



nyeri

DISTRICT ENVIRONMENTAL ASSESSMENT REPORT

**Published by: National Environment Secretariat,
Ministry of Environment and Natural Resources
P.O. Box 30126
Nairobi**

**in cooperation with Clark University
and the United States Agency
for International Development**

May, 1980

FOREWORD

This report is the second in a series of environmental profiles in Kenya. It is part of an experimental series in district planning to determine whether improved resource data will enhance resource management and development. A report on Kajiado is already published. Kitui and Kisii are soon to appear.

This document is a cooperative effort, prepared by Kenya's National Environment Secretariat, in association with Clark University's Program for International Development (USA). Funding has come from the Kenyan Government and the United States Agency for International Development.

As Director of the National Environment Secretariat, the Project has come under my supervision. The first project Secretary was Mr. Arap-Lelei who initiated the fieldwork. Part way through, Mr. M. Wanga assumed responsibility. The research team received training during preparation of the first report (Kajiado) and is now carrying out the rest of the series. The multidisciplinary team which prepared this report were:

1. Mr. G. Ondenge (Soil Specialist)
2. Mr. P. Ngau (Urban Geographer)
3. Mr. S.W. Luvutse (Demographer)
4. Miss J. Ngina (Sociology)
5. Mr. M. Muiyuro (Research Assistant)
6. Mr. M. Wanga (Agriculturalist/Project Secretary)

Coordination of the Clark University contributions came from Philip O'Keefe, Visiting Professor of Geography and International Development at Clark. His field work and assistance in preparing the first draft helped immeasurably in meeting production deadlines.

Typing, cartography, and printing, both in Kenya and at Clark University, have been provided by the staff of the National Environment Secretariat and Clark University's Program for International Development.

The basic frame work of the project has been derived from the Guideline for Environmental Management (GEM) prepared by the Secretariat. The focus on the district level reflects our current emphasis on local development initiatives and government's policy to use the district as the basic unit of planning.

Comments regarding this approach to district planning and resource management will be welcomed.

M.J. Njenga,
Director.

TABLE OF CONTENTS

	Page
Foreword	i
Table of Contents	ii
List of Tables	vi
List of Figures	viii
1. <u>INTRODUCTION</u>	1
1.1 Purpose of Environmental Profile	1
1.2 Situation of Nyeri	2
2. <u>PHYSICAL ENVIRONMENT</u>	3
2.1 Physiography	3
2.2 Geology	7
2.3 Pedology	9
2.3.1 Soils of Nyeri District	9
2.3.2 Soils Conservation in the District	11
2.4 Climate	14
2.4.1 Climatic Factors	14
2.4.2 Climatic Classification	17
2.5 Surface and Groundwater: Quantity and Quality	19
2.5.1 Groundwater	19
2.5.2 Surface Water	19
2.6 Vegetation	27
2.7 Forest Resources	31
2.8 Wildlife Resources	36

TABLE OF CONTENTS (Cont'd)

	Page
3. <u>HUMAN ENVIRONMENT</u>	38
3.1 Population	38
3.1.1 Ethnic Structure	38
3.1.2 Population Distribution ...	40
3.1.3 Population Characteristics of Nyeri District	41
3.1.4 Migration	44
3.1.4.1 Rural-Urban Migration	44
3.1.4.2 Rural-Rural Migration	47
3.1.5 Population Density and Availability of Land	47
3.1.6 Demographic Changes	48
3.2 Land Tenure	50
3.3 Agriculture	54
3.3.1 Crop Production	54
3.3.2 Animal Husbandry	60
3.4 Commerce and Industry	66
3.5 Cooperative Societies and Self- Help Projects	69
3.6 Tourism	76
3.7 Employment Patterns	78
3.8 Infrastructure and Services	81
3.8.1 Water Supply	81
3.8.2 Waste Disposal	83
3.8.3 Health Facilities and Human Diseases	84
3.8.4 Housing	93
3.8.5 Education	94

TABLE OF CONTENTS (Cont'd)

	Page
3.8.6 Transport, Communication and Energy	99
3.8.7 Service Centres	103
4. <u>ANALYSIS OF ENVIRONMENTAL TRENDS AND PROBLEM IDENTIFICATION</u>	111
4.1 Stable Areas.....	111
4.2 Soil Erosion, Deforestation and Siltation.....	114
4.3 Resource Pressures Associated with Urban Growth.....	116
4.4 Population Growth.....	117
5. <u>SUGGESTIONS AND RECOMMENDATIONS</u>	119
5.1 Resource Information Review.....	119
5.2 Emphasis on Urban Planning.....	120
5.3 Attention to Improved Resource Management.....	120
5.4 Environmental Training and Education.....	121
<u>APPENDIX I</u>	123

LIST OF TABLES

TABLES		PAGE
2.1	Soil Conservation Programme - Nyeri District Operation Projects	13
2.2	Nyeri District - Boreholes, Their Depths, Depth of Water Table and their Yield	20
2.3	Nyeri District - Surface Water Hydrology	23
2.4	Existing/Proposed Rural Afforestation and Soil/Water Conservation Programmes (Nyeri District)	34
3.1	Population by Ethnic Groups	40
3.2	Population Distribution	41
3.3	Male and Female Sex Proportions	42
3.4	Sex Proportion - Nyeri Town	43
3.5	Movement of Population in and Out of Nyeri (%)	46
3.6	Population Projection Nyeri District 1970-1980 Population in 1000	49
3.7	Land Tenure in Nyeri District	50
3.8	Crop Production - Nyeri District 1977	58
3.9	Nyeri District - Agro Chemical Consumption	59
3.10	Livestock - Nyeri District, 1978	63
3.11	Livestock - Nyeri District, 1978	64
3.12	Distribution of Cooperatives in Nyeri District, 1969	70
3.13	The Structure of Cooperatives in Nyeri District, 1972	71
3.14	Tourist Accommodation in Nyeri District	76
3.15	Wage Employment by Sectors	78
3.16	Self Employment in Nyeri District	78

LIST OF TABLES (Cont'd)

TABLES		PAGE
3.17	Distribution of Wage Employment in Nyeri District, 1976	79
3.18	Men and Women in Wage Employment	80
3.19	Water Supply and Consumption, Nyeri, 1969	82
3.20	Health Units in Nyeri District	84
3.21	Bed Capacity	85
3.22	Nyeri District Human Disease Incidence	88
3.23	Acute Mental Illness Due to Alcoholism and Drug Abuse in Nyeri	90
3.24	New Acceptors and Revisits in Nyeri	92
3.25	Housing Units Developed By N.H.C. in Nyeri District	95
3.26	Distribution of Primary Schools	96
3.27	Road Network in Nyeri	99
3.28	Schedule of Principal Towns and Service Centres - Central Province	104
3.29	Age - Sex Ratios in Nyeri Town	108

LIST OF FIGURES

FIGURES		PAGE
I	Relief, Drainage, and Geology - Nyeri District	5
II	Soils and Erosion - Nyeri District	10
III	Climate - Nyeri District	15
IV	Mean Annual Rainfall	16
V	Vegetation - Nyeri District	28
VI	Population Density	39
VII	Age-Sex Pyramid for Nyeri	45
VIII	Land Tenure - Nyeri District	52
IX	Commercial Crops - Nyeri District	55
X	Stocking Rates - Nyeri District	61
XI	Health Units and Educational Facilities Nyeri District	86
XII	Communication Network - Nyeri District	100
XIII	Market Center Services - Nyeri District	106

1. INTRODUCTION

1.1 Purpose of Environmental Profile

This Nyeri District Environmental Assessment Report constitutes the second in a series of district pilot studies. The objective of this report is twofold, mainly to:

- (a) identify environmental pressure points related to development opportunity; and
- (b) anticipate possible environmental consequences of development.

The pilot studies at the district level fulfil the Government's goal of environmental management as outlined in the present National Development Plan. The Government has recognized the need to develop an information base on the state of the environment and to establish a monitoring system so that changes in environmental conditions can be recognized.

This information system will work towards identifying environmental needs and situations of mismanagement. It will supply basic information required for the identification of corrective measures to conserve the environment for future generations.

1.2 Situation of Nyeri

Nyeri District is situated between Mt. Kenya, to the east, and the Aberdares, to the west. It is 3,284 sq kilometres in area, varying between 1,580 and 2,700 metres above sea level. The district receives relatively high rainfall and is characterised by rich volcanic soils. These two ecological factors make Nyeri one of the most fertile districts in the country. The area is predominantly rural with a wide range of agricultural activities.

Nyeri District is divided into six administrative divisions: Mathira, Tetu, Mukurweini, Kieni West, Othaya, and Kieni East. Each of these divisions is headed or administered by a district officer (D.O.). The divisions are further divided into locations with each location headed by a chief. There are 21 locations, including Nyeri Municipality. Apart from the 21 locations which are also divided into about 99 sub-locations, each headed by an assistant chief, Nyeri has three local authorities: Nyeri County Council, Nyeri Municipal Council and Karatina Town Council.

2. PHYSICAL ENVIRONMENT

2.1 Physiography

The landscape around Nyeri (like many parts of Central Kenya) is a product of repeated faulting and lava outpouring which date as far back as 25 million years ago (Early Tertiary). This period saw the formation of erosion surfaces over most of Kenya (Sub-Miocene erosion surfaces) which are now represented by remnants on the major plateaus.

During the Late Tertiary (2 to 25m years ago), the main outlines of the Rift Valley, in the sub-Miocene level, were formed. This period was also the beginning of the formation of Mt. Kenya and the Aberdare Mountains, along lines of weakness running away from the main rift faults.

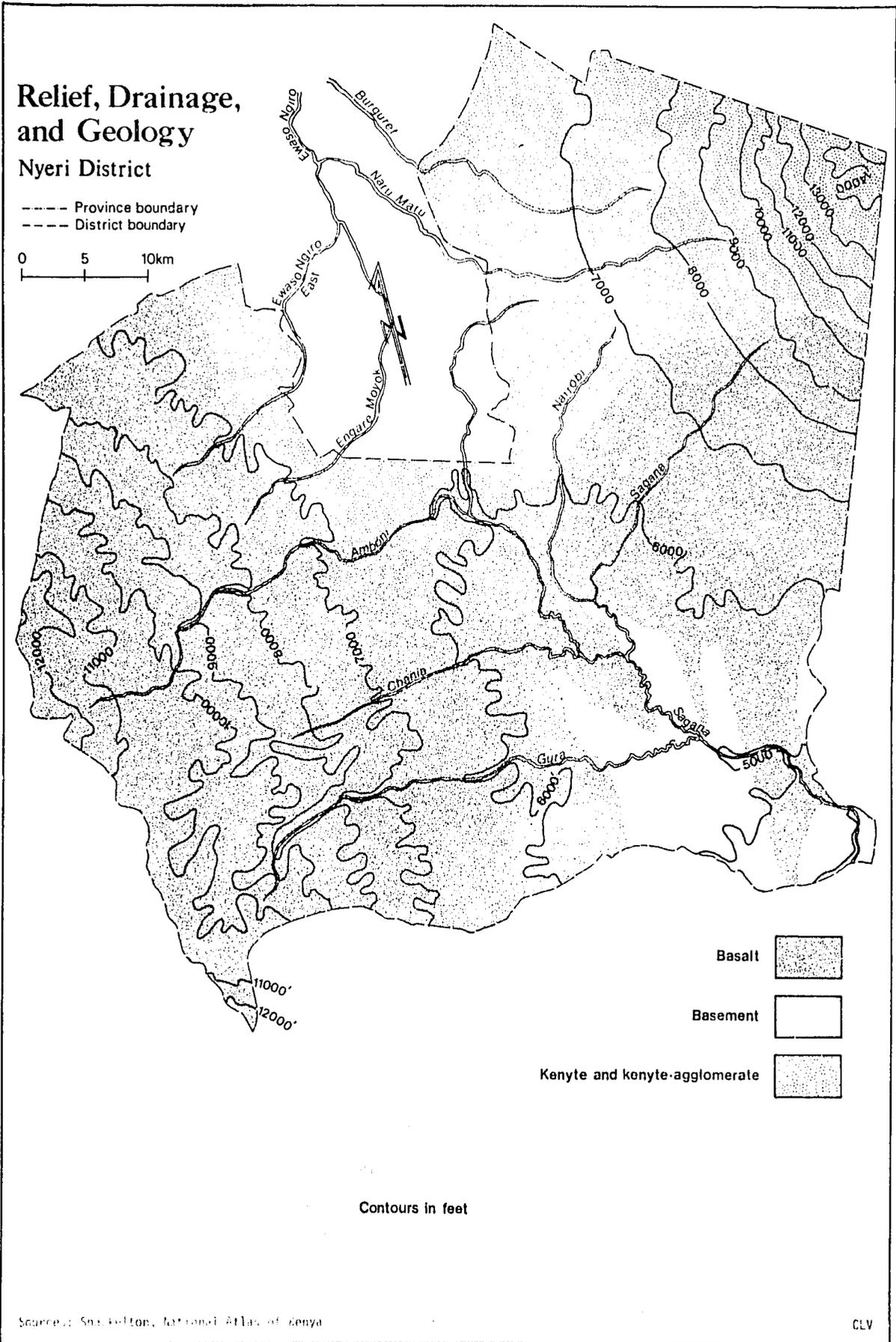
From the Pleistocene (2 million years ago) to about 10,000 years ago, there were renewed volcanic activities and faulting which gave detail to the features developed during the late Tertiary, creating the landscape that the present sub-aerial erosion is modifying. The location of Nyeri District is directly affected by this modification process, particularly by virtue of its proximity to Mt. Kenya and Aberdares. The region of Nyeri District lies between the dissected slopes of the Aberdare mountains to the west and Mt. Kenya to the East in a saddle that could be defined as

the footslopes of these two mountain masses. Mt. Kenya has a maximum altitude of 5174 metres above sea level while the Aberdares rise to a maximum of 3980 metres above sea level on Oldoinyo Lesatima. Most of Nyeri District lies 1500 M above sea level or higher but has great topographic variability. Human habitation extends up the mountains up to about 2100 M above sea level.

Several tributaries of the Rivers Tana and Ewaso Nyiro drain the district. They rise in both the Aberdares and on Mt. Kenya. These tributaries form a dense dendritic system, flowing through steep sided valleys that make the landscape particularly irregular.

The river Ewaso Nyiro, with its tributaries, drains the northern part of the district. Its tributaries originate from the western slopes of Mt. Kenya and the north-eastern slopes of the Aberdares. The eastern slope of Aberdares is drained by the Amboni, Chania, Muringato and Gura which converge with others in the southeastern part of the district to form the Sagana river which later forms the Tana river. The southwestern side of Mt. Kenya is drained by the rivers Nairobi, Thego, and Sagana which also drain to the southeastern part of the district to form the Sagana river. Figure I illustrates relief and drainage of the district.

Figure I



Problems associated with physiography in the district are soil erosion, road construction, and farm mechanisation. All factors being equal, the high gradients on steep sided valleys suggest a correspondingly high potential for soil erosion and small-scale mass movement processes, particularly during the wet seasons when soil pore water pressures are high. This problem is aggravated by increased exploitation of land for settlement and agriculture. The cost of road construction in Nyeri is very high because of "cutting and filling." Associated with cutting are minor mass movement processes on the cut banks. Similarly, in the most dissected parts of the district, for example, Central Nyeri, farm mechanisation is partly inhibited by ruggedness of topography.

It is a common practice that most dwellings and settlements are built on well-drained, high ground. Except where population densities are very high, the steep valley slopes, valley bottoms, and mountain slopes are not inhabited. In Nyeri District, there are few places where floods occur and, therefore, most sites are suitable for building. However, settlements have slowly crept into marginal lands on the slopes with consequent soil erosion. Settlement and cultivation has gone as high as 3,000 metres above sea level on Mt. Kenya in recent years. The highest mountain slopes and sum-

mits of Mt. Kenya and Aberdares areas are, however, preserved for water catchment and soil conservation through the use of gazetted forests.

2.2 Geology

Most of Nyeri District is covered with Tertiary volcanic rocks stretching from the Aberdares to Mt. Kenya slopes. A greater portion of the northern part of the district is covered with volcanic Kenyte and Kenyte agglomerates. Basement rocks occur in limited patches to the southeast of Nyeri Town towards Murang'a. Alluvium deposits are found along major river valleys and moraines on mountain slopes around Mr. Kenya. The rest of the district consists mainly of volcanic basalt. Apart from basalts, other tertiary volcanic rocks found in the district are phonolites and trachytes.

The following geological materials are of economic importance in the district -- lava (hard stone), tuff (soft stone), and brick earths. Lava is suitable for surfacing bitumen roads, construction of road base and for making concrete aggregate for building and construction work. Tuff (referred to as soft stone in Nyeri) can also be used for building and construction. Tuff is found in large quantities near Nyeri township. Brick earth is found in many parts of the district but is not fully exploited as there are cheaper building stones in

the district. Diatomite is available near Ngobit but in too small quantities to be used commercially. Quarrying is also important in many areas of the district to provide building and construction materials including murram. More often than not, quarrying sites are breeding grounds for mosquitoes and "black spots" for accidents to children.

2.3 Pedology

2.3.1 Soils of Nyeri District

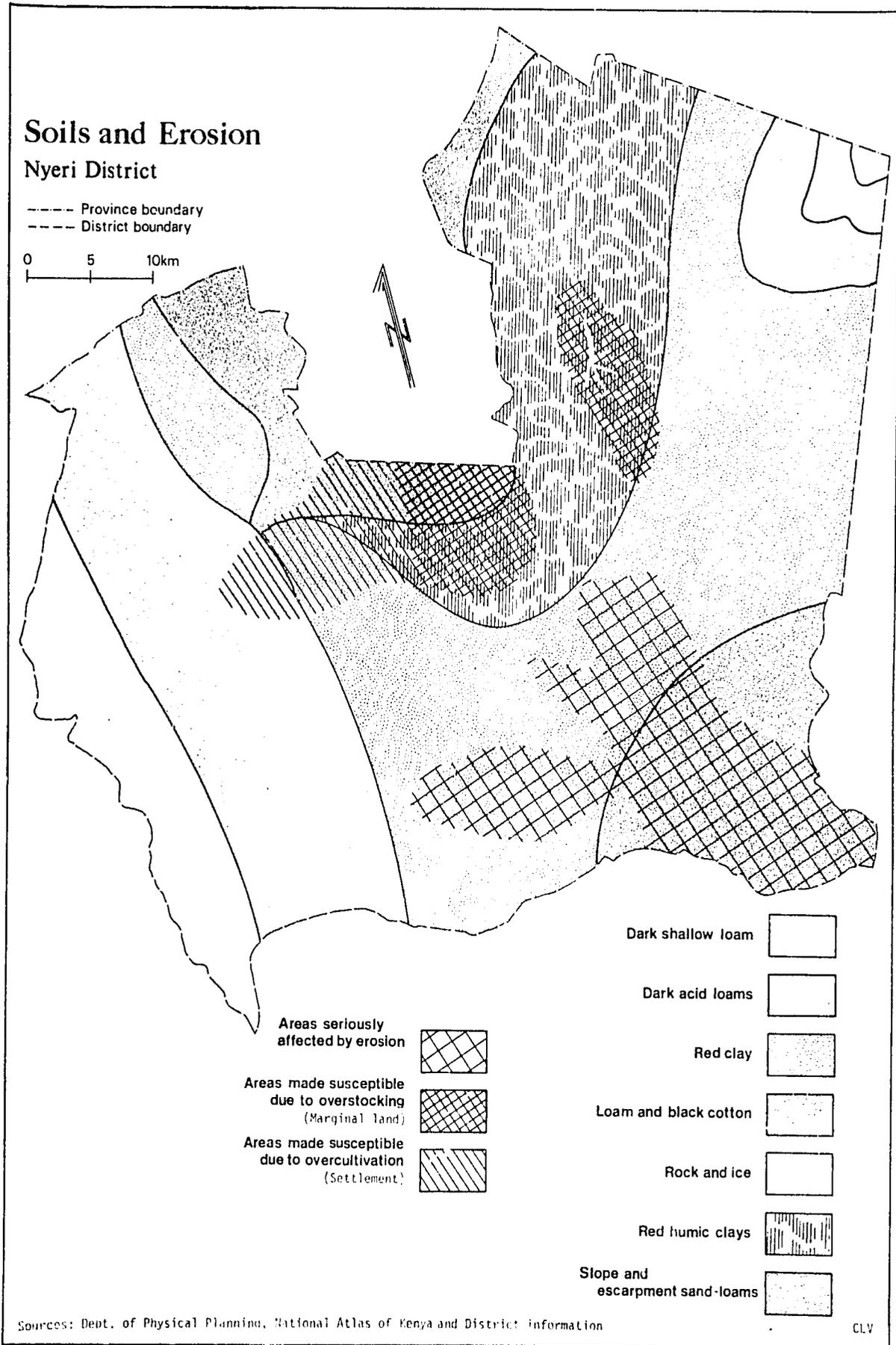
The soils of the district are generally well drained. Only in the high areas of Mt. Kenya and the Aberdares do we find areas of impeded drainage.

Nyeri's soils have developed from volcanic and basement complex rocks. In most areas, the soil is deep as a result of the high rate of weathering. In the high altitude areas, however, outcrops are common.

As shown in Figure II, there are 7 groups (orders) of soil represented in Nyeri district. These are:

1. Dark shallow loam -- poorly drained, consists of dark peaty loams, alpine in nature. The soils are red and have many rock outcrops. The organic matter content is high.
2. Dark acid loam soils -- consists of brown loam (andolike) soils. This soil is high in organic matter. (5-8%).
3. Red clay soils -- consists of dark-red friable clays (latosolic) and dark red friable clays with deep humic top soil. The humus content of these soils is about 3-5 percent.

Figure II



4. Loam and Black cotton soils - mainly associated with peneplains with soils varying from calcareous to non calcareous.
5. Red-humic clay soil - The soils of this areas are high in organic matter and well weathered. The soils are also relatively deep and well drained.
6. Sandy loam soils - latosolic in nature. The area where they are found is highly dissected with steep slopes. The soils are deep and acidic.
7. Rock and Ice - This is an area below icetops around Mt. Kenya.

2.3.2 Soils Conservation in the District

Sheet erosion, caused by runoff and rain drop splash, is the district's most common soil loss. Hill and gully erosion are also prevalent. Soil erosion is accelerated by overstocking, overcultivation, forest clearing, and badly designed water channels at the roadsides. Excessive land pressure has extended cultivation to steep slopes and river valleys, thereby accelerating soil erosion. Overstocking also increases susceptibility to water and wind erosion, especially because of trampling by animals.

Another problem is storm water. Heavy runoff, especially along roadsides, is discharged into farms, causing sheet and gully erosion. Indiscriminate burning and cutting of vegetation leaves the soil bare and more vulnerable to erosion by running water. Control measures currently in use are:

- (a) Six already existing afforestation programs, implemented and funded by both the Ministries of Agriculture and Natural Resources (See Table 2.4).
- (b) Construction of cut-off drains and terraces with assistance from the Ministry of Agriculture. Maintenance is emphasized (See Table 2.1)
- (c) Planting of napier grass and developing vegetative strips in cultivated areas.
- (d) Construction of trash lines.

For the period of 1980-83, twenty three soil water conservation programmes have been planned for the district. (See Table 2.4)

TABLE 2.1 Soil Conservation Programme - Nyeri District

Operation Projects

PROJECT	LOCATION	EXTENT Ha/Metres	FINANCER
Waraza Imere	Kieni East	200 ha	D.D.C.
Kihora/Mungari	Tetu	550 ha	D.D.C.
Thangathi S.C.P.	Mukurweini	500 ha	D.D.C.
Kagere/Kamoko S.C.P.	Othaya	220 ha	D.D.C.
Riamwangi	Mathira	6,880 m	M.O.A.
Gura/Thuti	Othaya	5,375 m	M.O.A.
Murua	Tetu	4,680 m	M.O.A.
Ngamwa	Mukurweini	5,000 m	M.O.A.
Kiganjo	Kieni East	5,500 m	M.O.A.
Njengu	Kieni West	6,000 m	M.O.A.
<u>Proposed but not implemented projects</u>			
Marua S.C.P.	Mathira	-	D.D.C.
Marua S.C.P.	Tetu	-	D.D.C.
Ngamwa S.C.P.	Mukurweini	-	D.D.C.
Gura/Thuti S.C.P.	Othaya	-	D.D.C.
Njengu/Amboni S.C.P.	Kieni West	-	D.D.C.

D.D.C. - District Development Committee

M.O.A. - Ministry of Agriculture

Source: District Agricultural Report 1979

2.4 Climate

2.4.1 Climatic Factors

Nyeri District falls within the "Highland" Equatorial climatic zone of Kenya, where the temperatures are lower than typical equatorial zone (modified by relief). It is close to a warm temperate climate in terms of a global classification.

The pattern of rainfall is typically equatorial with two maxima. The main maximum lasts from March to May while the minor maximum lasts from October to December. The amount of rain received varies considerably from one month to another and from one place to another within the district (see Figure III). Annual rainfall received varies from 750 mm to 1750 mm, with the highest coming in the mountains.

The probability of obtaining less than 500 mm in a year is 0 - 10 percent. The probability of obtaining less than 750 mm in a year is 20 - 30 percent. Two factors which significantly affect rainfall in the district are relief and wind. Figure III shows that the higher slopes of Mt. Kenya and the Aberdares receive more rain than the footslope zones. The higher slopes trap the moisture-laden winds, creating rain-shadow effects on areas around them. The intertropical convergence zone follows the sun's movement with roughly a month's lag and, therefore, is the dominant pressure system in the district twice a year. This zone of air thus provides the district's double maxima rain-

Figure III

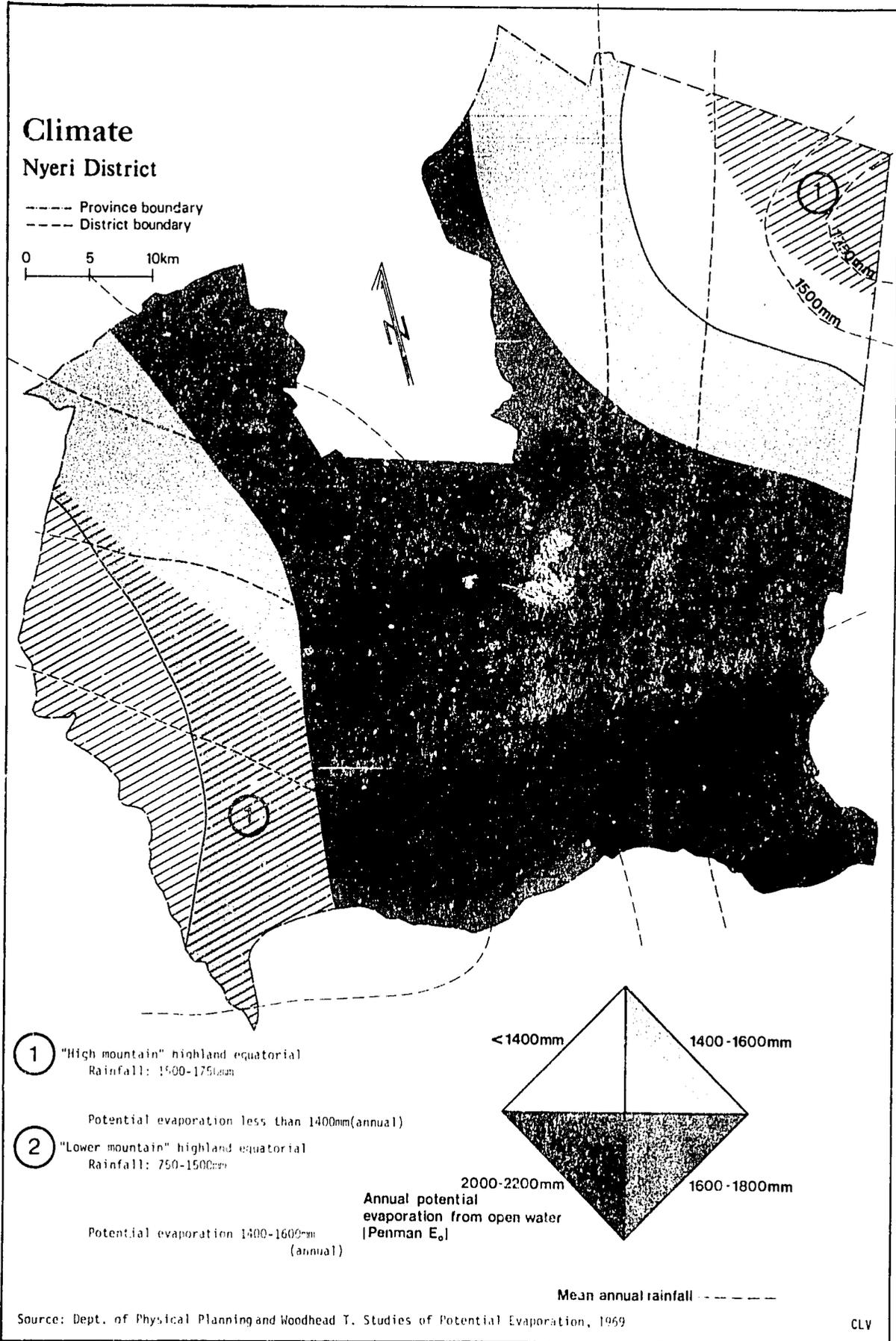
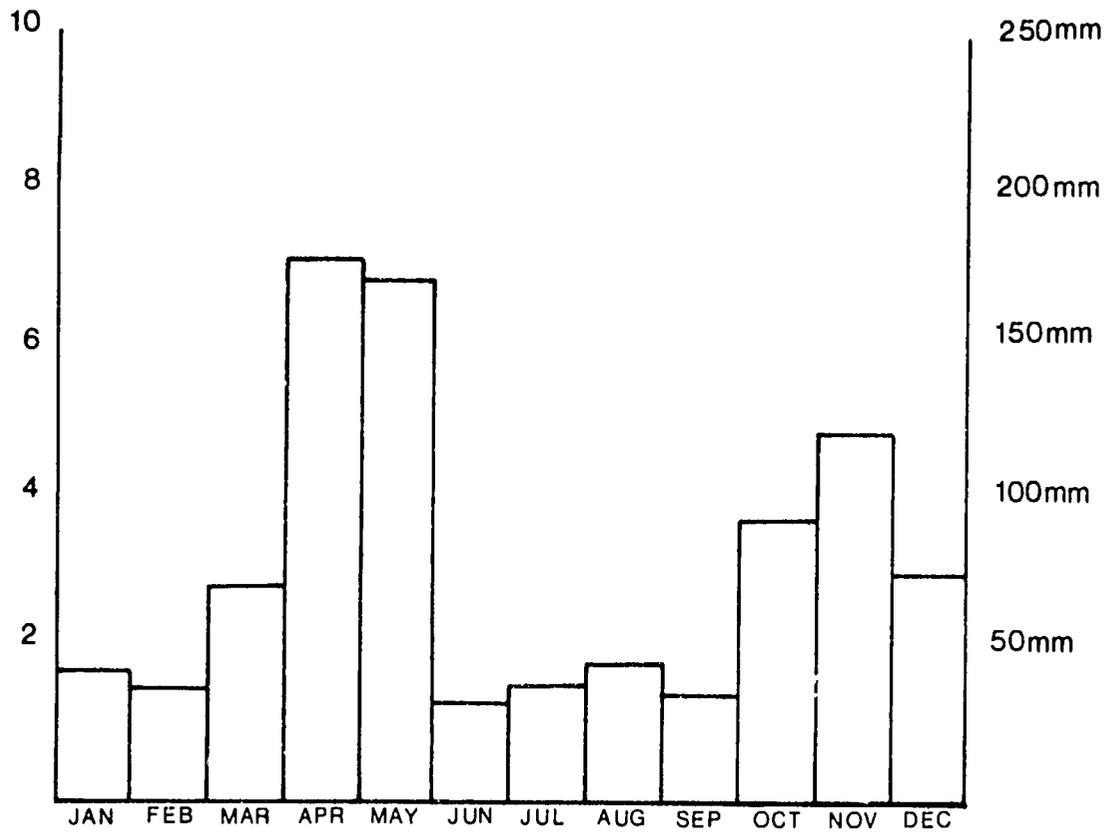


Figure IV



MEAN ANNUAL RAINFALL 36.7" (935mm)

fall pattern.

The upper slopes of Mt. Kenya and Aberdares experience a mean maximum annual temperature of less than 6°C. The temperatures are 6 - 10°C on the lower slopes of the mountain and 10 - 14°C on the footslopes (saddle). The mean minimum annual temperatures on the upper slopes of Aberdares and Mt. Kenya are less than 18°C, being 18 - 22°C on the lower slopes and 22 - 26°C on the footslopes (saddle). Temperature is controlled mainly by relief in the district.

The potential evaporation on the slopes of Mt. Kenya and Aberdares is less than 1,400 mm and 1400 - 1,600 on the footslopes. Only the mountain areas have excess water most of the time. In Central Nyeri, the amount of rain received is less than the potential evaporation.

Sunshine and radiation data for Nyeri District were not available but data for Nanyuki, the nearest station, show:

- (a) Mean hours per day: 6 hours
- (b) Sunniest month: January with 7½ mean hours per day;
- (c) Dullest Month: November with 4.1 mean hours per day.

2.4.2. Climatic Classification

On the basis of the data available, Nyeri District can be divided into 2 broad climatic regions (see Figure III.) The classification corresponds clearly with

the relief regions:

- (a) High mountain highland equatorial - This region lies on the slopes of Mt. Kenya and Aberdares, especially on the mid slopes up to the peaks. The temperatures here are low (mean annual maximum less than 14°C) and the potential evaporation is less than 1,400 mm/year. Generally, rainfall is high with a mean annual rainfall of 1,500 - 1,750 mm.
- (b) Lower mountain highland equatorial - This region occupies the lower slopes of the Aberdares and Mt. Kenya (the intermont plateau lying between these mountains). Because of altitude, relative to the high mountain region, it is warmer on this plateau (mean annual maximum temperature: 26°C) but less wet with a rainfall ranging from 750 mm to 1,500 mm/year. Potential evaporation is up to 1,600 mm/year.

2.5 Surface and Groundwater: Quantity and Quality

2.5.1 Groundwater

Table 2.2 gives the location and depth at which water was struck along with the yields of various boreholes. Most of the boreholes are found in the rather dry areas of Kieni East and West. Their depth varies from 19 to 235 metres, with 107 metres the average depth. The depth of aquifers also varies considerably, with the average depth being 102.77 metres.

The groundwater yield varies from zero to 16.4 m³/hr. (3,608 gals/hr); the average yield being 4.93 m³/hr (1,084.1 gals/hr). The quality of groundwater in the district is classified as good. Groundwater flows more or less in a southeasterly direction from the high areas of Mt. Kenya and Aberdares (Figure IV).

2.5.2 Surface Water

Table 2.3 gives discharges of surface water at the following gauging stations: Thego (4AA2), Little Tana (4AA6), Nairobi (4AA4), Sagana (4AA1), Amboni (4AB5), Upper Sagana (4AA4), Gura (4AAD1), Sagana (4AC3), and Chania (4AC5). The table shows that there are seasonal and annual variations in surface water flow rates. For example, the average maximum flow rate of gauging station 4AA2 on the Thego river is 278 cusecs while the minimum flow rate is 127 cusecs. The mean flow rate at 4AA2 is

31.83 cusecs. The average maximum, mean, and minimum flow rates of Little Tana river at gauging station 4AA6 are 15.78, 2.63, and 0.38 cusecs respectively. The average mean flow rates of Nairobi (4AA4), Sagana (4AA1), Amboni (4AB5), Gura (4AAD1), Sagana (4AC3), and Chania (4AC5) rivers are 24.47, 39.27, 29.69, 322.0, 9.64 and 94.94 cusecs respectively. The flow rates vary from a high of 2080 cusecs at the Gura river to a low of 0.06 cusecs at the Upper Sagana river. The Gura river, has the highest average discharge for the period reviewed.

Evaporative losses from surface water are greatest in the southeastern part of the district (2000-2200 mm/yr) and smallest in the areas of Mt. Kenya and Aberdares (1400 mm/yr).

The water chemistry and the state of water pollution in Nyeri District has been reported for the year 1975 by the Ministry of Water Development, Water Quality and Pollution Control Section, in their Technical Report No. 3. This report deals with the Upper Tana river which drains a part of the Nyeri. Although some stations are not actually in the district, their results reflect the general position in the Nyeri District.

TABLE 2.2 NYERI DISTRICT - Boreholes, Their Depths, Depth of
Water table and their Yield

BOREHOLE NO.	LOCALITY	TOTAL DEPTH (M)	AQUIFER/ WATER STRUCK	YIELD M ³ /hr
267	Mungeto Estate	134.1	45	7.01
467	Kagumo	152.4	46.6	3.18
574	Kagumo School	138.0	72	9.54
747	Mweiga Estate	182.8	54.8	2.04
748	Ol'Dopal Land	36.5	12.4	4.09
762	Ol'Dopal Land	96.3	-	Nil
790	Mweiga	76.2	48.7	1.27
1140	Naromoru	122	98.15,118.8	1.27
1566	Mweiga	122	14	3.4
1643	Moringato Est.	85	31-77	9.09
2305	Naromoru	235	30	3.64
2377	Naromoru	109.4	97.5	4.0
2387	Naromoru	128	102.1	6.62
3489	Naromoru	33.5	0-9.7	2.27
3500	Naromoru	182.89	-	Dry
3670	Naromoru	213.2	167.6	0.52
3706	Tree Tops	152	54.9,73,129	5.6
4364		213	-	6.0
456C	Mweiga	141	100-120	6.8
4577	Mweiga	141	3.0	3.64
4590	Ngandu	180	28	0.75
2371	Kabaro Est.	121.9	115.8	0.170
119	Naromoru	72.2	64.6	10.45
185	Timau	75	86.86	3.5
193	Loldiaga	85	69.18	0.5
195	Loldiaga	73	68.58	0.5
336	Wairangwa Est.	50	27	3.8
371	Nanyuki	35	18-30	1.8
372	Nanyuki	33	17-30	0.5
373	Nanyuki	59	50.0	4.3
395	Nanyuki	61	42.0	1.5
396	Nanyuki	19	9	2.8
490	Sweet Waters	38.4	32	7.57
508	Solio	91.0	113,151,124	16.4
514	Kamburuani	128	47	6.36
674	Nanyuki	69	64-76	1.1
693		91		13.6
861	Solio Est.	91	83-85	6.4
884	Maramemo	35	52-67	9.1
887	Solio	126	64	15.9

TABLE 2.2 (Continued)

BOREHOLE NO.	LOCATION	TOTAL DEPTH (M)	AQUIFER/ WATER STRUCK	YIELD m ³ /hr
1117	Mweiga	93.9	32.0-79.2	0.473
1164	Naromoru	92	33-35	2.6
1168	Naromoru	126	85-127	5.5
3704		32.9	7,13.7,29	12.7
4625	Ruringu	155	32	6.81
4629	Wangombe Waihora Rd.	200	(83-145 153-189)	6.8

average dept	average depth	average yield
107.52	102.77	4.928 m ³ /hr (1,034.16 gal/hr)

Source: Ministry of Water Development

TABLE 2.3 NYERI DISTRICT - Surface Water Hydrology

YEAR	THEGO RIVER (4AA2)			LITTLE TANA RIVER (4AA6)			NAIROBI RIVER (4AA4)			SAGANA RIVER (4AA1)		
	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES
1970	-	-	-	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-	-	-	-
1972	-	-	-	-	-	-	-	-	-	-	-	-
1973	317.0 32.8 5.47	11970 cd	23744 af	-	-	-	-	-	-	367.0 38.4 6.39	11750 cd	23307 af
1974	196.6 34.28 35.47	12513 cd	-	26.6 4.62 0.64	1688 cd	3343 af	-	-	-	222.0 34.34 33.9	12533 cd	24859 af
1975	269.4 31.2 4.41	11388 cd	22588 af	11.5 1.45 0.19	528 cd	1039 af	-	-	-	916.0 45.09 6.39	16457 cd	32643 af
1976	329.0 29.04 5.47	10600 cd	21026 af	9.25 1.82 0.32	663 cd	3343 af	161.0 19.11 2.13	6975 cd	18589 af	-	-	-
1977	-	-	-	-	-	-	242.0 29.84 6.34	10891 cd	21602 af	-	-	-

SOURCE: Ministry of Water Development.

TABLE 2.3 NYERI DISTRICT - Surface Water Hydrology (Cont'd)

YEAR	AMBONI RIVER (4AB5)			UPPER SAGANA RIVER (4AA4)			GURA RIVER (4AAD1)			SAGANA RIVER (4AC3)		
	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOATL ARCE FEET/ METRES	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES
1970	-	-	-	970.0 * 11.42	-	-	1720.0 * 15.6	-	-	-	-	-
1971	-	-	-	197.0 * 11.42	-	-	1980.0 * 91.4	-	-	-	-	-
1972	-	-	-	6.26 * 0.06	-	-	2080.0 * 181.0	-	-	103.7 13.4 3.54	3736 cmd	32277 am
1973	-	-	-	-	-	-	-	-	-	50.71 9.37 2.67	2829 cmd	24456. am
1974	-	-	-	-	-	-	-	-	-	355.5 7.94 2.67	2484. cmd	21547. am
1975	556.0 49.38 8.29	18021 cd	35746 af	-	-	-	1225.0 335.5 322.74	117799 cd	23365 af	35.02 9.25 3.006	2585. cmd	22340. am
1976	218.0 10.0 3.79	13868 cd	27508 af	-	-	-	1540.0 321.5 99.7	117650 cd	23335 af	29.14 8.24 2.83	2309. cmd	19952 am
1977	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 2.3

NYERI DISTRICT - Surface Water Hydrology (Cont'd)

CHANIA RIVER
(4AC5)

YEAR	CUSECS	TOTAL CUSEC/ CUMSEC DAYS	TOTAL ACRE FEET/ METRES
1970	-	-	-
1971	-	-	-
1972	-	-	-
1973	-	-	-
1974	391.5 97.09 32.5	35439 cd	70294 af
1975	638. 92.8 30.3	33899 cd	67239 af
1976	-	-	-
1977	-	-	-

K E Y

cd = Cusec days
 cmd = Cumsec days
 af = Acre feet
 am = Acre metres

The three values in the first column
 (cusec column) for each river/guaging station
 represents:- 1) maximum discharge
 2) mean discharge
 3) minimum discharge

* represents missing value.

SOURCE: Ministry of Water Development.

Results of Maragua river at Murang'a road show that bicarbonate, sodium, and potassium levels were normal while calcium was low. The high turbidity and colour, nitrate, iron, permanganate value, and B.O.D. all suggest erosion and pollution by organic materials. Results of Tana river at Tana power station show rather high salt content of the water and high organic material. Results of Chania river at Thika road also suggest soil erosion and pollution by organic material.

Coffee effluent is the major nuisance in the Upper Tana, especially during processing time. Furthermore, a new tannery is under construction at Sagana and there are several sisal factories which have caused serious water pollution in the past. The K.C.C. Dairy near Nyeri Town discharges pretreated effluent into the Nairobi river.

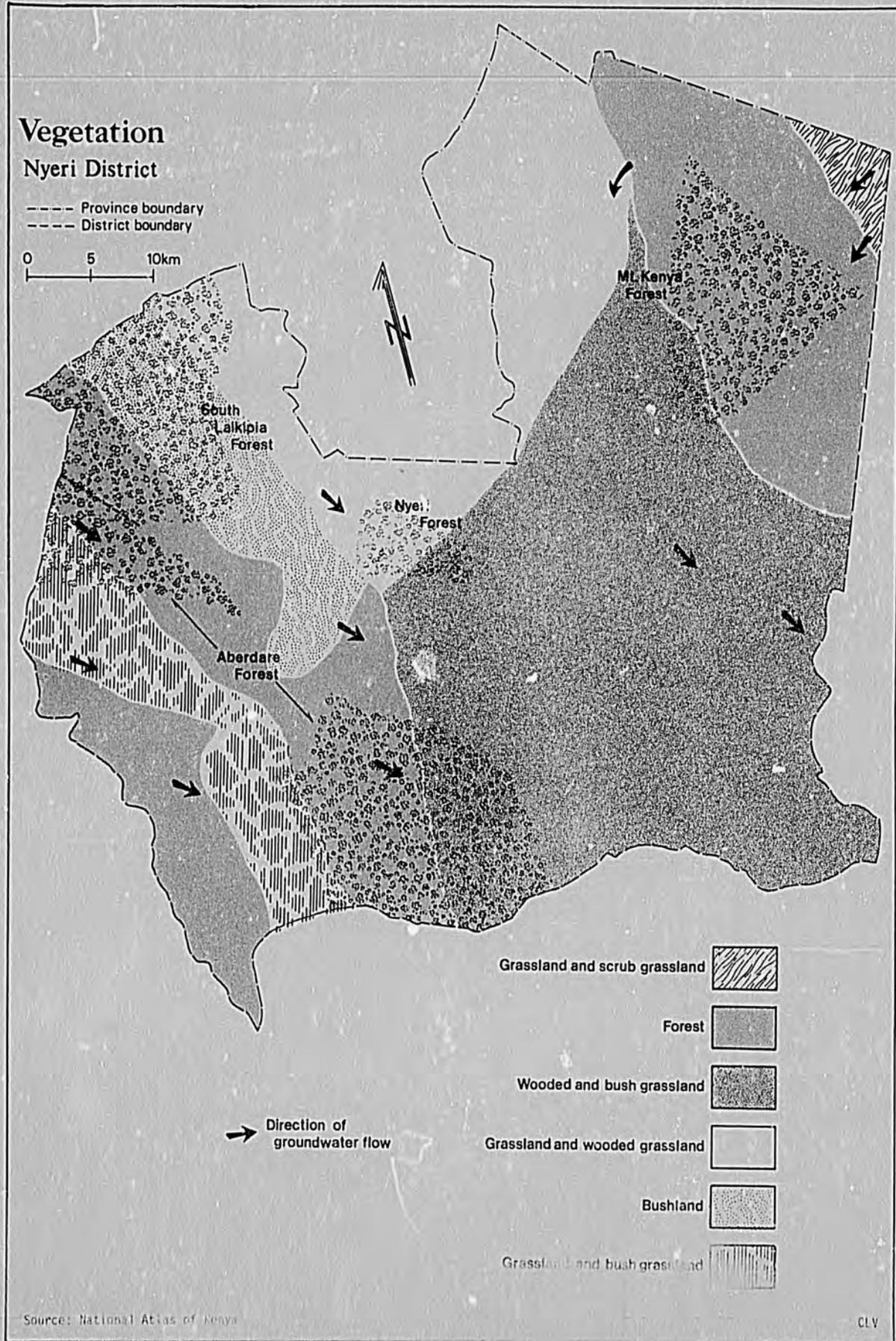
Water conservation projects in the district include: dams, boreholes, wells and water holes, water tanks, rock catchments, and piped water projects. In 1978, there were 60 dams, 2,521 bareholes, 515 wells and water holes, 6,517 water tanks, and 175 water projects in the district.

2.6 Vegetation

Figure V shows the major vegetation zones which are broadly related to the climatic conditions in the district. These are:-

- Zone 1: The area of the upper slopes of Mt. Kenya, classified grassland and scrub grassland. The region is too cold for good plant growth and instead is covered with short grasses or is barren above the forest line. This area is of limited use except for tourism and water catchment.
- Zone 2: The areas bordering the high areas of Mt. Kenya and Aberdares. These areas are covered by forest and are derived grasslands and bushlands. The potential is for forestry, wildlife development, and intensive agriculture. The stock carrying capacity is 1 stock unit per 1-1½ hectares.
- Zone 3: The area of Mukurweini, Othanya, Tetu, and Mathira divisions. The zone is classified as wooded and bushed grassland or savanna. The

Figure V



types of vegetation are the Combretum species and larger evergreen shrubs. The agricultural potential is high. The stock carrying capacity is less than 2ha. per stock unit.

Zone 4: The area of Kieni East and West. It is classified as grassland and wooded grassland. The agricultural potential is marginal. The vegetation consists of Acacia trees, Themeda grass, or derived semi-evergreen or deciduous bushland. This area is a range area and the stock carrying capacity is less than 4 ha. per stock unit. Tree species are predominantly woody ones.

Zone 5: This zone covers a greater portion of Kieni West. The zone is classified as bushland. The area has a low agricultural potential. Vegetation consists of woody tree genera such as Commiphora ciliaris and Chloris roxburghiana. The stock carrying capacity is more than 4 hectares to a stock unit. The area is suitable for wildlife.

Zone 6: This zone covers slopes of the Aberdares. The zone is classified as grassland and bushed grassland. The vegetation consists of dwarf scrub grasses or a very dry form of bushgrasses with Acacia reficiens mixed with annual and perennial grasses such as Chrysopogon ancheri. The potential is for both domestic and wild animals.

2.7 Forest Resources

The forested areas are the areas of Aberdares, Mt. Kenya, Nyeri, Kiganjo, and South Laikipia. The total area of Mt. Kenya forest is 78,985 hectares while the total area of the Aberdare forest is 40,751 hectares. There are two forest stations in the Aberdares, the Kiandongoro (18,705 hectares), and Kabage (22,045 hectares). There are three forest stations in the Mt. Kenya forest area, the Kabarú station (21,363 hectares), Nanyuki station (30,970 hectares) and Ragati station (20,625 hectares). The Nanyuki station manages two forests, Gathioro and Nanyuki forests.

Of all the forests, S. Laikipia and Nyeri are the only dry forest (protecture) where cutting is restricted. The tree species found in these forests are:

Kiandongoro area	-	E.A. Camphor, Podo and Indigenous hardwoods
Kabaga area	-	Cedar, Podo and Mweru
Nanyuki area	-	Cedar, indigenous species and Podo
Kabarú area	-	Cedar and Podo
Ragati area	-	Cedar, Podo, Hombe cheche, Camphor, Oak, Mucharage and indigenous species
Nyeri area	-	Muchugu, Pine and Cypress
South Laikipia	-	Cedar, and indigenous trees

Two methods of forest management are used in the district. One system involves selecting small numbers of mature trees, then cutting and replacing them by newly planted trees (after reseeding). The second system involves selecting areas for cutting, leaving 200 foot strips on either side of rivers to avoid soil erosion then cutting down trees for timber. Crop cultivation follows in these areas for 10 months with tree planting coming after the crop harvest. These two systems ensure a balanced exploitation of the forest so as not to cause deforestation.

The district's forested areas are protected and no cutting is allowed except under unusual circumstances. Tree harvesting is usually carried out when trees are about 30 years of age. There are 5 sawmills in the Nanyuki area.

Deforestation in the district is due to forest fires, wild animals, indiscriminate felling of trees, and overgrazing. Fires come from many sources: poachers, charcoal burners, people who clear for cultivation or settlement, honey hunters, and through accidents. In 1974, there were 5 fires: 3 at Ontulili, 1 at Burguret, and another at Kabarú. In 1976, 2 hectares burned at Kabarú; in 1977, 32 hectares at Nanyuki, and 50 hectares at Ontulili (in Sirimon block). In 1978, 2 hectares were burned at Tigithi.

Big game animals, particularly elephants and buffaloes, destroy forests. Measures taken to avoid

this include herd thinning by game scouts and construction of game moats. Human activities are another problem. Demand for timber along the slopes of Mt. Kenya goes on to an extent which needs attention. If strict measures are not taken, Mt. Kenya forest will soon be destroyed. Overgrazing in the forests also causes devegetation. To curb this, forest authorities in the district do not allow goats to graze in the forests. Cattle and sheep are allowed in controlled grazing areas. However, no grazing is allowed at all in the catchment areas.

Rural afforestation along with soil and water conservation is very active in the district. Several such programmes have been initiated in the district. Help in terms of seedlings is given by the government and various organisations. Tree species planted include Pinus patula, Eucalyptus saligna Vitex Ken, Hakea Saligna and Cup Iusitanica. The germination rates in nurseries for most species do not fall below 50 percent in most areas. Table 2.4 gives the locality, type and size of these projects.

TABLE 2.4 EXISTING/PROPOSED RURAL AFFORESTATION AND SOIL/WATER CONSERVATION PROGRAMMES (NYERI DISTRICT)

YEAR	DIVISION	LOCALITY	ITEM	HECTARES	REMARKS/CONDITION/GENERAL COMMENT
78/79	Mathira	Itiali	35200 plants	20	Itiali Hill afforestation project. Water catchment conservation.
	Kieni (W)	Ndonyo Guasi	35200 plants	20	Ndonyo - Guasi afforestation project. Water catchment conservation
	Kieni (E)	Aguthi	35200 plants	20	Aguthi ranch afforestation project. Water catchment.
	Mukurweini	Muhito	50000	-	Muhito farmers area afforestation project. Soil conservation. Farmers to plant.
	Tetu	Aguthi	-	-	Aguthi farmers afforestation project. Soil conservation.
	Othaya	Chinga	-	5	Chinga dam afforestation project. Soil conservation.
79/80	Mathira	Konyu	-	-	Konyu afforestation project. Soil conservation. Farmers to plant.
	Kieni (W)	Njengu	-	10	Njengu dam afforestation project. Water catchment.
	Kieni (E)	Kanguret Munyu	-	-	Kanguret - munyu farmers afforestation project. Water catchment.
	Mukurweini	Gura-Sagana	-	-	Gura-Sagana Ruturu river afforestation project; soil conservation
	Tetu	Ruturu river	-	-	Farmers to plant
		Thegene	-	-	Thegene afforestation project. Soil conservation. Farmers to plant.
Othaya	Witima	-	5	Witima Old Village afforestation project. Soil Conservation/Water Catchment.	
80/81	Ruguru		-	-	Ruguru Location afforestation project Soil conservation.
	Kieni (W)	Sungari		70	Sungari Location afforestation project Water catchment.
	Mukurweini	Githi	-	-	Lower Githi afforestation project. Soil conservation.
	Kieni (E)	Naromoru	-	-	Naromoru township afforestation project wind break amenity.

TABLE 2.4 (Cont'd)

YEAR	DIVISION	LOCALITY	ITEM	HECTARES	REMARKS/CONDITION/GENERAL COMMENT
80/81	Tetu	Gankanga	-	-	Gakanga afforestation project. Soil conservation.
	Othaya	Gura Thuti	-	-	Gura Thuti River bank afforestation project. Soil conservation.
81/82	Mathira	Karatina	-	-	Karatina township afforestation project. Water conservation.
	Kieni (W)	Gathare	-	20	Gathare Hill afforestation project. Water conservation.
	Kieni (E)	Burguret	-	-	Burguret Farmers afforestation project. Water catchment
	Mukurweini	Gikondi	-	-	Gikondi afforestation project. Soil Conservation.
	Tetu	Nyeri	-	5	Nyeri Kingong'o afforestation project. Soil conservation and amenity.
82/83	Othaya	Kagere	-	-	Kagere area afforestation project. Soil conservation.
	Kieni (W)	Bellevuw-Watuka	-	20	Bellevuw-Watuka Hill afforestation project. Water catchment.
	Kieni (E)	Tanyai Nairutia	-	-	Tanyai - Nairutia farmers afforestation project. Water catchment.
	Kieni (E)	Rugati Farmers	-	-	Rugati Farmers Co. afforestation project. Water catchment. Farmers to plant.
	Mukurweini	Thangathi	-	-	Thangathi Farmers afforestation project. Water catchment.

SOURCE: Provincial Planning Office

2.8 Wildlife Resources

Wildlife is found in two National Parks: the Aberdares and Mt. Kenya. These are areas not inhabited by people (see Figure VI). Although no specific animal count has been done in these two national parks, a survey carried out for the north central area of Kenya in 1977-78, shows the following species of wild animals present in the north central area:

Elephant	Burchell's Zebra
Giraffe	Waterbuck
Buffalo	Impala
Eland	Grant's Gazelle
Oryx	Lesser Kudu
Kongoni	Gerenuk
Grevy's Zebra	Ostrich
	Thomson's Gazelle

Additionally, hyenas, lions, leopards, wild cats, wild dogs, cheetahs, monkeys, chimpanzees, and baboons are also present in the parks. While the numbers of elands, giraffe, buffalo, elephants, oryxes, Grevys-zebra, impalas, Thomson's gazelle, lesser kudus, and ostriches showed a decrease in 1978, the number of kongonis, Burchell's zebras, waterbucks, gerenuks, and warthogs showed an increase (KREMU, 1979)

Causes of reduction in wildlife numbers are poaching, habitat change brought by changes in land use practices, habitat changes resulting from climatic changes,

and disease. Wildlife diseases noticed in the district are East Coast fever, trypanosomiasis and Creb's fever. Diseases transmitted from domestic animals also occur in wild animals. No cases of malignant catarrh have been reported in the district.

Damage to crops in the neighbouring farms by wild animals, especially elephants, has been reported in the district. The Game Department is trying to prevent this by putting up moats around the park and by fencing with high tension wires.

3. HUMAN ENVIRONMENT

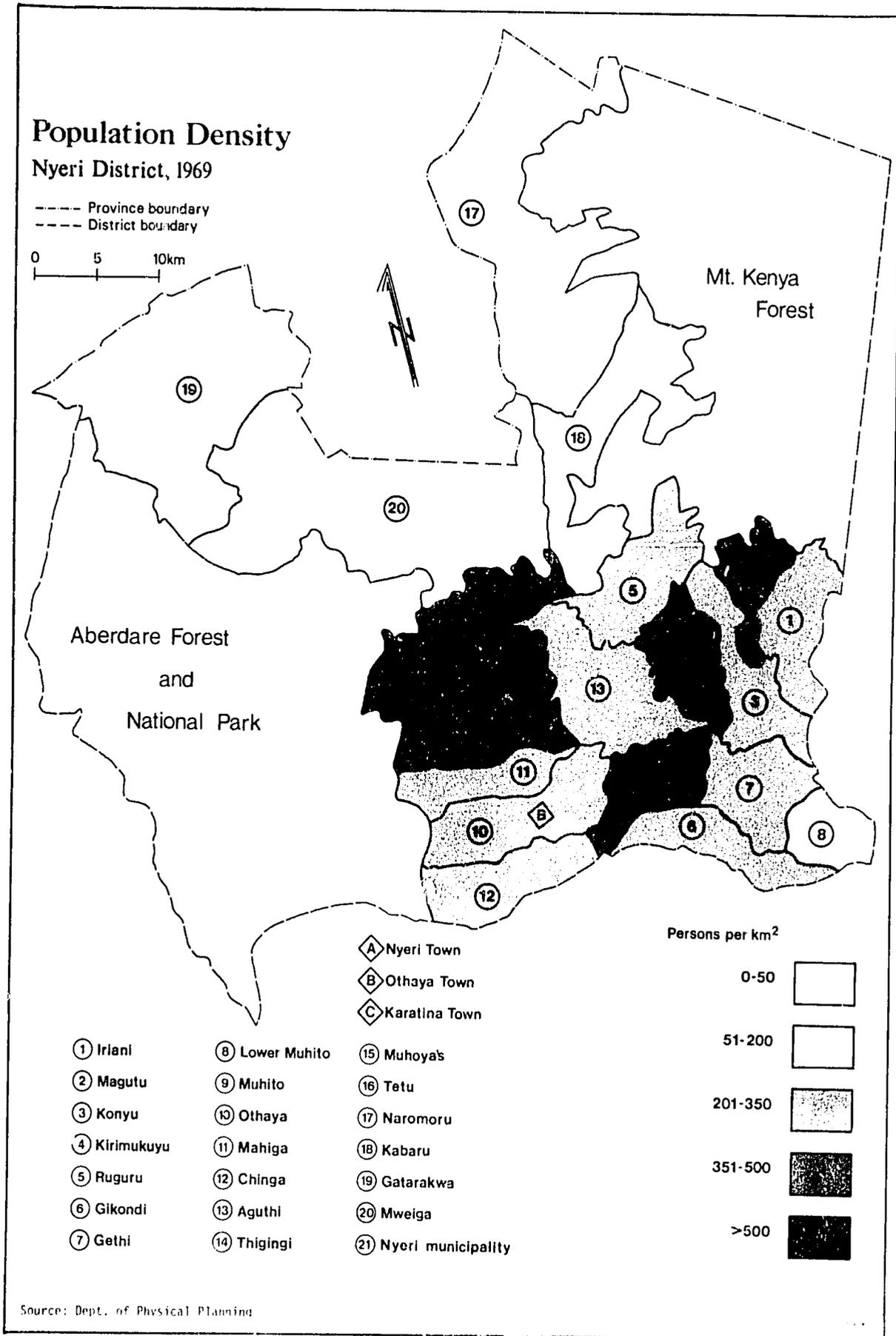
3.1 Population

Kenya's rate of growth is among the highest in the world. At the rate of 3.9 percent annual increase, Kenya's population will double in 20 years. Although the overall population density for Kenya is only 19 persons per km², this figure masks a problem of population distribution in Kenya. Ninety percent of the population is concentrated on one fifth of the land. Districts such as Kisii and Kakamega have rural population densities of about 600 persons per km² and some urban areas have reached critical population density, to the extent that adequate services and other public activities have become difficult to provide.

3.1.1. Ethnic Structure

Nyeri District is populated predominantly by Kenyan Africans of the Kikuyu community, this district being one of their traditional homelands. The Kikuyu community comprises 97.8 percent of the total district population. Table 3.1 shows the ethnic structure of Nyeri District, including non-Kenyans both of African and non-African origin. It shows that Nyeri District has attracted some Kenyan Africans of other ethnic groups. Nyeri also has a share of non-African Kenyans, mainly Asian businessmen (1,129) and Europeans (765). There are also small numbers of non-Kenyan

Figure VI



Africans (340). Most of these non-Africans live in the towns where they are engaged in Government service or as traders and labourers.

TABLE 3.1: POPULATION BY ETHNIC GROUPS

<u>ETHNIC COMMUNITY</u>	<u>MALE</u>	<u>FEMALE</u>	<u>TOTAL</u>
Kikuyu	167059	185703	352762
Kamba	744	308	1052
Meru	688	177	865
Luo	557	268	825
Luhya	544	276	820
Other Ethnic (Kenyan) groups	1189	733	1922
Europeans	381	384	765
Asians	638	491	1129
Non-Kenya Africans	217	123	340
Others	37	35	72

SOURCE: Central Bureau of Statistics

3.1.2 Population Distribution

Nyeri District has high concentrations of population in the high potential land areas. Although the overall density is 145.3 persons per square kilometre, as mentioned, population concentration is mainly in fertile land areas of the Mt. Kenya slopes and the edges of Aberdare Mountains. Table 3.2 shows population size and densities, by division.

TABLE 3.2: POPULATION DISTRIBUTION

<u>DIVISION</u>	<u>TOTAL POPULATION</u>	<u>AREA (KM²)</u>	<u>DENSITY</u>
Mathira	94,414	274	344
Mukurweini	50,916	182	280
Othaya	48,954	173	282
Tetu North	92,213	242	381
Kieni East	26,698	1085	25
Kieni West	33,495	586	57
 <u>TOWNSHIPS</u>			
Nyeri	10,004	7	1349
Karatina	2,436	2	1478
Kiganjo	1,715	2	1088

SOURCE: Central Bureau of Statistics

3.1.3 Population Characteristics of Nyeri District

In the 1969 census, Nyeri had a population of 360,845 with a growth rate of 3.43 percent per annum and an overall density of 108 persons per Km². According to the recent census of 1979, Nyeri had a population of 487,000 and a density of 145.3 persons per Km².

Sex ratios are significant for the planning of services and community institutions such as health, education, etc. Social roles and cultural patterns reflect sex ratios. For example, as a result of the male "shortage" brought about by the 1952 Mau-Mau freedom struggle for

independence in Nyeri District, the extent of labour force participation and the occupational distribution of women in Nyeri underwent considerable change. A new pattern of social relationships between the sexes emerged including a greatly increased independence of women from household tasks. Table 3.3 below, shows the sex proportions for Nyeri District.

TABLE 3.3 MALE AND FEMALE SEX PROPORTIONS

AGE	TOTAL	MALES	MALE PROPORTIONS	FEMALES	FEMALE PROPORTIONS
0- 4	105850	52930	50.00	52920	49.99
5- 9	112404	57400	51.07	55004	48.93
10-14	54765	27765	50.69	26000	47.47
15-19	42504	21450	50.46	21054	49.53
20-24	33739	14845	43.99	18894	56.00
25-29	26168	10476	39.98	15701	60.01
30-39	37299	16039	43.00	21260	56.99
40-49	28687	11475	40.01	17211	59.99
50-59	22954	9185	40.10	13772	59.99
60+	37168	17070	45.01	20038	53.91
TOTAL	489,000	232,275	47.50	256,725	52.50

SOURCE: Central Bureau of Statistics.

The table shows the average proportion for the early age groups 0-4 to 15-19 years. This represents the young population which is less mobile, generally tied to the home, and attending local school. The picture changes rapidly for age group 20-24, showing lower male proportions. This denotes the absence of males in these age groups, the most critical being from ages 25-29. This

pattern perhaps reflects a typical situation of rural areas in Kenya. Males of working age migrate to the urban areas in search of schooling and employment. Hence, females form the main source of labour force in the rural areas, significantly outnumbering males in all categories beyond the age of 20.

In the urban centres, a different situation exists. Table 3.4 below shows the male and female proportions for Nyeri Town. The pattern depicts a characteristic feature of urban areas, with large numbers of males. This result from migration from rural areas.

TABLE 3.4: SEX PROPORTION - NYERI TOWN

AGE	TOTAL	MALE	FEMALE
0- 9	2426	50.00	50.00
10-14	719	46.59	53.40
15-19	1028	39.78	60.21
20-24	1458	58.29	41.70
25-29	1261	68.99	31.00
30-39	1581	72.23	27.76
40-49	879	76.79	23.20
50-59	388	77.83	22.16
60+	264	60.98	39.01

SOURCE: Kenya Census 1969, Vol. I.

Another important index of population structure is age sex distribution. It shows the proportion number of people by sex for various age groups. The age

sex pyramid for Nyeri rural and urban is shown in Figure VII. The pyramid shows a broad base, indicating that a large proportion of Nyeri population consists of youth, specifically children under 15 years. The pattern is different when it comes to urban population, where there are more females and males in the age group of 20-29.

3.1.4 Migration

Migration in Nyeri District is of two types. The first is from rural to urban areas, resulting in the high population concentrations in the cities and towns, frequently straining urban social services. The second stream is rural to rural, resulting in fragmentation of land and consequently reducing crop production. (See Table 3.5).

3.1.4.1. Rural-Urban Migration

Rural-urban migration in Nyeri District can only be crudely estimated. This is due to large movements of people, not only to Nyeri District towns, but to other towns in Kenya. Although the data on migration is scanty, an estimate, based on immigration tables, notes that far more males leave rural areas for cities than return; and that significant numbers of women move to cities, though not as many as men.

AGE-SEX PYRAMID FOR NYERI

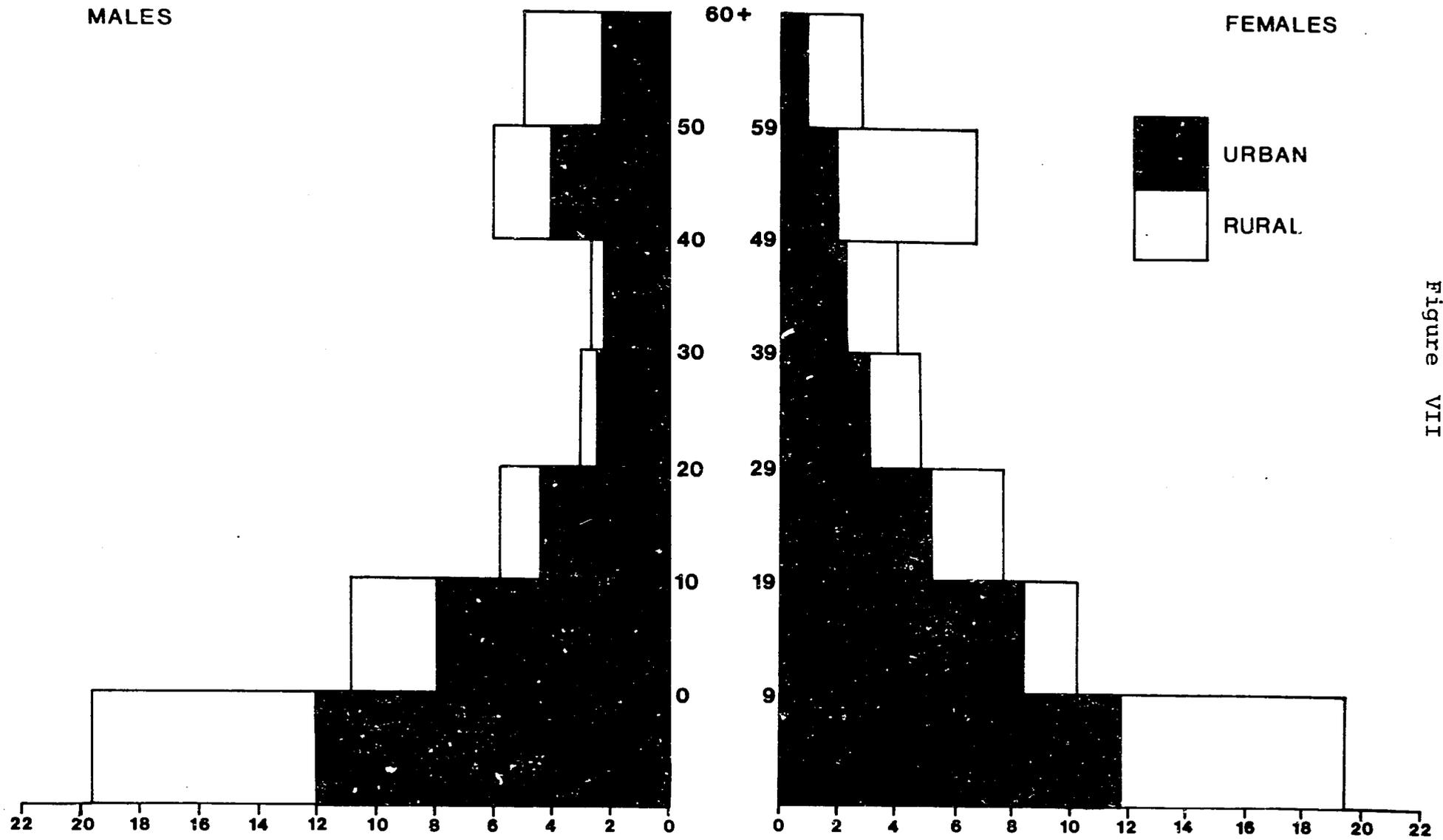


Figure VII

TABLE 3.5 MOVEMENT OF POPULATION IN & OUT OF NYERI DISTRICT (%)

<u>PROVINCES</u>	<u>NAIROBI</u>	<u>CENTRAL</u>	<u>COAST</u>	<u>NORTH EASTERN</u>	<u>NYANZA</u>	<u>RIFT VALLEY</u>	<u>WESTERN</u>	<u>EASTERN</u>	<u>TOTAL</u>
<u>IN-MIGRATION</u>									
Males	70.7	12.0	0.9	0.1	2.0	7.0	1.8	5.5	100.0
Females	75.3	11.7	0.5	0.2	1.2	7.1	1.0	3.0	100.0
Total	73.0	11.8	0.7	0.2	1.6	7.1	1.4	4.2	100.0
<u>OUT-MIGRATION</u>									
Males	27.0	37.2	2.4	0.4	0.8	28.2	0.5	3.5	100.0
Females	17.3	45.7	1.3	0.1	0.6	31.9	0.5	2.6	100.0
Total	22.4	41.2	1.9	0.3	0.7	29.9	0.5	3.1	100.0

Source: 1969 Census

Central Bureau of Statistics

3.1.4.2 Rural-Rural Migration

Although rural urban migration remains a serious threat to planning and implementation of services, there is a comparable danger because of treks from over-crowded, high potential areas to less-crowded marginal lands. Migrations to marginal lands cause:

1. reduction in agricultural production, because of land fragmentation;
2. destruction of the environment, for example, destruction of forests and tilling of land in slope areas and overgrazing which results in heavy soil erosion.

On-going discussion within the Lands Development suggests that Lusoi Settlement area remains as the only new settlement area in Nyeri District.

3.1.5 Population Density and Availability of Land

The vast majority of Nyeri's population, about 91 percent of the total population, live in rural communities and most rural families earn their livelihood from agricultural produce. Therefore, the relationship of population to land in Nyeri is a critical issue. Of Nyeri's total land area of 3,284 Km², only about 871 Km² or 20 percent is purely arable, suitable for sustained agricultural cultivation. More than one half of the holdings among small scale farmers, who use nearly three quarters of the arable

land, are less than one hectare in size. Only one quarter of the holdings are more than two hectares.

3.1.6 Demographic Changes

Population growth rate in Nyeri will continue at very high levels and mortality will continue to decline. In this regard, the demographic trends in Nyeri parallel those in many other districts such as Makamega and Kisii. Like many other districts, the future of the environment continues to be threatened, with few alternatives available. In this context many of the population will be left with a meager or non-existent resource base for items such as fuel.

TABLE 3.6 POPULATION PROJECTION NYERI DISTRICT
1970 - 1980 POPULATION IN 1000

<u>YEAR</u>	<u>SERIES (B)</u>
1970	373
1971	386
1975	440
1976	454
1977	471
1978	489
* 1979	509
1980	530

SOURCE: Kenya Statistics Digest Vol. 1, No.2

* N.B. The 1979 Census set Nyeri's population at 487,000

3.2 Land Tenure

Land is a vital factor in the economy of Nyeri District, affecting other activities such as type and pattern of land uses and population distribution and movement. There are three broad categories of land tenure in the district: Government Land, Trustland, and Private Land. Table 3.7 shows the amount of land under the three categories in Nyeri District.

TABLE 3.7 LAND TENURE IN NYERI DISTRICT

<u>LAND TENURE CATEGORY</u>	<u>AMOUNT (SQ. KM)</u>
1. <u>GOVERNMENT LAND</u>	
a) Forest Reserve	972
b) Other Government Reserve	5
c) Township	55
d) Alienated	434
e) National Park	555
f) Open water	-
TOTAL	2021
2. <u>TRUSTLAND</u>	
a) Forest	-
b) Government Reserve	2
c) Townships	5
d) Alienated land	-
e) Game Reserve	-
f) National Park	-
TOTAL	7

TABLE 3.7 (Continued)

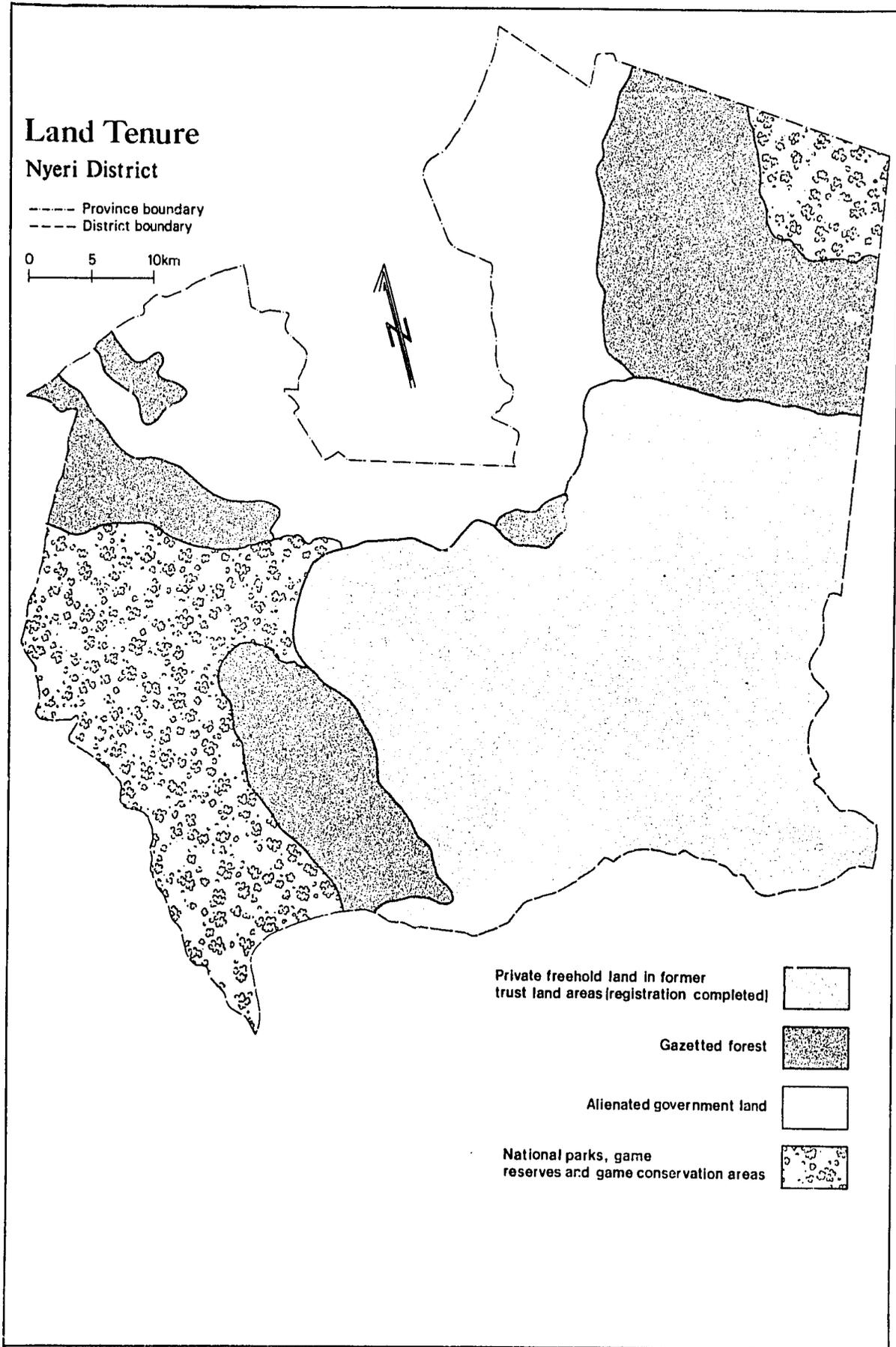
<u>LAND TENURE CATEGORY</u>	<u>AMOUNT (SQ. KM)</u>
3. <u>PRIVATE (FREEHOLD LAND)</u>	
a) Small holder schemes	840
b) Other	18
TOTAL	416
Available for small holder registration:	
a) already registered	840
b) not yet registered	-

SOURCE: Statistical Abstract, Kenya, 1978, p.4-5.

Government land is the land designated as crown land during the colonial period and considered by colonial administrators to be unoccupied by the indigenous people. Also included in this class are National Parks and forest lands. Trustland consists of the former native reserves, which were under effective occupation by the indigeneous population. Also included in this class are game reserves.

Most of the land in the district is under private ownership (freehold). This is land alienated both from government land and trustland to private owner-

Figure VIII



ship through adjudication. By 1977, all the land in the district was registered with a total of 76,600 hectares. Private land is taken up by small scale farms; settlement occupies much of the alienated government land. Much of the private land has become fragmented, due to population pressure, and land prices are exceedingly high. There is some encroachment into gazetted forests and national parks.

3.3 Agriculture

3.3.1 Crop Production

Nyeri is blessed with good land resources. Most of the district is considered high potential (194,645 ha); the remaining lands are either medium potential (46,864 ha) or marginal (14,950 ha.). Current land use is distributed as follows:

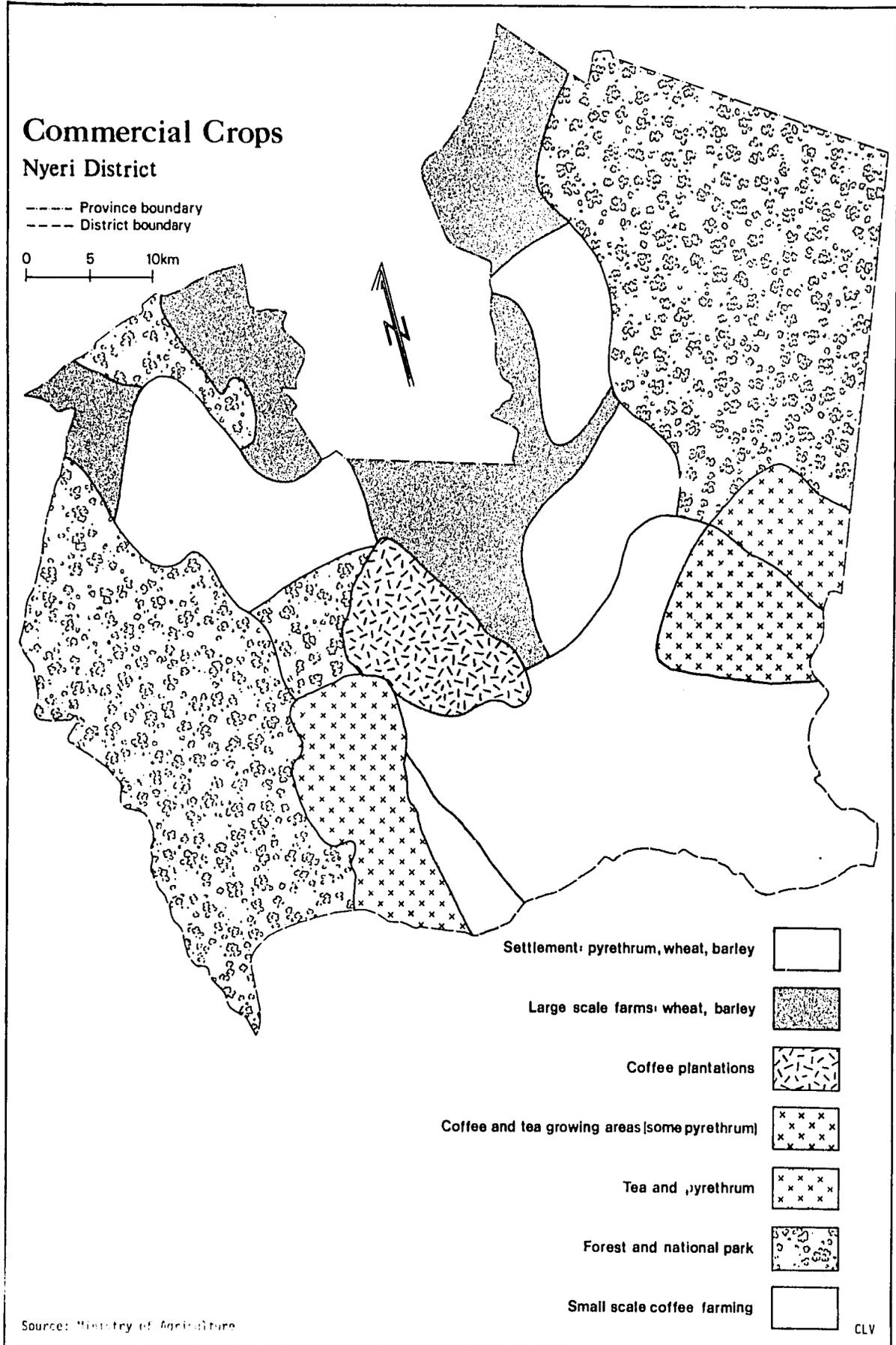
Forest	..	..	..	..	..	5,871 ha
Fallow	..	..	..	..	..	13,172
Grazing	..	..	..	..	..	79,016
Annual Crops	..	..	..	..	..	42,748
Perennial Crops	..	..	..	..	..	16,804

See Figure IX for further details.

In 1973, 62,229 families were engaged in farming of whom 6,669 were designated large scale. Most of the rest are small scale farms, varying in size from 0.4 to 8 hectares. Taking seven as an average number of persons per family, the total number of people engaged in and dependent upon farming in 1978 was 435,603, or roughly 90 percent of the district's people.

Mixed farming is widely practised in the district. This involves production of both crops and livestock. Cattle are the most common form of livestock although sheep, goats, and pigs are also kept. Crops grown on a commercial scale are coffee, tea, pyrethrum, wheat, and barley (refer to Figure IX). Local food crops include maize, beans, potatoes, tobacco, sweet potatoes, onions, arrow root, cabbages, tomatoes, passion fruit, sugar cane, capsic-

Figure IX



cums, bananas, and onions. Crops are grown in all areas of the district except the forested and wildlife areas. In the settlement areas, wheat, pyrethrum, and barley are grown. Table 3.8 gives the type of crops, their land area, production and yield levels for 1977. The statistics show that maize (15,700 ha.) has the highest area, followed by coffee (8,100 ha).

Large scale mixed farming includes combinations of cattle/tea, cattle/coffee, and cattle/wheat.

Small scale farms include cattle, sheep, and goats in combination with subsistence crops. In areas where tea, coffee, pyrethrum, wheat, and barley are grown, monocropping is practiced.

Crop production in the district is related to the two rainy seasons. Most subsistence crops are grown in both the long and short rain seasons.

Agriculture is relatively modern in Nyeri. Though most of the farms are small, the people use fertilizers, tractors, improved husbandry practices, improved crop varieties, modern marketing systems, and irrigation. Yields are generally considered to be high.

Irrigation is practised mostly on a small scale. There are 1,800 hectares of irrigated land on 20 small schemes (refer to Figure IX). The total area under irrigation will most likely increase in the near future. Irrigation in the district promotes horticultural crops along valley bottoms and keeps coffee farms well watered.

Irrigated horticultural crops include tomatoes, cabbages, carrots, and various other vegetables. Most horticultural irrigation is with furrows; coffee irrigation is mostly overhead sprinklers. Because the irrigation is small scale, there are no significant environmentally-related diseases.

Food storage is also well advanced. Dried dehusked maize is stored in wooden structures built in raised places. Some structures are thatched while others are covered with iron sheets. In the structures built on areas which are not raised, there is usually a danger of infestation by white ants and rats, particularly in warm areas. Weevils also destroy produce in storage. Contamination of produce may be through:

- a) Dust
- b) Pesticides
- c) Faeces of pests
- d) Use of unclean containers

The main pests and diseases of crops are:

Coffee	C.B.D., Leaf rust, antestia bug, leaf miners, coffee stem borers, and green scales.
Tea	Armillaria root rot and aphids.
Pyrethrum	Bud disease and Thrips.
Wheat	Leaf and stem rust and birds.
Maize	Maize streak, stalk borer, and aphids.
Irish potatoes	Blight, bacterial wilt, virus, lady bird, and aphids.

TABLE 3.8 CROP PRODUCTION - NYERI DISTRICT 1977

CROP	HECTERAGE ha (000)	PRODUCTION tons (000)	YIELD LEVEL hag/ha
Maize	15.7	38.0	-
Beans	2.42	2.2	-
Wheat	2.7	4.7	12
Barley	0.6	1.7	12
S. Potatoes	1.7	1.5	-
Tea	4.1	19.0	-
Pyrethrum	0.2	0.1	-
Tobacco	0.035	0.018	-
Coffee	8.1	4.7	-
Sugar Cane	0.2	1.5	-
Pineapples	-	-	-
Capsium	0.08	0.127	-
Passion Fruit	0.73	0.435	-
Tomatoes	0.0127	1.270	-
Bananas	2.2	54.6	-
Cabbages	0.5	5.0	-
Potatoes	4.8	38.6	-

SOURCE: Ministry of Agriculture

TABLE 3.9: NYERI DISTRICT - AGRO CHEMICAL CONSUMPTION

CHEMICAL	1974	1975	1976	1977	1978
DIFOLATAN 80%(t)	4.0	18.0	64.7	222.3	53.7
COPPER 50%(t)	144.1	91.1	51.9	169.4	283.5
BAVISTIN (t)	-	0.7	0.1	2.28	1480.5
BACOPEX (t)	-	-	11.7	0.8	630.5
BRAVO (L)					627.5
FENITROTHION (L)	40,660	11,470	6,117		14,423
DIELDRIN (L)	679	1,504	2,697	1,526	538
DIAZINON (L)	207	1,038	-	4,188	1,702
GUSATHION (L)	-	-	-	-	2,966
ABOLEUM (L)			5		173
C.A.N. 26%(t)	224	242.5	440.2	1,918	501.4
A.S.N. 26%(t)	98.5	31.5	19.4	9.5	257
FOLIAR FEED (L)					1,412
GRAMMOXONE (L)	453	471	201	15,222	1,023
ROUND UP (L)					763
FAMITHION (L)			6,117	10,352	-
D.A.P. (t)					1,020
N.P.K. (t)					150
DOUBLE SUPER (t)					400
SINGLE SUPER (t)					7
PHOSPHATE (t)					150
DITHANE M45(t)					100
DDT 50%(t)					150
MALTHION (t)					1,162
SERVIN (t)					800
ZINEB (t)					130
DDT 25%(t)					135
ROGORE (L)					185
SUMITHION (L)					16,981
LASSO (L)					131
KYANADRIN (L)					1,812

SOURCE: Ministry of Agriculture

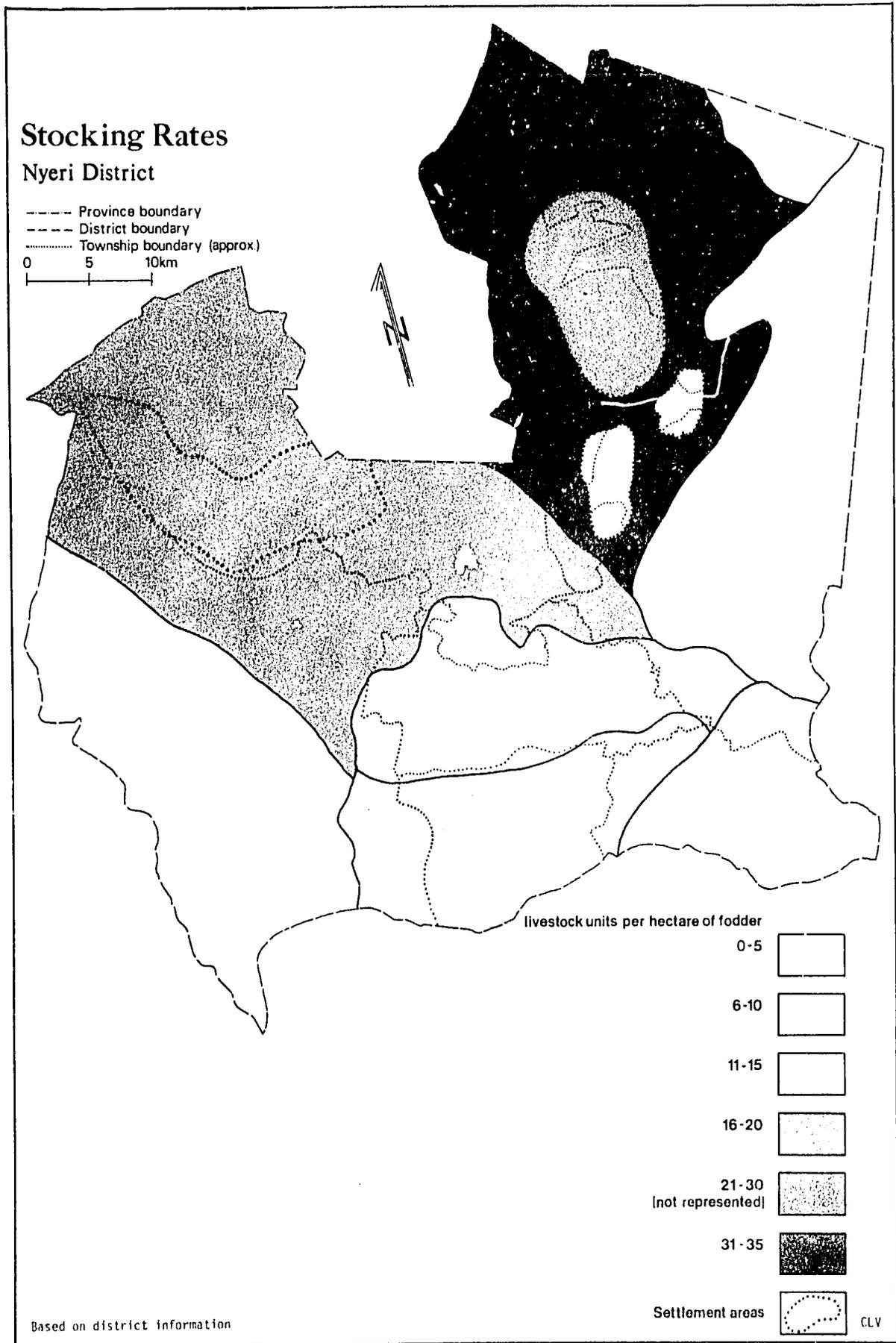
Table 3.9 gives the names of agricultural chemicals used in the district while Figure IX shows where these chemicals are used. These chemicals are fertilizers herbicides, insecticides, and fungicides. The insecticides include chlorinated-hydrocarbons, organo phosphates, and carbamates while the fertilizers include nitrogenous, phosphatic, and compound fertilizers.

3.3.2 Animal Husbandry

Nyeri has over 242,457 animals (including pigs) on a total area of 331,927 hectares. There are 139,932 cattle, 26,341 goats, 58,608 sheep, and 17,576 pigs. The total number of cattle, sheep, and goats is 224,881. Both local and grade cattle are kept. Of the total number of cattle, 10 - 15 percent are local while 85 - 90 percent are grade cattle. The exotic breeds of cattle in the district include Palts, Sanata-Getrudis, Herefords and Sahiwals. The local cattle are Zebus. The number of sheep, goats, and pigs is expected to rise with improved management techniques. Poultry farming is practised only on a very small scale.

Fodder crops such as Nappier and Bana grasses and sweet potato vines are used to feed livestock. Dairying is widely practised in the district except in the areas of Mt. Kenya and Aberdares (Figure IX) and beef animals are kept mainly in the Kieni divisions. There are about 8 ranches in Kieni divisions on a total area of 3,800 hectares with about 8,178 animals. The number of beef cattle has decreased due to sub-divisions of farms. Stall feeding and rotational

Figure X



grazing are common in the dairying areas.

The stocking rates (number of hectares per animal) range from 4.05 ha per animal in Kieni East to 0.73 ha per animal in Othaya divisions (refer to Tables 3.10 & 3.11). The average stocking rate (on animal basis) in the district is 2.07 hectares per animal. Livestock occupy roughly half of the total land. The settlement areas have the highest number of cattle, sheep and goats combined, while Mukurweini division has the lowest number of animals on an area of 17,814 ha. Tetu division has the highest number of pigs (10,702) while the settlement area has the lowest number of pigs (125). The stocking rate (on animal/Hectare basis) in the ranches is about 0.46 ha/animal. The number of animals per available fodder unit ranges from 69.37 animals per hectare of fodder in Kieni East division to 6.99 animals per hectare of fodder in Mathira division. The settlement area has 43.56 animals/hectare of fodder. The number of livestock units per hectare of fodder ranges from 32.61 livestock units/hectare of fodder in Kieni East division to 5.3 livestock unit/hectare of fodder in Tetu division (refer to Table 3.11). The average livestock unit per hectare of fodder in the district is 13.99 livestock unit/hectare of fodder.

No seasonal movement of livestock is apparent because of land ownership patterns in the district. Dairy cattle are kept mainly in the Upper Zone. In the Lower Zone, dairy cattle performance is poor.

TABLE 3.10 LIVESTOCK - NYERI DISTRICT - 1978

LOCALITY	LOCAL CATTLE INVENTORY	BEEF CATTLE INVENTORY	GRADE CATTLE INVENTORY	TOTAL NO. OF CATTLE	NUMBER OF SHEEP	NUMBER OF GOATS	TOTAL NO. OF CATTLE, SHEEP & GOATS	TOTAL NUMBER PIGS	AREA IN HECTARES	APPROXIMATE RATE HA/ANIMAL
KIENI EAST	2,841	1,020	9,927	13,788	8,969	4,014	26,771	2,368	108,500	4.05
KIENI WEST	3,570	2,145	3,883	9,598	7,771	8,523	25,892	529	101,852	3.93
TETU	2,956	-	25,374	28,330	2,854	960	32,144	10,702	61,957	1.92
OTHAYA	359	-	16,356	16,715	4,743	1,746	23,204	282	17,032	0.73
MATHIRA	2,364	-	26,031	28,395	2,632	1,849	32,876	2,578	25,572	0.77
MUKURWEINI	1,200	-	9,106	10,306	4,139	2,149	16,594	989	17,014	1.02
SETTLEMENT (KIENI EAST)	800	3,100	28,900	32,800	27,500	7,100	67,400	125		
TOTAL	14,090 (10%)	6,536 (5%)	119,577 (85%)	139,932	58,608	26,341	224,881	17,576		
MEAN										2.07

SOURCE: District Agricultural Officers' Report - 1978.

TABLE 3.11 LIVESTOCK - NYERI DISTRICT - 1978

AREA (DIVISION)	AGRICULTURAL AREA (HA)	HIGH POTENTIAL AREA (HA)	MEDIUM POTENTIAL AREA (HA)	MARGINAL AREA (HA)	AVAILABLE FODDER (HA)	NUMBER OF ANIMALS PER HECTARE OF FODDER	LIVESTOCK UNITS	LIVESTOCK UNITS PER HECTARE OF FODDER
TETU	55,757	55,757	-	-	5,500	7.79	29,000	5.3
MATHIRA	24,137	17,930	6,306	-	5,065	6.99	28,400	5.6
OTHAYA	15,159	13,635	1,515	-	1,550	15.15	16,400	10.5
MUKURWEINA	16,163	10,275	5,892	-	1,660	10.59	10,100	6.0
KIENI EAST	89,300	43,200	32,550	13,550	420	69.37	13,700	32.61
KIENI WEST	61,070	53,852	600	1,400	530	49.85	9,600	18.11
SETTLEMENT (KIENI EAST)	-	-	-	-	1,550	43.56	30,800	19.87
AVERAGE						29.04		13.99

SOURCE: District Agricultural Officers' Report - 1978.

The main livestock parasites and diseases
in the district are:

- Anaplasomosis - cattle disease
- Theilariasis - disease localised in Mathira
(E.C.F.) and Tetu divisions because
of the large number of non-
dippers. Occurs in cattle.
Mortality rate is 500 animals
per year.
- Mastitis - disease of cattle, incidence
gets higher with rain.
- Red water - occurs in cattle.
- Pneumonia - occurs in cattle, sheep and
goats.
- Scour (diar- - occurs in cattle, sheep and
rhoea) goats.
- Viral - occurs in pigs.
pneumonia
- Leptospi- - occurs in cattle, sheep,
rosis goats and pigs. The disease
intensifies as the rains
start in Kieni East and West.
- Foot & Mouth - occurs in cattle. Still
exists in some parts of Kieni.
Mathira and Tetu divisions
have of late been affected.
- Infertility - occurs in cattle, sheep and
goats. Found all over the
district. Reduces reproduc-
tive ability of animals.
Pronounced in Kieni divisions.
- Coccidiosis - common in poultry.

Brucellosis - diseases of cattle but may also attack human beings. Causes infertility and abortion in cattle.

3.4 Commerce and Industry

Commercial and industrial sectors constitute the second major livelihood system, after agriculture, in Nyeri District. Commercial activities consist of both wholesale and retail trades, virtually all of which are run through private entrepreneurship, 90 percent of whom are Africans. In 1978, a total number of 2134 traders were involved in both retail and wholesale trade. Most trade businesses are small scale and managed wholly by family members.

Government participation in commercial activities consists of parastatal commercial enterprises such as boards for handling coffee and tea produce. It also provides credit facilities in the form of loans and issues trade licenses.

Main limitations in trade are unavailability of credit facilities, poor transportation, especially during the rainy season, and lack of good business management skills. The district is served by 3 banks: 2 Kenya Commercial Bank branches at Nyeri Town and Karatina, and 1 branch of Standard Bank at Nyeri Town. In addition, mobile bank services are provided to a large number of rural centres in the district.

Nyeri District has several light industries, mainly for processing local products such as coffee, tea, and wood. The range of industries includes:

- (a) 50 coffee factories
- (b) 3 tea factories at Chinga, Gathuthi and Ragati
- (c) Wananchi saw mills
- (d) K.C.C. plant at Kiganjo
- (e) a cooking fat factory
- (f) Mt. Kenya Bottling Company
- (g) Highlands mineral water plant

There is a rural industrial development centre (R.I.D.C.) in Nyeri Town which provides a variety of training services for small-scale industrialists:

- (i) Extension service involving visits to the clients in their workshops, especially those granted (R.I.D.C) loans;
- (ii) Training of clients in basic skills and then providing them with loans (in the form of machinery and tools and a small working capital);
- (iii) Running a repair workshop for local industrialists who would like to make repairs;
- (iv) Loan schemes for small industrialists up to sh. 50,000/-. By the end of 1974, the committee had approved loans totalling Sh. 750,788/- mainly for improvement of wood work shops and saw mills.

About 2,000 persons are employed in these firms on permanent basis and an additional 5,000 on a casual basis. There is also a wide range of informal industries: barbers, cobblers, watch repairers, street vendors, mechanics, handicraft groups, and charcoal dealers who provide a

wide range of informal employment. They also produce goods and services for domestic and other local demand. About 500 skilled and unskilled persons are engaged in building and electrical activities in the district.

Some of the district's industries use water pumped directly from streams while others, especially in towns, use tap water. Many of the industries are supplied with electricity.

Waste products from the industries include effluents from factories (for example, coffee), smoke, noise, sawdust and solids. Discharge standards for most of these waste products are poor:

- (1) In the saw mills, the workers are faced with extremely poor working conditions as they are exposed daily to sawdust and noise from the wood cutting machines. Few protective coverings are provided for the workers.
- (2) Water effluents from numerous coffee factories are usually dumped into the nearby streams during coffee cleaning. The most affected rivers are the Karatina and Kiringu.
- (3) The tyre retread factory, situated close to the market centre at Karatina, emits very thick smoke. There is noise and smell pollution from the factory.
- (4) The oxidation ponds, designed to control pollution from factories (coffee and tea), are frequently inefficient. They are usually situated near riverbanks. During the rainy season, the ponds often fill up and pollutants are washed into the river flow.

3.5 Cooperative Societies and Self-
Help Projects

The cooperative movement in the district dates back to the pre-independence period. In 1949, four cooperatives were active in Mathira division, dealing mainly with coffee and other agricultural commodities. A number of credit and savings societies were also subsequently started in the urban centres of the district. In the post-independence period, the cooperative movement has grown very strong, making a significant contribution to development, particularly the agricultural sector. Currently, there are 76 registered cooperatives in the district. Of these, 44 are active with a membership estimated at 74,000. Problems such as misappropriation of funds, poor prices for some agricultural commodities, and general lack of participation from members has rendered a number of societies inactive and dormant in the district. This is the case for many of the pig and pyrethrum societies started after independence.

Table 3.12 shows the number of active cooperatives, by divisions, in Nyeri District.

TABLE 3.12 DISTRIBUTION OF COOPERATIVES IN
NYERI DISTRICT - 1969

DIVISION	NUMBER OF COOPERATIVES
Tetu	11
Othaya	2
Mathira	3
Kieni East	12
Kieni West	13
Mukurweini	3
TOTAL	44

SOURCE: District Cooperative Department, Nyeri.

The societies deal with a wide variety of activities:

- (a) agricultural commodities (crops and livestock),
- (b) farm purchase,
- (c) settlement schemes,
- (d) house construction,
- (e) savings and credit, and
- (f) multipurpose activities

Table 3.13 shows the name, the main function, the area of operation, and the membership of the active cooperatives in the district.

TABLE 3.13

THE STRUCTURE OF COOPERATIVES IN NYERI DISTRICT, 1972

ACTIVITY	LOCATION	NAME OF COOPERATIVE	MEMBERSHIP
A.1. Coffee	Tetu division	Tetu Coffee Growers C.S. Ltd.	
	Mathira division	Mathira Farmers C.S. Ltd.	14951
	Othaya division	Othaya Farmers C.S. Ltd.	7532
	Mukurweini	Mukurweini Farmers C.S. Ltd.	10874
Dairy	Tetu division	Tetu Dairymen's C.S.	6237
	Mathira division	Ihururu Dairymen's Mathira	1507 11774
	Mukurweini	Mukurweini Gakindu	1330 1274
	Othaya	Mathingira, Chinga & Mahiga	4764
	Kieni East (Kiganjo)	Kieni Farmers	550
	2. Pyrethrum	Tetu (Tetu & Muhoya Loc.)	Tetu Farmers	1496
3. Farm Purchase	Kieni East (Kiganjo)	Gatei Farmers	65
	"	Mureri Farmers	-
	Nanyuki	Muramati Farmers	-
	"	Ragati Farmers	245
	"	Ethi Farmers	234
	Kieni West (Kiganjo)	Nairotia Farmers	-
	"	Thigu Farmers	-
	Ngobit Mweiga	Kamiruri Farmers Hohi Farmers	- -
4. Settlement Societies	Kieni East (Kiganjo)	Waraza Farmers	221
	"	Naromoru Farmers	382
	"	Island Farmers	262
	"	Lusoi Farmers	400
	Nanyuki	Kalalu Farmers	438

TABLE 3.13 (Cont'd)

ACTIVITY	LOCATION	NAME OF COOPERATIVE	MEMBERSHIP
	Kieni West (Mweiga)	Endarasha Farmers	59
	"	Mweiga Farmers	390
	"	Watuka Farmers	208
	"	Gataragwa Farmers	124
	"	Thuruthuru Farmers	65
	"	Nagringiro	-
5. Housing	Nyeri Town (Municipality)	Nyeri Muslim Housing	-
6. Savings and Credit	Nyeri Municipality (Nyeri Town)	Cathedral Parish Savings and Credit	1057
	"	Ruare Savings & Credit	-
	Kieni East Nanyuki Town	Mbatian Savings & Credit	-
	Kieni West Mweiga	Ark Savings & Credit	-
	Mathira Tumutumu Hosp.	Urigiti Savings & Credit	-
	Nyeri Municipality Mt. Kenya Bottlers	Mout Kenbot Savings & Credit	56
	Nyeri District	Nyeri Ushirika	-
		Mugi Savings & Credit	291
		Nyeri Teachers	1900
7. Multipurpose	Kieni West	Ngukurani Farmers	186
B. Nyeri District Cooperative Union Ltd.			36 cooperative societies (affiliated)

SOURCE: Ministry of Cooperative Development

The savings and credit societies are affiliated to the Kenya Union of Savings and Credit (K.U.S.C.O.).

In addition, the district has four programmes basically intended to provide services to cooperative societies:

- (1) Members Transaction System (M.T.S.) Programme, by which cooperative societies are taught how to use standardised recording, book keeping and accounting systems. This programme is fully implemented in Nyeri District Cooperative Union, in Tetu and Mukurweini coffee growers societies, and in the Ihururu and Tetu Dairy Societies.
- (2) The cooperative production and credit schemes offer short-term loans to members of cooperative societies. In 1973/74, 3,396 farmers received loans totalling Ksh. 2,640,428 from cooperative saving societies, 8,235 farmers received 1,990,823 from the cooperative bank.
- (3) Union banking systems programme. There are presently 2 coffee societies with full union banking systems accepting deposits in the district.
- (4) Promotion and building of weak societies programme, whereby the officials are sent to attend and participate in the societies' committee meetings.

Problems facing cooperative societies in the district include:

- (1) Poor management,
- (2) Misuse of funds, and
- (3) Lack of adequate transportation and storage facilities for their agricultural products.

The self-help spirit (Harambee Projects) is a major source of development initiative in Nyeri. Thirty percent of the national development is attributed to self-

help effort in Kenya. (Mbithi, 1972). Self-help projects have made significant contributions to major aspects of development in Nyeri District. These could be categorized as:

- (1) Social welfare projects, providing facilities and services, for example, schools (nurseries, primary, secondary and technical), youth and adult centers, and house construction;
- (2) Economic projects, poultry keeping, pig keeping and cattle dips;
- (3) Environment oriented projects, tree planting, water and soil conservation.

The projects are carried out mainly through the contribution (in form of money and labour) for the local people organized at various levels, from sub-locations (for small projects) to district level (for major projects requiring a lot of money). Further assistance, both technical and financial is usually provided to these projects from the Government and various national and international sources.

The contribution of three groups is noteworthy: (1) the Mabati Women's Group, (2) the National Council of Kenya Women, and (3) Foreign Donors. The Mabati Women's Group has played a large role in improving the standard of housing in the district. All members have been assisted in building brick or stone houses, roofed with iron-sheets (Mabati) in place of traditional grass thatched houses. Recently, the group has embarked on other projects such as cattle, pig, and poultry keeping.

The National Council of Kenya Women has made a significant contribution to self-help projects in the district. Foremost is its contribution in tree planting, and water and soil conservation activities.

Foreign assistance to the district has come from various organisations. Two of the larger are:

(1) The Cooperative of American Relief Everywhere (CARE)

(2) European Economic Community (EEC).

CARE has given 200,000 shillings of assistance to various projects in the district, including water and primary schools. As early as 1967, a total of 77,665 shillings was given to four secondary schools and one primary school in the district. These are:

Ndungamano,
Githakwa,
Endarasha,
Moi Equator secondary schools, and
Thunguma Primary school.

The European Economic Community is currently providing over 2 million shillings worth of material to development projects in the district. It has already supported the Naromoru and Endarasha water projects.

Self-help projects in the district are faced with two main problems:

(a) lack of sufficient coordination of locally initiated projects and district priorities; and

(b) lack of proper management, including inadequate application of accounting procedures and misappropriation of funds.

3.6 Tourism

Nyeri is one of the most attractive districts for tourism in Kenya. Like other major sectors of human activity, tourism can have positive and negative effects upon the physical environment. Positive effects include the considerable conservation measures that have ensured the protection of historic sites and monuments as well as wildlife and its habitat. Protecting this cultural heritage creates a setting which attracts many tourists. As a result, there are a number of tourist hotels, as shown in Table 3.14.

TABLE 3.14

TOURIST ACCOMMODATION IN NYERI DISTRICT

HOTEL/LODGE	BED CAPACITY
Outspan Hotel	85
Green Hills Hotel	75
White Rhino Hotel	36
Treetops Lodge	73
Aberdares Country Club	30
The Ark	79
Mountain Lodge	122
Secret Valley Lodge	42
Holiday Lodge	50
Mt. Kenya Safari Lodge	130
Naro Moru River Lodge	70
Elephant Camps	-
TOTAL 12	792

SOURCE: Ministry of Tourism

These hotels and lodges are registered as tourist hotels. They play a significant role in the Northern Tourist circuit which includes:

Nairobi - Treetops - Mt. Kenya - Meru - Samburu-
Maralal - Baringo - Bogoria - Nakuru - Nairobi

According to the 1979-83 National Development Plan, the main objective of tourism and wildlife development is to maximise net returns, but not at the cost of social cultural quality in the district.

Other benefits from tourism include:

- (a) Promotion of foreign exchange in the country;
- (b) Creation of employment;
- (c) Woodland/habitat protection;
- (d) Development of sophisticated lodges and hotels in the district.

Tourist development also has its destructive elements. There is evidence of social and cultural disadvantages emanating from tourism. Moral decadance has taken place, for example, with increases in the urban areas. Secondly, tourism may create over concentration of investment of public funds to improve the infrastructure, sometimes at the expense of other parts of the country which remain relatively underdeveloped. More research is called for to analyse the negative results of tourism.

3.7 Employment Patterns

The total number of Nyeri residents engaged in formal wage employment is 13,870 while 5,419 are registered as self-employed. Tables 3.15 and 3.16: show the employment pattern by main employment sectors in Nyeri.

TABLE 3.15

WAGE EMPLOYMENT BY SECTORS

AGRICUL- TURE AND FORESTRY	MANU- FACTUR- ING	CONSTRUC TION	WHOLE- SALE RETAIL TRADE, RESTAU- RANTS & HOTELS	TRANS- PORT & COMMU- NICA- TION	COMMUN- ITY, SO- CIAL, PER- SONAL SERVICES	FINA- NCE, INSUR- ANCE REAL ESTATE & BUSI- NESS	ELECTRI- CITY & WATER
1,829	470	592	11	114	10,492	15	267

SOURCE: Statistical Abstract 1977 - Ministry of Finance and Planning.

TABLE 3.16

SELF EMPLOYMENT IN NYERI DISTRICT

AGRICUL- TURE AND FORESTRY	MANU- FACTUR- ING	CONSTRUC- TION	WHOLE- SALE RETAIL TRADE, RESTAU- RANTS & HOTELS	TRANS- PORT & COMMU- NICA- TION	COMMUN- ITY, SO- CIAL, PER- SONAL SERVICES	FINA- NCE, INSUR- ANCE REAL ESTATE & BUSI- NESS	ELECTRI- CITY & WATER
2,407	453	1	41	1,739	249	51	478

SOURCE: Statistical Abstract 1977 - Ministry of Finance and Planning.

Table 3.15 shows that community, social and personal services is the largest employer in wage employment. The agriculture and forestry sectors are second while the building sector is third. Table 3.16 shows that the largest number of self-employed work in agriculture. Another large group is self-employed in retail and wholesale trade.

Table 3.17 indicates the distribution of wage employment by income groups in Nyeri as of 1976. The largest block is 200 - 399 shillings per month; three quarters of wage earners in the district earn between 150 and 799/-. Wages are, therefore, generally low for the majority of the workers in Nyeri District. The problem is compounded by high dependency ratios; most wage earners have at least five or more family dependants.

TABLE 3.17

DISTRIBUTION OF WAGE EMPLOYMENT IN NYERI DISTRICT 1976

Monthly Income	UNDER to 150	150 to 199	200 to 399	400 to 599	600 to 799	800 to 999	1,000 to 1,499	1,500 to 1,999	2,000 to 2,999	3,000 to 5,999	6,000 to OVER	Total
Workers	809	3,308	4,000	3,401	3,680	1,775	1,067	517	425	239	23	19,000

SOURCE: Statistical Abstract 1977

In wage employment there are more males than females in Nyeri District. Table 3.18 shows that the number of men in regular wage employment is almost five times that of females. Generally, men have more formal education than women, giving them access to wage employment opportunities; strong traditional

values still persist whereby women are assigned to domestic duties such as cultivation while males look for formal employment outside the home.

TABLE 3.18

MEM AND WOMEN IN WAGE EMPLOYMENT

<u>MALES</u>		<u>FEMALES</u>	
<u>Regular</u>	<u>Casual</u>	<u>Regular</u>	<u>Casual</u>
15,584	2,864	3,728	1,274

SOURCE: Statistical Abstract 1977 - Ministry of Finance and Planning.

3.8 Infrastructure and Services

3.8.1 Water Supply

The main sources of water supply in the district are rivers and streams. The district receives good precipitation and has numerous streams flowing from the slopes of Mt. Kenya and Aberdares range. The main streams and rivers are:

Sagana,
Chania,
Amboni,
Little Tana,
Thengo,
Nairobi, and
Gura.

The central and southern parts of the district utilize surface water from the above streams while areas of Kieni East and West mainly utilize dams and ground water from boreholes.

The responsibility of water supply in the district is largely under the Ministry of Water Development. There are also other agencies: the County Council and the Ministry of Health (Environmental Health Projects). The District Development Committee assumes a coordinating and planning responsibility in respect to all three categories of supply. The target is to supply every home with piped water by the year 2000.

Much of the water used in the rural areas (mainly for domestic purposes) is still obtained directly from rivers and streams. However, considerable progress has been achieved to provide tap water to rural homes. The major water supply schemes in the district are:

- (a) Zaina Water Supply (supplying Muhoya location);
- (b) Tetu/Thegenge/Muruguru Water Supply (covering the whole of Tetu division except Aguthi location); and
- (c) Mathira Self-help Water Supply.

Water sources are limited in the Kienis. Many of the dams used by the former settlers have fallen into disuse due to silting and require dredging. Most of the boreholes in the district are found in the Kienis. Table 3.19 shows water supply and consumption patterns in the district, 1969.

TABLE 3.19
WATER SUPPLY AND CONSUMPTION, NYERI, 1969

DIVISION	SOURCE	METHOD	CAPACITY	USE	POPULATION
Tetu	River	Gravity	400,000	400,100	10,004
Mathira	River	Pump & Gravity	230,000	52,000	2,436
Othaya	River	Pump	11,000	11,000	800
Mujurweini	River	Pump	12,000	8,800	2,000

SOURCE: Ministry of Water Development.

The main urban areas of Nyeri Town, Kiganjo, Karatina, and Othaya are supplied with public piped water by the Ministry of Water Development. Water supply for Nyeri Town and the surrounding area is from two sources: Ihua and Chania both on the Chania River. The Ihua source supplies 100m³ of water per hour, using pumps, while the Chania source

gives 60m³ of water per hour, using four pumps. The other urban areas have also separate water supplies.

The quality of the water varies with the sources, from piped and treated water to ground water and direct flowing rivers (surface water). In the urban centres, piped water is treated with various chemicals. However, many urban households, especially the low-income communities, obtain their water from streams passing through or near the towns.

For water treatment, both in the urban and rural water supplies, the chemicals used include, chlorine, alums for sedimentation of heavy metals, and soda ash for raising the Ph of the water.

3.8.2 Waste Disposal

Waste disposal mechanisms vary. In rural areas, domestic wastes are normally thrown into cattle bomas or compost pits for conversion into manure and later use in the shambas. Pit laterines are common for human wastes. However, as fewer and fewer people have land for keeping domestic animals, the traditional forms of rural waste disposal are disappearing. Alternative methods need to be devised.

In urban areas, waste disposal creates a big problem. Types of waste vary from domestic areas, shopping areas, and industries. Much of the waste is simply dumped together along the roads and near residential areas in Nyeri, Karatina, and Othaya townships. There are few dust bins in

the towns and waste is only occasionally collected in open vehicles. A lot of waste ends up in streams and rivers passing near the towns, such as the Chania river. Attempts have been made to construct oxidation pools for industrial and other town sewage. Often these pools are flooded, and overflow, spilling untreated wastes into the streams and surrounding area. Burning of solid wastes (tins, broken bottles, waste textiles, leather goods, scrap paper, plastics, and other domestic wastes) is uncontrolled.

3.8.3 Health Facilities and Human Diseases

Medical facilities and services in the district are provided by Government, Harambee organisations, missionary groups and private practitioners (both modern and traditional). The district has a fairly large number of health units consisting of hospitals, maternity homes, health centres, dispensaries, and private clinics. Table 3.20 shows the distribution of health units by division.

TABLE 3.20

HEALTH UNITS IN NYERI DISTRICT

DIVISION	DISPENSARIES	HEALTH UNITS	MATERNITY HOMES	HOSPITALS
1. Tetu	8	1	2	1
2. Othaya	4	1	2	-
3. Mukurweini	5	2	3	-
4. Mathira	8	2	2	1
5. Kieni East	2	1	-	-
6. Kieni West	2	1	2	-
7. Nyeri Municipality	3	-	-	2
TOTAL	32	8	11	4

SOURCE: Ministry of Health.

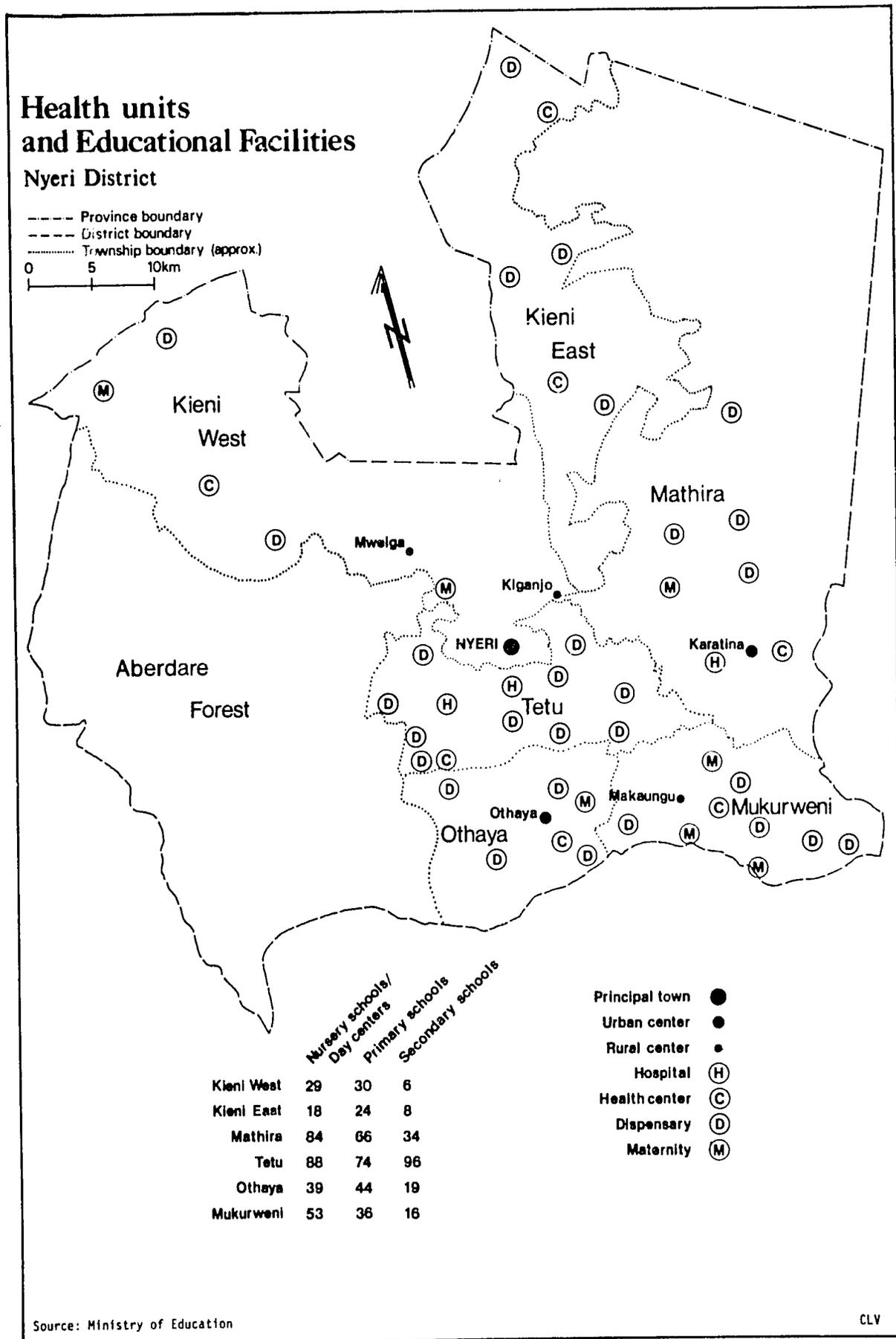
From Table 3.20 and Figure XI, it is clear that medical facilities are concentrated in the densely populated areas of the district. These are Tetu, Othaya, Mukurweini, and Mathira divisions and the main towns such as Nyeri, Othaya and Karatina. There is a general hierarchical arrangement of health units from dispensaries to health centres to maternity homes to hospitals. Table 3.21 shows the bed capacity in the four main hospitals in the district.

TABLE 3.21
BED CAPACITY

TYPE OF BEDS	PROVINCIAL GENERAL HOSPITAL	MT. KENYA HOSPITAL	TUMUTUMU HOSPITAL	MATHIRA HOSPITAL	
Surgical beds	78	18	50	34	
Medical beds	42	-	49	42	
Children beds	32	46	40	25	
Maternity beds	44	2	40	45	
Gynaecological beds	20	-	-	-	
Isolation beds	27	-	-	40	
Psychiatric beds	28	-	-	-	
Amenity beds	17	-	4	20	
Other beds	23	-	-	7	
TOTAL	311	66	183	213	(773)

SOURCE: Ministry of Health

Figure XI



In addition, the district has six health centres serving the six administrative divisions. The total hospital beds (including health centres) in the district is 857. At the lower level are dispensaries. Many of these are built on a self-help basis.

The existing medical facilities are inadequate for the large population in the district. There is a shortage of maternity beds in the district and often mothers are forced to sleep on the floor with their newly born babies, to provide room for those in labour. Long queues are common in both hospitals and health centres, where out-patients are served by only one doctor. There is a shortage of qualified medical personnel and equipment.

Several private clinics operate in Nyeri. They help to ease the congestion of patients in Government health units. In Nyeri municipality alone there are 8 such private clinics.

A wide variety of human diseases are commonly reported in the district. Table 3.22 provides the statistics from 1975-78. Gastroenteritis, malaria, measles, upper respiratory problems, trachoma, and gonorrhoea are the most commonly reported diseases. The highest number of deaths occur from gastroenteritis, measles, meningitis, upper respiratory, dysentery, and tetanus. Most of these are infectious, transmitted by various parasites including fleas, lice, mosquitoes and bed bugs. Children are the most common victims of endo-parasites: roundworms, tapeworms, ringworms, amoeba,

TABLE 3.22

NYERI DISTRICT HUMAN DISEASE INCIDENCE

DISEASES	1975		1976		1977		1978	
	C	D	C	D	C	D	C	D
Amoebiasis	191	-	70	1	225	1	18	-
Chicken pox varicella	491	-	350		1511	-	725	-
Gastroenteritis	647	55	3462	37				
Gonorrhoea	118		2000	-	5128	-	2432	-
Infectious hepatitis	18	1	15	3	18	5	9	-
Influenza	48	-	268	-	1326	-	372	
Leprosy	1	-						
Malaria	639	-	1441		50	2	2	-
Malaria clinical					4055	2	876	1
Measles	926	66			1932	48	1243	27
Meningitis	9	9	45	23	87	28	330	29
Mumps	104	-	238	-	2450		996	-
Pneumonia	136	8	702	-	3998	25	852	30
Poliomyelitis	7	-	2	-	23	4	1	-
Syphilis	1	1	143	-	98	-	3	-
U.R.T.I Upper Respiratory	8311	122	9484	141				
U.R.T.I.	-	-	40464	143	-	-	13148	-
Taehia (tapeworm)	11	-	-	-	356	-	77	-
Tetanus	38	34	40	31	73	52	25	25
Trachoma	881		2360	-	3585	-	956	-
Tuberculosis (p)	116		196	24	222	26	165	18
Tuberculosis	9		3	2	9	5	-	-
Typhoid Fever	2	-	8	3	29	5	17	2
Whooping Cough	121	-	19	2	422	4	446	2
Anthrax	-	-	1074	45				
Kala-azar	-	-	2	1				
Dysentery	-	-	132	132	32	5	3	-
Encephalitis					13	2		
Salmonellosis					1		2	2
Gastroenteritis					11417	20	3763	14

KEY: C - Cases

D - Deaths

and hookworm. Poor living conditions and sanitation standards create an environment suitable for the multiplication of many of these parasites.

In addition to the above diseases, Nyeri residents experience mental illness, drug abuse, and alcoholism. Information collected from the Nyeri hospital psychiatry section is presented in Table 2.23. Populated divisions have more cases and 1978 appears to have had unusually high incidences.

Related to medical care are nutrition and family planning programmes. Government and non-governmental organisations are working to improve the district's nutritional standards. These efforts include:

1. teaching MCH/FP clinics through talks and demonstration;
2. teaching in hospitals to visiting mothers;
3. mobile clinics and home visits;
4. teaching women's groups in barazas.

These activities are directed mainly toward women. There is need to involve men also since they often have the last say in family budgets.

The improvement of nutritional activities is constrained by:

- (a) transport problems for personnel on duty, and
- (b) shortage of staff.

The district has only 9 nutritional field workers.

TABLE 3.23

ACUTE MENTAL ILLNESS DUE TO ALCOHOLISM
AND DRUG ABUSE IN NYERI

DIVISION	1974	1975	1976	1977	1978	Total
Mathira	2	2	1	-	5	10
Othaya	1	-	-	-	4	5
Mukurweini	1	-	1	-	3	5
Tetu	1	1	2	2	2	8
Kieni	-	-	1	-	-	1
Others	1	1	-	-	1	3
TOTAL	6	5	4	2	15	32

SOURCE: Ministry of Health

Nyeri District is fertile and produces a wide variety of food crops. However, several cases of malnutrition have been reported in the district although statistics are not readily available. Malnutrition is not easily noticed except in extreme cases of marasmus and kwashiokor. Malnutrition in the district is attributed to several indirect causes. The first is ignorance about proper nutritional methods. A second cause is poverty; many households are unable to afford the necessary varieties of food such as protein and fat and only feed on starch. The third reason has to do with conservative traditional beliefs and codes which hinder proper nutri-

tional practices. For example, some groups prohibit children and females from eating eggs and some varieties of meat. Lastly, the modern food advertising media has changed peoples outlook. Usually the impression is created that tinned foods and sodas are more nutritious than locally available green foods.

Family planning is another important part of health. In Nyeri district, family planning is practiced through:

- (a) The Ministry of Health family planning clinics (MOH).
- (b) The Family Planning Association of Kenya Clinic (FPAK), and
- (c) Private doctors.

There are 26 Ministry of Health Family Planning Clinics and one clinic operated by FPAK. Family planning services are mainly directed to married females, age 15 to 49. In Nyeri, these are estimated as 46,187.

The contraceptive methods offered by the district's FPAK clinic include the pill, intra-uterine device or IUD (coil), depo provera (DP injection), and others. Most new acceptors use the pill while continuing acceptors receive the D.P. injection. Table 3.24 shows the number and percentage of new acceptors and revisits at the FPAK clinic from 1971 to 1978.

Nyeri's figures of 19 percent of national acceptors and 16 percent of revisits is the highest in both categories for the country as a whole. While there has been

TABLE 3.24

New Acceptors and Revisits in
Nyeri, 1971 - 1978

YEAR	NUMBER OF ACCEPTORS	% INCREASE OVER PREVIOUS YEAR	NUMBER OF REVISITS	% INCREASE OVER PREVIOUS YE
1971	129	-	-	-
1972	173	34	1130	-
1973	201	16	1302	15
1974	356	77	1756	36
1975	375	5	2564	46
1976	664	77	3652	42
1977	1010	52	5689	56
1978	1122	11	8587	51
Total	4030	19% of the nation- al totals	24690	16% of the nati- al total

Source: Family Planning Association of Kenya

an overall increase of new acceptors over the years, there have been great variations between the years. On the other hand, there is clear evidence of steady increase in percentage of revisits over the years.

3.8.4 Housing

The standard of dwelling houses in the district is generally high, a reflection of the overall development of the area. In the rural areas, traditional circular houses, with mud walls and grass thatched roofs are still common. However, modern houses also appear, especially in the more developed parts of the district. Most of the houses in the rural areas are built by individual families or by cooperative groups. For example, the Mabati Womens Group is a cooperative society assisting members to build good houses. Government assistance comes usually through agencies such as National Housing Corporation (N.H.C.) or the Housing Finance Company of Kenya (H.F.C.K.). But, these agencies have concentrated their efforts mainly within urban areas where housing shortages are acute. In 1974-8, the Nyeri District Development Committee allocated £ 373,000 for rural housing, to be given in form of loans. Subsequently, few applications were made and the money was diverted to other projects. Constraints to good housing in rural areas include low incomes and the high, high prices of building materials.

In most urban areas in the district, the housing sector approaches crisis proportions. Urban housing comes through private developers and public agencies (e.g.,

NHC, HFC and Government Ministries). Information on the participation of NHC in public housing is presented in Table 3.25.

In spite of this NHC activity, major towns, like Nyeri, Karatina, and Othaya, exhibit contrasts between a wide extent of very poor houses (mostly slums and squatter settlements) alongside a few good modern houses.

The slums and squatter areas, especially in Nyeri Town (Majengo) and Karatina, consist of mud-walled, carton-like structures, characterized by overcrowding, lack of proper sanitary facilities, lack of lighting, and non-existent piped water. In Nyeri Town, 26 percent of the population live in the Majengo slum area. Here rents are low, averaging 15 to 20/- per month. The residents include many who work in the informal sector. Refuse from Majengo flows directly into the Chania river where some residents of Majengo still draw water.

3.8.5 Education

Educational facilities is a major concern in the district. Approximately 34 percent of the total annual district recurrent budget is spent on primary and secondary education (Development Plan 1974-8). The district is well provided with educational institutions which are widely distributed, ranging from nurseries to primary and secondary schools to colleges to village polytechnics to adult education centres.

TABLE 3.25

HOUSING UNITS DEVELOPED BY N.H.C. IN NYERI DISTRICT
(AS PER JANUARY - 1969)

SCHEME (LOCATION & TYPE)	COST (K£)	NUMBER OF UNITS
1. NYERI TOWNSHIP		
i) Nyeri USAID (Tenant Purchase)	101,565	59
18 units, 1 bed roomed		
41 units, 2 bed roomed		
ii) Nyeri Site and Service Phase I	263,150	277
Nyeri Site and Service Phase II	72,200	76
2. KARATINA TOWNSHIP		
Site and Service Phase 2	29,300	38
Site and Service Phase 3	26,214	34
3. WAMAGANA RENTAL HOUSES		
(Thigingi Loc. Tetu Division)	-	-

SOURCE: National Housing Corporation

The District County Council is responsible for nursery schools or day care centres, providing teachers, equipment, and buildings along with assistance from the local people. There are 311 day care centres in the district, with an enrollment exceeding 25,000.

Nyeri District also has a large number of primary schools. In 1977, there were 274 primary schools in the district, with an enrollment of 137,356 pupils and 3,875 teachers. Eighty percent of the teachers were professionally qualified while 20 percent lack full qualifications. The teacher-student ratio in the district was, therefore, 1:34 which is among the best in the country. In 1977, 92.5 percent of the pupils who sat for C.P.E. passed. Table 3.26 shows the distribution of primary schools, by division, in the district.

TABLE 3.26

DISTRIBUTION OF PRIMARY SCHOOLS

DIVISION	NO. OF PRIMARY SCHOOLS - 1977
Kieni East	24
Kieni West	30
Mukurweini	36
Othaya	44
Tetu	74
Mathira	66
TOTAL	274

The development of secondary schools in the district has been very rapid. In 1977, there were 21 Government maintained schools, 15 for boys and 6 for girls, excluding Nyeri Technical School. In addition, the district has 75 Harambee schools and 10 missionary and private secondary schools. Twenty of the Harambee schools are aided. The total enrollment for all secondary schools for 1977 was 20,674 with 753 teachers, giving an overall teacher student ratio of 1:27. Candidates who enrolled for E.A.C.E. in Government maintained, Harambee, and private schools rose from 3,043 in 1977 to 3,734 in 1978.

Both primary and secondary education institutions suffer from a number of problems:

- (a) shortage of well built classrooms, and overcrowding;
- (b) inadequate equipment (e.g. furniture and text books);
- (c) inadequate housing for teachers;
- (d) a general shortage of teachers; and
- (e) a high drop-out rate, especially during coffee picking periods.

In addition, the district has a large school age population and the existing facilities fall below the requirement. The number of pupils presently qualifying from primary education is too large for the available secondary schools in the district.

The district has several institutions providing professional and technical courses. These include:

1. Kimathi Institute of Technology - it started in 1978 with an initial intake of 30 students for a two year training course leading to C.P.A.I;
2. One Technical School with an enrollemnt of 520 students;
3. Two Teacher Training Colleges at Kamwenja and Kagumo with 660 and 570 students, 45 and 38 teachers respectively. They offer two-year courses.

In addition, basic courses and trades are offered:

1. Secretarial courses at Cathedral Secretariat College (six months course for a group of 30 girls) and advanced commercial private college (six months course for 100 students);
2. Wambugu Farmers Training Centres offers courses for approximately 3,000 farmers annually;
3. Ten village Polytechnics, training in such crafts as masonry, tinsmithing, carpentry and dress making, agricultural skills in growing crops and marketing, business training in bookkeeping, shop management, and typing;
4. Nyeri Nurses Training School, enrolling 30 students every year;
5. The adult education branch in the district conducts 95 literacy classes, with a total enrollment of 5,928 members, the majority of whom are women. The purpose of these programmes is to provide literacy and functional education. The programme has now been enhanced by the creation of a separate department of Adult Education, staffed by well trained personnel.

The above courses provide technical skills for job opportunities that could be available in rural areas.

They are designed to curb the mass migration of people into major towns where there are few jobs and only an inadequate

infrastructural base.

3.8.6 Transport, Communication, and Energy

The district has a well established road network, a railway line, several airstrips, and postal and telecommunication facilities. Responsibility for roads rests with the Ministry of Transport and Communications and the District Development Committee. In 1977, the total length of all categories of roads in the district was 1,210.9 km. Many of the roads are only earth roads. A combination of high rainfall, modulating terrain, and deep soils in the district render many of these roads difficult to pass during the rainy season.

Figure XII shows the network of roads, railways, and airstrips in the district. A breakdown of all categories of roads in the district is given below in Table 3.27.

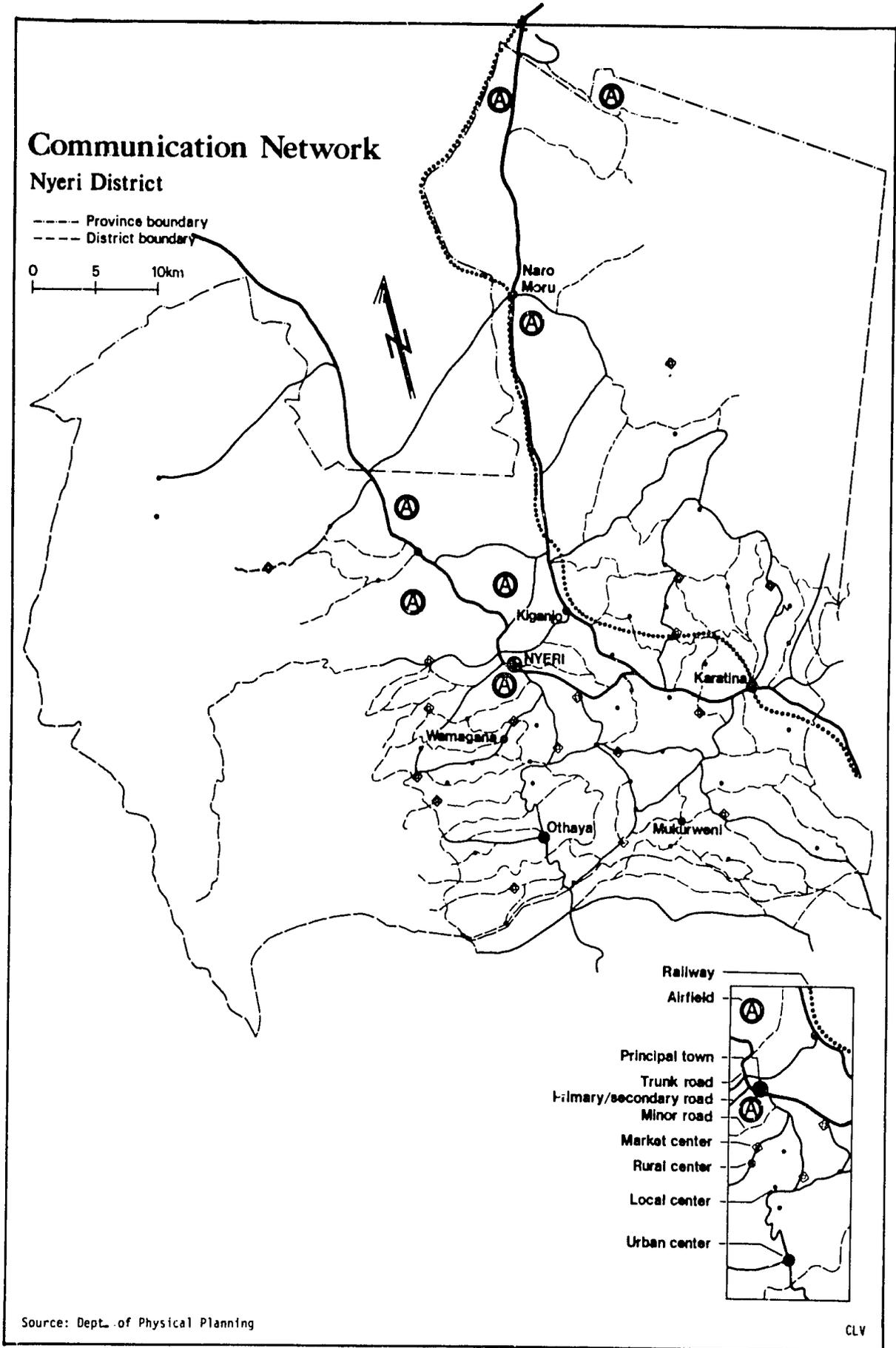
TABLE 3.27

ROAD NETWORK IN NYERI

1.	International Trunk Roads (A2)	36.4 KM
2.	National Trunk Road (B32)	40.3 KM
3.	Primary Roads (C71)	53.5 KM
4.	Secondary Roads (D41)	246.4 KM
5.	Minor Roads (E503)	529.7 KM
6.	Temporary Classified	218.4 KM
7.	Township Roads	22.8 KM
8.	Government Access Roads	8.6 KM
9.	Settlement Scheme Roads	29.8 KM
10.	Tea Roads	25.0 KM
TOTAL		1210.9 KM

SOURCE: District Development Plan, 1974-78, Nyeri

Figure XII



The higher category roads, A2, B32, and C71, consisting of 130.2 kms, emphasize the link with other districts, with Nairobi, and with major towns such as Nyeri Town, Karatina, Kiganjo, Othaya, and Naro Moru. The rest of the roads, while connecting to the major road categories, provide the intra-district linkage serving the high potential agricultural areas and commercial centres. However, the lower category roads are not well serviced. The road network is heavier to the south, in the more developed parts of the district.

In addition, minor roads of temporary classifications include township roads and special purpose roads like tourist, tea, wheat, pyrethrum, settlement, and rural access roads.

The district is served by a railway line, linking it with Nairobi, and connecting Karatina, through Kiawaria, Ruthangati, Kiganjo to Naromoru and extending to Nanyuki in Laikipia district. The line was established to serve mainly the former white highland farms and little effort has been made recently to serve the African small scale agricultural areas.

There are several airstrips in the district. However, these are rarely used and only for special purposes such as tourism, administrative needs, and medical transport. Air travel is still too expensive for daily commercial and normal travel purposes.

There are 7 post offices and 16 sub-post offices in the district, serving a population of 509,000. The national average is a post office for 25,000 people so the district is close to the average. Postal services are concentrated in the main towns. Telephone facilities are very few, and like postal services, are available mostly in the main towns.

Firewood is the main sources of energy in the rural areas. It is used mainly for cooking. Charcoal and paraffin are also widely used in many homes. Firewood and charcoal are obtained from the district's forest areas. There has been considerable destruction of the forest on the slopes of Mt. Kenya and Aberdares and the destruction continues, despite the ban on charcoal burning. Large patches of deforested slopes have been formed, making the land vulnerable to soil and wind erosion.

In urban areas, charcoal and paraffin are the principal fuels used for cooking. Electricity is available in the main towns and is used for lighting, cooking, and in industry. Gas is also commonly used for domestic purposes. Both petrol and diesel fuel supply needs for automobiles and truck transport.

Consumption figures for different fuels and sources of energy are not readily available for the district. Electricity is provided by the East African Power and Lighting Company. In Nyeri District, there are two small sources of hydro-electricity: Warijie and Khuroro stations on the upper Sagana river. The district is under the Rural Electrification Program through which efforts are being made to provide electricity to rural areas.

3.3.7 Service Centres

A hierarchical network of human settlements exists in Nyeri District. They function as both service centres and growth centres. Basic services consisting of infrastructural facilities and social services referred to earlier tend to be concentrated in these centres.

The hierarchy of service centres is based on the level of infrastructural development and the catchment population served by each centre. These centres are outlined below, according to a general scheme which applies to the entire country. Table 3.28 shows the schedule in Nyeri.

At the bottom of the hierarchy are 40 local centres. Local centres are designed to serve a catchment area of approximately 5,000 people, with lower level facilities including a full primary school, several shops, a dispensary, a public water supply, and an open market. Figure X shows the distribution of the local centres in Nyeri and the availability of infrastructural facilities. Some services such as schools, administration, and road networks, have been shown elsewhere and are excluded here. Most of the local centres are served by minor roads. Water supply is also well provided, especially in the well developed areas of the district. The dry Kieni divisions get water from a few seasonal streams. A number of dams situated in these divisions have silted up. It is clear from the map that many essential facilities are not available in many of these local centres.

TABLE 3.28 SCHEDULE OF PRINCIPAL TOWNS AND SERVICE CENTRES - CENTRAL PROVINCE

PRINCIPAL TOWNS	ADMINISTRATIVE DISTRICT	URBAN CENTRES	RURAL	MARKET CENTRES		LOCAL CENTRES		
Nyeri (38,200)	Nyeri	Karatina (5,100) Othaya (2,000)	Mweiga Wamagana Munurweini Naro Muro Kiganjo (Kirichu)	Ihururu Kinunga Gatitu Endarasha Kabiruini Ruthagati Giakanja Ihithe Kiandu	Tumutumu Ciakaibai Gichichi Mahiga Gathinga Mihuti Gakindu Waraza	Ndathi Muthuaini Muruguru Gichira Gachika Kiamariga Gatunganga Ngorano Gachatna Mukarara Gatumbiri Gathuthi Kigwandi	Kangatia Kiawarigi Gikororo Ndimaini Kianjogu Ngandu Gaikuyu Gatondo Ihuririo Karema Birithia Kagicha Chinga Kagere	Kaheti Kahoro Thageini Tambaya Ichamara Gumba Gikondi Kanunga Gatarakwa Hombe Amboni Embaringo Muyogo

SOURCE: Development Plan - 1974-78 (Government Printer)

The second level of service centres consist of 17 market centres. Market centres are designed to serve a catchment rural population of 15,000 and a resident population of 2,000. The needed facilities and services include:

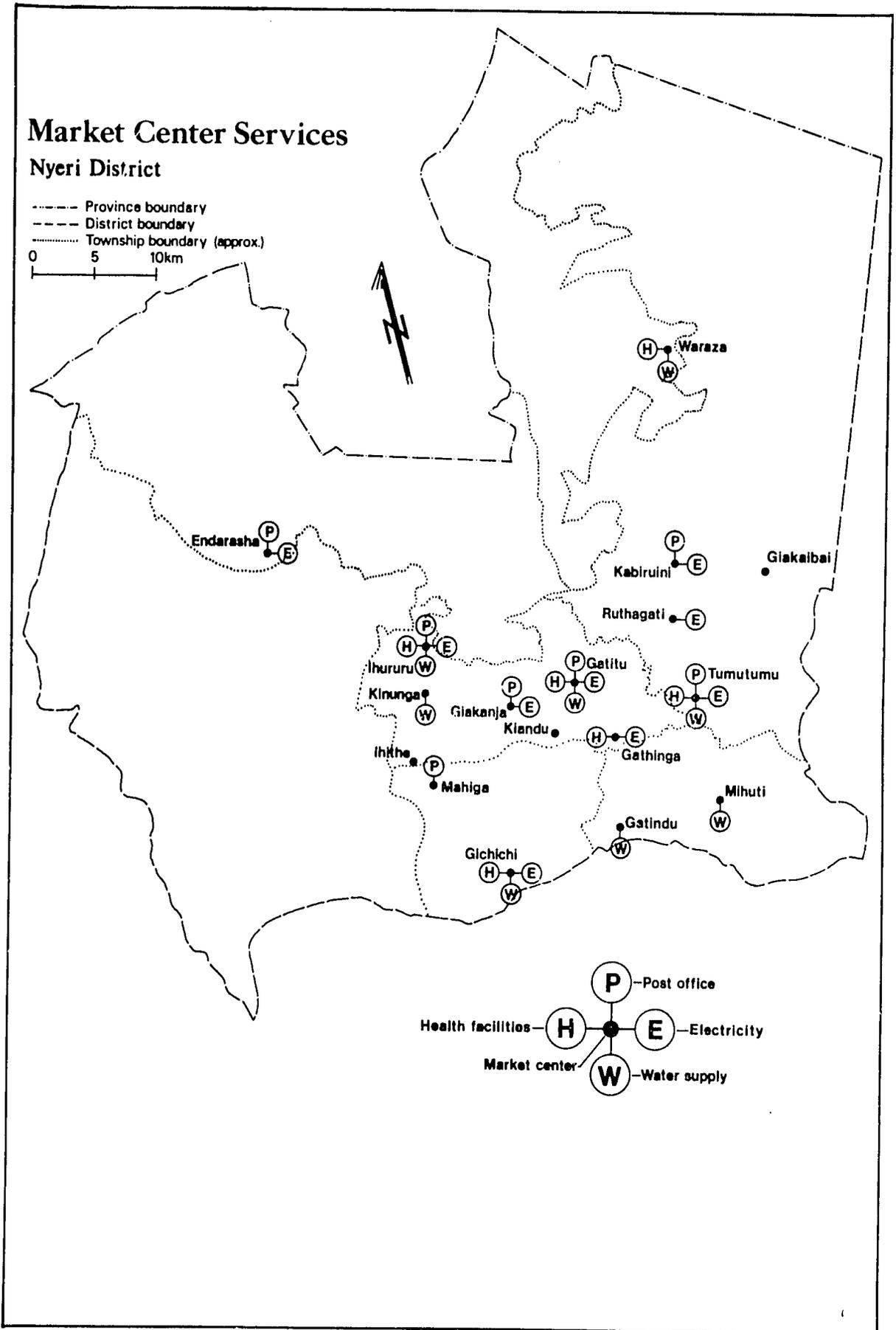
- public water supply,
- both primary and secondary schools,
- sub-post office,
- telephone facilities,
- a police post,
- a local bus service and other social, commercial and local administrative services.

Figure XIII shows the distribution of market centres and the availability of infrastructural facilities. Again, many of these centres lack some necessary facilities while those available are inadequate for the large population.

The third level of service centres consist of 5 rural centres. Rural centres are designed to serve a catchment area of 40,000 rural population and a resident population of 2,000 or over. The needed facilities and services are:

- secondary schools,
- several primary schools,
- a health centre with maternity and family planning facilities,
- good shopping facilities,
- piped water supply,
- electricity,

Figure XIII



- sewage disposal system;
- telephone and postal facilities;
- banking facilities and a mobile library.

The fourth level of centres consists of 2 urban centres, Karatina and Othaya. Urban centres are designed to serve a rural hinterland of 100,000-150,000 population, and a residential population of over 5,000. The needed facilities and services for such centres include a full range of services: treated piped water supply, piped sewage system and disposal plants, fully equipped hospitals, senior secondary schools, technical schools, and several primary schools. They should be served by a primary road and with an industrial development centre.

On top of the hierarchy of centres is the principal town of the district, forming Nyeri municipality and town (See Figure XIII). A principal town is considered both as a major service centre and a growth centre of the district. Principal towns are designed to serve a rural hinterland of about 1 million people and include a residential population of over 100,000. In addition to full services and facilities, they are expected to be centres of industrial and commercial activities (e.g., industries based on agriculture and industries supporting agricultural production) generating employment for a large number of people migrating from rural areas.

Nyeri Municipality covers 72 sq. km. and is formed by Nyeri Town and four smaller townships: Kiganjo,

Ruringu, Kamakwa, and Mathari Mission. The municipal area is provided with major facilities and services such as: provincial headquarters, provincial general hospital, technical high school, Kimathi Institute of Technology, a post office and a library. There are important tourist hotels, such as Green Hills Hotel and Outspan Hotel. There is an industrial estate at Kingongo Ridge with industries such as Wanachi Sawmills, Mt. Kenya Bottling Company, Highlands Soda Mineral Company, and the offices of Kenya Industrial Estates.

Nyeri Town had a population of 34,800 in 1969 and is growing rapidly at 7.35 percent per annum. It is situated in the heart of the district, on a ridge beside Chania river and the boundary between Kieni West and Tetu divisions. The population is characterized by an excess of males over females (Table 3.29), reflecting high migration of people (especially males) from the rural areas in search of employment.

TABLE 3.29

AGE - SEX RATIOS IN NYERI TOWN

AGE	TOTAL POPULATION	TOTAL MALES	TOTAL FEMALES	SEX RATIO
0- 9	1426	1213	1213	100
10-14	719	335	384	87
15-19	1028	409	619	66
20-24	1458	850	608	139
25-29	1261	870	391	222
30-39	1581	1142	439	260
40-49	879	675	204	330
50-59	388	302	86	351
60+	264	161	103	156

SOURCE: Population Census Report, 1969

The significantly small population of age groups of 10-14, 40-49 and 50-59 apparently reflect the effects of the emergency period in the 1950's which resulted in less child births and a lot of deaths for the middle aged population of that time. The rapid population growth in Nyeri Town and the lack of adequate employment has put undue stress on the limited infrastructural facilities and services creating a poor urban environment.

The transport network in the town consists of two main tarmac roads: Kimathi Street and Kenyatta Road, and a number of minor earth roads. The town has grown up without proper planning with a result that activities are situated in places without proper regard for their suitability. For example, the market area and the main shopping area are situated adjacent to a slum area called Majengo. The sewage facilities are inadequate, especially in the low income residential areas. Refuse is often left on the streets for many days before it is collected. The disposal methods are not very efficient, with a result that the dumping areas have become breeding ground for rats and mosquitoes.

Perhaps one of the biggest problems facing the town is that of low-income housing. At the central part of the town and near the main shopping centre, there has grown a big slum and squatter area Majengo. The slum extends along Chania river. Houses are of a poor standard, consisting of mud and carton structures. Water is difficult to get, available only in the nearby Chania river, and a few public water

places in the area. There are only a few public toilets and refuse is normally scattered about the slum. It is inhabited by low-income and unemployed residents. Rents are low, 15-20/- per month. The houses are very overcrowded.

The good residential areas in the town include Ring Road area, Queen Village, Kimathi Estate, and the former Asian quarters. Blue Valley and Kangemi areas are low-income residential areas. The National Housing Corporation has put up residential estates in Nyeri Town for tenant purchase and for site and service development.

4. ANALYSIS OF ENVIRONMENTAL TRENDS
AND PROBLEM IDENTIFICATION

4.1 Stable Areas

Nyeri is located in the nation's high potential area and as a result has a number of stable resource situations. Rainfall is generally reliable with the probability of less than 500 mm annual rainfall less than ten percent. Adequate rainfall is in part a result of upswelling of the land and in part from the wind patterns. Maxima are achieved in April-May and October-December. Although the upper altitude regions of the district are too high and therefore too chilly for agriculture, the lower zones are quite productive.

Consistent rainfall and favourable geology provides good supplies of groundwater. The region supports many boreholes (See Table 2.2 on pages 21-22), with average depth at roughly 100 meters and average yields at approximately 5 m³ or 1000 gallons per hour. Surface water is equally abundant. Although there are clearly demarcated seasonal flow levels, the effective annual flow is considerable. Table 2.3 (pages 23-25) provides details. Farmers and other water users have capitalised on the good surface and groundwater supply by constructing 60 dams plus hundreds of boreholes, wells, water holes, and water tanks. Although there

are early danger signs of water pollution from soil erosion and coffee effluent, it is not now a dangerous situation. However, water quality bears careful monitoring as organic compounds and tannery and sisal wastes may be increasing in the near future.

For the most part, the vegetation and forest cover situation is under control. Forest management programmes are practised as well as a number of reforestation efforts. The average germination rate for the tree planting is an impressive fifty per cent. Although there is a concern that the forests on the slopes of Mt. Kenya are experiencing excessive depletion rates, the situation is known and under study. Even so, special monitoring of the rate of wood offtake is an area that requires careful scrutiny, especially in light of comments on soil erosion which appear below.

The district is well endowed with wildlife. As might be expected, increasing human population is placing pressure on the land resources in the district's two national parks, yet there seems to be a temporary truce. Even so, the Wildlife Conservation and Management Department has undertaken a fencing programme to assure that stray game will not inflict damage on nearby crops as well as curb human encroachment in the national parks.

Agriculture is another generally stable area in Nyeri. Of the region's arable land, about 75

percent is classified as high potential. Farming systems combine livestock with a good mix of crops to hedge against unforeseen circumstances. In addition, a large percentage of the land produces coffee, tea, and pyrethrum which bring needed cash income to the region. Agricultural systems are generally modernised with tractors, fertilisers, and small-scale irrigation used in many parts of the district.

Livestock production is another major activity. Good quality cattle are maintained, fodder grown and harvested, ranching schemes well developed, and still feeding and rotational grazing commonly practised. Although stocking rates are beginning to cause concern, it is not now an alarming problem. However, close monitoring of the grazing land should be maintained as soil erosion, in selected areas, is beginning to cause concern, it is not now an alarming problem. However, close monitoring of the grazing land should be maintained as soil erosion, in selected areas, is beginning to become serious. (See below)

The district's infrastructure has grown at a fast pace. Coffee and tea factories, sawmills, and bottling plants are the more significant industries; schools, credit groups, maintenance facilities, and co-operative societies are well advanced. Yet this early level of small-scale industrial activity must be watched as there are signs that groundwater and air pollution

may become a problem. Occupational health problems and worker safety are another problem area which seems not yet to be receiving full attention.

Tourism is active in Nyeri. Hotel capacity of nearly 800 beds is a testimony of the attractiveness of the area, both in its scenic beauty as well as wildlife. Although tourism inevitably introduces alien elements which threaten the wellbeing of local cultural autonomy, it is not yet threatening to undermine traditional cultural cohesiveness. Even so, periodic reviews of tourism's impact need to be undertaken.

In spite of these generally stable circumstances in Nyeri, there are three areas of concern that suggest difficulties in resource use and management.

- (1) Soil erosion, deforestation and siltation;
- (2) resource pressures associated with urban growth;
- (3) population increase.

4.2 Soil Erosion, Devorestation, and Siltation

These three phenomena are closely inter-related. Soil erosion itself stems from two basic causes: road building and improper land management practices.

Nyeri is a rugged district with sometimes severe slopes and gradients. Road building often cuts across these slopes, thus disrupting natural contours and setting the stage for soil degradation. To install proper filling and drainage for small feeder roads is a costly business as is proper maintenance.

Of greater impact is increased pressure from grazing and agriculture. More intensive cultivation of high potential soils and spill-over into marginal lands is causing soil erosion to occur at increasingly intense rates. Yet there is no analysis of the problem available or underway to provide a precise measure of the trends in soil loss.

Soil erosion is accelerated by increased cutting of trees, mostly for woodfuel. Tree loss is particular concern on the slopes of Mt. Kenya and in the Aberdares but seems to be increasing in other parts of the district as well. As more trees are cut, soil vulnerability to wind erosion and water runoff increases.

A problem related to soil erosion is siltation. The Maragua and Tana rivers show high organic content, much of it derived from soil loss along the drainage basins of the two river systems. Several dams, especially in the Kieni divisions, have silted up.

Several soil conservation projects have been initiated by the District Development Committee as well as by the Ministry of Agriculture (See Table 2.1 on page

13). This is an important step and should be carefully observed. Yet the broader based need to determine rates and causes for soil erosion throughout the district is abundantly clear and should be given priority.

4.3 Resource Pressures Associated with Urban Growth

Rural exodus is a concern in much of Kenya, not so much because it depopulates the rural areas but because it places excessive stress on urban infrastructure.

Table 3.3 (page 42) and Figure VII (page 45) indicate population structures with abnormal gaps on the age groups between 20-40 years. The gap is especially severe among males. The abnormality can be explained in part by the emergency of the 1950's but probably falls more on the migration away from the district to large urban areas, particularly Nairobi. These figures are based on the 1969 census. It is assumed that the urban trend will be as severe or even more so in the 1979 data. For example, a preliminary review of the 1979 figures show Nairobi increasing at about 6 percent per year (national average at 4 percent) and Nyeri town growing at a staggering 26 percent per year (10,000 in 1969 and 36,000 in 1979). Of Kenya's major cities and towns, only Kericho and Kisumu are growing at faster rates.

Nyeri town and other urban areas in the district are having difficulty coping with this rapid influx. Waste disposal is a particular concern. Industrial and residential waste is dumped along roadsides and in streams, thus threatening the quality of water supply.

The housing situation approaches crisis proportions. There are sharp contrasts between modern housing available to those who can afford it and the sub-standard housing that has sprung up in the peri-urban area. For example, 26 percent of the people of Nyeri town live in the Majengo section where houses are poorly constructed, sanitation inadequate, piped water unavailable, and lighting non-existent. Trash and refuse from Majengo flow directly into the Chania river, thereby threatening the health and wellbeing of other Majengo residents who draw their water from the Chania.

There are no fast or easy solutions to problems of the urban environment. However, action is necessary if the quality of urban life is to be attended to and if the physical and human resource base in the urban areas is to be maintained.

4.4 Population Growth

As in other parts of Kenya, population growth is a concern for the resource base. Because it is mostly high potential land, population densities are high.

Density for the district as a whole was 108 persons km² in 1969 and 145 km² in 1979. In 1969, Mathira Division had 344 persons per km². Although the 1979 divisional figures are not yet available, it is assumed to be even higher.

Population pressure is at the root of several of Nyeri's other environmental problems. It accelerates urban migration, thereby overtaxing the urban environment; it places greater stress on agricultural and grazing lands, thereby increasing soil erosion and siltation; it increases pressure on woodlands, thereby leading to potentials for greater deforestation.

The Government is very much aware of the population issue and is taking action. Nonetheless, it is important that population trends in the district be closely monitored to determine what shifts may be underway and whether any actions may be required.

5. SUGGESTIONS AND RECOMMENDATIONS

5.1 Resource Information Review

In Nyeri district, several resource trends bear close monitoring. In some cases, the current situation is of concern and careful data collection should be undertaken in a systematic way. These areas include:

Water quality, including both siltation and wastes from coffee, sisal, leather processing and other industrial wastes;

Deforestation, with special attention going to wood offtake on the slopes of Mt. Kenya;

Soil erosion;

Stocking rates;

Industrial pollution and occupational health;

Impact of tourism;

Urban environmental issues;

Population growth.

In all of the above cases it may be helpful to organize a data room or information room, accessible to district planners and officers, who can use these data to check resource trends and to build resource data into their planning and evaluation activities. The data room could also serve as a place where maps and other visual materials (perhaps a Landsat image) could be displayed for use by planners.

5.2 Emphasis on Urban Planning

Given the unprecedented growth of Nyeri town as well as other towns in the district, greater attention to housing, water supply, sanitation, education, and other urban services is called for. Although this planning effort is already within the jurisdiction of planning authorities, it is urged that the planning effort take particular note of resource problems which are arising because of the rapid urban growth.

5.3 Attention to Improved Resource Management

Monitoring of resource trends and urban planning are important steps. But they do not automatically lead to action. In the name of improved resource management, a number of programmes can be strengthened or initiated.

Soil conservation work is already underway and should be expanded. Control of water pollution has been started and should be supported and continued. Experiments in reforestation are underway and should be greatly expanded. Cultivation in marginal lands has created potential land exhaustion and should be examined to determine the extent of risk. Livestock pressure needs more careful analysis and management. And all of these resource pressures need more careful coordination between and among district officer's jurisdictions and ministerial responsibilities. For example, water quality

problems should be dealt with by a combination of several authorities including agriculture, water, industries, power and energy. Mechanisms, at the district level, need to be explored whereby several district officials work cooperatively on common resource management problems.

5.4 Environmental Training and Education

For longer range resource work, training and education become essential. Short-term training on resource information systems, monitoring, water quality, resource management planning, soil erosion analysis, and grazing management are some areas where training would help. Training related to management procedures with the district's current administrative structure would also help. It may also be helpful to post an environmental officer (probably at the provincial level) to work with district officials in training current staff in ways to improve resource management.

At another level, improved environmental education would be effective. Teachers might be encouraged to visit the district "data room" in order to have recent information available to their students on local resource issues. Teachers might undertake field trips to teach students how to monitor and measure resource trends. If training of teachers is required, this too might be initiated, especially in techniques

of using resource information in preparing instructional materials. Students should also be encouraged to conduct surveys of environmental perceptions among their parents and families, thereby expanding environmental awareness beyond the immediate school classrooms.

In the informal sector, education in areas already underway such as health, family planning, agriculture, extension, should be assisted in incorporating resource information into training and education efforts.

APPENDIX I

Below is a summary of major historical events relevant to the environment in Nyeri since 1901.

<u>YEAR</u>	<u>EVENT</u>
1901	There was a prolonged drought which resulted into famine referred to as "Ngaragu ya Ruraya."
1902	Nyeri Town was founded by the colonial government as an administrative centre for Central Province. It was also to become a recreational centre for the European community and a place for getting cheap labour for their big farms and homesteads.
1916	There was an outbreak of locusts which destroyed crops and vegetation. This was followed by famine.
1918	Another famine occurred in the district and forced people to go to other places in Central Province like Thika for food. This famine was referred to as "Ngaragu ya Thika."
1932	This year witnessed another outbreak of locusts.
1940	There was an outbreak of plague.
1943	There was a severe famine referred to as "Ngaragu ya Mianga" affecting the entire population in the

district. Food was brought from outside the district to feed the people in Nyeri.

1949-50

Prolonged drought affected many parts of Nyeri District and particularly Mukurweini, Othaya division, Ruguru and Aguthi locations.

1948

An outbreak of locusts caused considerable damage to crops and vegetation in the district.

1952

Emergency declared. British colonial police and military forced Africans to live in concentration camps under quite unhealthy conditions.