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RANGELAND SURVEYS

K E N Y A

VEGETATION AND LAND USE SURVEY of NAROK DISTRICT

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This working paper is one of a series of reports prepared during the course of the UNDP/SF project, Kenya - Range Management Division of the Ministry of Agriculture. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

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ABSTRACT

The use of vegetation as an indicator of land potential is described. The vegetation of Narok district is mapped at 1:250,000 scale. Vegetation types mapped are described and their eco-climatological significance indicated. Available information on soils is correlated.

An outline of the relevant district development plan is included and development conflicts mentioned.

An annotated bibliography lists sources of information on the district.

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1. INTRODUCTION

1.1 OBJECTIVES AND BACKGROUND

Narok District has been the object of much quite detailed survey work during the last fifteen years. Geology, climate, soils and vegetation have all been described and it is not proposed to duplicate previous work in this report. With the exception of one report which remains restricted all the survey reports are readily available in Kenya and are listed in Section 5.

The main objective of this survey has been the production of a vegetation map showing the main vegetation types of ecological significance in the district.

This area of 18513 sq. km. experiences a considerable range of climatic conditions. Altitude ranges from 3000 m. to 600 m.; annual rainfall from 1900 mm. to 400 mm.

The range of climatic conditions is reflected by a distinctive zoning of the natural vegetation which can be used as a climatic guide to agricultural planning.

There is very little vegetation in Kenya which has not been directly or indirectly influenced by the human population and it is necessary to combine 'climax' types with secondary types which have been produced by cultivation and fire. Impeded drainage areas, which are extensive in Narok district, frequently carry a specialised vegetation type and are therefore mapped separately.

A large part of the district, i.e. all that portion north of latitude 1°15" south is included in the Directorate of Overseas Surveys Land Resources Division Ecological Survey of S.W. Kenya. Full use has been made of the D.O.S. maps though for present purposes a considerable simplification of detail has been necessary. Time has not permitted the intensive attention to detail which has been possible during the thirteen years of work to date on the D.O.S. survey. No less than fifty vegetation types are recognised in the part of Narok district included in the D.O.S. maps. Reduction to eighteen types for present purposes is considered to be the minimum. For clarity at the scale used ecotones have not been mapped and have been merged into the type indicating the lower land potential in all cases. This will be noted in the examples of the Nkuruman and Ol Soit Ololol (Siria) escarpments.

The vegetation classification used in the D.O.S. survey combines phenological, physiognomic and floral characteristics. Vegetation types used here are correlated with the D.O.S. types and physiognomic terms follow current definitions as used in the Kenya National Atlas (1970 Edition).

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2. NAROK VEGETATION TYPES

2.1 LIST OF THE MAPPED TYPES

The numbers are those used on the map.

1. BAMBOO AND BAMBOO/FOREST MIXTURES.
2. FOREST.

Vegetation types derived from FOREST.

3. Evergreen and semi-deciduous bushland.
4. Acacia and Acacia - Combretum woodland and wooded grassland.
5. Grassland.
6. Evergreen clump grassland.
7. Mountain scrub

8. EVERGREEN AND SEMI-DECIDUOUS BUSHLAND.

Vegetation derived from EVERGREEN AND SEMI-DECIDUOUS BUSHLAND.

9. Grassland

10. SEMI-EVERGREEN THICKET AND ASSOCIATED TYPES.

Vegetation derived from SEMI-EVERGREEN THICKET

11. Bushed and wooded grassland.
12. Grassland.

13. ACACIA WOODLAND ON RECENT ALLUVIUM.

14. ACACIA-COMMIPHORA BUSHED AND WOODED GRASSLAND.

Vegetation of soils with impeded drainage.

15. Grassland on clay plains.
16. Evergreen clump grassland.
17. Grassland in drainage lines and swamp areas.

18. MONTANE GRASSLAND.

2.2 DESCRIPTION AND ECOLOGICAL SIGNIFICANCE OF VEGETATION TYPES.

2.2.1 Bamboo and Bamboo/Forest Mixtures. Mapped Vegetation Type No. 1

a. Floral Composition.

This high mountain vegetation is dominated by Arundinaria alpina the 'Mountain Bamboo.' A. alpina often forms dense thickets of which there are 51,000 hectares on the Mau Range. Of this total at least 20,000 hectares occur in Narok district.

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The dense bamboo thickets occur between 2400 - 3000 m. altitude. As forest mixtures with Podocarpus milanjianus and Juniperus procera bamboo occurs down to 1860 m.

b. Rainfall.

Annual rainfall over 1500 mm. is received.

c. Soil

This vegetation type attains its maximum development on deep volcanic soils rich in humus. See section 3 for soil analysis.

d. Land use and potential.

Bamboo poles are widely used for building purposes. Within the forest reserves bamboo thickets have a valuable catchment protection role. Little or no clearing of bamboo has been carried out in this district. Land potential is limited by the low temperatures associated with high altitude.

2.2.2 Forest. Mapped Vegetation Type No. 2.

a. Floral Composition.

Vegetation of forest stature is produced on the Mau Range and the Loita Hills and at relatively lower altitudes in the Trans-Mara area.

In the wetter mountain evergreen forests characteristic tall trees are Juniperus procera, Podocarpus milanjianus, Olea hochstetteri, Cassipourea malosana, and Nuxia congesta. The lower, drier parts of the mountain forests often are dominated by Juniperus procera.

Forests at lower altitudes in Trans-Mara are mainly semi-deciduous and include Diospyros abyssinica/Olea africana types.

The Narok forests appear as a heterogeneous mosaic of zones and communities influenced by differences in rainfall, soil and aspect.

It has not been considered necessary to define the many different forest zones for this survey. A detailed analysis will be found in the D.O.S. maps.

b. Rainfall.

The forested area of the Mau Range receives 730 mm. of rain at its lower reaches and over 1900 mm. at high altitudes. The Trans-Mara forest area receives at least 1300 mm. annual rainfall.

The Loita forest is difficult to assess as the rainfall station at Morijo returned low annual totals averaging 639 mm. A new rainfall station at Naikara has recorded an annual average of 637 mm. over four years.

It is probable that the Loita forest is a 'mist' forest and dependent on 'occult' precipitation i.e. moisture

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not received as measurable rain. This moisture would not be precipitated if the forest cover were removed.

c. Soil.

Some of the best and most productive soils of the district occur in the forest areas. They include the deep volcanic dark brown loams of the Mau, the dark red friable clays of Trans-Mara and the red friable clays of the Loita Hills. For analyses of typical forest soils see Section 3

d. Land use and potential.

The forest areas have been much reduced by the traditional grass burning habits of the Masai. The remaining forest represents a valuable asset but only a small proportion is gazetted forest reserve. Most of the surviving forest is not protected in any way and is rapidly being destroyed, particularly by cultivators in the eastern Mau. There can be no doubt as to the necessity for retention of vital catchment protection forest in the Mau Range and the Loita Hills.

The necessity for removal of much of the forest to provide high potential arable land must also be accepted.

There is a most urgent need to review the catchment protection policy in this district and to ensure that adequate forest areas are preserved in time. This does not necessarily mean solely catchment protection but the maintenance of forests on a multiple land use basis. Producing a sustained output of water, timber, grazing and wildlife a well-managed forest will tend to be regarded as a valuable economic asset and its preservation will be acceptable to the people.

The Narok forested and ex-forested areas contain the only undeveloped arable lands remaining in Kenya (apart from areas in other districts where irrigation will be required). In the Narok hills the range of crops will be restricted by low temperatures at the higher altitudes but this factor will not be limiting in the Trans-Mara.

Increasing cultivation of the forest lands will effectively remove much of the high potential grazing lands which are the traditional Masai dry season pastures.

2.2.3 Vegetation types derived from forest. Mapped Vegetation Types Nos. 3, 4, 5, 6 and 7.

These secondary physiognomic vegetation types have been mapped separately as their development potential differs widely. Their forest derivation has been deduced from the presence of surviving true forest plant species scattered throughout the types. Often only occasional forest trees survive; frequently in situations where they have been protected from fire. Sometimes only understorey species survive.

Climatic conditions will remain largely similar to those of the original forest area. An exception will be noted in the Loita Hills where drier conditions may prevail following forest removal.

Forest soils become rapidly modified when the supply of humus diminishes and when they are exposed to rain and sun.

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The forest-derived vegetation types of Narok give easy access to the favourable climatic conditions characteristic of the forest and it is in these areas that the new cultivation of recent years has been concentrated.

(i) Evergreen and semi-deciduous bushland. Mapped Vegetation Type No. 3.

Much former forest land in the Mau and Loita Hills is occupied by this vegetation type. Botanically it is usually very similar to the 'climax' evergreen bushland (Vegetation Type No.8 on map) but is distinguished by the presence of forest plant species. Forest-derived evergreen bushland may merge into true evergreen bushland at the lower limits of former forest land. This vegetation type, in common with the 'climax' bushland, is frequently dominated by Tarchonanthus camphoratus ('leleshwa'). The density of the bushland varies and it includes much high potential grazing land. Land preparation for cultivation involves a considerable amount of bush clearing particularly when the bushland is Tarchonanthus dominated.

(ii) Acacia and Acacia-Combretum woodland and wooded grassland. Mapped Vegetation Type No. 4.

Derived from forest by regular burning over long periods there are substantial areas occupied by these types. Acacia lahai woodland and wooded grassland is a notable representative of these types and the excellent grass cover includes Pennisetum clandestinum and Cynodon dactylon. Combretum species including C. binderianum are characteristic of the grassland types in Trans-Mara and the Loita Hills, in both areas towards the Tanzanian border.

(iii) Grassland. Mapped Vegetation Type No. 5.

The final forest-land product desired by the Masai as a result of their traditional grass burning practice. While regular grass burning continues this grassland type is usually dominated by Themeda triandra. Without burning a coarse grass phase with abundant Pennisetum schimperi and P. catabasis develops.

(iv) Evergreen clump grassland. Mapped Vegetation Type No.6.

A vegetation type producing an unusual and striking pattern on air photographs and difficult to distinguish from mapped vegetation type No. 16. The pattern in both cases is one of uniformly distributed rounded bush clumps in grassland. It is assumed that both clump patterns develop on old termite mounds. The mound vegetation includes forest species and escapes the full effect of the grass fires.

Soils include fertile red friable clays which have been extensively cultivated in the Angata Baragoi area.

(v) Mountain scrub. Mapped Vegetation Type No. 7.

The D.O.S. physiognomic term has been retained as most suitable for this typical mountain vegetation.

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Characteristic woody plants are Hypericum lanceolatum, Lasiosiphon glaucus, Berberis holstii, Clutia abyssinica, and C. robusta.

Even at the high altitude (over 2700 m.) Themeda triandra is often the dominant grass. The unpalatable coarse grass Eleusine jaegeri forms large colonies. Extensive areas in this vegetation type have been ploughed for wheat production.

2.2.4. Evergreen and semi-deciduous bushland. Mapped Vegetation Type No. 8.

a. Floral Composition.

Characteristic plants of this bushland type are Tarchonanthus camphoratus, Olea africana (usually somewhat stunted), Acokanthera friesiorum, Euphorbia candelabrum, Rhus natalensis, and Boscia angustifolia. Tarchonanthus is dominant through large areas of what is the most widespread vegetation type in Narok district.

b. Rainfall.

Annual rainfall ranges from 500 mm. at the drier reaches of this type to 600 mm. where the bushland merges into the forest lands.

c. Soil.

Most of the evergreen bushland has developed on brown calcareous loams of volcanic ash origin. Details of typical soils are included in Section 3.

d. Land use and potential.

The evergreen and semi-deciduous bushland and derived grasslands provide much of the traditional wet season grazing for the Masai. The bushland itself varies considerably in density and includes much valuable grazing.

Tarchonanthus has attracted attention as a bush control problem and there is useful information on control methods available.

Given improved pasture management and adequate bush control the evergreen bushland could be far more productive than at present. Generally the grazing value is decreasing with increase in bush density. Intensive over-grazing results in very little grass burning and opening up of the bushland. The area is distinctly marginal for cultivation.

2.2.5 A vegetation type derived from evergreen and semi-deciduous bushland. Mapped Vegetation Type No. 9.

The major open grasslands of the district are of this type and include the extensive grasslands of the Loita Plains and the relatively limited Suswa Plain grasslands.

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The grasslands are fire-induced and single relic specimens of Boscia angustifolia may be the only large woody plants. Grass species include Themeda triandra, Pennisetum mezianum, P. schimperi, Sporobolus discosporus, Eragrostis braunii, E. tenuifolia, Aristida adscensionis, Harpachne schimperi, and Microchloa kunthii.

Themeda triandra is dominant when the grasslands are in good condition and burned over regularly. Under conditions of heavy over-utilisation Pennisetum schimperi and Harpachne schimperi become dominant.

In the absence of regular burning there is a tendency for the open grasslands to be invaded by the woody species of the evergreen bushland. This process can be observed in various places; in the Maji Moto area, for example, the grassland is rapidly reverting to bushland.

The climatic conditions of the grassland are similar to those of the drier parts of the evergreen bushland.

2.2.6 Semi-evergreen thicket and associated types. Mapped Vegetation Type No.10.

a. Floral composition

Many of the botanical components of the evergreen bushland occur here. Higher rainfall produces a much richer flora and it is considered that this type has affinities with the thicket vegetation of the Lake Victoria region and in fact may be regarded as an extension of that type.

In addition to many of the evergreen bushland species, the following are characteristic: Euclea divinorum, E. schimperi, Acacia brevispica, Ziziphus mucronata, Haplocoelum foliolosum, Teclea nobilis, Pterolobium stellatum, Securinega virosa, Scutia myrtina, Albizia schimperiana, A. petersiana, Croton dichogamus.

b. Rainfall

Annual rainfall of at least 750 mm.

c. Soil

Brown clay soils, seasonally waterlogged, but rather better drained than the true black clays, carry this vegetation type. In the Mara River - Keekorok area a mosaic of brown and black clays reflects the drainage pattern.

d. Land use and potential

The thicket as such is of little value except that in the Masai - Mara Game Reserve the surviving thicket patches provide food for browsing game and the thickets provide cover for various animals, particularly lion. This vegetation type is the 'lion bush community' of Fraser Darling (1960).

Very little thicket vegetation survives as most has now been burned out by grass fires. Elephant have also played a part by breaking up the thicket and making paths through it, thus enabling fire to penetrate.

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The Masai-Mara Game Reserve is rapidly becoming open grassland as the intense fires regularly sweep through.

The diversity of wildlife available in the area is likely to be reduced by the changing habitat. Elsewhere the land formerly occupied by thicket vegetation is high potential rangeland but cultivable with difficulty because of the heavy clay soils.

2.2.7 Vegetation types derived from semi-evergreen thicket. Mapped Vegetation Types 11 and 12.

Where mapped these fire induced secondary physiognomic vegetation types have replaced almost all the original thicket. Some patches survive on hillsides, in depressions, in gullies, and in other situations where they are protected from fire.

(i) Bushed and wooded grassland. Mapped Vegetation Type No. 11.

The more fire resistant species of the thicket vegetation survive for a considerable time and perhaps indefinitely depending on the intensity of grass fires.

(ii) Grassland. Mapped Vegetation Type No. 12.

Regular intense fires produce open grassland with few scattered trees; here again Boscia may be the only survivor. This process will be noted as complete in much of the Game Reserve. The grassland, as usual, is dominated by Themeda triandra and thicket indicator species may be entirely restricted to water courses.

2.2.8 Acacia. Woodland on recent alluvium. Mapped Vegetation Type No. 13.

This vegetation type has been mapped not so much for its ecological importance but because it is such a conspicuous element of the Narok landscape. Many rivers, both permanent and seasonal, have a fringe of tall (20 m.) Acacia xanthophloea and A. kirkii. Pluchea ovalis is often present as an undershrub - usually in saline areas where Sporobolus spicatus also occurs.

2.2.9 Acacia-Commiphora bushed and wooded grassland. Mapped Vegetation Type No. 14

a. **Floral Composition.**

Characteristic species are Acacia mellifera, A. nilotica, A. etbaica, A. thomasii, A. tortilis (the latter is locally common especially near water courses), Commiphora africana, C. campestris, C. schimperi, Albizia anthelmintica, and Delonix elata.

Typical grasses are Cenchrus ciliaris, C. setigerus, Sporobolus helvolus, Lintonia nutans, Chloris roxburghiana, Bothriochloa radicans, and Eragrostis superba.

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b. Rainfall.

The average annual rainfall is 375-500 mm.

c. Soil.

Mainly brown calcareous loams.

d. Land use and potential.

This vegetation delimits the only true 'semi-arid' areas of Narok and is restricted to the Rift Valley along the eastern district boundary. During the wet season this area is grazed intensively by Masai stock. Extremely heavy tsetse infestation prevents grazing of this type at the foot of the Nkuruman escarpment in the Lorsuete Hills area.

Very good grass develops on the deeper soils between the lava ridges on the floor of the Rift Valley and Sporobolus helvolus is often dominant. This is a favourite wet season grazing area of the Masai and in parts, particularly near permanent water, the area is much over-utilised with destruction of valuable grassland.

2.2.10. Vegetation of soils with impeded drainage. Mapped Vegetation Types 15, 16 and 17.

The D.O.S. vegetation classifications is followed here in segregating the more specialised vegetation types which develop under impeded drainage conditions. These are not regarded as major climatic vegetation types.

(i) Grassland on clay plains. Mapped Vegetation Type No. 15.

Grasslands on black clay are well represented in Narok district. While most extensive in the true 'plains area' they also occur up to 2000 m. altitude in the Loita Hills. When regularly burned Themeda triandra is often dominant but other grasses typically present include Pennisetum mezianum, P. stramineum, Bothriochloa insculpta and Setaria phleoides.

Frequently Acacia drepanolobium forms extensive colonies, depending on the degree of grass burning.

When wet the soils are very sticky and when dry they are hard and difficult to break.

These grasslands are best utilised for dry season grazing as during the rains stock trampling damages the grass cover.

(ii) Evergreen clump grassland. Mapped Vegetation Type No. 16.

A similar vegetation pattern to Vegetation Type No. 5. Type No. 16 is the result of the combined factors of impeded drainage and fire. The mound soils are better drained and support well-developed woody vegetation. The grassland soils are typical impeded drainage types and include black clays. Soils are usually rather shallow with laterite close to the surface. Grass species include those of the clay plains and additionally Imperata cylindrica and Panicum coloratum are common, together with Hyparrhenia dissoluta and

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Hyparrhenia filipendula. The very shallow soils have much Loudetia arundinacea and Cymbopogon excavatus. Numerous sedges are also common.

This vegetation type provides good dry season grazing.

(iii) Grassland in drainage lines and swamp areas. Mapped Vegetation Type No. 17.

Limited areas of these types occur in Narok district. A notable large swamp occurs near Entasekera in the Loita Hills and under very dry conditions this swamp provides useful forage.

On the Mau Range the swamp and drainage line areas reduce the effective areas available for cultivation.

2.2.11 Montane Grassland. Mapped Vegetation Type No. 18.

a. Floral composition.

The D.O.S. term has been retained for this typical mountain vegetation.

While not true afro-alpine moorland this vegetation type includes a number of plant species of the moorland flora. Erica arborea, Stoebe kilimandschariaca, and Artemisia afra are common. In valley bottoms giant lobelias, Lobelia gibberoa and L. aberdarica occur.

Up to at least 2700 m. Themeda triandra is often a dominant grass. Other grasses include Pennisetum clandestinum, Digitaria scalarum, Cynodon dactylon, Agrostis keniensis, Andropogon chrysostachyus, Pennisetum schimperi, Eleusine jaegeri and Sporobolus africanus.

b. Rainfall.

The montane grasslands receive considerably less rain than the mountain forest areas. Records at Mau Narok show average annual rainfall of just over 1000 mm.

c. Soil.

Dark brown loams derived from volcanic tuff and ash.

d. Land use and potential.

In Narok district the Masai have made limited use of the high mountain grasslands. Much of the Mau Narok farming area has been developed in this vegetation type. A high potential area, ideally suited to grain/ley rotation.

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2.2.12. Correlation of vegetation types with the D.O.S. survey types and with eco-climatic zones.

Vegetation Type Mapped	D.O.S. Vegetation Types	Eco-climatic Zones (1)
1	59, 51a, 51b, 41	2
2	42, 42e, 42f, 39, 27, 27a, 27d, 27e, 18	2
3	13C	2
4	5, 5a, 49b, 17A, 16B, 16E	2
5	2, 2a, 2c	2
6	17, 17a, 17c	2
7	16, 16A, 16B (in part)	2
8	13, 13b, 13h, 13i	4
9	1, 1b, 10a, 10b	4
10	24, 24a, 24c	3
11	52	3
12	10a (in part)	3
13	30	various
14	55c	5
15	47, 47a, 47d	various
16	8a	3
17	9	3
18	3a	2

(1) For explanation of eco-climatic zones, see Kenya National Atlas 3rd Edn (1970) p.28.

2.2.13 Map preparation

The vegetation map was produced from ground and air observations and air photograph interpretation. South of lat. 1°15'S., and east of long. 36°00'E. air photographs dated 1967 were used. The D.O.S. sheets used as a basis elsewhere were prepared from older air photographs.

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3. SOILS

It has been possible to select a number of soil analyses from Glover (1966) which are typical of certain of the mapped vegetation types.

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Vegetation Type No. Soil Type Locality. Altitude.	Depth cm.	Percentage Carbon Uncorrected 1/	N (%)	C/N	Organic matter (%)	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	pH	Extractable bases 2/ K	Na
Veg. Type No. 1	0-8	6.45	0.720	11.9	12.9	4.1	43.4	17.7	21.9	5.5	1.95	0.15
Dark brown loam	32-40	4.22	0.510	11.0	8.4	5.7	37.6	26.5	21.8	5.5	1.95	0.20
Doboti. 2940 m.	65-75	2.98	0.340	11.6	6.0	7.0	29.9	42.9	14.2	6.0	1.95	0.10
Veg. Type No. 2	0-8	13.48	1.285	14.0	27.0	4.3	37.3	17.9	13.5	7.2	4.50	0.39
Dark brown loam	8-16	6.40	0.680	12.5	12.8	7.9	35.1	28.8	15.4	7.5	3.35	0.14
W. of Olokurto (Mau)	32-40	2.48	0.235	14.0	5.0	8.5	22.1	31.9	32.5	7.5	3.80	0.19
2880 m.	64-72	0.96	0.130	9.8	1.9	9.0	20.8	22.2	46.1	7.4	6.45	0.14
Veg. Type No. 2	0-8	7.26	0.660	14.6	14.5	45.4	27.3	4.4	8.4	8.0	1.60	0.33
Dark red friable clay	18-25	1.38	0.140	13.1	2.8	55.3	22.3	9.4	10.2	8.3	1.10	0.13
Endama, Trans-Mara	40-55	0.65	0.065	13.3	1.2	58.1	17.2	11.1	12.4	8.1	1.90	0.15
1620 m.												
Veg. Type No. 2	0-8	5.10	0.500	13.6	10.2	29.8	29.4	2.0	28.6	6.8	3.20	0.40
Red friable clay	32-40	2.38	0.225	14.1	4.8	29.0	19.9	5.9	40.4	6.6	1.37	0.25
Entasekera (Loita)	80-85	1.70	0.105	22.5	3.4	24.8	19.5	5.1	47.2	6.5	0.90	0.25
2190 m.												

1/ Percentage carbon uncorrected by the Walkley-Black method.

2/ Extractant used: Neutral ammonium acetate solution.

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Vegetation Type No. Soil Type Locality. Altitude.	Depth cm.	Percentage Carbon Uncorrected 1/	N (%)	C/N	Organic matter (%)	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	pH	Extractable bases 2/ K	Na
Veg. Type No. 6 Darkred friable clay Siria Plateau 1980 m.	0-8	1.35	0.130	13.8	2.7	18.3	31.6	21.2	26.2	6.2	0.80	0.52
	32-40	0.85	0.085	13.3	1.7	17.0	31.1	18.9	31.3	6.3	0.45	0.74
	50-58	0.31	0.065	6.3	0.6	14.7	33.2	20.0	31.5	6.4	0.65	0.64
	80-90	0.32	0.045	9.4	0.6	27.4	29.1	25.5	17.4	6.7	1.75	1.19
Veg. Type No. 7 Dark brown loam 2850 m.	0-8	8.44	0.745	15.0	16.9	13.3	32.3	17.8	19.7	6.8	2.65	0.15
	16-25	3.94	0.335	15.6	7.9	18.6	30.2	30.5	12.8	6.8	2.20	0.10
	55-63	2.02	0.155	17.3	4.0	9.7	25.5	28.4	32.4	5.9	1.60	0.15
Veg. Type No. 9 Dark brown calcareous loam S.E. of Ngorengore 1860 m.	0-8	2.37	0.210	15.0	4.7	3.4	36.9	33.7	21.3	6.7	1.90	0.29
	31-41	0.93	0.095	13.0	1.9	4.3	37.0	26.4	30.4	6.2	3.00	0.19
	69-76	0.26	0.045	7.7	0.5	4.5	29.7	50.6	14.7	6.9	4.30	3.24
Veg. Type No. 15 Black clay Ololomei plains 1650 m.	0-8	3.13	0.225	18.5	6.3	14.9	36.0	26.8	16.0	6.8	2.90	0.69
	13-24	1.46	0.150	12.9	2.9	5.7	25.7	11.3	54.4	7.5	5.65	3.74
	35-50	0.91	0.115	10.5	1.8	3.4	27.1	26.9	40.8	8.7	6.25	6.59
	60-70	0.49	0.070	9.3	1.0	4.4	29.9	37.9	26.8	8.9	6.65	7.74

1/ Percentage carbon uncorrected by the Walkley-Black method.

2/ Extractant used: Netural ammonium acetate solution.

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4. NAROK DISTRICT DEVELOPMENT PLAN

4.1 PLAN PREPARATION

The Narok District Development Plan is in active preparation at present (July 1972). The Kenya Government is to make application for I.B.R.D. funds to finance district development.

4.2 DEVELOPMENT ZONES. (MAP IN FIG. 1)

A preliminary draft of the vegetation map was supplied to the working party responsible for production of the Development Plan and the following provisional development zones have been recognised:

A. Trans Mara. A mainly arable area suitable for maize/ley rotation. Stock farming could make use of the impeded drainage areas.

B. Mara Game Reserve. Status to remain unchanged.

C. Central Area. This includes the Loita Plains, the Siana Plains, the Suswa area etc. Ranching, tourism and game utilisation are the best land use indicated here.

D. Loita Highlands. An area of high potential where mixed farming could be introduced at a later stage.

E. Loita Forest. Should be preserved and exploited on a multiple land-use basis - water protection, game hunting, tourism and, dry season grazing in specific areas.

F. Nguruman Escarpment. To be developed in conjunction with area E.

G. Mau Forest. Extension of the existing forest reserves to be considered - particularly from the catchment protection aspect.

H. Upper Mau. A mixed farming area on a grain/ley rotation.

I. Lower Mau. Also a mixed farming area but of probably rather lower potential than H. A grain/ley rotation indicated.

4.3 DEVELOPMENT PROBLEMS

Apart from the obvious need to conserve vital catchment forests there are other rather basic land use problems. These arise from the change from nomadic pastoralism to cultivation which is occurring over large parts of Narok district. The areas involved were formerly the high potential dry season grazing lands. There is thus an increasing loss of this grazing land and unless this is accompanied by stock reduction and improved livestock management it will result

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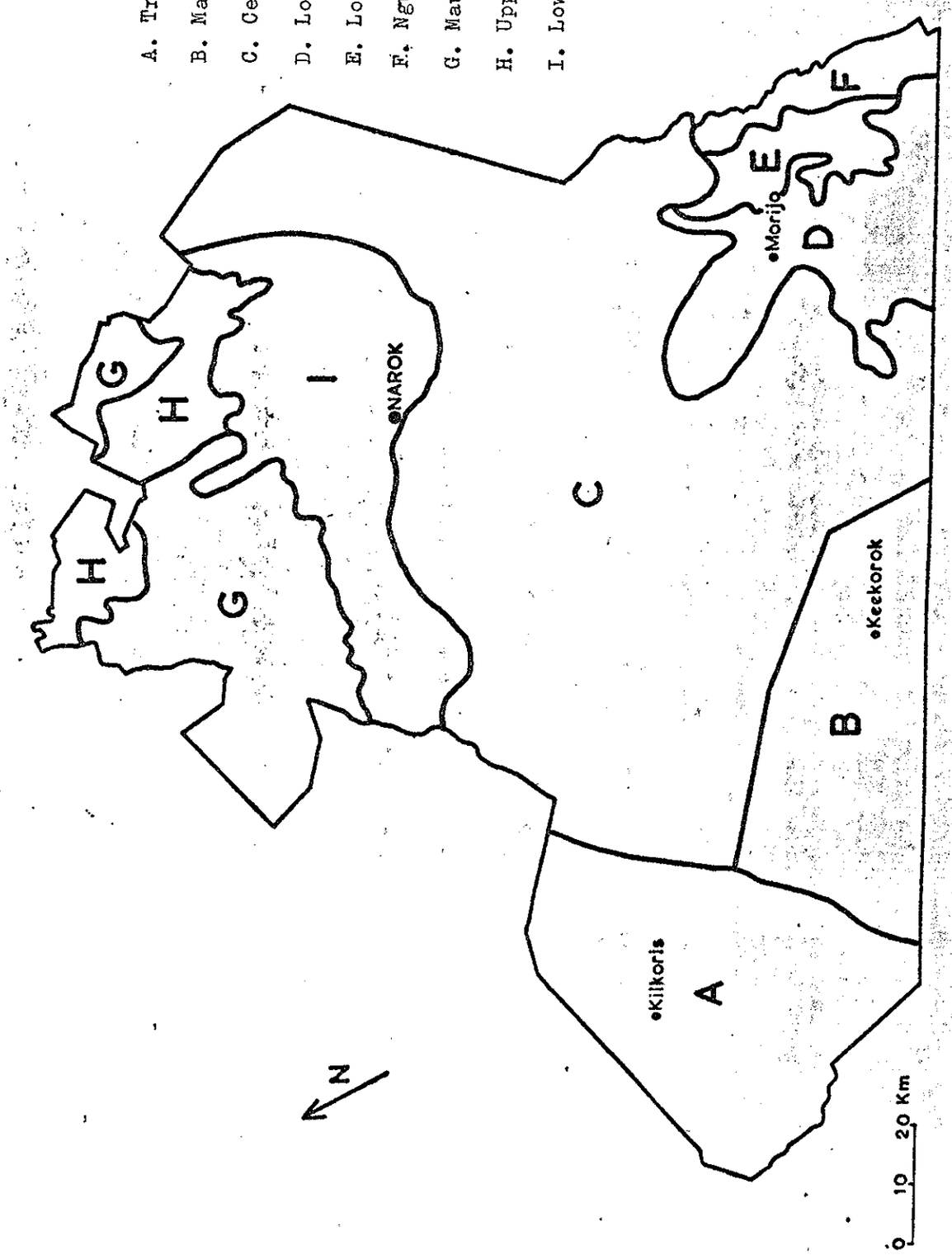
Figure 1. Outline map showing development zones in Narok for preliminary Land Use Plan.



in disastrous overstocking of the remaining range areas. There are signs that this is already happening. Effects on wildlife will also be substantial with over-concentration of game and the problems which arise in protecting crops against game.

5. SOURCES OF INFORMATION ON NAROK DISTRICT

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