches of the forest have been cleared for tea production in some parts and forest occurs in patches interspersed with small scale farms. This area has deep, fertile, well-drained soils compared to the eastern part. At a lower altitude, this area gives way to the sheep and dairy zone, where tea is generally grown on small farms ranging in size from 4.8 - 8.0 hectares per holding and lower still to a coffee-tea transition zone and finally to a coffee zone. Coffee and tea are both grown on fertile well-drained soils but coffee cannot tolerate high altitudes like tea. The average field size in the coffee zone is smaller.

The annual rainfall decreases gradually from 2700 mm in the highest area in the west to about 800 mm in the lowest area to the east. The intervening areas, namely, the marginal coffee zone, and the cotton zone and the marginal cotton zone receive moderate amounts of rainfall. The eastern part of the district is flat or very gently undulating. This area is suitable for mechanized farming

and coffee and pineapple are grown on large plantations using sprinkler irrigation in most cases. In this area, there are large sisal estates and cattle ranches.

1.3 PROBLEM STATEMENT

Murang'a district, like many other districts in the high potential agricultural area, is beginning to show some serious signs of environmental deterioration. There is also the appearance that almost all the available cultivable land has been turned over to crop production. The fragmentation of land following traditional practices has continued to produce very small fragments of land. These changes have only become apparent in the last two decades after independence.

The following series of photographs illustrate the seriousness of this problem. Plate 1 shows an area in Ithanga location within the marginal agricultural zone. The area in the foreground has been legally allocated into settlement schemes. The top of the hill, however, is occupied by people who hold no legal title to the land. Plate 2 depicts an area of temporary settlements in the bamboo zone of the Aberdares. The cultivation of this area is endorsed by the forest department as a measure for clearing land for forest plantations. Plate 3 depicts the increasing incidence of soil erosion creating deep gullies and loss of topsoil. In the same photograph, cultivation

practice appears to have spread to the water front. This is a common feature in the coffee zone. Plate 4 demonstrates the expansion of agriculture onto the road reserve. Again, this is typical of the middle highly populated zones of the district.



Plate 1. Settlement Scheme Land in the Marginal Agricultural Zone Showing Unrestrained Settlement at the Hilltop.



Plate 2. Temporary Cultivation in the Bamboo Zone of the Aberdares Forest.



Plate 3. Main Coffee Zone Showing Cultivation up to the river front and soil erosion along the road. Coffee factory on the left.

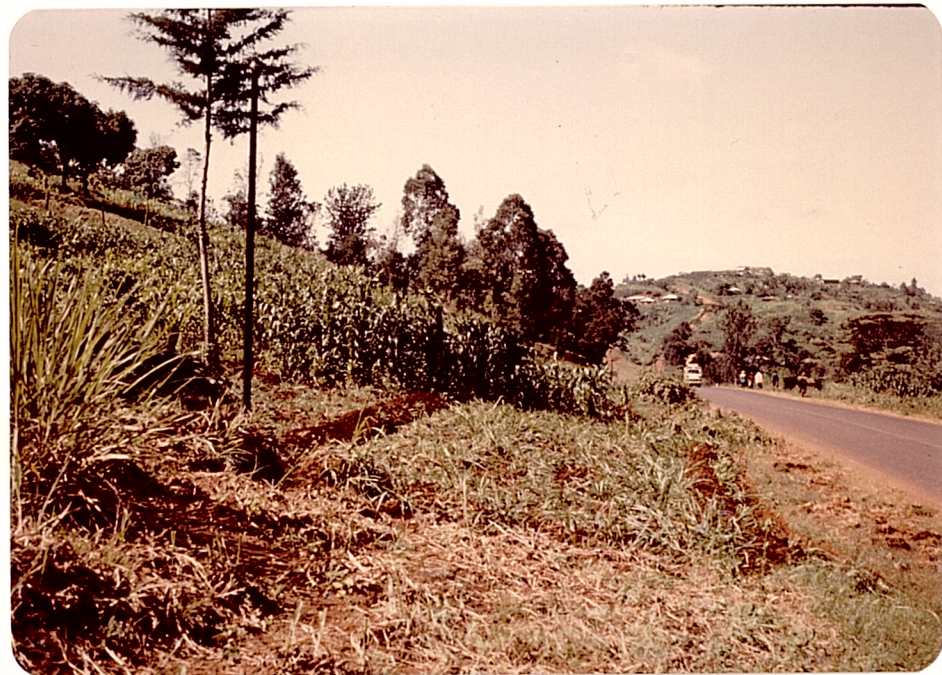


Plate 4. Main Coffee Zone. Cultivation Expansion to the Road Reserve.

The rapidly growing human population with limited land resources has led to increasing numbers of landless and unemployed. This has raised concern about the future supply of some of the basic resources like land, water, and soil. The government has made a big effort to promote more reasonable use and protection of natural resources through extensive soil conservation and reforestation programmes. Other agencies, including several international agencies, non-governmental organizations, and local self-help groups, have also made significant contributions. However, there are still problems to be overcome in the following areas:

1. Developing a sound resource data base for future programmes.
2. Filling gaps in government legislation for control and regulation of resources use.
3. Coordinating information flow between the government's aid agencies and the local people; and
4. Enhancing personal identity with resources among leaders and the people.

Basically, the resource systems are known but the potential and prospects for future development is not fully understood. Similarly, the implications of the observed changes in land use patterns have not been addressed. It is apparent that significant measures have been taken to control environmental degradation. Some examples are:

afforestation, catchment area rehabilitation, and soil erosion control. However, many of these projects do not seem to maintain general self sustained improvement after the initial period. It may be possible that there are gaps in the legislation relating to environmental preservation. It may also be that the public are not conscious of the developments in their surroundings, particularly their potential impacts. These possibilities and others need to be examined.

1.4 OBJECTIVES

The primary objective of this study was to provide an overview of natural resources development in Murang'a district in Kenya with a view to assisting natural resource planning and management.

Specifically, the objectives were:-

1. To determine the extent to which the resource base is known and define the ownership structure of resources.
2. To determine the existing land use patterns and how they have changed in recent years.
3. To determine the information needs of planners at the district level and the extent of incorporation of new scientific data in the planning process.

4. To identify gaps in government legislation for the control and regulation of natural resources.
5. To determine the level of public involvement in the decision making process involving the planning and management of natural resources.

1.5 METHODS

Various methods were used in addressing the objectives of this study. Most of the information was obtained from published sources and personal accounts of past events. Three principal methods were used:-

1.5.1 Literature Survey

This was carried out from a variety of sources:

1. The Central Bureau of Statistics - results of their small farm census, small farm management surveys, and the integrated rural surveys were used.
2. District and National Development Plans - these have the activities of all government sectors for most 5 year periods since 1963.
3. The Lands office - provided useful data on the land ownership structure.
4. Libraries - archival data from the Kenya National Archives, the University Library and the Central Bureau of Statistics Library.

Other sources of information were The Environment Liaison Centre and the University of Nairobi's Institute for Development Studies which were used to a limited extent.

1.5.2 Reconnaissance field trip

During this trip, interviews were held with several departmental representatives at the district, divisional, and locational levels. It was also an opportunity to view a large cross-section of the study area. The interviews provided some insight into the role of government agencies in the area, and the manner in which district planners involve the public in the planning process. Specific reference was made to natural resources planning and development programmes.

1.5.3 Aerial survey data

Aerial survey data from a recent survey by K.R.E.M.U. revealed the existing land cover classification of the district. This data was obtained from the a survey carried out in October 1984.

1.5.4 Personal Interviews

The structure of attitudes and beliefs of the rural population is of vital importance in the study of rural change. Due to the limited amount of time that was

available for this study, a detailed survey of some aspects of the study was not feasible. However, interviews with several long term residents of the area provided supplementary information. The discussions took the form of an unstructured questionnaire carried out in a random sample of sublocations within the district.

1.6 DELIMITATIONS

This study was delimited in the following aspects:-

- Secondary sources of data were relied on quite heavily acknowledging the constraints of time, limited budget, and distance from the study area.

- The study was done mainly from the natural resources manager's point of view. Politics of land ownership could not have been covered adequately within the scope of this study.

- Detailed analysis of the organizational structures at play, the management strategies being employed, or legal aspects in land dispute settlements was limited by the unavailability of literature.

1.7 ORGANIZATION OF THE STUDY

After the preliminary introductions in chapter 1, the literature review in chapter 2 covers the nature of land tenure during the precolonial and colonial periods. The prevailing land tenure system and natural resource supply is outlined in chapters 3 and 4. Chapter 5 shows the existing government programmes, data gaps and the role of the public in natural resources management. The response of the population to the resource imbalance that has occurred is summed up in chapters 6 and 7 and the whole study is summarized in chapter 8.

Chapter II

LITERATURE REVIEW

2.1 INTRODUCTION

Limited literature exists on the nature of land use in Murang'a district before the 19th Century. The literature is concentrated in the period between 1895 to the present. Sorrenson (1967), gives a detailed account of land reform in the Kikuyu country, of which Murang'a district is a part from the traditional land tenure practices of the Kikuyu, through the transition to the period after independence. In the following chapter, the three stages in land tenure reform outlined by Sorrenson and which are most significant in the evolution of the Kikuyu agrarian and tenurial systems are summarized. These three periods are the time before the colonisation prior to the year 1895, the colonial era up to the time of the independence and finally the period after independence up to the late sixties. This background is important to understand the nature of some of the environmental problems facing this district today. The prevailing situation will be covered elsewhere in this report.

2.2 THE TRADITIONAL FARMING ECONOMY

Before the 19th Century, the concept of land ownership in Kenya was affected by three factors: the abundance of land available, the degree of fertility of the land, and the technology used to farm it. Land shortage or deterioration was never a serious concern and shifting cultivation was common among agricultural tribes. Their frequency of movement depended on the fertility of the soil and the availability of rainfall. Because land was easily available, it was used extensively and there were few pressures for technical innovation to extract more from the soil.

Peoples' rights to land were generally related to its availability, which again was related to patterns of settlement and kinship ties. Among all communities, every single individual could expect to have some right to occupation and use of the land. Every large community had their rules governing forms of ownership of the land, distribution of land to family members and friends and to outsiders who wished to cultivate for a limited period. The Bantu generally practised shifting cultivation on the better land and ran cattle, sheep and goats as a sideline.

The area of land on which Murang'a district lies was obtained by the Kikuyu from the Dorobo people towards the end of the 19th Century. It is not certain how the land was obtained but it could have been by occupation and first

clearing or by purchase from the original holders. The Kikuyu people in this area lived in dispersed households. Individuals and their families owned land, the prime ownership structure being the joint family. Each family occupied a section of a ridge, with land holdings extending down one or both sides of the ridge. The pattern was not clearcut because each wife cultivated several distinct segments of land other than one long narrow strip. Boundary lines between families became blurred by the growth of the extended families. Sons who married got portions of their mothers land to cultivate. Sometimes, tenants were allowed to build and cultivate on the land.

The larger social grouping (consisting of members of an extended family with a common ancestry also called "mbari") combined land-owning with the regulation of marriage. This grouping often occupied an entire ridge, identified by the name of the person who first occupied and put a stake to it. This land became the common property of his descendants who continued to cultivate on an individual household basis. Land outside the ridge could be acquired by individuals and what amounted to the sale of land by individuals was noted. Authority over the disposition and use of land was derived from the informal meetings of clan elders or other relatively small social groups.

Sorrenson (1967), stresses the fact that there was no form of tribal tenure, despite frequent European assertions that land was owned communally by the tribe. At most there

was the vague sentiment of a tribal territory. However, there was unrestricted right of the individual to graze livestock on common land. The whole clan could claim a right to earn support from the land and ownership was vested in the community. There was a conception that the various members of the society accept a fair share in what belongs to the whole. Some land could grow good maize for example and other land only sugarcane and often the dispersion of an individual holding over many patches may have been an attempt to give each member a share of each type of soil.

By the time of colonisation at the end of the 19th Century, the majority of Kikuyu seemed to have vacated the lands they normally occupied. Land was granted to the settlers under the Crown Lands Ordinance, which stipulated that land that was not in beneficial occupation at the time was at the disposal of the crown. Areas of sparse and haphazard cultivation were also considered for settlement. The Africans, especially the Kikuyu regarded land as something sacred, eternally the possession of the people who once occupied it and depended on it. Most Bantu people believed that the spirits of the dead continued their existence through the soil. Temporary abandonment did not change this situation. The settlers applied European concepts of land ownership to the new lands they found virtually empty. It was parcelled out, purchased, fenced and partly cultivated. Some African squatters were allowed to

live on the unused portions, in return, they had to work 180 days a year for this right.

The Kikuyu in this area had displaced the Dorobo people towards the end of the 19th century. Prior to the arrival of the Europeans, the Kikuyu lived in constant threat of their neighbours, the nomadic Masai and the Kamba. They were already declining in strength by the time the first whites penetrated. This was followed in 1898 by a smallpox epidemic which killed more people, followed directly by an outbreak of rinderpest, which decimated the livestock. About this period, there followed a serious drought and an unprecedented attack by locusts. These four disasters decreased the African population in this area, and the survivors turned northward in the direction of Murang'a town. The overall effect was the temporary depopulation of the eastern sector of the highlands and it was this "empty" land that the British Commissioner first saw.

2.3 THE TRANSITIONAL FARMING ECONOMY

As mentioned in the previous section, the settlers were granted all lands that were not in beneficial occupation and was thus regarded as crown land under the Crown Lands Ordinance, 1902. On colonisation, 12,000 sq miles of the best agricultural land in Kenya was alienated on behalf of European farmers up to 1963, and native Kikuyus were restricted in reserves. An account of the areas settled by

Europeans at this time is given by Morgan (1963) and Sorrenson (1967). This marked the beginning of the land problem which was to take on an important position in the total history of Kenya's rural development.

In the first decade of the 20th century, the lands available to the Africans in the African reserves were sufficient to meet their needs. They continued to practise shifting (patch) cultivation and as time went on, the method began to reduce the capacity of the soil. Lands which were initially adequate failed to produce the required yields, and lands to which the population could have expanded their cultivation were unavailable to them. The British administration ascribed the loss of soil fertility to "wasteful and harmful methods" of African agriculture. Some work was done to combat the growing soil erosion problem but it was unsystematic, partly because even agriculturalists did not agree on the nature and size of the difficulties. The efforts amounted to the distribution of better seeds and a few model plots were laid out on government land, but nothing fundamental or aggressive was done. Because of European pressure, such central government consideration as was given to African lands by the early 30's was largely designed to ensure "security of tenure". Other questions such as the sufficiency of land for an expanding population and the flexibility of land holding systems remained in the background.

Meanwhile Africans who had fled their lands around 1899 returned to find their lands either set aside for white occupation or to overcrowd the areas reserved for natives. As the reserve areas became areas of severe population pressure, many Africans made their way to Nairobi and onto European settler farms in search of wage labour. Since the early 1920's, the problem of land shortage became more and more acute and has been central to Kenya's politics throughout this century. The land shortage resulted in subdivision and fragmentation of lands into smaller and smaller patches, created greater squatter problems and was to lead to periodical crisis of which the Mau-Mau "emergency" was the most intense.

2.3.1 The Carter Commission, 1932

After World War 1, a number of Kikuyu returned from service in other parts of the world and political organization among the Africans started with the aim to effect a change in the government's land policies. The pressure that resulted led to the appointment of the Carter Commission in 1932 also called the Kenya Land Commission. The objective of the Carter Commission was to resolve the conflict between European and African claims and fix the boundaries with justice to both groups. The commission was also to decide whether land was to be held on tribal or individual tenure. As a result, some land was given over to

Africans but basic policies such as the reservation of land on the basis of skin colour remained unchanged.

The commission recognised that the African population was very badly distributed within its own lands, and the fixing of boundaries had led to rigid non-traditional barriers. As a result, certain densely populated districts were becoming exhausted, therefore, a programme to promote more skillful land use was recommended.

The commission found that a better balance of population within the congested areas would only be achieved very gradually by educating the Africans in the better use of their land. The institution of settled government, the establishment of boundaries, the introduction of money, the increase in population and the general industrialization of the country had caused profound changes, even the disintegration of native law and custom. Conscious regulation of change was deemed necessary.

The commission concluded that the tenure of each native reserve should be built on the basis of the native custom obtaining therein but it should be progressively guided in the direction of private tenure, proceeding through the group and family towards the individual holding. Native reserves were now categorized as native lands other than crown lands (this was intended to reassure the Africans). Also, all the traditional African rights or claims to land

outside the reserves were eliminated, the intention of which was to move squatters off European lands.

The Carter commission thus helped to identify the land problem and recommended deliberate efforts to improve the land in the African reserves and made small additions to the African reserves. However these recommendations took a long time to implement as they were interrupted by the 2nd World War (Odingo, 1971). As of 1939 then, all land in Kenya was held as:

1. native reserves, where particular tribes had exclusive rights where the maximum size of holdings was fixed at 8.5 hectares;
2. the highlands, which were protected and controlled by the highlands board for the exclusive use of the Europeans; and
3. the northern frontier and Turkana districts (Zwanenberg and King, 1975).

The western part of Murang'a district earlier described as the tea zone and the area to the southeast of the district both fell under the former "scheduled areas", the rest of the district falling under the previous native land units. The vast majority of holdings in the former non-scheduled areas are now less than 5 hectares each. Some large farms on the other hand average 600-700 hectares each (Heyer et al, 1981).

Due to the interruption during the 2nd world war, even up to 1945, the land problem of the 1930's was still unresolved. There was also an atmosphere of crisis regarding the conservation of soil resources which had deteriorated rapidly during the war.

2.3.2 Land Consolidation

The land crisis entered it's crucial stages on the return of the World War II veterans, especially on the return of Jomo Kenyatta in 1946. African veterans had received work permits while whites got land concessions. There were restrictions upon Africans on certain crops such as coffee and tea, wage scale differences, and segregation practices. The requirement that Africans should carry an employment registration certificate created increasing tensions. In 1946, the government set up the African Land Utilization and Settlement Board, subsequently renamed the African Land Development Board (Sorrenson, 1967) to study this problem.

This organization was created as a response to the emergency situation regarding the land problem and the government's realization of how desperate the people had become about land deprivation. The board initially emphasized land settlement as the solution to the increasing population in the African land areas. In the post war period, government policy sought to revive "community control" other than individual tenure as recommended by the Carter Commission. However attempts at community farming

had failed in other parts of the country. In Kikuyuland, where it was difficult to consolidate scattered strips to single holdings; it would have been even more difficult to persuade larger numbers to agree to consolidate even more strips for a group farm.

Over the 10 year period that the board lasted, (1950-1960), it initially emphasized resettlement of the surplus population as a solution to the African land problem. Emphasis then shifted to the reconditoning of the existing lands and to the introduction of more intensive farming. This change was encouraged by and in part encouraged the adoption of more positive attitudes towards African land tenure in areas being farmed. After further research had been done, the authorities concluded that improved farming on a communal basis was too complex and difficult to control than that based on individual tenure, and that if group farming should develop, it should grow out of small holdings, through agreed pooling of resources.

As race relations continued to deteriorate and demands for more land by the Africans became more and more frequent, a Royal Commission was appointed in 1953 to study the means of improvement. In 1955, it reported that the policy of reserving land on the basis of race should be avoided. The measures adopted to apportion land more equitably derived from those gradually developed from the informal systems of individualization. They had however to be directed to more

definite objects and to be placed within a comprehensive economic and administrative framework. The result was The Swynnerton plan for African Agriculture.

2.3.3 The Swynnerton Plan, 1955

The implementation of the Swynnerton plan marked the first phase of land reform in the Kikuyu country (Odingo, 1971). The plan called for a change in African ownership from customary tenure to individual freehold. This meant the enclosure and registration of existing rights, the consolidation of land fragments, the introduction of lucrative cash crops, high yielding livestock and marketing facilities; access to agricultural credit, and the provision of rural water supplies and technical assistance. The plan aimed at providing Africans with the means to progress from subsistence agriculture to modern planned cash farming. Economic farming on a large number of fragmented parcels of land was clearly impossible, thus consolidation into freehold units was the cornerstone of the plan (Heyer, 1975 and Odingo, 1971).

As a result, African production in Kikuyuland rose by 15% and by 1974, about 12 million acres (4.8 million hectares) had been reorganized into 650,000 individual holdings. Coffee, pyrethrum, pineapples, tea, and tobacco were introduced and the quality of livestock was greatly improved. Vast areas of the Kenya highlands were virtually

relandscaped and new settlement patterns and areas of production emerged.

The plan did have problems: there was not enough land to go round , so that consolidation and settlement into viable economic units actually intensified the problems of landlessness. In places, illegal subdivision occurred and land once devoted to high value cash crops reverted to production of staple foods. Migration to Nairobi, Nakuru and other urban centres accelerated as the population swelled, and the number of landless increased.

2.3.4 Phase 2 of Land Reform, 1961

This phase was centred on the decision to open up the former "white highlands" for farming by all races. It took part in three steps starting in 1961:

1. In 1961, government purchased 1 million acres (405,000 ha) of European owned farms and estates out of which 36,000 hectares of African owned farmland was created.
2. The government instituted a programme of instruction in agricultural techniques and marketing and encouraged formation of cooperative societies.
3. Three types of settlements were planned: high density small holder settlements averaging 11 hectares intended for Africans with limited capital and agricultural expertise; low density small holder

settlements averaging 15 hectares for more experienced farmers with some capital; and a scheme for large scale cooperative farms and ranches.

Farms in the low density schemes were designed to earn a net income of about \$500 a year while farms in the high density schemes were expected to earn a net annual income of \$140 (Whetham, 1968).

Farmers who were landless or unemployed prior to being settled experienced serious management and production difficulties especially small scale cultivators on what were once large scale farms. The government thus decided not to subdivide any further estates. They were kept intact and ran like state farms. Several farms were purchased by Kenya's small African elite, but still the largest acreage remained in European hands.

Resettlement did not solve the problems of landless Kikuyu nor that of urban unemployment to which landlessness contributed. During the first five years, production fell in almost every type of operation except in the low density schemes, where traditionally high outputs were maintained due to the intensity of supervision and technical advice, development capital and because settlers had been selected according to their farming ability. In 1967, for the first time, Kenya's small holders contributed more than half of the total output of marketed agricultural products. Before

decolonization, Europeans accounted for almost all Kenya's coffee exports, and coffee was and remains the leading export. By 1977, almost half the output was produced by some 300,000 smallholders. The small holders have also made tremendous inroads in Kenya's tea production. Small farms also account for the bulk of the country's staple, corn. Most of the sisal was grown on large estates (sorrenson, 1967).

As a whole, the land reform programme was found to work. Individual tenure resulted in increased productivity, a greater investment on the land and increased social stability. The aim of the consolidation of fragmentary holdings was to register freeholds of not less than 7.5 hectares. Yet in practice, 86% of all the holdings registered in Central Province were less than 7.5 hectares (Zwanenberg and King, 1975). But of greater significance is the fact that after registration was completed, people once again subdivided their plots according to age-old customs. The size of a single farm unit has continued to diminish. This is because many people still regard giving land as the best way of supporting their kinsfolk, rather and as a form of investment.

By the time Kenya gained independence in 1963, land was held in three ways:

1. Alienated land, including national forests and the areas alienated to Europeans and Asians, national parks, mountains and craters.
2. Tribal lands, either in the native land units or in other areas where Africans had priority in the use of the land.
3. Crown lands, other than the Northern Frontier District, theoretically open to occupation by any race.

Within the alienated lands, farms and residential holdings are held on 99 or 999 year Crown Land leases or on freehold title. In the African land units, land was normally held according to tribal law and custom. However, in the high potential agricultural districts, land which had hitherto been fragmented into small holdings in consequence of indigenous tribal customs was consolidated into larger individual holdings. In crown lands, temporary occupation leases may be issued in the case of land set aside for settlement, usually by African tenants, but in some ranching areas by Europeans also. Such land was intended to be permanently alienated or absorbed into one of the native land units which in effect is what happened when such land was passed onto individual tribes on independence in 1963.

2.4 SUMMARY

In Kenya, land has been at the centre of many considerations in the political, social and economic fields due to its importance as an economic resource. For this reason, there is considerable literature on the land resource, for example, the land tenure system before and during the colonial era is well documented by Morgan (1963), Wasserman (1976) and Sorrenson (1967) among others.

Morgan (1963), describes the land tenure system in the former "White Highlands" while Sorrenson (1967), describes the land consolidation process before and after independence. Among the more recent works are Leo's (1984), which traces the history of the formation of current social classes to the colonial era and Njonjo (1975) who examines the sociological and political meaning of the Africanization of the "White Highlands."

The literature on agrarian change is more current and prolific and includes the works of Heyer et al (1981), Heyer (1975), Soja (1967), Ominde et al (1972), Lamb (1967), and Lele (1975).

The literature related to natural resources control and legislation is scarce and restricted to settlement of disputes on land. On individual resources, the soil resource is well documented while the mineral, wildlife, forestry and especially water resources are seldom mentioned in the literature relating to the study area.

Generally, existing survey data and analysis was used as the principal method by most authors, in combination with interviews with persons involved in planning and implementation of rural development policy. Most authors have relied heavily on secondary data and literature searches of records in provincial and district offices, and the lands department. Questionnaire surveys were applied in a number of cases.

Chapter III

THE NATURAL RESOURCE BASE

3.1 INTRODUCTION

A tremendous amount of field work and expertise would be required to make a complete inventory of natural resources in Murang'a district. An attempt is made here to compile inventories of the resources based on a variety of secondary sources of information and limited field observations. The Kenya Bureau of Statistics for instance, has carried out large-scale inventories based on ground surveys of forests, cropland, livestock, wildlife, fisheries, water, and mineral resources over the past two decades. In addition, they have general physical, demographic and socio-economic data published yearly in the Kenya Statistical Abstracts. The standards of measurement used have varied in successive years making it very difficult to carry out any serious analysis of trends on the basis of this data.

Similarly, data on the agricultural sector has been compiled by the Ministry of Agriculture over the years. More intensive surveys have been carried out in the last few years, notably by the German Agricultural team in the same Ministry (Jaetzold and Schmidt 1983). These authors give a detailed account of the natural potential of the land,

population distribution, land availability and agricultural statistics. These data was all obtained from ground surveys.

In September 1984, the Kenya Rangeland Ecological Monitoring Unit (K.R.E.M.U.), carried out an aerial survey of the area to provide estimates of ground area coverage of different land use types in the area. This aerial survey was based on a sample fraction of 4%. A summary of their 1984 survey will be discussed in a later section.

Based on the above sources and other literature about the area, a reconnaissance field trip to the area, and personal communication with people residing or working in the area, it was possible to arrive at some conclusions about the actual and potential resource base in the district and current land use practices. However, a large number of sources and the varied standards of measurement were used. Therefore, it was necessary for the author to apply some personal discretion based on local reference knowledge in making some of the conclusions.

In this chapter, the various resources are discussed. An attempt is made to provide an estimation of the current situation regarding their supply. However, these resources are interrelated especially in the ecological sense and cannot therefore be considered in isolation.

3.2 LAND

The land classification arrived at the end of the second phase of land reform has not changed except for internal changes within the three broad classes. Murang'a district covers an area of 2476 Km². Land is still held as government, freehold or trust land (Provincial Statistical Abstract, 1981).

Government land, covering 35.6% of district land is composed largely of national forests and reserves such as the Aberdares and the area formerly alienated for European and Asian settlement. Most government land falls in Makuyu division. Government land is leased to small scale and large scale farmers on 99 or 999 year leases. Freehold land, also formerly alienated, has been turned over to private ownership through the establishment of small holder schemes. Freehold land covers 2.6% of district land. Trust land, formerly called tribal lands, consisting largely of the former native land units, covers 61.5% of district land. Virtually all trust land has been turned over to private ownership.

3.2.1 Government Land

This is composed of forest and other reserves, the Aberdare National park and unalienated land and alienated land that formerly belonged to European farmers in former scheduled areas. The alienated and unalienated land is now leased on

99 or 999 year leases to individual small scale and large scale farmers. Government land covers an area of 888 Km² composed of the following:-

(Area sq Km) (% Total)		
Forest reserves	267 Km ²	10.8
Other Government reserves	62 Km ²	2.5
Alienated Land	493 Km ²	19.9
Unalienated Land	40 Km ²	1.6
National Parks	26 Km ²	1.1
TOTAL GOVERNMENT LAND	888 Km²	35.6%

3.2.2 Freehold Land

This is land which was formerly alienated to settler occupation which has since been registered to private ownership often through the establishment of small holder schemes. It is composed of:-

Small holder schemes	24 Km ²	1.0
Other	41 Km ²	1.6
TOTAL FREEHOLD LAND	65 Km²	2.6%

3.2.3 Trust Land

This land, which covers 61.5% of the total district land area, was formerly called the native reserves prior to independence. It is now owned by small scale holders, often with very fragmented plots. It consists of a total area of

1523 Km² of which 1482 Km² was available for small holder registration. All 1472 Km² has been registered to private owners.

Trust Land Not Available for Small Holder Registration

Forest	9 Km ²	0.4
Government Land	2 Km ²	0.1
Townships	29 Km ²	1.2
Alienated Land	1 Km ²	0.0
TOTAL	41 Km²	1.7%

Trust Land Available for Small Holder Registration

Already Registered	1482 Km ²	59.8
Unregistered	0 Km ²	0.0
TOTAL	1482 Km²	59.8

TOTAL TRUST LAND	1523 Km²	61.5
TOTAL DISTRICT LAND	2476 Km²	100.0%

3.2.4 Farm Patterns

There are three farm categories in this district with very distinct problems and patterns of farming.

"Large Farms" mainly fall in Makuyu division in the eastern part of the district. The cultivation is commercial

and mechanized and centred around coffee, pineapple, sisal, and cattle ranching. Large farms range in size from 19 to over 20,000 hectares. The Del Monte company leases a large pineapple estate in the area. Several other foreign groups have interests in the sisal, coffee and ranching estates here. Others are owned by local societies and individuals. In 1975 large farms covered 22% of the total district land. This percentage remained steady till 1982. However, during the same period, the number of large farms increased from 84 to 136. This increase in the number of large farms without a corresponding increase in the total area they covered can be attributed to increased fragmentation of the once large commercial farms into small units for settlement purposes. There has been a corresponding increase in the number of large farms which average about 20 hectares. This feature has been common in areas of mixed farming where arable land has been extensively subdivided. The subdivision of the large farm is expected to be even more active in future as a result of the recent government directive that large farms owned by companies or societies should be subdivided (Kenya Bureau of Statistics, 1984).

"Small Farms" cover about 60% of the total district land and fall under trust land or the former native reserves. All the available trust land has already been registered to private ownership. This indicates that future registration or settlement programmes will have to draw on land that is

now government land and the portion of small holder schemes that has not as yet been allocated to private holders.

"Smallholder Schemes" cover about 2.6% of the total district land (1981). As of 1981, 24 Km² was under settlement schemes and the balance of 41 Km² had not been converted to settlement schemes. Settlement schemes are located in the eastern part of the district, Ithanga and Maragua ridge have a total of 2108 plot holders.

The above report shows that a total of 84.6% of the district land is occupied under small, large, or settlement scheme farms. The remaining 14% is either under forest reserves, government reserves, government land and townships. It is therefore expected that the growing trend of subdivision of larger farms for resettlement may continue for several years to come. Eventually, we may have to draw more on government and forest reserves. This has already happened in the tea area where a 100.6 metre belt was cleared around the forest in 1985 to make way for tea production.

3.3 SOIL

Murang'a district has a large variety of soils derived from variations in altitude, rainfall and temperature between the highland and lowland zones, and the underlying geology. Soil could be considered the primary physical resource to be managed in this area. The above mentioned

four factors generate varying land use potential which can be broadly classified into different agroecological zones. The classification of soils is shown in Figure 2.

The physiography in the western part of the district is dominated by the Nyandarua range, the eastern part by ridges of basement rocks, the central part of which consists of undulating to rolling topography (volcanic foothill ridges).

The highest parts of the area contain soils of a variable fertility but it is too cold for any land use. At a slightly lower altitude, soils with a humic topsoil of moderate to high fertility are found. They may be leached and very acid (pH 3.5 to 4.5 or lower). Hill soils occur in the north eastern and south eastern parts of Murang'a district which are of variable or moderate to high fertility.

The volcanic foothills landscape, has soils with a variable topsoil, but often fairly rich in organic matter and of moderate to high fertility.

On the eastern and south eastern uplands, the soils are of low fertility. On the plateaus, various soils occur. In the north eastern and southern parts, soils are of moderate to high fertility. At the southern boundary of the district east of Thika, soils occur on footplains which are also of moderate to high fertility. Generally, hill slopes are steep (13° to 15°) on average, but exceeding 28° in places. Over most areas, the soil has a friable texture, which

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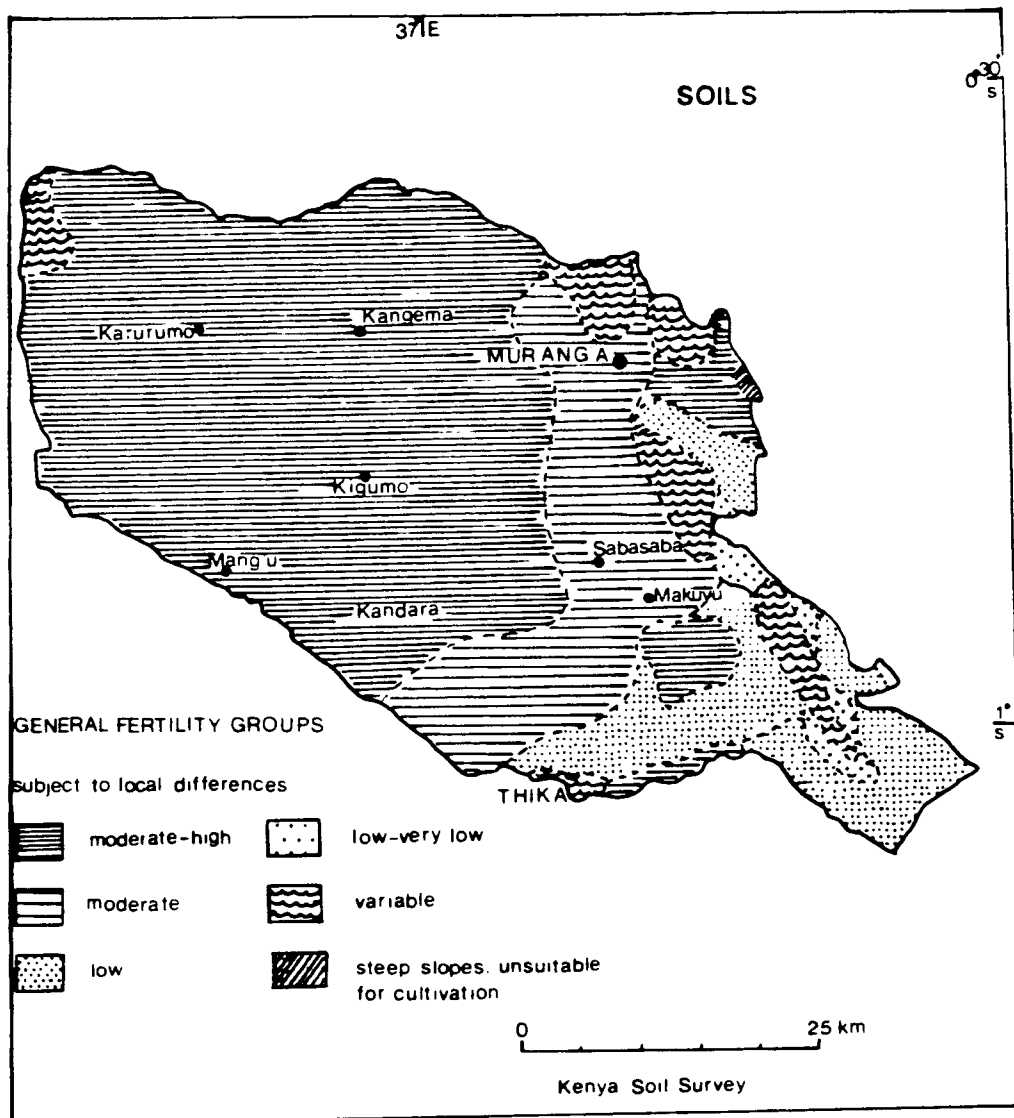


Figure 2: Distribution of Soil Types

coupled with the steep slopes and the high precipitation, make the area extremely vulnerable to soil erosion (O'Keefe et al 1972). Soil erosion is posing the danger of lowering the agricultural potential through soil degradation. Pressure on agricultural land in high and medium potential agroecological zones is high. These areas have deeply dissected ridges. Continual cultivation along steep slopes of these ridges has resulted in serious soil erosion along river banks and roads. Marginal areas hardly experience soil erosion problems except in Ithanga location where settlement and consequent agricultural activities have rendered the land prone to erosion.

The Ministry of Agriculture has made efforts to control soil erosion through extensive soil erosion conservation. However, farmers have failed to maintain the terraces constructed, and there is unwillingness to donate small parts of land where cut-off drains can be constructed. Casual labour for constructing terraces is difficult to obtain because the low rates paid by government cannot compete with prevailing wages.

Soil conservation practice was began within the native land units during the colonial period. However, the manner in which it was taught to Africans generated resentment towards the practice. Colonial officials used soil conservation tasks as punishment for those who were found to be disloyal to the government. During the struggle for

independence, the natives defied the colonial administration by neglecting soil conservation. The soil erosion problem was enhanced by the easing of control and implementation of soil conservation programs immediately following independence in 1963 up to about 1974 when conservation practices were again identified as being politically desirable. It may be that this negative attitude developed in the past still prevails in some sectors of the population.

3.4 FOREST SUPPLY

Murang'a district being a mountainous area, it's main forests have a vital part to play in maintaining the dry season flow of it's rivers and in stabilising the soil. The Aberdare forest, part of which lies in Murang'a district is important in this respect, as are the other smaller forests.

Forests cover roughly 58,900 hectares, about 15-16% of the total district land area. The main forest area is part of the great Aberdare forest which covers the Aberdare range with an extension to Gatare/Wanjerere forest. Roughly, 4600 hectares of this forest are productive. Kimakia forest, is another significant forest. It has 2000 hectares of softwood plantations. In addition, there are smaller forests scattered throughout the district, Kiambicho (376 ha), Kiamuti (182 ha), Karua (210 ha), and Kangure (189 ha).

The forests next to the Aberdares are the major productive forests, the smaller ones in the lower areas are covered with grass, bush and shrubs of no economic value. Their main use is as water catchment areas. Approximately 10% of the forests in the Aberdares are covered with softwood plantations of cypress, pines and cedar. The rest of the area is covered by bushes, bamboos and indigenous hardwoods, such as Musharage, Mweri and Muchugu.

Two sawmills are currently operational in Kimakia and Gatere forest using mainly softwood plantations. The area utilized covers 3500 hectares or 6% of the total forest area. It is estimated that these plantations can easily accomodate two additional sawmills operating at full capacity. The remaining 94% of the forest can selectively be exploited to yield the valuable hardwood and bamboo that they contain. Wood and other forest products such as charcoal, have a guaranteed market in the district since at present it is a net exporter of timber and timber products. Elsewhere in the country, such products could be sold easily as there is generally a shortfall of wood based fuel.

Poor accessibility to the forest area is a serious constraint which has limited fuller exploitation of these forest resources. The few roads that exist are generally in very poor condition and are only accessible during the dry season. It has been suggested that improvement of at least three of the major roads to all weather status may improve access to this area.

Wattle bark used to be an important cash crop 20-30 years ago. However, because it is mainly grown in the tea zone, most of the wattle trees have been replaced by tea bushes. Between 1976 and 1982, both the hectarage and production of wattle declined by approximately 50%. Although recently there have been good prices, it is unlikely that the present area under the crop will change as tea, its prime competitor, is a better income earner.

Analysis of the timber purchases made in the last four years indicates that demand has been increasing annually (M.D.D.P., 1983). The forest department intends to establish more tree nurseries, promote tree planting and better management practices in Trust lands, extend forest plantations in the gazetted forest zone, and encourage selective exploitation of timber resources for fuel. The existing six tree nurseries have not been adequate and they propose to expand the capacity to provide at least 500,000 softwood trees annually. Some areas are not adequately served by the existing nurseries. Five new nurseries will be established to cater for these areas. The establishment of private nurseries by institutions such as schools, churches and cooperative societies has been encouraged. Other projects include the upgrading of two of the lesser forest stations and improvement of the communications system.

In addition to the official gazetted forests, woodlots planted by individual landowners form a significant proportion of the total land cover in Murang'a district. Woodlots account for 8.4% of all cover types and are composed mainly of wattle trees for fuelwood purposes, or land which was originally forested or bushy and has not as yet been opened for crop production. In terms of area, woodlots cover an estimated 20,606 hectares in total (K.R.E.M.U. 1984).

There is no underutilized infrastructure in the area of forests. However, there is an important natural resource that is not being properly utilized; the part of the Aberdare forest in Murang'a District. The maintenance and monitoring of seedlings in this area is inadequately executed. As of 1979, the forest industry provided employment to 1200 families with a total of 2000 people also serving as agricultural land for these people who keep dairy cattle, sheep and goats to supplement their family incomes. These forests also act as catchment areas for the districts rivers, besides offering employment to an additional 300 people engaged in timber extraction and more in other parts of the district and outside it where the timber is finally processed (M.D.D.P., 1983) and (K.R.E.M.U. 1983).

The Kenya Forest Department came into being in 1902; at that time large tracts of forest were unoccupied. Forest destruction started noticeably with the arrival of the train (Russell, 1962). Then followed the clearing of large areas

of forest to make way for settlement and cash crop cultivation. In the 1960's the bulk of the poles and firewood were drawn from unreserved lands. Indigenous sources of supply were diminishing but were replaced by the establishment of woodlots and windbreaks of exotic trees on farms and small holdings throughout the farming districts. The main productive effort of the forest supply industry was to meet the demands for sawn timber and in due course for peeler logs and raw materials for building boards and paper pulp. Only to a small extent was it utilized for meeting local needs of firewood and poles.

In those days as a general principle, no forest clearing was allowed on slopes of more than 30% even if replanting was to follow within two or three years. Not even light selection fellings were allowed (Russell, 1962). During my trip to the area however, it was clear that some of these regulations have been ignored even in gazetted forest areas.

3.5 MINERALS

No minerals of economic significance occur anywhere in the district. Scattered occurrences of garnet and sillimanite, and kaolinite have been found within the basement system. Their quantities are, however, too small for economic exploitation. The volcanic rocks however, provide suitable materials for quarrying such as construction stone, while the coarse granitoid gneisses available north of Murang'a township and west of Ithanga

provide an unlimited supply of materials for road ballast and concrete aggregate.

Claystones used for brickmaking and pottery is found in several places in the southwest of the district near Thika and west of Murang'a township. These are quarried from Gathamba valley and Kianochi, south west of Murang'a township. In the western parts of Ithanga, similar building materials are found.

Sand is found in great quantities in river valley bottoms and river banks, particularly in the lowlands on the eastern side of the district in Makuyu division. Sand is mined for local consumption and export, mainly to Thika, Nairobi, and the outlying districts (Nyeri and Kirinyaga) (M.D.D.P., 1983).

The existing clay deposits are currently being utilized for making native pots and ornamental vases on a limited scale. However, the activities above suggest that the district's mineral resources are being exploited in a credible manner. Nevertheless, no attempt has been made so far to establish industries that use the materials. The district for instance, still imports concrete from Nairobi, whereas the large granitoid gneisses in the district can support a concrete and concrete products factory.

Volcanic stones, quarried mainly in the lower parts of Kiharu, Kigumo and Kandara have been major sources of

building materials for the district. The availability of these stones has enabled some families to build modern permanent houses.

Little attempt has been made to establish industries that utilize local mineral resources. The existing infrastructure and markets are sufficient to get such industries going. However, there are major constraints in lack of capital and enterprise by the local people. An attempt could be made to interest entrepreneurs in these possibilities, using the Kenya Industrial Estates credit facilities. Brick making clay soil, if exploited, could provide additional employment, income and perhaps cheaper, low-cost building materials.

3.6 WILDLIFE

The population of wildlife in this area is limited. Very little wildlife exists in the lower zones but a fair concentration is found in and around the Aberdares. The Aberdare National park consists of 760 Km² of national park and 800 Km² of national forest but, although they straddle both Murang'a and Nyeri, they are contiguous and jointly administered. The Aberdare National park's main attraction is the large variety of wildlife: elephants, buffaloes, the rich birdlife, and the rare bongo. It is estimated that the tourists who visit the park number approximately 50,000 per year and bring in park revenues of Ksh 1.5 million annually (M.D.D.P., 1980).

Murang'a district appears not to have benefited from or developed its wildlife based tourist potential. The district, however can develop this potential. It has been suggested before that an effort should be made to develop good and acceptable catering facilities in the Aberdares; the district would then act as a natural stopover for tourists doing the northern circuit. To augment wildlife based tourism, sites of cultural and historic significance should be investigated.

Wildlife conservation was actively started in 1984 when a wildlife department office was opened in Murang'a district. Before the establishment of this office, cases such as illegal hunting activities were handled by the administration and the police. The current district warden believes that there is a growing consciousness of the economic and educational potential of wildlife among the local administrators in this area.

In terms of numbers, the wildlife population within the marginal zone around Mitubiri is declining. This is because this area is now being settled. It is believed that the wildlife in this area may eventually be exterminated as has been the case in the other densely settled areas. The district Game Warden believes that the elephant population in the Aberdares is increasing since there is little pressure from poaching. The buffalo population is believed to be equally stable.

No serious conflict between farmers and wildlife has been experienced. According to the district warden, the public attitude towards wildlife conservation has been very supportive except in cases where actual human life is endangered or crops have been damaged. However, like forestry programs, the whole program is based on persuasion and full acceptance may take a lot of patience on the part of the wildlife department. The full exploitation of this important local resource will depend on the development of good roads and hotels in the Aberdares area of the district.

3.7 WATER RESOURCES

There has been no comprehensive hydrological survey done in the district yet. Most of the district receives over 875 mm of rainfall annually (Figure 3), most of which is retained in the underlying volcanic rocks. Many rivers in the district carry flows throughout the year. Figure 3 shows the annual rainfall distribution. In this area, there is high relief induced rainfall which has given rise to hundreds of small streams. The district has roughly 112 river courses, most of which originate in the Aberdares. Seven of these are major rivers: Tana, Maragua, Thara, North Mathioya, South Mathioya, Itembe and Irati. Approximately 90% of the districts population draw their water directly from the river. All the rivers in the district are used mainly to provide water for human and livestock consumption.

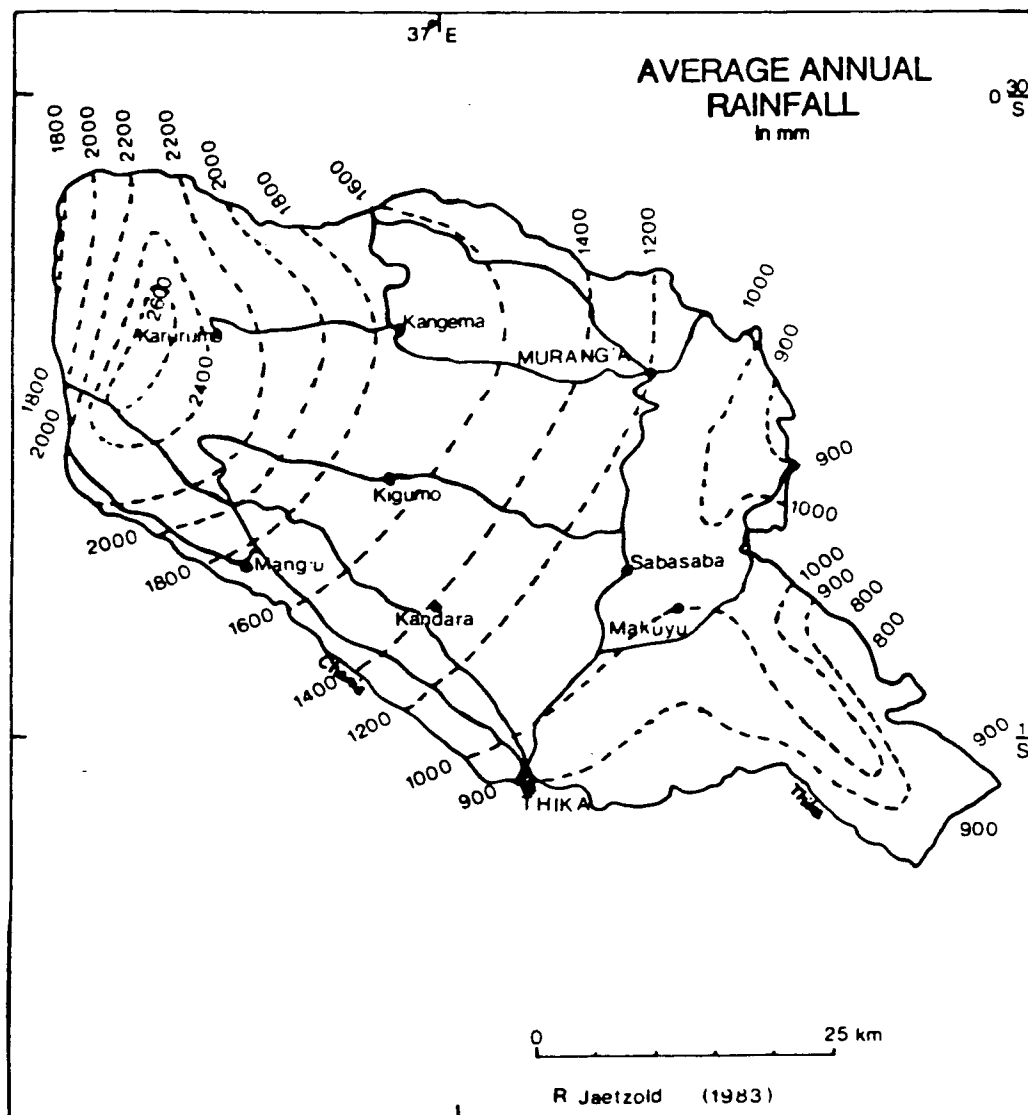


Figure 3: Annual Rainfall Distribution

The ample water resources have not been adequately harnessed for agricultural production. There is approximately 33,700 hectares suitable for irrigation. Of this only 8414 hectares have been developed mainly in estates in Makuyu and on a number of individual farms in Gikindu and Maragua ridge. Perhaps the reluctance to expand irrigation in the semi arid zone is based on the expected dangers of salinisation in such areas. The high evaporation rates in dry areas keeps salts in the soil. If these salts become redissolved by irrigation, they become deposited as a crystal crust on the surface. The result is increased salinity which could make previously fertile soil virtually useless.

There has been no comprehensive study done on the ground water potential. However, there are a number of operational boreholes in Makuyu division. The boreholes indicate that water is generally struck at average depths of 84.0 metres, some go as deep as 117 metres. The average rest level for water is roughly 43 metres. The water table tends to fall sharply from the western to the drier eastern side of the district.

So far, about 10% of the people have piped water supplies. Makuyu Division is less well endowed with natural water supplies and some people have to travel 3 Km to get their water supplies. In the rest of the district, the average distance to a water site is about 1.5 Km. The natural catchments in farming areas and river banks are

generally not protected. The former areas are used as agricultural land. Consequently, many rivers are highly silted due to erosion. Self help effort has a major role to play in developing piped water projects in the area.

There has been a growing problem of river pollution from factories such as coffee, pineapple and sisal which discharge highly organic wastes into the river courses without treatment of any kind.

Thika and Maragua rivers have been harnessed for hydroelectric power. Four other hydroelectric power stations exist at Ndula, Wanjili, Mesco and Tana and generate power mainly for export to outlying districts. Despite the need for exhaustive studies on the use of water as a development resource, the above discussion suggests that water is not being optimally exploited. Further studies need to be done in this area, not only to determine the districts potential, but also to recommend ways of exploiting the resource. The drainage and flood control programme on various valley bottoms is expected to release some land for agricultural use (M.D.D.P., 1980).

3.8 FISHERIES RESOURCES

As has been indicated above, the district is well endowed with many rivers and streams. These, particularly in the upper and middle zones of the district, are inhabited by a variety of fish. Apart from the natural population, there are 33 farmers who have constructed 38 ponds in the same region. The fish stocks in these ponds vary between 50 and 100 each. The higher region of the district unquestionably has high potential for fish production, although it is currently underutilized. With a diminishing food base, fish farming in this overpopulated farming district provides an alternative source for increasing food production.

Limited departmental involvement in the District and a less favourable attitude on the part of many farmers to fish farming in the past has been the major drawback. The local community is not used to eating fish, a fact that has discouraged fish farming efforts here in the past.

A carefully designed programme for stocking the rivers and more collective and controlled fishing in addition to a more vigorous programme to develop fish ponds and reorient the populations attitudes towards the industry and its products will help tap this potential. Trout fishing, in the higher zones of the district can also offer an additional attraction for recreational fishing.

3.9 SUMMARY

The foregoing assessment of the natural resources potential of the district has suffered from a lack of case studies or feasibility reports. It has been largely based on the perceptions of various departmental officials in the district and it is believed to be an informed assessment of the possibilities that exist.

Chapter IV

LAND USE PRACTICES

The average farm size and farming activities differ from one agroecological zone to the other. These zones are determined by the various combinations of altitude, rainfall, climate and soil types in the district (Figure 4).

4.1 NATURAL POTENTIAL

Murang'a district in the eastern slopes of the Aberdare range has high rainfall and a long agrohumid period which is characteristic of increasing altitudes due to the effect of southeastern trade winds.

The annual average rainfall reaches a maximum of 2700 mm at 2500 metres above sea level. From this altitude down to the forest line at 2150 metres, it is so cold, wet and steep that the area is not recommended for agriculture. This area is the forest zone (UHO). This area also includes a small strip of sheep and dairy zone which is distinct due to heavy cloud cover exceptionally low at about 2050 metres (UH1). In view of the heavy population pressure, vegetable cultivation would be more appropriate in this area.

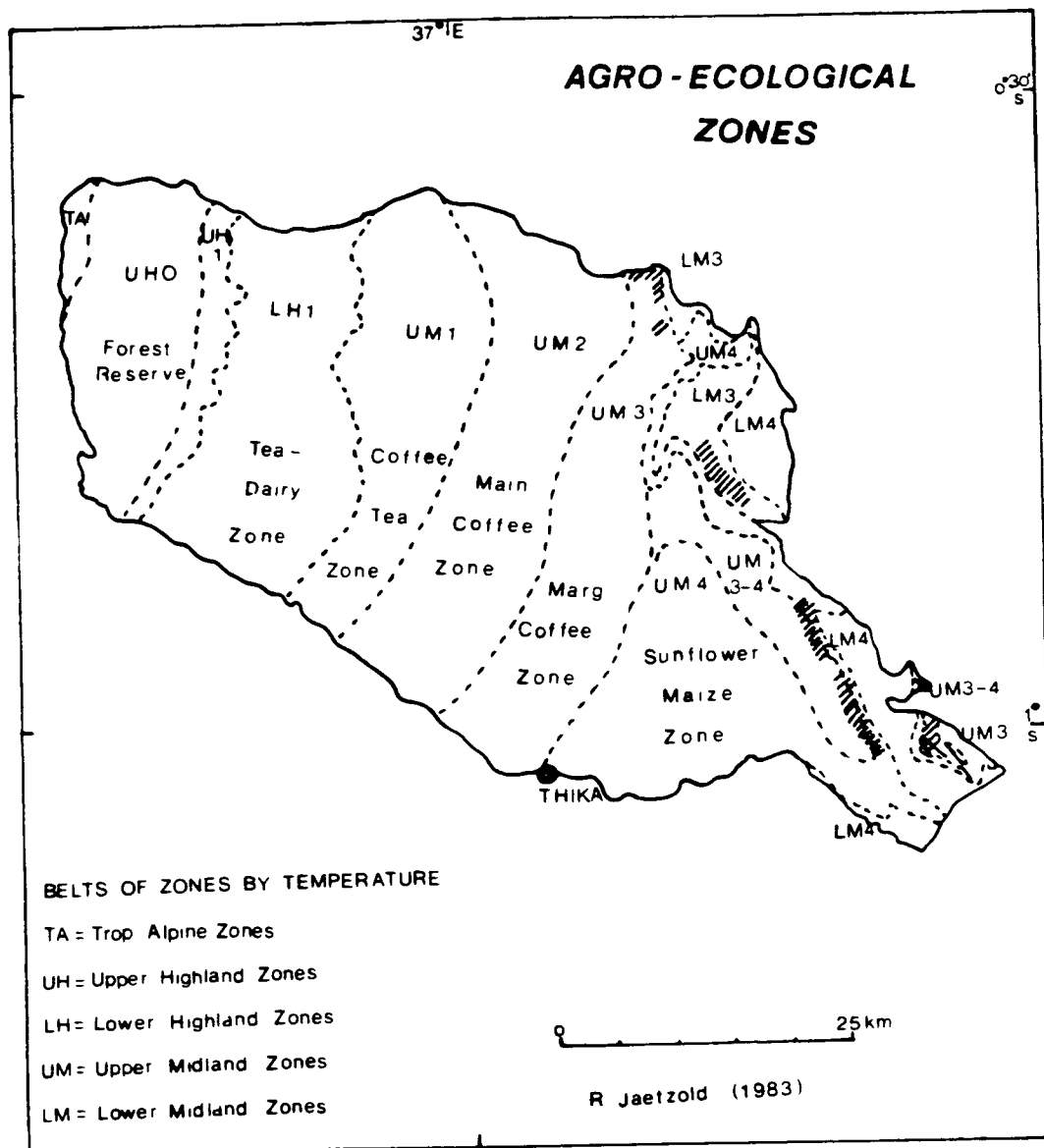


Figure 4: Agroecological Zone Distribution.

The following zones are found in descending order in the middle zone on the eastern slopes of the Nyandarua range: the Tea- Dairy zone (LH1), the Coffee- Tea zone (UM1), the Main Coffee zone (UM2), the Marginal Coffee zone (UM3) and the Sunflower- Maize zone (UM4) which is partly a sisal and pineapple zone due to large estates. A strip of UM3-4 occurs towards the east in the Kakuzi hills, although on less suitable soils which are very marginal for coffee.

Further down on the plains, where cotton production is feasible, the annual average is 800-900 mm and the good cotton zone is only a transitional strip to the Marginal Cotton zone, LM4.

4.2 LAND USE PATTERN

A sample aerial photography was carried out by K.R.E.M.U. in the study area during the dry season in September 1984 (Table 1). It should be noted that this photography was taken at the peak of the dry season and represents only those plants whose features allows them to be identified by human observers from an aircraft flying at 300 to 400 ft above ground level. Attention is drawn to the fact that cultivation in this area is mixed and the aerial coverage of cover types depicted in Table 1 is only a mere estimation of the true situation on the ground.

TABLE 1

Results of a Sample Aerial Survey Carried out by K.R.E.M.U.
in September 1984. (Hectarage of Major Cover Types).

	Maize	Beans	Vegetables	Bananas	Fruit Trees	Tea	Coffee	Sisal	Pineapple	Improved Grazing	Napier Grass	Woodlots	Unimproved Grazing	Fallow	Shrub Bushland	Hedges	Houses/ Buildings	Paths	Roads	Bare Ground
Kandara	5497	1897	545	5257	608	3071	6317	0	0	826	1977	4531	905	2354	884	1087	1251	314	593	261
Kigumo	6426	2784	746	3719	975	4154	5074	0	0	1812	1520	6270	1610	2478	1245	2299	816	464	797	320
Karigema	7245	2193	1422	2171	1218	4168	3642	0	0	3229	2431	3001	1623	898	317	3689	940	1405	675	197
Kiharu	6757	2887	488	1740	2220	1190	4244	0	0	613	1501	3412	2130	3954	1717	2731	616	869	376	537
Maloyu	5775	9088	165	2154	590	0	4667	4897	3272	547	769	3572	13123	9560	5671	1166	827	576	3209	1029
Total	31700	18849	3366	15041	5611	12583	23944	4897	3272	7027	8198	20606	19391	19244	9834	10972	4450	3628	5650	2344
% Cover	13.75	8.17	1.46	6.52	2.43	5.46	10.38	2.12	1.42	3.05	3.55	8.93	8.41	8.34	4.26	4.76	1.93	1.57	2.45	1.02

The most dominant land cover types in the district were maize (12.9%), coffee (9.8%), woodlots (8.4%), unimproved grazing (7.9%), fallow land (7.8%), beans (7.7%), bananas (6.1%) and tea (5.1%) (Table 1). Table 1 also indicates the mixed nature of agricultural practice. The distribution of cash crops follows the natural potential of areas or agroecological zones as will be outlined in the following section. Most of the other crops have a widespread distribution throughout the district. The reconnaissance field survey of the area revealed a similar pattern of land use. Plates 5 and 6 depicts the general characteristics of the landscape in the upper zones of the study area. Plates 7 and 8 illustrate the contrasting features in the marginal area of the district.

Small farms cover about 62% of the district land area and about 64% of agricultural land with subsistence and cash crops and dairy livestock farming activities. Most agricultural activities have a rising trend except for things like sisal and wattle due to competing market prices for sisal and competition from tea and food crops growing in the same zones for wattle. Tea and coffee are the main agricultural sources of income. Coffee farmers are served by 16 cooperative societies. Tea is grown by 16988 farmers on 6849 hectares, 2192 of which are under mature tea. Coffee on small farms is grown by 37,920 farmers on 12,000 hectares.



Plate 5. The Tea- Dairy Zone with Forest Zone in the Background.



Plate 6. The Coffee- Tea Zone Depicting Intensive Mixed Cropping.



Plate 7. Marginal Agricultural Land Under Irrigated Coffee Plantations.



Plate 8. Marginal Agricultural Land Under Small Holder Settlement Schemes.

Another 5130 hectares is under coffee in estates owned by 11 cooperative groups while some are owned by individual farmers. Other important cash crops are pyrethrum, cotton, tobacco, sunflower, pineapples and macadamia nuts. Citrus, passion and temperate fruits are becoming important cash crops.

Maize, potatoes, beans, bananas, green grams and a variety of other vegetables are grown by small scale farmers on a subsistence basis. Livestock farming is practised on a small scale for sale and household consumption. In the high and medium potential areas, grade cattle and cross bred varieties are kept. In the marginal zones, indigenous varieties dominate exotic species. All over the district, indigenous cattle are declining and exotic cattle and pigs increasing. There are several ranches in Makuyu Division with a total of 10860 cattle. Tick borne livestock diseases are a problem. However, there are several public cattle dips available to farmers.

4.2.1 Tropical Alpine Zone (TA)

This zone lies above the forest line where the land cover is dominantly tropical alpine moorland and heathlands. The portion of the Aberdare National Park in Murang'a district lies here. There are several species of wildlife in this area predominantly elephant and buffalo. The land has limited grazing potential.

4.2.2 Forest Zone (UH0)

This area is composed partly of softwood plantations of cypress, cedar, and pines. The rest of the area is covered by bushes, bamboos and indigenous hardwoods such as Mucharage, Mweri and Muchugu.

4.2.3 Sheep - Dairy Zone (UH1)

The sheep and dairy zone or otherwise called vegetable zone has permanent cropping possibilities divisible into a long to very long cropping season followed by a medium one.

In the sheep and dairy zone, some of the upper parts are too steep and too important as a catchment area to be cleared, but some of the lower areas have been cleared. Beans and a large variety of vegetables, peas and potatoes have good yield potential in this area (60-80% of the optimum). Pyrethrum, maize, pears and plums have fair yield potential (40-60% of the optimum). The stocking rate in this zone is about 1.5 Livestock Units (LU) on secondary pasture of Kikuyu grass, rye grass (Lolium perrene) and Kenya white clover.

4.2.4 Tea- Dairy Zone (LH1)

This area has permanent cropping possibilities divisible into a long to very long cropping season followed by a medium one. This area has very good yield potential of vegetables such as peas, cabbages and lettuce (average over 80% of the optimum). It has good yield potential of high

quality tea which grows all year round. Loquats and passion fruit are found in lower places. fruit in lower places. Maize, lima beans, carrots, endive, leek and kales also do well in this area. The stocking rate is 0.5 ha/LU on secondary pasture of kikuyu grass, suitable for dairy cows with added clover for higher productivity.

4.2.5 The Coffee-Tea Zone (UM1)

The coffee-tea zone has a fully long cropping season, intermediate rains and a medium season. This area has very good potential for lima beans, cabbages and kale, passion fruit and black wattle. It also has good yield potential of tea Arabica coffee, bananas, mountain pawpaws, yams, loquats, avocados and arrowroots. The stocking rate is lower than in the preceeding zones falling between 0.5 - 0.7 ha/L.U. on secondary pasture of kikuyu grass down to about 0.15 ha/L.U. feeding napier grass, banana stems and leaves, sweet potato vines and maize stalks. Zero grazing is not a common practice but is a possibility where land is very scarce.

4.2.6 The Main Coffee Zone (UM2)

The main coffee zone has a medium to long cropping season, intermediate rains and a medium to short one. It has a very good yield potential for Arabica coffee loquats and mountain pawpaws and sunflower. It also has a good yield potential for maize, beans potatoes and vegetables such as kales, tomatoes and onions. Coffee, bananas, citrus, avocados,

passion fruit, pineapples, and taro in valleys, arrowroots. This area also grows crops that are suitable for marginal areas, such as katumani composite B, early maturing foxtail millet and early maturing sorghum.

The stocking rate is 0.6- 0.9 ha/L.U. on secondary pasture of star grass (*Cynodon dactylon*), but land is too valuable for grazing, and it can go down to about 0.2 ha/L.U. feeding napier or bana grass with banana leaves and other forage.

4.2.7 The Marginal Coffee Zone (UM3)

This zone has either a medium to short and a very short cropping season, or two short to medium cropping seasons. The annual rainfall here is lower than in the main coffee zone. There is good yield potential for early maturing maize like katumani composite B, beans, sunflower and vegetables. Pineapples and macadamia nuts have good yield potential in this area all year round. Arabica coffee is grown here but has only fair yield. In lower places, the yield is poor therefore additional irrigation is necessary. Bananas, citrus, pawpaws, cassava and pigeon peas are common.

The stocking rate of the land is 0.7-1.1 ha/L.U. on secondary high grass savanna with zebra grass (*Hyparrhenia rufa*) predominantly down to about 0.25 ha/L.U. feeding napier or bana grass, glycine, maize stalks, sweet potato vines and other forage.

4.2.8 The Sunflower-Maize Zone (UM4)

This area is sometimes referred to as the upper sisal zone. It has a short to medium and a short cropping season. The major cash crop in this area is sisal which grows all year round. Drought resistant varieties of maize like katumani composite, early maturing sorghum like serena, fast growing bean varieties and sunflower are grown here. Cassava, pineapple and castor have fair yield potential in this area.

The stocking rate declines even further in this region ranging between 0.9 to 1.30 ha/L.U. on high grass savanna with zebra grass predominant, down to 0.28 ha/L.U. feeding bana grass, Siratro (Macropitilium atropurpureum) horse tamarind (Leucaena leucocephala), maize stalks and silage (of green maize and green fodder sorghum).

Some areas of this zone have two short cropping seasons and crop potential drops by about 10% and stocking rates drop to about 0.9- 1.5 ha/L.U. Other areas have a short to very short cropping season and have good yield potential for sisal which is mainly grown in plantations. There is also an area of the sunflower maize zone with a short to very short cropping season which is good for sisal all year and other dryland crops. Virgin tobacco, onions, cabbages and tomatoes do well with seedbed irrigation.

4.2.9 The Cotton Zone (LM3)

This is a very small area in Murang'a district, most of the region falling in the adjoining Kirinyaga district. This area has short to medium and a short cropping season or two short cropping seasons. Dryland varieties of maize, sorghum, beans peas and millet do well in this area cotton and dwarf sunflower also have good yield here. Cassava, pineapples, macadamia nuts and mangoes grow all year round. The carrying capacity of the pasture in this area is 0.9 - 1.5 ha/ L.U. on high grass savanna with zebra grass predominant, down to 0.28 ha/ L.U. feeding bana grass and other forage.

4.2.10 The Marginal Cotton Zone (LM4)

Most of this area has two very short cropping seasons. It has good yield potential of very early maturing varieties of maize, sorghum, millet, beans, peas dwarf sunflower and pumpkins. The stocking rate is 1.5- 3.5 ha/L.U. on mixed medium grass savanna with Makueni guinea (Panicum maximum) and red oats grass (Themeda Triandra) predominant.

Chapter V

CURRENT PROGRAMMES & INFORMATION NEEDS

5.1 CURRENT PROGRAMMES

The major institutions in the district that regulate natural resources management and utilization are closely related to those that control agricultural change (Miller, 1971 and Oyugi, 1976). These are the central government administration including the District Commissioner and his staff, the agricultural administration, the forestry administration, the lands office, the county council, the political party and marketing organizations such as the Coffee Growers' Association and the Kenya Tea Development Authority. In addition, there are the departments of water, wildlife and mines. There are also several international aid agencies and local and international non-governmental organizations operating programmes related to natural resources conservation. Some prominent examples are The Green Belt Movement funded by the Swedish International Development Programme (SIDA) and the Kenya Energy Non-Governmental Organization (KENGO). These agencies have ongoing projects in the area.

Several local self-help or "Harambee" groups exist within the district. Membership to such groups is composed of people living in the district. The Kenya Rangeland Ecological Monitoring Unit and The Kenya National Environment Secretariat have a specific national role which will be discussed in a later section of this report. They operate within the auspices of their parent ministries, the Ministry of Natural Resources and the Ministry of Finance and Planning.

5.1.1 The District Administration

In the management of natural resources in Kenya, the most important links are between the lowest administrative levels of government and the rural population. The districts, of which there are 41 in Kenya, are the administrative hub of the entire rural development effort. Kenya is administratively divided into six levels: the central government, provinces, districts, divisions, locations, and sub-locations. Levels below the national level are implementing agencies, and individuals holding posts are appointed rather than elected (Figure 5). A fragmentation of responsibilities exists at the district level causing such offices as Agriculture, Forestry, Lands and Co-operatives to align themselves closer to their own ministries than to the District Commissioner's office. Communications and policy directives flow from the individual ministries although the district administration

still serves to coordinate many government activities (Miller, 1971). The District Commissioner's Office is part of the Central Administration and has little to do with the actual day to day management of natural resources apart from budget administration. The District Development Officer however is responsible for all district development activities be they roads, hospitals, schools, soil conservation projects or reafforestation projects.

The administrative structure described forms the basis on which the responsibilities falling under various ministries are carried out and especially the manner in which staff are deployed. This is important to understand the nature of natural resources management in Kenya. As an example, in the case of the Ministry of Agriculture at the district level, the district agricultural officer is responsible for the overall operation of the agriculture program. He is assisted by several assistant agricultural officers responsible for agricultural extension services in the divisions who in turn supervise agricultural assistants, junior agricultural assistants and other workers. The Lands office is an example of a system that has representatives at every level of administration. The forestry administration deviates slightly from the others because forests are demarcated into provinces that do not necessarily follow conventional political provincial boundaries. In Murang'a district there is a District Forest Officer. The District

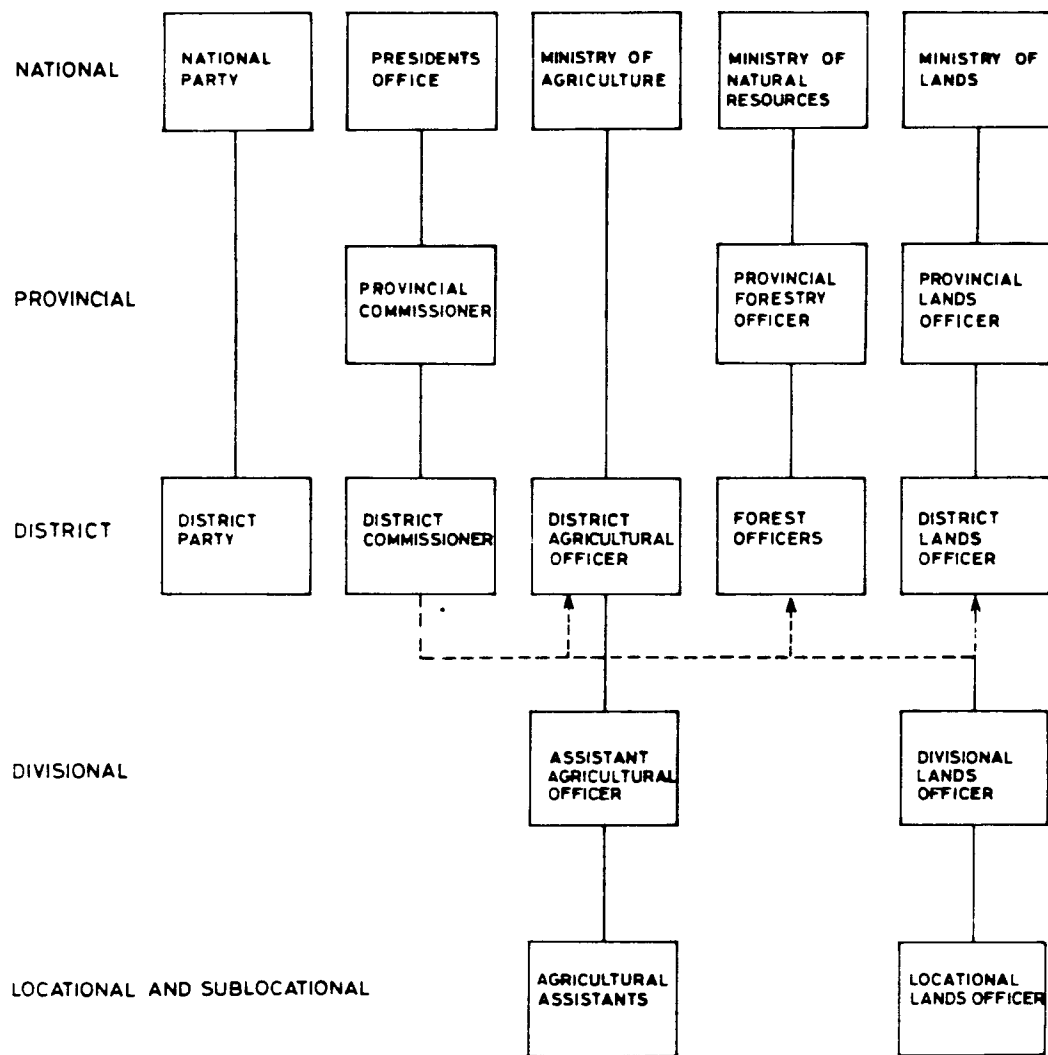


Figure 5: The Position of the District in the National Administrative Structure.

Development Officer oversees general district development and he is the Secretary to the District Development Committee. The District Commissioner is the Chairman of this committee.

5.1.2 The District Focus for Rural Development Strategy

The District focus for Rural Development Strategy was adopted by the Kenya government in 1983. It was aimed at broadening the base of rural development and encourage local initiatives to complement the ministries' roles. It was hoped that this would improve identification, resource mobilization and project implementation at the local level.

Under this strategy the ministries of fisheries and wildlife have established new offices at the district level. The shift to this new strategy reflects the government's wish to increase efficiency in natural resources management. The sharp focus and delegation of authority and participation of the general public at the local level is expected to make development in all areas more efficient and democratic.

5.1.3 The Kenya Rangeland Ecological Monitoring Unit and The National Environment Secretariat

As was mentioned earlier, these two agencies have the national role of overseeing general environmental quality and proper utilization of natural resources. The Kenya Rangeland Ecological Monitoring Unit, a department in the

Ministry of Finance and Planning, has been collecting data on the general monitoring of natural resources in the Kenya rangelands since its inception in 1976. K.R.E.M.U. was established mainly to provide a continuous flow of information on natural resources especially renewable natural resources. This decision was arrived at following the threat of desertification, conflicts in land use practices, fluctuating weather conditions, the food crisis and unavailability of resources all over the country.

K.R.E.M.U.'s objectives are; to provide an up-to-date and continuous flow of information on population estimates and spatial and temporal distribution of livestock and wildlife species in the country; to assess and monitor vegetation changes within the rangelands and in designated forest estates; to determine the extent and nature of human activity in the rangelands and other areas. In the last four years, however, K.R.E.M.U.'s mandate has been extended to include monitoring of resources in agricultural areas such as Murang'a district as well. Since the formation of the District Focus for Rural Development Strategy in 1982 (Kenya Government, 1983), K.R.E.M.U. has been looking for ways of making their data district responsive to suit specific district planning requirements. K.R.E.M.U. fulfils requirements for planning data principally from the ministries of Finance and Planning, Agriculture, Environment and Natural Resources, Water Development and Tourism and Wildlife. K.R.E.M.U. programs in agricultural areas include

domestic livestock census, wood fuel availability, land use mapping, forest cover mapping, and soil erosion susceptibility studies. These data are necessary for identifying the existing national natural resources base and in formulating future plans for their management.

The National Environment Secretariat is charged with the national role of carrying out periodical environment assessments of the country district by district.

5.2 INFORMATION NEEDS OF PLANNERS

In terms of scientific advancement, the planners role is to interpret the results of rapidly increasing and available knowledge for land use (resource) planning. Advancement in the understanding of ecological principles helps land use planners achieve a better "fit" between environment and land use. Scientific knowledge can aid in finding and assesing critical resources, determining development suitability for any kind of land use and can even improve planning from data gathering to plan implementation.

The district land use planners have information available to them from a variety of sources. In most cases however, this data tends to be of a generalized inventory nature which is at times not suited to planning needs at the lowest levels of government such as the location and the sub-location. In other cases, research information never reaches the planners.

In order to make better land use decisions, planners need to assess the relative quantity, quality and distribution of those resources useful in maintaining the continuous needs of the community. The most critical land use resources in this area are surface and ground water, land productivity for agriculture, and better biomass production including timber and firewood, wildlife and various earth resources such as sand, rock and gravel. Methods to assess all the above and any other valuable resources continue to be developed and improved.

As was demonstrated in a previous chapter, the surface water potential is not fully exploited so far. Data gaps in this area include: the amount and quality of water available, the topography, surficial and bedrock geology, erosion characteristics, and slope stability complemented with information on projected need, cost and political acceptance. For ground water assessment, alternative methods have been developed and are in use elsewhere. These include in increasing order of detail, remote sensing, surficial geologic techniques, on site geophysical interpretive techniques and on-surface site techniques. In this country, techniques for measuring the underground water potential are not very well developed. Water quality assessment can be made by making inferences from surficial characteristics and land use or by more accurate laboratory means. This has been done for this district on a general basis. It has been

possible, for instance, to detect water pollution cases from coffee, sisal and horticultural factories.

Land productivity for agriculture is among the best developed procedures. Soil scientists have developed accurate techniques for classification and assessment of soils. Among the ratings they assign is an estimate of the capability of the soil to support agricultural production, based on parameters such as slope, moisture holding capacity, erosion characteristics, texture, structure, and drainage characteristics. Soil capability is also the basis for the assessment of forest productivity and other land based biomass production. The land capability zoning is one of the best developed in this country. Additional work is being carried out in this area by K.R.E.M.U. who have been conducting aerial surveys in this area since October 1984, with the aim of generating a land use/cover map. The full importance of this geographic data for planning is expected to be realized with the introduction of the Geographic Information System in K.R.E.M.U. in the near future.

On wildlife, there exists detailed information on the pertinent species. Wildlife biologists have ascertained the most important characteristics of wildlife habitat elsewhere in the country. Such information can be easily extrapolated. The information gap lies in the lack of feasibility studies for the exploitation of these resources for instance for tourism and the population trend of wildlife.

The ability of science to measure or assess the critical resources is reasonably well developed in the country. It seems therefore, that scientists in these disciplines can become useful allies for land use planners in the administration. This should be particularly more true with the deployment of scientific staff to the district as a response to the district focus for rural development strategy. The dissemination of scientific findings has profound influence on our understanding of the major environmental stresses and on land use decisions at any level of planning. It has been shown that the body of pertinent information is large. Much of the scientific data and findings have already had an impact on land use decisions. Others however have not reached the land use planning community. This deficiency suggests that not only do we need more knowledge but that also better links between scientists and planners need to be established.

5.3 PUBLIC PARTICIPATION

In the past, land use planners did not have to pay much attention to the values of ordinary people. Current land use planners, however, realise that they must cultivate a better understanding of public and individual values. This is essential in gaining the cooperation of the people in the task of steering us toward our common goal of achieving an ecologically sound environment. Most ecological development programmes have found that success lies in the extent to which the community can be involved. Community involvement,

in turn, depends on the extent to which rural development workers appreciate the interests of the community as a whole. On the other hand, the success or failure of such programmes is a reflection of the manner in which these programmes are perceived by the public.

Formal public participation is still at a very early stage of evolution in this country. The government is still in the process of developing a suitable public participation strategy. Some early attempts at this process are the participation of community representatives and local politicians to the district and the divisional development committees.

The role of the public in land use decisions came to be appreciated early in this country as the public forged the struggle for land reform in the early part of this century. Public cooperation and involvement then became the political slogan of the first national government by the adoption of the "harambee" motto (this word means pulling together for the betterment of the whole community). Since then, the public has been invited to participate in the implementation of various development programmes on a self-help basis. Most of these programmes are in the area of environmental rehabilitation, such as reforestation, energy and water development, and sustainable agriculture. These projects are rarely originated by the public.

Several factors are known to shape peoples basic values towards the environment: environmental and cultural heritage, science and technology, the articulators, and public surveys. Public surveys are uncommon in this part of the world, however the others have had an impact on peoples' values towards their environment. The population in the study area was rural in origin and historically pursued activities linked with the natural environment. Their traditional lifestyles and the way in which the people perceived the resources around them combined to form a self sustaining environment. The Kikuyu regarded the forest as sacred, and had designated areas for prayer, burial, and grazing lands. Some forest areas were never cleared following religious and customary beliefs.

Technology too has been responsible for shaping the people's values towards their environment: when the ability to use the land was increased by improved technical resources, more forest was cleared for cultivation, industry and fuel, and large areas of forest were opened up. The extension and changes in agricultural systems is a result of improved technology.

Probably the largest source of the public's values towards their environment today comes from the articulators. Because of the low level of literacy in this country, public education is best carried out through word of mouth in public forums or extension works. Meetings are generally

called by the Chief, the District Officer or their representatives during which difficulties in providing a green cover and incorporating environmental conservation in farm management are discussed. Sometimes these meetings take the form of workshops whereby soil erosion control techniques are demonstrated. Trees are planted and the farmers are given general advice about their farms. During my stay in the area, I attended one such meeting on the occasion of the World Environment Day. The attendance of all government departmental heads was required. Public attendance however, was rather poor considering the importance of the occasion. The farmers and other rural residents are not required to attend these meetings. In the eyes of many farmers, environmental preservation work does not appear to produce immediate gains, so it is considered less important than the more pressing daily responsibilities on their farms.

Other avenues of public education used are school programmes and demonstration plots by local NGOs. Women's groups are another effective avenue of education. Their enthusiasm for ecodevelopment projects should be acknowledged as a growing and widely shared militancy among poor women to protect and enrich the natural resources that sustain them. The value of woman as teacher needs to be acknowledged and more aid for increasing the natural resources base needs to be directed to women. Women are the primary cultivators of food production, the gatherers of

firewood, and the collectors of water. Thus the sustainability of these resources is most critical to their economic activities and to their families' well-being. In turn, maintaining a sustainable natural resource base is not possible unless poverty and population growth pressures are curtailed. Fertility rates and thus overall population growth are indirectly related to women's educational attainment and economic autonomy. However, a large percentage of the districts illiterate population are women. Accordingly, they make a disproportionate proportion of the poor. The alleviation of poverty and the curtailment of high population growth rates, therefore are not possible unless economic development provides women access to education, accounts for women's labour contributions to the economy, and increases women's capacity to generate income.

The institutional means through which women's groups can form new alliances is already in place. Concerns about women's groups and about environmental protection have moved from the grassroots level to becoming institutionalized. Several agencies concerned with raising the status of women and increasing general family welfare have been created. The "movers" in both cases have often been women.

5.3.1 Summary

The public participation process is still in its evolutionary stages in Kenya. The institutional arrangements through which this process can be developed are already in place. A great amount of work still needs to be done to change people's attitudes to begin viewing environmental conservation as a positive goal. This will require a tremendous effort by rural development workers, politicians, and teachers. The experience of NGOs in changing rural people's basic values should be utilized wherever possible.

Chapter VI

POPULATION DENSITY AND DISTRIBUTION

6.1 INTRODUCTION

Murang'a district has a total population of 648,333 (1979 census). The population in 1985 was projected at 812,335 in the same census. Approximately 20,000 (3.12%) lived in Murang'a township and in the three larger trading centres in the district. The majority of the population therefore lives in the rural areas. Since this district is mainly suitable for high quality cash crops, farm sizes are in general small. Murang'a is the fourth most populated district in the country after Kisii (395), Kakamega (294), and Kiambu (280) with a density of 261 persons per Km². Most of the population except in parts of Makuyu practice small scale farming in the high potential land. (Table 2) shows the population distribution by location and division. Land pressure in these areas has been very high with much fragmentation of holdings.

The result has been considerable outmigration in search of employment and settlement opportunities. Makuyu district on the other hand, has been relatively sparsely populated, but recent expansion of pineapple, sisal and other

TABLE 2

Population Distribution by Location and Division.

LOCATION/ DIVISION	No. of Households Total	Farmers Family ^b			Non- relatives	Persons per house- holds total ^b
		Adults >15 years	Children <15 years	Other relatives		
Location:						
Kandaru	3638	3.19	1.78	0.45	0.27	5.69
Ruchu	4857	3.10	1.75	0.42	0.21	5.48
Gaichanjiru	7038	2.95	1.44	0.46	0.22	5.25
Muruka	9569	3.09	1.70	0.46	0.14	5.39
Gatanga	8172	3.13	1.80	0.43	0.19	5.55
Division: Kandara	33274	3.09	1.71	0.45	0.19	5.45
Location:						
Kinyona	4646	3.03	1.64	0.43	0.20	5.30
Muthithi	6084	2.96	1.68	0.44	0.49	5.27
Kamahuha	3358	2.72	1.26	0.41	0.25	4.65
Kigumo	5386	2.91	1.63	0.39	0.12	5.04
Nginda	7307	2.88	1.42	0.38	0.16	4.84
Division: Kigumo	26781	2.90	1.55	0.41	0.18	5.03
Location:						
Kiriti	5108	2.83	1.68	0.63	0.14	5.27
Gitugi	3960	2.85	1.62	0.69	0.20	5.36
Iyego	6199	2.76	1.48	0.45	0.12	4.80
Kanyenyaini	3677	2.80	1.50	0.50	0.16	4.96
Division: Kangema	25963	2.87	1.53	0.57	0.15	5.12
Location:						
Mugoiri	9823	2.93	1.60	0.57	0.14	5.24
Nbiri	1539	2.85	1.53	0.69	0.18	5.24
Gikindu	1957	2.59	0.47	0.54	0.24	4.61
Gaturi	5174	2.79	1.56	0.51	0.18	5.05
Weithaga	5289	2.96	1.65	0.58	0.13	5.31
Murang'a Township	4059	2.20	0.65	0.36	0.36	3.58
Division: Kiharu	27841	2.78	1.43	0.54	0.19	4.93
Location:						
Makuyu	3807	2.45	1.02	0.46	0.18	4.12
Kakuzi	3808	2.47	1.03	0.44	0.19	4.13
Mitumbiri	5405	2.08	0.51	0.21	0.34	3.14
Ithanga	2413	2.70	1.40	0.62	0.26	4.97
Division: Makuyu	15433	2.37	0.89	0.39	0.25	3.91
DISTRICT: MURANG'A	129292	2.83	1.51	0.48	0.19	5.00

a) Source: Central Bureau of Statistics (CBS).

b) Average figures, include one or two persons per household as well.

plantation agriculture has attracted immigrants and therefore has experienced an exceptionally high growth rate (5.0%). The largest urban centre in the area, Murang'a has a population of 15,290 whereas Makuyu had 2128, Sabasaba 1501 and Maragua 1298.

6.2 POPULATION AND LAND

Of the total rural area of 221,600 ha, in Murang'a district, 180,000 ha is agricultural land. The agroecological zone distribution of this land is as follows:

The tea dairy zone	34,000 ha
The Coffee Tea Zone	26,100 ha
The Main Coffee Zone	30,700 ha

These regions cover over 50% of the total agricultural area. A further 38% is assigned to the marginal coffee zone (UM3) and the sunflower maize zone.

(Table 3) shows the agroecological zone land area available per administrative location, division and per household and person.

The statistics on farm size show that an average household of 5 people had only 1.46 ha or 0.29 ha per person, but this varies e.g. in Weithaga location (UM1 and UM2) it is half the average, 0.72 ha per household and 0.14 ha per person. Although the agroecological conditions here allow extremely intensive cultivation of cash crops, this

TABLE 3

Agroecological Land Area Available per Location, Division, and Household.

Location/Division without townships	Area Total Census 79	In '00 ha = sq km			Agri- cultural land	In '00 ha = sq km										In ha		
		Non-agricultural land				Areas in agro-ecological zones										Agricultural land		
		Unsuit. steep slopes	Forest Res., Lakes, Swamps	Others (roads, home- steads, rivers)		AEZ										house- hold	person	
						UH1	LH1	UM1	UM2	UM3	UM3-4	UM4	LM3	LM4				
Kandara Ruchu Gaichanjiru Muruka Gatanga KANDARA DIVISION	104 68 76 89 83 420			18 12 15 18 16 79	86 56 61 71 67 341	1	78	7									2.36 1.16 0.87 0.74 0.82 1.03	0.41 0.21 0.16 0.14 0.15 0.19
Kinyona Muthithi Kamahuha Kigumo Nginda KIGUMO DIVISION	152 75 48 45 115 435			15 15 9 9 21 69	137 60 27 36 94 364	19	108	10		20	40		12	20	1		2.93 0.99 1.10 0.67 1.28 1.40	0.55 0.19 0.23 0.13 0.27 0.28
Kiru Kiriti Gitugi Iyego Kanyenyaini KANGEMA DIVISION	81 86 48 60 64 339			16 15 10 12 11 64	65 71 38 48 53 275	2	18	45									0.93 1.39 0.96 0.77 1.44 1.06	0.18 0.26 0.18 0.16 0.29 0.21
Mugolri Mbiri Gikindu Gaturi Weithaga KIHARU DIVISION	119 27 81 103 50 380			24 5 11 19 10 69	95 22 58 82 38 295		25	39	31					1			0.97 1.43 2.96 1.59 0.72 1.24	0.18 0.27 0.64 0.31 0.14 0.24
Makuyu Kakuzi Mitumbiri Ithanga MAKUYU DIVISION	134 203 223 82 642	7 10 11 28		20 20 29 12 81	107 173 194 59 533				7	19	60	6	15				2.81 4.60 3.59 2.44 3.62	0.68 1.10 1.14 0.49 0.91
TOTAL RURAL AREA	2216	34	12	362	1808	49	344	261	307	241	75	367	51	113			1.46	0.29

Source: Farm Management Handbook, Vol. III B

figure is near the optimum limit for a small farm. 2.4 ha/person has been empirically determined to be the point where external income linkages become less important (O'Keefe, 1976). In Kakuzi location however, where UM3 and UM4 predominate, 4.60 ha per person is not excessive. Data on the proportions of farm incomes gained from subsistence, cash crops, livestock and other activities could not be obtained. However, the proportions of farmland allocated to each of these activities is known to vary in different parts of the study area.

The department of Lands has classified arable land in Murang'a district into four classes determining the maximum acreage of land an individual can legally register. These subdivisions were recommended by the Agriculture department as being the most economical units to operate in each agroecological zone (Wilson, 1972). All land control boards in the country follow a similar formula. The land board ceilings set for various regions in the district are as follows:

Zone	Minimum Ha	Maximum Ha
High Bracken Zone (Aberdare forest, tea zone)	12	24
Kikuyu grassland zone (coffee, tea zones)	8	16
Star grass zone (coffee zone)	6	12
Grass woodland zone (marginal area)	10	20

The high bracken zone represents the area to the west of the district and covers the Aberdare forest, the tea/dairy zone and the tea zone. This area has high rainfall and good soil characteristics. The Kikuyu grassland zone represents the middle zone called the coffee-tea zone in which much of the small holder cultivation lies. The grassland woodland zone falls in the eastern part of the district within the marginal area.

Following customary law, families continue to subdivide their land into units that are far smaller than those recommended above. The land Board is no longer able to control such divisions. Within the individual land units the intensity of cultivation is very high. The large increase in the area under cultivation has been brought about by changes from the traditional shifting cultivation to the present level of subsistence/ cash crop economy.

6.3 POPULATION GROWTH RATE AND PROJECTION

The demographic profile of Kenya is one of the worst in the world today and is continuing to deteriorate steadily. The national population growth rate up to 1990 has been estimated at 4.05% annually.

Murang'a district's population has been growing at a rate higher than the national average. The district experienced a growth rate of 3.83% between the 1969 and 1979 census. This was higher than the estimated national derived average of

3.41% for that period. It would probably have been higher were it not for the outmigration from the district. Within the district Makuyu was the fastest growing division with an annual growth rate of 5%. The lowest rate was in Kigumo (3.39%). The people in this area consider a high birth rate favourable. This has a lot to do with traditional and cultural beliefs. Children are considered to be gifts from God and a good investment in the future, when they are expected to provide free farm labour and to look after the old.

Detailed population projections based on the analysis of fertility rates are not available. In any case they would not be easy to compile due to their sensitivity to the pattern of migration. The Central Bureau of Statistics, however gives the following rough estimation assuming a continuation of 3.83% growth rate for the district.

Year	Population
1985	812,335
1990	980,278
1995	1,182,942
2000	1,427,505

At this rate of growth, clearly the district's population carrying capacity will have been exceeded long before the year 2000. The future of Murang'a district depends on the nature of policies that will be developed to cope with the

situation. These may take the form of an agricultural revolution or the intensification of birth control programmes.

6.4 POPULATION STRUCTURE AND MIGRATION PATTERNS

Results of a survey done by the Central Bureau of Statistics indicate that over 57% of the population is under 15 or over 65 years of age (Table 4 and Table 5). This means that not only are current resources in the district under heavy stress to support the population, but in future the resource base will face even more severe population pressure.

A common response to resource and economic pressures in an area with closed frontiers for expansion is migration out of the district, either to find unoccupied land elsewhere or to search for employment. Another alternative would be to remain in the area and look for whatever work is available. The sex ratio gives an indication of outmigration shown by significant female majorities in the 20-24 age group until age 65. This is a common situation in Kenya in regions where men have migrated to urban or other rural areas in search of employment. Women often stay behind to continue working the family farms, thus giving rise to disproportionate sex ratios. Areas of outmigration usually have female majorities.

TABLE 4
Age Sex Proportions (1979).

<u>AGE</u>	<u>MALES</u>	<u>FEMALES</u>	<u>TOTAL</u>	<u>SEX RATIO (M/F)*</u>	<u>AGE GROUP AS % OF TOTAL POPULATION</u>
0-4	63,633	63,159	126,792	100.7	19.56
5-9	58,499	57,566	116,065	101.6	17.90
10-14	48,861	48,159	97,020	101.5	14.96
15-19	34,165	34,973	69,138	97.7	10.66
20-24	17,851	22,617	40,468	78.9	6.24
25-29	15,005	19,776	34,781	75.9	5.36
30-34	13,780	16,427	30,207	83.9	4.65
35-39	10,130	14,461	24,591	70.4	3.79
40-44	8,745	11,695	20,440	74.8	3.15
45-49	7,304	9,197	16,501	79.4	2.54
50-54	6,421	8,629	15,050	74.4	2.32
55-59	5,658	6,796	12,454	83.3	1.92
60-64	4,551	6,187	10,738	73.6	1.65
65-69	5,062	5,310	10,372	95.3	1.59
70-75	3,532	4,058	7,590	87.0	1.17
75+	6,578	7,898	14,476	83.3	2.23
(Not Stated)	857	793	1,650	-	0.25
TOTAL	310,632	337,701	648,333	92.0	100.00
* Males per 100 females					
<u>SOURCE:</u> Central Bureau of Statistics 1979					

All of the divisions except Makuyu have shown significant female majorities. These are also the divisions where there has been much fragmentation of land in recent years and average holdings per household are lowest. This may be an indication of migration into Makuyu for employment on the large plantation farms, which contrasts with the general pattern of migration out of the densely populated rural areas in the remainder of the district.

Nairobi and Thika have been powerful magnets for migration from Murang'a district due to their proximity. Altogether, about 8% of the total Nairobi population of about 828,000 was born in Murang'a (1979 census). The other

TABLE 5
Sex Proportions by Divisions.

SEX PROPORTIONS BY DIVISIONS, 1969 AND 1979				
<u>DIVISION</u>	<u>MALES (1979)</u>	<u>FEMALES (1979)</u>	<u>SEX RATIO (MALE/FEMALE)</u>	<u>1969 SEX RATIO</u>
Kandara	86,928	94,793	91.7	88.1
Kigumo	64,640	70,476	91.7	88.4
Kangema	61,939	70,974	87.3	80.3
Kiharu*	58,213	64,679	90.0	86.0
Makuyu	31,192	29,210	106.8	113.6
Murang'a Township	7,721	7,569	102.0	134.2
*Excludes Murang'a Township				
SOURCE: Central Bureau of Statistics, 1969 and 1979 Census				

areas of outmigration are Central and Rift Valley provinces. Most of this movement has been for land in areas open for settlement, as in Nyandarua, Nakuru, Laikipia and other districts that were part of the white highlands, or for agricultural and other employment in areas of large farms such as Kericho and Kiambu districts. Interestingly, there has been a preponderance of males over females in the population that has moved to Nairobi. In the agricultural areas of Central and Rift Valley provinces, the proportions are more nearly equal and there are even female majorities in some cases. This indicates that migration to large urban centres involves mainly males searching for employment,

generally leaving women behind to care for the family land, while migration to agricultural areas usually involves movement of the whole family.

Chapter VII

SOCIO-ECONOMIC PROFILE

The socio-economic organization is the nuclear family centered around the male head of the household who is also the principle resource manager. Comparable to other districts, Murang'a households have high incomes; however, the working member of the family has a large number of dependants to support. Income levels in the district depend upon climatic conditions, unemployment, underemployment on farms, limited and unreliable market facilities for agricultural and livestock products, landlessness, existence of uneconomic farming units and limited credit facilities. Limited credit hinders the landless from engaging in other income earning activities.

Crop growing and livestock keeping are the main sources of income for about 96% of the people in this district. Other sources of income include mainly rural commerce, small scale rural industries and paid employment. Although no quantifiable data was obtained, it is estimated that 70% of the non-farm incomes of the district come from rural commerce, 25% from paid employment and 3% from passenger vehicle transportation services.

As discussed in the previous chapter, the demands of the dependent members of this society are usually met by wage remittance. Most of these migrants are permanently absent from the village returning only once a month. Incomes remitted to the rural areas are usually spent on the children's education, food and clothing. In some cases, they are used to subsidize farm improvements. There is a characteristic return migration from the urban to the rural areas by the male population over 50 years of age, the reason being that there are no longer the same economic demands from the household as soon as the children become self-supporting. So the household head prefers to seek long term security on his own land rather than in wage employment.

It has been estimated based on 1978 prices that a Murang'a family would need Ksh. 8300 annually to meet its daily needs. About a quarter of this sum is the amount needed to meet the family's food budget; a family having 4.5 adult equivalents (Crawford and Thorbecke ILO Report 1978 in M.D.D.P., 1983). This figure yields an average of Ksh 9550 when adjusted for inflation, a figure which is considered to be around the poverty line. On the basis of this figure and local reference knowledge of the Chiefs and District Officers, it is estimated that 30% of the households in the four more densely populated divisions are below the poverty line. In Makuyu division, the figure is approximately 70%. These figures are not considered to have changed appreciably

since 1978 (except in Makuyu). High population growth on limited land resources and decreased economic opportunities coupled with the ongoing recession account for this lack of change (M.D.D.P., 1983).

Quantifiable data on the level of poverty is not available. However, a study done in 1979, used unavailability of basic needs as an indicator of poverty (M.D.D.P., 1980). This was based on the rationale that generally, families who are not able to acquire basic items and services are considered poor. Basic needs in this case refers to food, clothing, fuel, education for children and health services. Based on this arbitrary standard of measure, various categories of people were recognized whose cash and imputed value of subsistence fell below the desired income per household. These were squatters, landless people, the unemployed and people operating marginal and range land. These groups of people together form about 40% of the total district population (M.D.D.P., 1976).

7.1 SUMMARY

As implied in the foregoing discussion, there are inequalities in income levels which can be traced primarily to climatic conditions, lack of working capital, land use and land tenure systems. The marginal areas get about 500-900 mm of rainfall per year which is insufficient for crop growing while the medium and higher potential agro-ecological zones have adequate rainfall for crop

growing (900- 1600 mm). Coffee, tea, and dairy cattle earn a high income. In the marginal areas too, there are cases where incomes are high, especially in the estates. development. The majority of the farmers in this area had not until recently identified more suitable cash crops like tobacco, sunflower, and cotton. They had been planting subsistence crops and to some extent cash crops (coffee) which had poor yield due to insufficient rainfall.

In the medium and high potential zones, landlessness, small farm size and high incidence of underemployment have accounted for low incomes for some households. Agricultural activities suited to small farm sizes are not popular because there is no guaranteed market for such products, and the high cost of for example, poultry products.

Chapter VIII

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

8.1 SUMMARY

This study examined the historical perspectives of land use in Murang'a district, current land use practices, and problems in the natural resources sector. The Kikuyu people, before the 19th Century, maintained a moderate balance between preservation and use. They respected the traditional manner in which the land and other resources around them were utilized. The strong cultural beliefs about the land were committed to what amounted to a sustainable way of life that produced an ecologically sound environment. Every community executed local control over land ownership and there was an accepted conception that the various members of the tribe accept a fair share of what belonged to the whole. Even up to the first decade of the 20th Century, the lands available to the Kikuyu in the African reserves was sufficient to meet their needs.

Original concerns about the sufficiency of land for an expanding population were voiced in the early 20's. Africans restricted in reserves had continued to practise shifting cultivation which was beginning to reduce the quality of the

soil. Already, soil erosion problems were being experienced and the initial efforts at soil conservation were started. Migration to the urban centres was beginning to occur even at this time, as a response to the pressure on land. Several attempts were made to arrest the land problem. The biggest change came with the implementation of the Swynnerton plan. As a result of this plan, landownership was revolutionalized from customary to individual tenure. The production systems we see today are the result of the Swynnerton plan. Although the changes brought about increased production in the small farm sector, the problem of landlessness was beginning to emerge. In addition, consolidated land holdings were again being subdivided following age old customs.

The natural qualities of Murang'a district make the area very suitable for agriculture. Since the land reforms that took place in the early part of this century, the district has been able to sustain a healthy agricultural economy. The production of almost all cash crops has increased steadily since independence in 1963. Murang'a is now the leading producer of coffee, tea and pyrethrum. As the population in the study area has increased, the average land holding size has continued to shrink as land is still being fragmented following customary law. Despite the favourable trend in agriculture, and the fact that the farmers appear to be making the best use of their land, the distribution and availability of good quality agricultural land is still a limiting factor.

An imbalance of land ownership exists in the district and a process of unrestrained settlements in marginal agricultural lands and hilltops is emerging. The population of landless and unemployed people is rising. It is also estimated that a considerable number of farmers are operating uneconomic units of land. Several settlement schemes have been established in Makuyu division, and present government policy favours the release of land leased to large scale farmers for settlement purposes. Additional land is already being excised from forest reserve land.

When the agricultural revolution took place, other natural resources such as forest, water and wildlife, fisheries and minerals did not appear so important. They were relegated to unoccupied bushland or forest, areas that were too hilly and rocky to sustain agriculture. Yet, with the increasing demand for agricultural land, forest, soil, and water conservation needs to be considered side by side. The potential economic and ecological benefits to be gained from these resources is just beginning to be realized. A small proportion of the potentially productive forest is being utilized. The forest supplies available are adequate to accomodate two more sawmills. The demand for fuelwood has been met by the establishment of woodlots in the trust lands with considerable success. Seed distribution by the forest department for this purpose has been successful. Land availability for the expansion of forest plantations is a

constraint and therefore, future forestry programs will likely be dependent on social forestry programs. The major constraints in the forest industry are lack of a strong forestry infrastructure and inadequate application of regulations governing the replanting of young trees.

Water and soil resources are threatened by the spreading of agriculture to catchment areas. Considerable improvements are needed in bringing domestic water supplies to the majority of the population. Further expansion of irrigated land and the installation of boreholes must be preceded by the necessary research of the possible consequences to the hydrological cycle.

In the mineral resources sector, it appears that the available resources are being exploited in a credible manner. There is great potential in small scale industries using local minerals.

The development potential of small scale wildlife and fisheries industries is reasonable in this area. The general attitude among planners on the viable development of these resources is becoming more favourable. Considerable work needs to be done in convincing the general population in the study area to develop a positive attitude towards fish consumption.

As a whole, the natural resources sector could be utilized further to provide the much needed alternative employment in Murang'a district. The major constraints in

the development of some of these resources like forestry, fisheries and wildlife has been the lack of case studies and feasibility reports.

The expertise required in finding and assessing critical natural resources is mostly available, but availability of financial resources may be a constraint. Information, scientific and technical, has in some instances not been available to land use managers. High technology, such as satellite imagery and other remote sensing information which can contribute in the better use of the land is available in the country.

There are gaps in natural resource legislation that require attention and possible review. More enforceable regulations that take into account the prevailing socioeconomic realities are required.

Finally, while the general population has a very positive attitude towards the land as an agricultural resource, there is still an attitude problem in matters relating to environmental conservation. To change these attitudes, a great deal of work is required by rural development workers, NGOs, teachers and politicians. Only then can we develop a consensus that protecting the environment while utilizing it is a good idea.

8.2 CONCLUSIONS

The conservation of natural resources, especially forests, water, and soil is critical to the very existence of the people, not only in Murang'a district, but in the whole of Kenya. To a large extent, Murang'a district is characteristic of Nyeri and Kiambu districts, which fall in the same ecological and cultural zone, the Central province. Compared to areas outside the high potential agricultural zone in Kenya, Murang'a district has very good natural qualities such as rainfall, forest and soil. The district also has a longer history of environmental conservation practice than many districts in the arid and semi arid areas of Kenya. Murang'a district, therefore is better in environmental quality relative to many parts of Kenya.

However, serious problems involving destructive use of natural resources are emerging in Murang'a district. Prevailing land use changes indicate that the supply of good quality agricultural land is lower than the rising population demands. The demand on the limited supply of natural resources is expected to rise with the fast growing human population.

The Kenya government faces the challenge of ensuring a good supply of natural resources for the present population and future generations. Fortunately, the government has come to realize that there are justifiable social and economic benefits to be gained by protecting natural resources. In achieving these benefits, the government will

need to balance the considerations of conservation of natural resources, with the financial goals of economic progress.

8.2.1 Population and Land Resources

Though the traditional land resource management systems have been altered, the Kikuyu of this area still maintain a strong identification with the land. Many Kikuyu people still aspire to own land, both as a form of investment and as a place for retirement. The attraction of land is so strong that even people with stable non-farm incomes still strive to own land. However, it is becoming increasingly difficult to find unoccupied land for such purposes. Efforts to create land for settlement purposes have been made. However, the population growth rate in this area is among the highest in the world. It has been estimated that the district will have outstripped its carrying capacity by the year 2000. Thus, assuming that the same population growth rate is maintained, within the next two decades, many people in this area will not be able to aspire for land ownership.

Under conditions of such rapid population growth, the practice of fragmentation of holdings within the agricultural lands is expected to continue. Such fragmentation is likely to produce land holdings that will become uneconomical to operate. One possibility is that the operators of such units may eventually be forced into debt and lose their farms,

following which they may become tenants or find work on other people's land. Another option might be migration out of Murang'a district to the urban centres or other agricultural areas. There may be opportunities such as those that can be facilitated by technological improvements or an agricultural revolution, but it is too early to speculate. At the moment however, it appears that there are few employment opportunities in the villages apart from agriculture. The creation of employment by the utilizing local materials and local skills and labour is necessary.

8.2.2 Constraints

Increasing human demand on land resources, coupled with inadequate management may create a vicious downward spiral involving the whole ecosystem. Trees protect the soil and water regimes upon which agriculture is based. As forests become scarce, local soil and water resources are certain to be damaged. Murang'a district has had a long history of soil conservation practice. However, there are still problems in maintaining high soil conservation standards. There is inadequate labour for supervision of soil conservation projects. The forestry sector too, has difficulty in the application of forestry regulations. Water conservation requires more supervision of existing regulations, especially those governing catchment area protection and water pollution.

8.2.3 Opportunities

It is imperative that the general public be made aware of the problems developing in their environment in order to strengthen community support in the implementation of remedial measures. Fortunately, there is increasing government recognition of the prevailing difficulties. However, a broader perspective is required in order to maintain resource self sufficiency in this region. There is moderate public support for environmental conservation programmes which could be strengthened. Extensive public education is required to change people's attitudes. To build the essential awareness will take an all out effort by foresters, agricultural extension staff, teachers and politicians. A significant role will have to be played by the scientific community, aid agencies and the government in terms of financial assistance, and by NGOs.

8.2.4 Sustainable Development

Along with attitude change, a coherent plan on renewing and conserving the nation's natural resources is needed. Such a strategy should be based on confronting the prevailing problems while increasing the productivity of land and labour resources. This strategy could be put in place through the implementation of the country's food, soil and forestry policies, which call for living resource conservation to ensure maximum productivity of resource use. A realistic approach is to work closely with the existing

socio-economic realities. Based on the findings of this study, the following recommendations are made.

8.3 RECOMMENDATIONS

These recommendations are made for developing sustained self sufficiency in natural resources, while maintaining a productive agricultural economy.

Recommendation 1. Research: Investigation must be conducted into the best ways of increasing the sustainable development capability of resources while conserving them.

Research must be geared towards practical relevance and likelihood of application to local planning needs. The greatest investment in research is needed in integrated interdisciplinary research on forestry/agriculture/rural development relationships, forest renewal and utilization, social forestry, soil conservation and watershed protection. Hydrological surveys to determine the ground and surface water potential are needed. Studies on the possible ramifications of the continued practice of irrigation in semi arid areas are needed. Similarly, the effects of sinking boreholes to the overall level of the water table needs to be investigated. Feasibility studies that set out the benefits and costs of utilizing various natural resources are the only reliable guides for future investments in this sector. These should be developed where possible. High technology, which can help solve grassroots problems of how best to use the land should be used where necessary and cost-effective. Research should incorporate

periodic inventories of the natural environmental resources base, accompanied by reviews of land use, land capability and followup work.

Recommendation 2. Land use Changes: The implications of the land use changes occurring in the area should be given special consideration.

The implications of the expansion of high density agricultural holdings into marginal areas should be assessed and ways of providing more land for settlement purposes considered. Land degradation should be minimized and new ways of making the practice of soil conservation and reforestation attractive to the general public should be examined. Farmers should be encouraged to plant their own woodlots using tree species that have been found to be compatible with agriculture. Experimentation into suitable farming practices that rely less heavily on land resources should be continued.

Recommendation 3. Legislation: Gaps in the legislation relating to natural resources conservation and utilization should be investigated.

Government regulations relating to the control and utilization of natural resources should be studied and reviewed to be made more socially sensitive and enforceable. The legislation relating to the replanting of logged forest areas and unrestrained spreading of agricultural settlements should be supervised more closely. Environmental protection control should be more widely supervised and additional staff provided wherever possible.

Recommendation 4. Information: Scientific and technical information must be made more readily available to land use managers.

Investment should be made in better information systems throughout the country. The large body of information that exists should be used at all levels of planning to improve land use decisions. The dissemination of scientific information should be improved by the formation of better linkages between the scientific community, the planners, and the general public. The implementation of the district focus for rural development strategy signifies the willingness on the part of the government to create better communication links between the planners and the general public. This will encourage more democratic land use decisions and generate more community support. Better coordination of activities of various departments at the district level would increase efficiency and reduce interdepartmental mistrust.

Recommendation 5. Public Participation: More effective communication between resource planners and managers should be created.

This will help to foster mutual understanding for the ultimate benefit of the whole community. More public representation at the District Development Committee or at similar committees at the lower levels should be encouraged. The participation of representatives from women's groups should also be considered. Public participation through the already established and successful NGOs should be encouraged.

Recommendation 6. Awareness: An active environmental awareness campaign should be launched to educate the people about the realities of natural resources conservation and management.

Education forums such as the meetings called by the chief on a regular basis should be continued. Wherever possible, the discussion of issues in land use should be encouraged. More aid should be directed towards environmental education in schools which should be incorporated at all levels of the education process. The whole awareness program will require the effort of all those able to understand what is happening.

Recommendation 7. Population Control:

The cumulative effects of high population growth on limited land resources can lead to serious environmental consequences. Maintaining a sustainable natural resources base will not be possible unless poverty and population growth rates are maintained in balance with the available resources. Efforts should be made to change the people's negative attitude towards smaller family sizes by aiming to reach a larger section of the population in the prevailing birth control programmes. The creation of more education facilities for women, and more adult literacy should be encouraged.

Recommendation 8. Development: Assistance should be provided for the development of small scale cottage industries utilizing local materials and labour.

The development of cottage industries in the area that utilize locally found raw materials and traditional skills and labour should be examined. This would help to reduce the unemployment problem.

Recommendation 9. Sustainable Development: A coherent blueprint for saving and renewing the district's natural resources should be formulated.

In future, new ways will have to be investigated to integrate environmental and financial goals if economic progress is to be attained. Over the longer term, natural resources management should be built upon environmental planning and monitoring at the local level.

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