TRANS NZOIA DISTRICT

Contents

NATURAL POTENTIAL

INTRODUCTION

The Trans Nzoia District is the continuation of the fertile Uasin Gishu Plateau beyond ("trans") the Nzoia River. This part of the plateau has higher rainfall than most parts of the Uasin Gishu (annual average 1 000–1 200 mm compared to 900–1 000 mm there). It is the best zone in the country for maize and sunflower (UM 4) as the climate is ideal for late maturing hybrids. They grow together during the entire agro-humid period of both rainy seasons. It was therefore not reasonable to draw a rainfall reliability map of the first rains, as in other districts; it was better to show the reliability of rainfall in the total agro-humid period, which lasts from March to November/December in the UM 4. An expectation of getting 900 mm or more during that time in at least 6 out of 10 years (and not much less in the other 4 years) is a good position for maize cultivators (compare Crop List, Vol. IIA).

The altitude on the plateau is mainly between 1 800–1 900 m, i.e. it is just on the upper end of the zone UM 4. Wheat and barley are already in the process of being tried and may be successful if grown after the heavy first rains, to minimize the risk of diseases, especially rust. But it is better to concentrate these crops on the slightly higher Wheat/(Maize)–Barley Zone LH 3, although there is also the danger of rust there and late planting is advisable. The second rains start indistinctly around July (Table 1) and have their peak at the end of July/August. It is advisable to plant wheat or malt barley at the end of April to beginning of May so that the peak water demand in the growing of these crops will coincide with the rainfall peak. The 60 % rainfall reliability is then more than 600 mm, enough for a good yield.

The plain becomes drier towards the North due to the rain shadow of Mount Elgon and the Cherangani Hills, which changes the better zones to a transition of the Livestock-Barley and Livestock-Sorghum Zones. Barley means fodder barley in the general AEZ-System, but here it is not so recommended due to the availability of maize cobs or stalks.

It is difficult to divide the District into well-defined zones because many areas are transitional. The plain is bordered by mountain slopes or foot hills, parts of which are wet enough for Arabica coffee and, although at the upper limits for this crop, coffee cultivation here reaches the remarkable altitude of 2 150 m. However, the unimodal rainfall distribution and the sometimes relatively long dry season from October to February (the "small rains" in October/November are lacking) do not favour coffee. UM 3 – LH 3 and UM 2 – LH 2 in the map means coffee only on places with good, deep forest soils on microclimatically frost-free gentle slopes.

The District also grows tea, but good yields are obtained only in the very eastern part where it has a tea zone LH 1. Tea also occurs in zone LH 2 but the yields are fair to poor there.

5 NZOIA DISTRICT

TABLE 1: RAINFALL FIGURES FROM VARIOUS STATIONS

having at least 10 years of records up to 1976

No. and altitude	Name of Station	Years of rec.	Kind of rec.	Ann. rainf. mm	Monthly rainfall in mm Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
4001	Mt. Elgon, Forest	46	Average	1 236	23	48	78	156	161	118	169	176	98	98	74	39
25 m	Station		60 % rel.1)	1 110	6	17	58	132	143	99	141	160	95	78	52	18
4009	Elgon Downs,	40	Av.	1 045	17	33	58	141	143	98	134	150	90	86	61	34
20 m	Endebess		60 %	940	5	20	37	110	119	71	115	124	74	70	32	12
4010	O.H. Knight	30	Av.	1 047	15	27	64	151	142	103	145	145	86	77	65	26
73 m			60 %	941	5	14	46	135	133	86	114	139	53	58	30	11
4013	ADC Chorlini	49	Av.	1 048	15	34	62	145	146	103	137	153	82	83	62	26
41 m			60 %	942	5	20	47	122	120	91	116	141	68	58	29	11
35005	Kipkoitet,	54	Av.	1 086	27	34	66	134	133	105	160	164	93	71	60	38
20 m	Cherangani		60 %	972	10	17	49	107	100	88	136	142	68	62	35	14
35008	Kitale, N.A.R.S.	39	Av.	1 182	21	43	70	143	159	133	155	175	105	81	62	35
90 m	Farm		60 %	1 060	4	20	50	144	135	116	139	155	84	54	35	19
34008	Kimini, G. Vale Est.	59	Av.	1 286	25	51	83	166	183	132	139	166	133	95	71	38
829 m			60 %	1 150	6	29	51	149	158	103	130	138	107	73	28	15
34033	Kabewyan Est.	38	Av.	1 365	31	60	91	183	176	140	141	169	107	116	102	48
2 164 m			60 %	1 210	5	37	84	137	142	111	114	145	66	77	63	24
35043	Kaigamu Est.	43	Av.	970	20	31	66	123	117	99	139	149	70	63	66	27
1 920 m			60 %	870	2	12	44	108	121	86	121	128	53	50	38	13
35107	Kapsirowa Est.	34	Av.	1 136	31	38	58	118	133	108	159	181	102	78	85	49
2 140 m			60 %	1 020	13	13	43	98	117	87	142	172	86	68	57	18

1) These figures of rainfall reliability should be exceeded normally in 6 out of 10 years.

TABLE 2: TEMPERATURE DATA

No. and altitude	Name of Station	AEZ1)	Kind of records	Temperature in °C Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year	Y. of rec.
35001	Kitale, D.C.	UM 4	Mean max.	27.2	27.6	26.9	26.1	24.4	23.4	22.5	22.9	23.9	24.9	24.7	25.4	25.0	19
1 890 m	(operating	hp	Mean temp.	19.2	19.8	19.8	19.7	18.7	17.8	17.3	17.3	17.6	18.3	18.2	18.4	18.5	
	to 1951)		Mean min.	11.2	11.9	12.6	13.2	12.9	12.1	12.1	11.7	11.2	11.7	11.7	11.4	12.0	
			Abs. min.	7.8	7.8	7.2	7.2	7.1	8.6	7.8	7.2	7.8	8.9	8.9	6.7	6.7	
35008	Kitale,	UM 4	Mean max.	27.1	27.3	27.1	25.4	24.4	23.8	22.9	23.1	24.2	24.9	24.9	25.3	25.0	20
1 890 m	Agricultural	hp	Mean temp.	19.0	19.3	19.5	19.0	18.4	17.5	17.1	16.9	17.5	18.2	18.1	18.3	18.2	
	Department		Mean min.	10.9	11.3	11.8	12.6	12.3	11.2	11.2	10.7	10.8	11.4	11.2	11.2	11.4	
	N.A.R.S.		Abs. min.	7.0	6.7	3.9	7.2	8.9	7.2	5.6	5.6	6.0	7.0	6.1	7.5	3.9	
	Farm																
35024	Kitale, Met.	UM 4	Mean max.	27.1	27.1	26.2	25.2	24.6	24.0	22.9	23.5	24.4	24.8	24.4	25.8	25.0	5
1 895 m	Station	hp	Mean temp.	18.6	19.5	19.2	19.0	18.7	17.7	17.2	17.4	17.7	18.1	17.8	17.9	18.3	
			Mean min.	10.4	11.8	12.1	12.8	12.7	11.3	11.8	11.3	10.7	11.4	11.2	10.0	11.5	
			Abs. min.	6.4	7.4	8.0	9.8	9.7	8.5	8.1	8.6	7.9	8.0	7.5	6.4	6.4	
35076	Kitale,	UM 4	Mean max.	27.8	28.1	27.5	26.1	24.9	24.2	23.1	23.5	24.9	25.5	25.8	26.2	25.6	11
1 920 m	Airfield	hp	Mean temp.	18.7	19.0	19.3	19.3	18.6	17.7	17.2	17.2	17.6	18.2	18.0	18.2	18.2	
	(operating	to	Mean min.	9.5	9.9	11.1	12.5	12.2	11.1	11.2	10.9	10.3	10.8	10.2	10.2	10.8	
	to 1960)	UM 3	Abs. min.	4.2	5.0	6.9	7.7	8.3	7.2	7.1	6.4	5.3	4.9	5.8	5.3	4.2	
		lp															

TRANS NZOIA DISTRICT

TABLE 3: CLIMATE IN THE AGRO-ECOLOGICAL ZONES

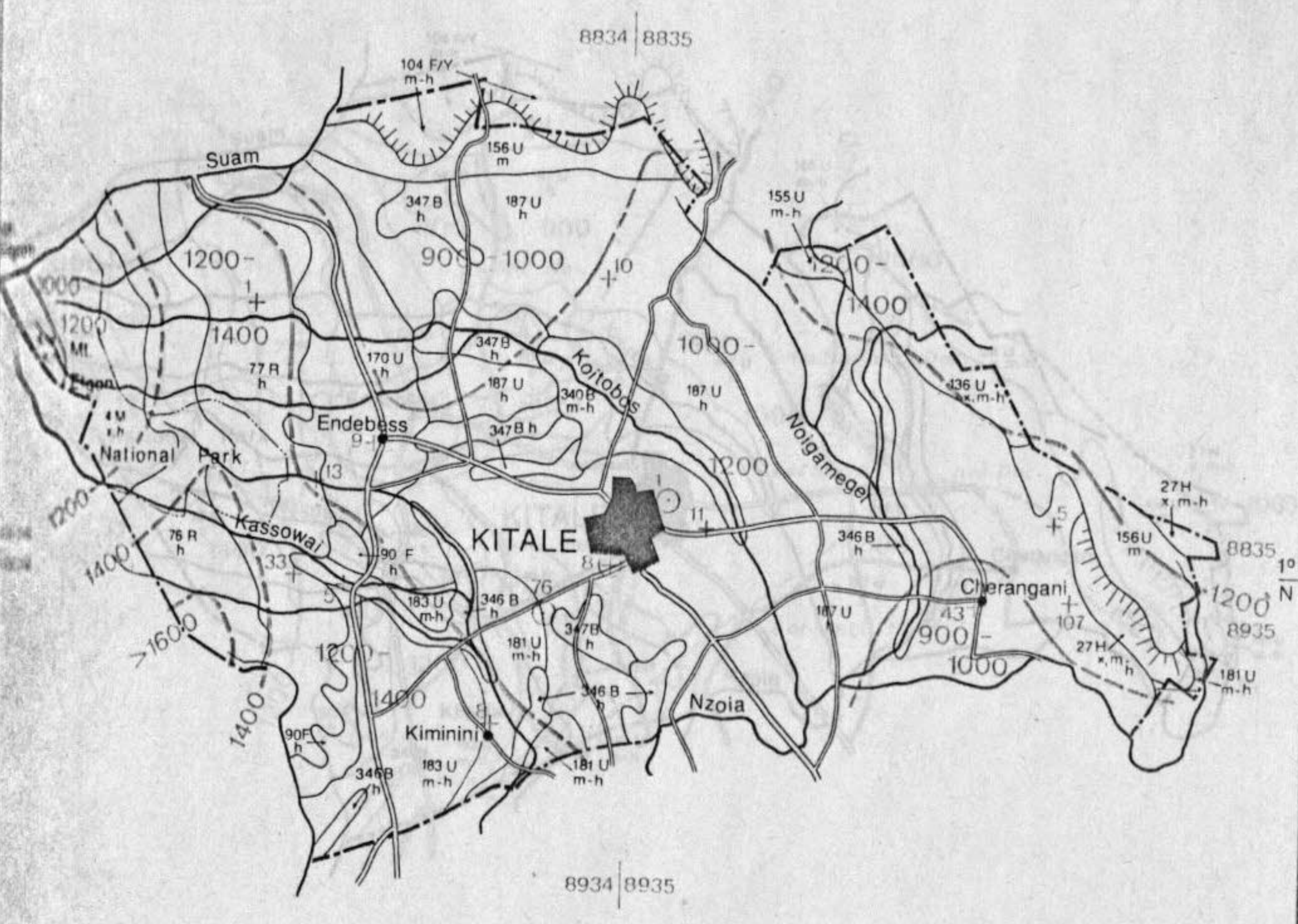
Agro-Ecological Zone	Subzone	Altitude in m	Annual mean temperature in °C	Annual av. rainfall in mm	60 % reliability of rainfall[1)] Tot. agrohum. per. in mm[2)]	60 % reliability of rainfall 2nd rains in mm	60 % reliability of growing period 1st rains[3)] in days	60 % reliability of growing period 2nd rains in days	60 % reliability of growing period Total in days
TA I and TA II Tropical Alpine Zones	Here National Park								
UH 0 Forest Zone	Here National Park or Forest Reserve								
UH 1 Sheep-Dairy Zone	p or l – m	Here mainly Forest Reserve because this timber land is too valuable to be cutted for grazing, or it is too slopy for cultivation							
UH 2 Pyrethrum-Wheat Zone	vl i or two	2 400–2 500	15.0–14.5	1 200–1 600	950–1 250	580–650	100 or more	170–200	270–300
LH 1 Tea-Dairy Zone	(vl) i or two	2 400–2 450	15.2–15.0	1 250–1 400	1 000–1 050	650–700	100 or more	190–210	290–310
LH 2 Wheat/Maize-Pyrethrum Zone	vl i or two	1 940–2 400	18.0–15.0	1 100–1 600	950–1 100	580–700	100 or more	170–200	270–300
	(vl/l) i or two			1 100–1 250	950–1 050	600–650	90 or more	170–180	240–280
LH 2 - UM 3 4) Wheat/Maize-Pyrethrum Zone to Marginal Coffee Zone	transitional	1 820–2 050	18.7–17.5	1 100–1 300	880–1 100	520–600	90 or more	150–160	250–260
LH 3 Wheat/(M.)-Barley Zone	vl/l or two	1 920–2 280	18.0–15.9	1 000–1 300	920–980	550–590	90 or more	140–160	230–260
	l/vl or two			950–1 100	880–980	420–620	90 or more	120–140	210–240
LH 3 - UM 3 4) Wheat/(M.)-Barley Zone to Marginal Coffee Zone	vl/l i or two	1 700–2 100	19.4–17.2	1 050–1 300	880–1 100	490–580	90 or more	140–160	230–260
LH 4 - UM 4 4) Cattle-Sheep-Barley Zone to Sunflower-Maize Zone	(l) i - (l/vl)	1 750–2 000	19.1–17.6	900–1 050	800–900	400–500	90 or more	110–130	200–230
UM 2	vl i or two	1 700–1 950	19.4–17.9	1 250–1 350	1 000–1 150	570–630	100 or more	160–190	260–290

35°E

AVERAGE ANNUAL RAINFALL

in mm

+SOILS



Temperature recording station, operating 1976, ⊙ closed

+ Rainfall recording station, operating 1976 and having at least 10 years of records

76 Station number in grid

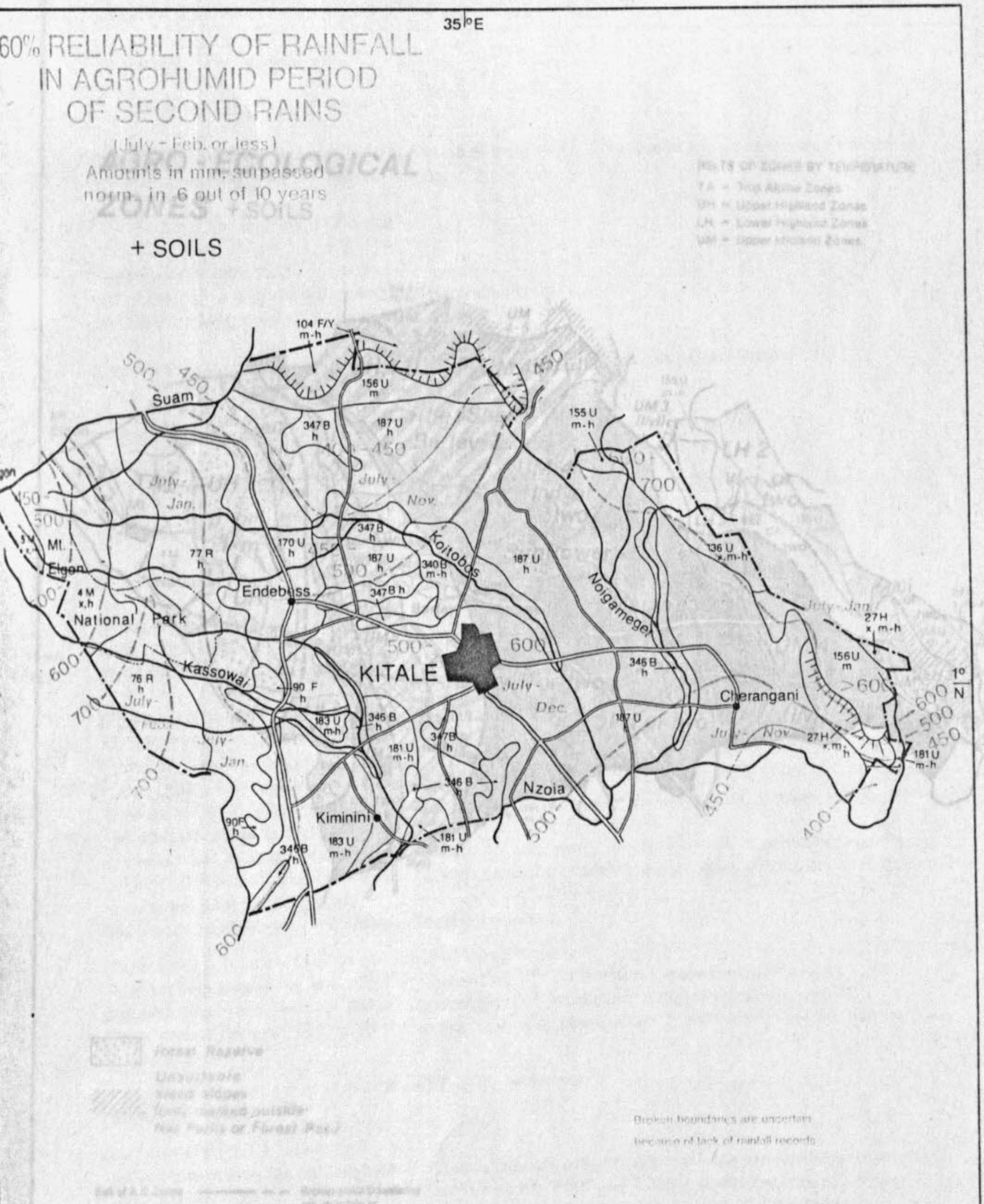
8934 Grid number

Broken boundaries are uncertain because of lack of rainfall records

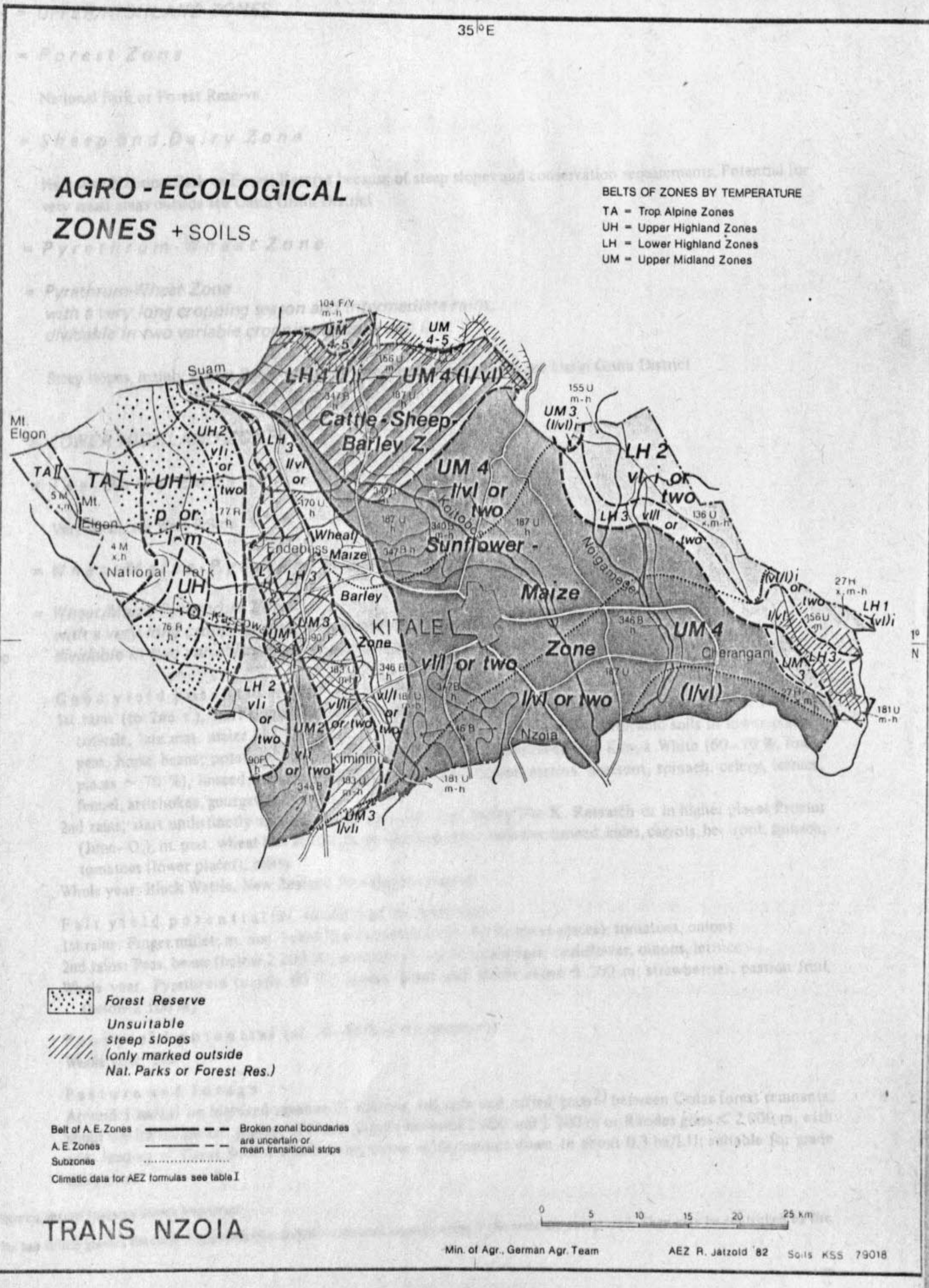
0 5 10 15 20 25 km

TRANS NZOIA

Min. of Agr., German Agr. Team, R. Jaetzold Soils KSS 79018



35°E
60% RELIABILITY OF RAINFALL
IN AGROHUMID PERIOD
OF SECOND RAINS
(July - Feb. or less)
Amounts in mm, surpassed
in 6 out of 10 years
+ SOILS
Suam
Mt. Elgon
National Park
Endebess
Koitobos
Noigameget
Kassowai
KITALE
Cherangani
Nzoia
Kiminini
July - Jan.
July - Nov.
July - Dec.
1° N
0 5 10 15 20 25 km
TRANS NZOIA
Min. of Agr., German Agr. Team, R. Jaetzold Soils KBS 79018



AGRO - ECOLOGICAL ZONES + SOILS
BELTS OF ZONES BY TEMPERATURE
TA = Trop. Alpine Zones
UH = Upper Highland Zones
LH = Lower Highland Zones
UM = Upper Midland Zones
35°E
1° N
Mt. Elgon
Suam
National Park
Cattle - Sheep - Barley Z.
LH 4 (l) – UM 4 (l/vl)
Sunflower - Maize Zone
Wheat/Maize Barley Zone
KITALE
Endebess
Kiminini
Nzoia
Noigameget
Koitobos
Cherangani
Forest Reserve
Unsuitable steep slopes (only marked outside Nat. Parks or Forest Res.)
Belt of A.E. Zones
A.E. Zones
Subzones
Broken zonal boundaries are uncertain or mean transitional strips
Climatic data for AEZ formulas see table I
0 5 10 15 20 25 km
TRANS NZOIA
Min. of Agr., German Agr. Team
AEZ R. Jätzold '82
Soils KSS 79018

= *TROPICAL-ALPINE ZONES*

Here National Park

= *UPPER HIGHLAND ZONES*

0 = *Forest Zone*

National Park or Forest Reserve

H1 = *Sheep and Dairy Zone*

Here also National Park or Forest Reserve because of steep slopes and conservation requirements. Potential for very small areas outside see Uasin Gishu District

H2 = *Pyrethrum-Wheat Zone*

H2
i
r two
= *Pyrethrum-Wheat Zone with a very long cropping season and intermediate rains, dividable in two variable cropping seasons and i.r.*

Steep slopes, mainly Forest Reserve. Potential for small areas outside see Uasin Gishu District

LH = *LOWER HIGHLAND ZONES*

LH 1 = *Tea-Dairy Zone*

Very small, see West Pokot

LH 2 = *Wheat/Maize-Pyrethrum Zone*

LH 2
vl i
or two
= *Wheat/Maize-Pyrethrum Zone with a very long cropping season and intermediate rains, dividable in two variable cropping seasons and i.r.*

Good yield potential (av. 60–80 % of the optimum)

1st rains (to 2nd r.), start norm. March: Late mat. wheat like Kenya Bongo (Apr./May–O./N.), late mat. triticale, late mat. maize like H 611 (e. of F./Apr.–S./N., ~ 80 % on deep volcanic soils in lower places); peas, horse beans; potatoes[1] (e. of Apr.–Au.); late mat. sunflower like Kenya White (60–70 %, lower places ~ 70 %), linseed, rapeseed; cabbages, kales, cauliflower, carrots, beetroot, spinach, celery, lettuce, fennel, artichokes, gourgettes

2nd rains, start undistinctly around end of June: M. mat. barley like K. Research or in higher places Proctor (June–O.), m. mat. wheat like R 200 (June–O.) and other varieties; linseed; kales, carrots, beetroot, spinach, tomatoes (lower places), celery

Whole year: Black Wattle, New Zealand Flax (higher places)

Fair yield potential (av. 40–60 % of the optimum)

1st rains: Finger millet; m. mat. beans like Cuarentino (50–60 %, lower places); tomatoes, onions

2nd rains: Peas, beans (below 2 200 m); potatoes (S.–D./J.); cabbages, cauliflower, onions, lettuce

Whole year: Pyrethrum (nearly 60 %); apples, pears and plums above 2 200 m; strawberries, passion fruit (below 2 100 m)

Poor yield potential (av. 20–40 % of the optimum)

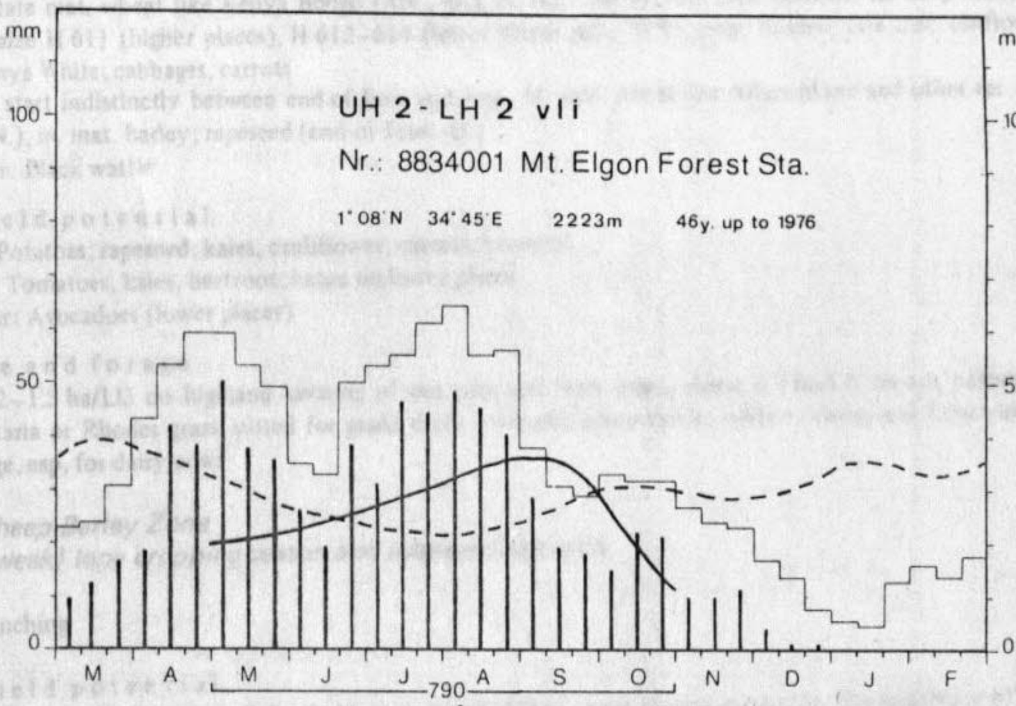
Whole year: Tea

Pasture and forage

Around 1 ha/LU on highland savanna of Kikuyu, red oats and tufted grass[2] between Cedar forest remnants; about 0.6 ha/LU on art. pasture of Nandi Setaria between 2 000 and 2 200 m or Rhodes grass < 2 000 m; with add. feeding of Giant Setaria and lucerne, clover or Lotononis down to about 0.3 ha/LU; suitable for grade dairy cows

1) Spraying against fungus diseases important

2) The bad tufted grasses Eleusine jaegeri and Pennisetum schimperi are expanding if the areas are overgrazed. They may be controlled by fire.



Average rainfall per decade | rainfall surpassed in 6 out of 10 years

Approx. pot. evapotranspiration of a permanent crop like pyrethrum

Approx. pot. evapotranspiration of l. mat. maize like H 611

790 Rainfall per indicated agrohumid season, surpassed in 6 out of 10 years

LH 2 = Wheat/Maize-Pyrethrum Zone
(vl/l) i with a (weak) very long cropping season and intermediate rains,
or two dividable in two variable cropping seasons and i.r.

Small, see Elgeyo Marakwet District

LH 3 = W h e a t / M a i z e - B a r l e y Z o n e

LH 3 = Wheat/Maize-Barley Zone
vl/l with a very long to long cropping season,
or two dividable in two variable cropping seasons

G o o d y i e l d p o t e n t i a l

1st rains, start norm. e. of March: M. mat. wheat like R 200 (70–80 %, e. of Apr.–S.) and other var.; m. mat. durum wheat, late mat. wheat like Kenya Bongo (70–80 %, Apr.–O.), m. mat. barley, late mat. triticale, on deep soils late mat. maize H 611 (higher places), H 612–614 (lower places); peas; linseed, rapeseed, late mat. sunflower like Kenya White; cabbages, carrots, kales, spinach

2nd rains, start indistinctly between end of June and Aug.: M. mat. wheat like Africa Mayo and other var. (m. June–N.), m. mat. barley; rapeseed (end of June–O.)

Whole year: Black wattle

F a i r y i e l d p o t e n t i a l

1st rains: Potatoes; cauliflower, carrots, beetroot

2nd rains: Tomatoes (lower places), kales, beetroot; beans (lower places)

Whole year: Avocadoes (lower places)

P a s t u r e a n d f o r a g e

Around 1.2 ha/LU on highland savanna of red oats and wire grass, about 0.6 ha/LU on art. pasture of Nandi Setaria or Rhodes grass; suited for grade dairy cows and grade cattle; subterr. clover, Lotononis and Silver leaf Desmodium (Desmodium uncinatum) as add. forage

3 = *Wheat/Maize-Barley Zone*
with a long to very long cropping season,
wo *dividable in two variable cropping seasons*

G o o d y i e l d p o t e n t i a l
1st rains, start norm. end of March: M. mat. wheat like R 200 (e. of Apr.–S.) and other var.; m. mat. durum wheat, late mat. wheat like Kenya Bongo (Apr.–O.), m. mat. barley, late mat. triticale, on deep soils late mat. maize H 611 (higher places), H 612–614 (lower places, 60–70 %); peas; linseed, late mat. sunflower like Kenya White; cabbages, carrots
2nd rains, start indistinctly between end of June and Aug.: M. mat. wheat like Africa Mayo and other var. (m. June–N.), m. mat. barley; rapeseed (end of June–O.)
Whole year: Black wattle

F a i r y i e l d p o t e n t i a l
1st rains: Potatoes; rapeseed; kales, cauliflower, carrots, beetroot
2nd rains: Tomatoes, kales, beetroot; beans on lower places
Whole year: Avocadoes (lower places)

P a s t u r e a n d f o r a g e
About 1.2–1.5 ha/LU on highland savanna of red oats and wire grass, about 0.7 ha/LU on art. pasture of Nandi Setaria or Rhodes grass; suited for grade dairy cows and grade cattle; subterr. clover and Lotononis as add. forage, esp. for dairy cows

H 4 = *Cattle-Sheep-Barley Zone*
) i *with a (weak) long cropping season and intermediate rains*

Mostly ranching

F a i r y i e l d p o t e n t i a l
1st rains, start norm. begining of April: M. mat. barley (other crops mostly marginal). The variability of rainfall is so high that crop failures occur from time to time, expecially on shallow soils in the northern parts. Ranching is therefore more advisable

P a s t u r e a n d f o r a g e
Around 2 ha/LU on nat. pasture of short grass highland savanna; down to 1 ha/LU on art. pasture of Rhodes grass (var. Elmba most recommended); suited for grade cattle; subterr. clover and m. mat. fodder barley like B 106 as add. forage

UM = *UPPER MIDLAND ZONES*

UM 2 = *M a i n C o f f e e Z o n e*

UM 2 = *Main Coffee Zone*
l i *with a very long cropping season and intermediate rains,*
or two *dividable in two variable cropping seasons and i.r.*

V e r y g o o d y i e l d p o t e n t i a l (av. more than 80 % of the optimum)
1st rains, start norm. March: Late mat. maize H 612–614 (~ 80 %, Mch.–O./N.); cabbages, kales
Whole year, best planting time March: Castor

G o o d y i e l d p o t e n t i a l
1st rains: Finger millet; sweet potatoes (lower places); late mat. sunflower like Kenya White (May–O., 70–80 %), m. mat. soya beans (lower places); onions, spinach, tomatoes
2nd rains, start indistinctly around July: E. mat. beans (~ 60 %), m. mat. sunflower like HS 301 A (lower places); onions (on light soils)
Whole year: Arabica coffee (~ 60 %, on good deep volvanic soils[3]), Macadamia nuts, passion fruit, avocadoes, mountain pawpaws, bananas (in valleys), guavas

F a i r y i e l d p o t e n t i a l
1st rains: M. mat. wheat and barley (nearly 60 %, in higher places, May/June–O.); beans[4]), potatoes, sweet potatoes (higher places)
2nd rains: M. mat. maize H 511–513 (50–60 %), 622, 632 (~ 50 %); potatoes, sweet potatoes; tomatoes
Whole year: Arabica coffee (on less suitable soils), bananas (outside valleys), citrus, taro (in valleys), yams

3) Yields relatively low because of unimodal rainfall and high elevation

4) Sometimes rotting because of too wet conditions

with a long to very long cropping season
dividable in two variable cropping seasons

Good yield potential
1st rains, start from end of March: M. mat. wheat like K 200 (e. of Apr. - S.) and other var., m. mat. durum wheat, late mat. wheat like Kenya Bongo (Apr. - D.), m. mat. barley, late mat. triticale, on deep soils late mat. maize H 611 (higher places), H 612, 613 (lower places, 60 - 70 %); peas, linseed, late mat. sunflower like Kenya Sunflower, onions, carrots
2nd rains, start indistinctly between end of June and Aug.: M. mat. wheat like Africa Mayo and other var. (in June - D.), m. mat. barley; rapeseed (end of June - O.)
Whole year: black wattle

Fair yield potential
1st rains: Potatoes, rapeseed, kales, cauliflower, carrots, beetroot
2nd rains: Potatoes, kales, beetroot; beans on lower places
Whole year: Avocadoes (lower places)

Pasture and forage
About 1.4 - 1.5 ha/LU on highland savanna of red oats and wire grass, about 0.7 ha/LU on art. pasture of Nandi setaria or Rhodes grass suitable for grade dairy cows and grade cattle; oathay, clover and Lotononis as add. forage esp. for dairy cows

= Cattle-Sheep-Barley Zone
with a weak long cropping season and intermediate rains

Mostly ranching

Fair yield potential
1st rains, start many, because of April: M. mat. barley (other crops mostly marginal). The variability of rainfall is so high that crop failures occur from time to time, especially on shallow soils in the northern parts. Ranching is therefore more advisable.

Pasture and forage
Around 2 ha/LU on nat. pasture of short grass highland savanna, down to 1 ha/LU on art. pasture of Rhodes grass (var. Elmo Anton recommended) suited for grade cattle, mainly clover and m. mat. fodder barley like B 106 as add. forage

UPPER MIDLAND ZONES

Main Coffee Zone

Main Coffee Zone
with a very long cropping season and intermediate rains
dividable in two variable cropping seasons and (+)

Very good yield potential (av. more than 80 % of the optimum)
1st rains, start from March: Late mat. maize H 6[illegible] (614 (> 80 % March - O./N.)); cabbages, kale
Whole year: best planting time March: Castor

Good yield potential
1st rains (higher places): Sweet potatoes (lower places); late mat. sunflower like Kenya White (May - O., 70 - 80 %); tomatoes
in mat. beans (lower places); onions, spinach, tomatoes
2nd rains, start indistinctly around June: L. mat. beans (> 60 %), m. mat. sunflower like EX 8 (A (lower places)); onions (on light soils)
Whole year: Arabica coffee (> 60 % on good deep volcanic soils[3]), Macadamia nuts, passion fruit, avocadoes, mountain papayas, bananas (in valleys), grasses

Fair yield potential
1st rains: M. mat. wheat and barley (mainly cf. 8. in higher places, May/June - O.); beans[4], potatoes, sweet potatoes (higher places)
2nd rains: M. mat. maize H 511, 513 (50 - 60 %), 622, 632 (> 50 %); potatoes, sweet potatoes; tomatoes
Whole year: Arabica coffee (on less suitable soils), bananas (outside valleys), citrus, taro (in valleys), yams

3) [illegible] relatively low because of coffee [illegible] and high altitude
4) [illegible] the planting of [illegible] wet conditions

P a s t u r e a n d f o r a g e
0.7–1 ha/LU on sec. pasture, around 0.5 ha/LU on art. pasture of Rhodes grass; down to 0.16 ha/LU feeding Napier & Bana grass; Silver leaf Desmodium (D. uncinatum) best fodder legume (for rotation and dairy cows)

UM 3 = M a r g i n a l C o f f e e Z o n e (here Coffee-Maize Zone)

UM 3 = Marginal Coffee Zone
vl/l i with a very long to long cropping season and intermediate rains,
or two dividable in two variable cropping seasons and i.r.

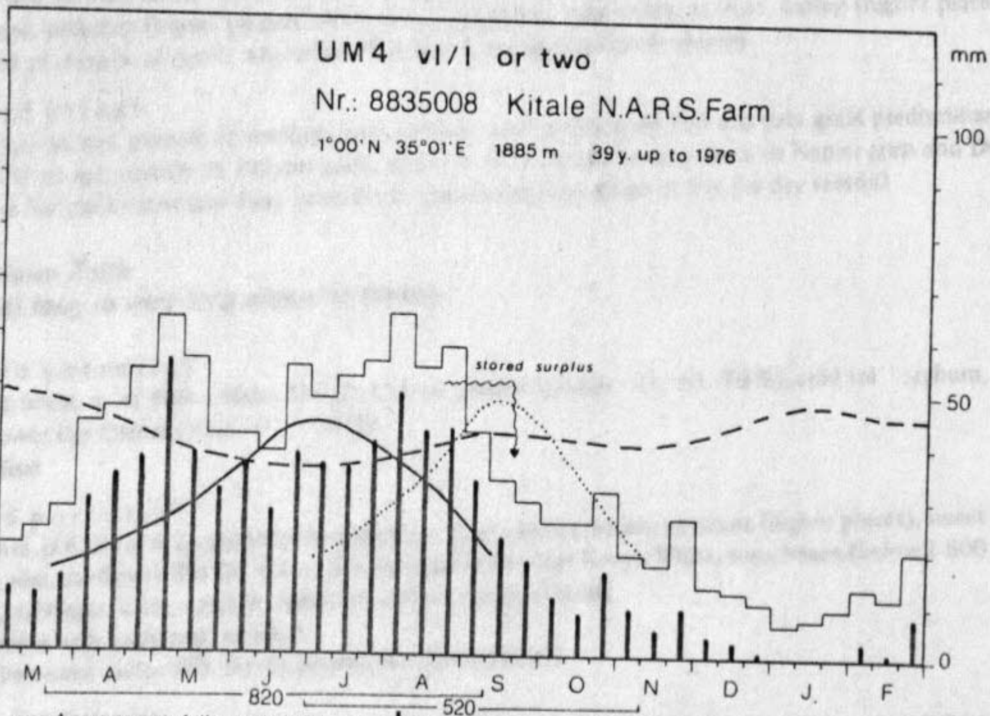
G o o d y i e l d p o t e n t i a l
1st rains, start norm. b. of March: Maize H 612–614 (nearly 80 %), finger millet (~ 60 %), high alt. = cold tol. sorghum; m. mat. beans; late mat. sunflower like Kenya White (May/June–O./N. ~ 60 %), m. mat soya beans (lower places, ~ 60 %); cabbages, kales, onions (on light soils), tomatoes, spinach
2nd rains, start indistinctly around July: E. mat. beans (~ 60 %), m. mat. sunflower like Comet (July–N.) or HS 301 A (lower places); onions
Whole year: Macadamia nuts, castor, mountain pawpaws

F a i r y i e l d p o t e n t i a l
1st rains: M. mat. wheat and barley; potatoes, sweet potatoes
2nd rains: Potatoes, sweet potatoes; tomatoes
Whole year: Arabica coffee (with mulching on good deep soils ~ 40 %, otherwise poor resp. marginal)[3]), bananas (like coffee), avocadoes, citrus, pineapples (lower places)

P a s t u r e a n d f o r a g e
1–1.2 ha/LU on nat. savanna pasture, about 0.6 ha/LU on art. pasture of Rhodes grass; down to 0.18 ha/LU feeding Napier and Bana grass. Silver leaf Desmodium (D. uncinatum) best fodder legume

UM 3 = Marginal Coffee Zone
(l/vl) i with a (weak) long to very long cropping season and intermediate rains

Very small, see West Pokot



Average rainfall per decade
I rainfall surpassed in 6 out of 10 years
Approx. pot. evapotranspiration of a permanent crop (bananas)
Approx. pot. evapotranspiration of late mat. maize like H 612
Approx. pot. evapotranspiration of m. mat. sunflower
820 Rainfall per indicated growing period, surpassed in 6 out of 10 years

UM 4 = S u n f l o w e r - M a i z e Z o n e

UM 4 = Sunflower-Maize Zone
vl/l with a very long to long cropping season,
or two dividable in two variable cropping seasons
(see Diagram Kitale)

Very good yield potential

1st rains, start norm. Mch.: Maize H 611 (higher places), 612–614 (lower places, e. of Mch.–S./O.); cabbages, kales (to 2nd r.), spinach, pumpkins, gourgettes

2nd rains, start indistinctly around July: M. mat. sunflower like Comet or HS 301 A (b. of July–Nov.)

Good yield potential

1st rains: High alt. sorghum, finger millet; late mat. sunflower like Kenya White (June–N., 60–70 %), m. mat. sfl. like HS 301 A, soya beans (lower places)

2nd rains: Cabbages, spinach

Whole year: Citrus[5], sisal (lower places), avocadoes, perennial castor

Fair yield potential

1st rains: Late mat. and late planted m. mat. beans[4]; sweet potatoes, egg plants and tomatoes (to 2nd r.); onions (on light soils)

2nd rains: Beans, potatoes, sweet pot.; onions (on light soils); m. mat. barley (higher places)

Pasture and forage

About 1 ha/LU on nat. pasture of medium grass savanna with Zebra grass (Hyparrhenia rufa) and red oats grass (Themeda triandra) predominant; around 0.6 ha/LU on art. pasture of Rhodes grass; down to about 0.2 ha/LU feeding Napier or Bana grass and Desmodium; well suited for grade cattle, and on art. pasture plus fodder very well for dairy cows

4 = Sunflower-Maize Zone with a long to very long cropping season, dividable in two variable cropping seasons

Good yield potential

1st rains, start norm. e. of Mch.: Late mat. maize like H 612–614 (e. of Mch.–S./O., 70–80 %), cold tol. sorghum, finger millet; late mat. sfl. like Kenya White (June–N., ~ 60 %), soya beans (below 1 800 m); cabbages, kales, spinach

2nd rains, start indistinctly around July/Aug.: M. mat. sunflower like HS 301 A or Comet (July–N.)

Whole year: Sisal, perennial castor like C–15

Fair yield potential

1st rains: Late and m. mat. beans[4]; sweet potatoes, egg plants and tomatoes (to 2nd r.), onions (on light soils)

2nd rains: Beans, potatoes (higher places), sweet pot.; onions (on light soils); m. mat. barley (higher places)

Whole year, best pl. time b. of April: Avocadoes[5], citrus[5], pineapples (lower places)

Pasture and forage

About 1.2 ha/LU on nat. pasture of medium grass savanna with Zebra grass and red oats grass predominant; about 0.6 ha/LU on art. pasture of Rhodes grass, down to 0.23 ha/LU feeding Bana or Napier grass and Desmodium; suited for grade cattle and dairy cows (with special care, esp. silage or hay for dry season)

M 4 (l/l) = Sunflower-Maize Zone with a (weak) long to very long cropping season

Good yield potential

1st rains, start norm. e. of Mch.: Maize H 612–614 on deep soils (Apr.–O., 60–70 %), cold tol. sorghum, m. mat. sunflower like Comet (June–O., ~ 60 %)

Whole year: Sisal

Fair yield potential

1st rains: Maize H 612–614 on moderately deep soils, finger millet; beans; potatoes (higher places), sweet potatoes; m. mat. sunflower like HS 301 A, late mat. sunflower like Kenya White, soya beans (below 1 800 m), egg plants, cabbages, kales, spinach, tomatoes, onions (on light soils)

2nd crop possible with early mat. varieties

Whole year: Perennial castor (50–60 %), pineapples (lower places)

Pasture and forage

1.3–1.7 ha/LU on undestroyed nat. pasture of medium grass savanna mixed with dry bushland, about 0.8 ha/LU on art. pasture of Rhodes grass, down to 0.28 ha/LU feeding Bana grass and other forage; suited for grade cattle; if eroded see Baringo District UM 4 (l/m) i for palatable shrubs

UM 5 = Livestock-Sorghum Zone

Transitional, downward escarpment near northern boundary. Potential see West Pokot District

5) With add. irrigation (D.–F.) better growing

Very good yield potential
1st rains, start norm. Mean: Maize H 613 (higher places), 612–614 (lower places, e. of Mch.–S./O.); cabbages,
kales (to 2nd r.), spinach, pumpkins, courgettes
2nd rains, start indistinctly around July: M. mat. sunflower like Comet or HS 301 A (b. of July–Nov.)

Good yield potential
1st rains: High alt. sorghum, finger millet; late mat. sunflower like Kenya White (June–N., 60–70 %), m. mat.
sf. like HS 301 A, soya beans (lower places)
2nd rains: Cabbages, spinach
Whole year: Citrus[5], sisal (lower places), avocadoes, perennial castor

Fair yield potential
1st rains: Late mat. and late planted m. mat. beans[4], sweet potatoes, egg plants and tomatoes (to 2nd r.);
onions (on light soils)
2nd rains: Beans, potatoes, sweet pot., onions (on light soils), m. mat. barley (higher places)

Pasture and forage
About 1 ha/LU on nat. pasture of medium grass savanna with Zebra grass (Hyparrhenia rufa) and red oats grass
(Themeda triandra) predominant, around 0.6 ha/LU on art. pasture of Rhodes grass, down to about 0.2 ha/LU
feeding Napier or Bana grass and Desmodium; well suited for grade cattle, and on art. pasture plus fodder very
well for dairy cows

= Sunflower-Maize Zone
with a long to very long cropping season,
dividable in two variable cropping seasons

Good yield potential
1st rains, start norm. e. of Mch.: Late mat. maize like H 612–614 (e. of Mch.–S./O., 70–80 %), cold tol.
sorghum, finger millet; late mat. sfl. like Kenya White (June–N., > 60 %), soya beans (below 1 600 m);
cabbages, kales, spinach
2nd rains, start indistinctly around July/Aug.: M. mat. sunflower like HS 301 A or Comet (July–N.)
Whole year: Sisal, perennial castor like C–15

Fair yield potential
1st rains: Late and m. mat. beans[4], sweet potatoes, egg plants and tomatoes (to 2nd r.), onions (on light soils)
2nd rains: Beans, potatoes (higher places), sweet pot., onions (on light soils), m. mat. barley (higher places)
Whole year, best pl. time b. of Apr.: Avocadoes[5], citrus[5], pineapples (lower places)

Pasture and forage
About 1.2 ha/LU on nat. pasture of medium grass savanna with Zebra grass and red oats grass predominant;
about 0.6 ha/LU on art. pasture of Rhodes grass, down to 0.23 ha/LU feeding Bana or Napier grass and Desmodium; suited for grade cattle and dairy cows (with special care, raw silage or hay for dry season)

= Sunflower-Maize Zone
with a (weak) long to very long cropping season

Good yield potential
1st rains, start norm. e. of Mch.: Maize H 612–614 on deep soils (Apr.–O., 60–70 %), cold tol. sorghum, m.
mat. sunflower like Comet (June–O., > 60 %)
Whole year: Sisal

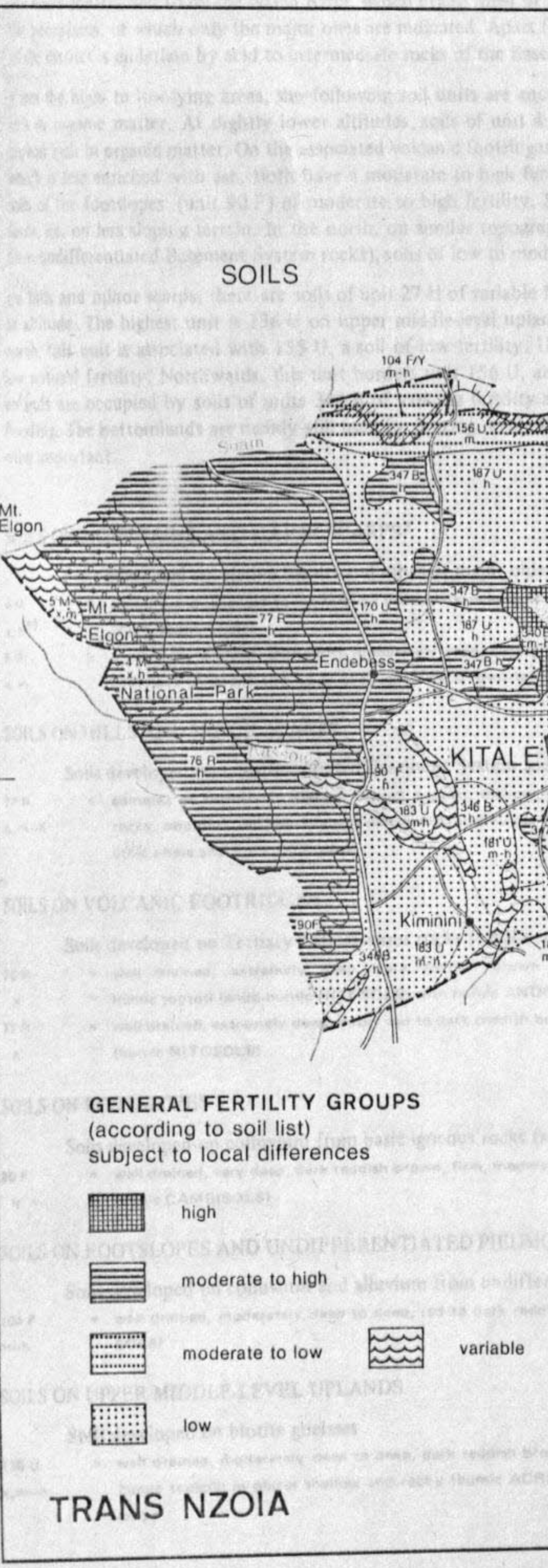
Fair yield potential
1st rains: Maize H 612–614 on moderately deep soils, finger millet, beans, potatoes (higher places), sweet potatoes; m. mat. sunflower like HS 301 A, late mat. sunflower like Kenya White, soya beans (below 1 800 m),
egg plants, cabbages, kales, spinach, tomatoes, onions (on light soils)
2nd crop possible with early mat. varieties
Whole year: Perennial castor (50–60 %), pineapples (lower places)

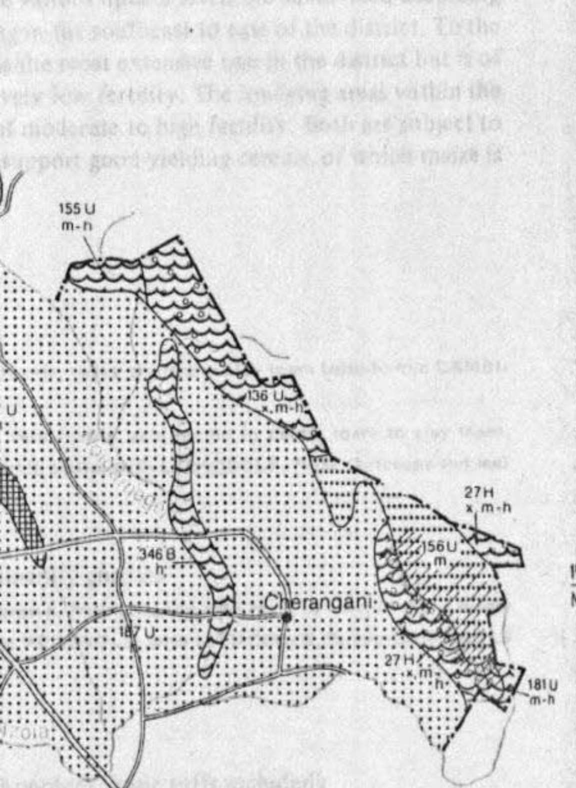
Pasture and forage
1.3–1.7 ha/LU on undestroyed nat. pasture of medium grass savanna mixed with dw. shrubland, about 0.8 ha/LU
on art. pasture of Rhodes grass, down to 0.25 ha/LU feeding Bana grass and other fodder; suited for grade
cattle, if eroded see Baringo District UM 4 (1/m) i for palatable shrubs

= Livestock-Sorghum Zone

Transitional, downward escarpment near northern boundary. Potential see West Pokot District

... irrigation (0–1/2) better growing


SOILS
104 F/Y
m-h
156 U
m
Suam
347 B
187 U
h
Mt.
Elgon
5 M
x,m
Mt
Elgon
4 M
x,h
National Park
77 F
h
170 U
h
Endebess
347 B
187 U
h
347 B
KITALE
76 F
h
90 F
h
183 U
m-h
346 B
181 U
m-h
Kiminini
90 F
346 B
183 U
m-h
GENERAL FERTILITY GROUPS
(according to soil list)
subject to local differences
high
moderate to high
moderate to low
variable
low
TRANS NZOIA



RIOUS LIMITATIONS
(...e descriptions)

Steep slopes, unsuitable for cultivation, not marked in Nat. Pks, For. Res. and (See AEZ-map)

Shallow soil

Waterlogging

0 5 10 15 20 25 km

M. Buch,

Soils KSS 79018

SOIL DISTRIBUTION, FERTILITY AND MAJOR CHARACTERISTICS

The major part of the district consists of a series of uplands of progressively lower altitude towards the west. The eastern boundary is formed by the Cherangani Hills, while on the western boundary the extinct volcano Mt. Elgon is an outstanding landmark. A scarp in the north marks the watershed between the Lake Turkana drainage basin and the Lake Victoria basin, the latter contributed to by the Nzoia River, which drains most of the district. Its tributaries have caused numerous valleys in the peneplains, of which only the major ones are indicated. Apart from the volcanic rocks of the Mt. Elgon area, the majority of the district is underlain by acid to intermediate rocks of the Basement System.

From the high- to low-lying areas, the following soil units are encountered. On the mountains, units 5 M is found, which is rich in organic matter. At slightly lower altitudes, soils of unit 4 M occur which are developed on volcanic ash and have a topsoil rich in organic matter. On the associated volcanic footridges, soils of units 76 R occur, with a humic topsoil and 77 R, which is less enriched with ash. Both have a moderate to high fertility. South of Endebess, the latter unit is associated with soils of the footslopes (unit 90 F) of moderate to high fertility. Soils of unit 170 U are similar but occur on lower-level uplands, i.e. on less sloping terrain. In the north, on similar topography but different parent material (colluvium and alluvium from undifferentiated Basement System rocks), soils of low to moderate fertility (104 F) occur.

On hills and minor scarps, there are soils of unit 27 H of variable fertility. The various upland levels are subdivided according to altitude. The highest unit is 136 U on upper middle-level uplands, occuring in the southeast to east of the district. To the north, this unit is associated with 155 U, a soil of low fertility. Unit 187 U is the most extensive one in the district but is of low natural fertility. Northwards, this unit borders unit 156 U, also of relatively low fertility. The lowlying areas within the uplands are occupied by soils of units 346 B of variable fertility and 347 B of moderate to high fertility. Both are subject to flooding. The bottomlands are mainly still used for grazing, while the uplands support good-yielding cereals, of which maize is most important.

SOILS ON MOUNTAINS AND MAJOR SCARPS*

Soils developed on olivine basalts and ashes of major older volcanoes

4 M = well drained, shallow to moderately deep, dark reddish brown, friable, humic, rocky and stony clay loam (nito-humic CAMBISOLS, rocky phase)
x, h[1]

5 M = imperfectly drained, shallow to moderately deep, dark greyish brown, very friable, acid humic to peaty, loam to clay loam, with rock outcrops and ice in the highest parts (dystric HISTOSOLS, lithic phase; with LITHOSOLS, Rock Outcrops and ice)
x, m

SOILS ON HILLS AND MINOR SCARPS

Soils developed on undifferentiated Basement System rocks, predominantly gneisses

27 H = complex of excessively drained to well drained, shallow, dark red to brown, friable, sandy clay loam to clay; in many places rocky, bouldery and stony and in places with acid humic topsoil (dystric REGOSOLS; with LITHOSOLS, humic CAMBISOLS lithic phase and Rock Outcrops)
x, m–h

SOILS ON VOLCANIC FOOTRIDGES

Soils developed on Tertiary basic igneous rocks (basalts, nepheline phonolites; basic tuffs included)

76 R = well drained, extremely deep, dark reddish brown to dark brown, friable and slightly smeary clay, with acid humic topsoil (ando-humic NITOSOLS; with humic ANDOSOLS)
h

77 R = well drained, extremely deep, dusky red to dark reddish brown, friable clay, with acid humic topsoil (humic NITOSOLS)
h

SOILS ON FOOTSLOPES

Soils developed on colluvium from basic igneous rocks (serpentinites, basalts, etc.)

90 F = well drained, very deep, dark reddish brown, firm, moderately calcareous clay (calcic CAMBISOLS)
h

SOILS ON FOOTSLOPES AND UNDIFFERENTIATED PIEDMONT PLAINS

Soils developed on colluvium and alluvium from undifferentiated Basement System rocks

104 F = well drained, moderately deep to deep, red to dark reddish brown, firm, sandy clay loam to clay (chromic and vertic LUVISOLS)
m–h

SOILS ON UPPER MIDDLE-LEVEL UPLANDS

Soils developed on biotite gneisses

136 U = well drained, moderately deep to deep, dark reddish brown to dark brown, friable, sandy clay loam to clay, with thick acid humic topsoil; in places shallow and rocky (humic ACRISOLS and humic CAMBISOLS, partly lithic phase; with Rock Outcrops
x, m–h

SOILS ON LOWER MIDDLE-LEVEL UPLANDS

Soils developed on biotite gneisses

155 U = well drained, moderately deep to deep, dark reddish brown to brown, friable to firm, sandy clay loam to clay, partly with acid
m–h humic topsoil (ferralo-orthic ACRISOLS; with dystric and humic CAMBISOLS and humic ACRISOLS)
156 U = well drained, moderately deep to deep, brown to dark yellowish brown, firm sandy clay loam
m (orthic LUVISOLS)

SOILS ON LOWER-LEVEL UPLANDS

Soils developed on basic igneous rocks (basalts, etc.)

170 U = well drained, extremely deep, dark red, friable clay
h (eutric NITOSOLS)

Soils developed on granites and quartz-feldspar gneisses

181 U = well drained, deep, strong brown to reddish yellow, very friable, sandy clay loam to sandy clay
m–h (orthic FERRALSOLS; with ferralic CAMBISOLS)

Soils developed on biotite gneisses

183 U = well drained, very deep, dark red to dark reddish brown, very friable, sandy clay loam to clay
m–h (rhodic FERRALSOLS)

Soils developed on undifferentiated Basement System rocks

187 U = well drained, very deep, red to dark red, very friable to friable clay
h (rhodic FERRALSOLS)

SOILS ON BOTTOMLANDS

Soils developed on infill from limestones

340 B = poorly drained, deep, very dark grey to very dark brown, firm, moderately calcareous, clay loam to clay, with humic topsoil
m–h (haplic CHERNOZEMS)

Soils developed on infill mainly from undifferentiated Basement System rocks

346 B = complex of imperfectly drained to very poorly drained, very deep, very dark grey to dark greyish brown, mottled, firm clay; in
h places peaty or with acid humic topsoil (dystric GLEYSOLS; with eutric PLANOSOLS and some dystric HISTOSOLS)
347 B = poorly drained, very deep, dark greyish brown to black, very firm, slightly calcareous, cracking clay; in many places with a
h saline and sodic deeper subsoil (pellic VERTISOLS, partly saline-sodic phase; with eutric or vertic GLEYSOLS)

1) Soil texture-classes

h = heavy soil
l = light soil
m = medium soil
x = stony or bouldery soil
v = varying texture
m–h = medium to heavy
m, h = medium and heavy (e.g. abruptly underlaying a topsoil of different texture)

* Soil description from Kenya Soil Survey:
Exploratory Soil Map and Agro-climatic Zone Map of Kenya, scale 1 : 1 000 000. Expl. Soil Survey Rep. E1, Nairobi 1982.
See this map also for colours; symbols simplified here.

DB X

KENYA

NAKURU DISTRICT

Contents

District page

NATURAL POTENTIAL

INTRODUCTION

Nakuru District covers the highest part of the Rift Valley and includes the bordering escarpments and plateaus. The western plateau, (the Mau Hills above the Mau Escarpment) rises to nearly 3 000 m within the district territory. The climate is cold and wet with a mean temperature of 10–15°C and annual average rainfall of about 1 200–1 400 mm. The area belongs mainly to Agro-Ecological Zone UH 1, is excellent sheep country and to a lesser extent also good for dairy. This zone is also found on the eastern plateau, but mainly outside Nakuru District.

The western escarpment bordering the Rift Valley floor is clearly divided into two levels, with a small but long plateau at an elevation of about 2 300 m stretching from Molo to Njoro. This is mainly a Wheat/Maize-Pyrethrum Zone, LH 2. The higher parts form the Wheat-Pyrethrum Zone UH 2 because maize there is affected by cold weather and frosts.

At slightly lower altitudes, it is too dry for pyrethrum but still good for wheat and malt barley, the Wheat-Barley Zone LH 3, which is mainly situated between 2 100 and 2 300 m. We find LH 3 and UH 2 also on the old volcanic ridge of Eburu. On the floor of the Rift Valley, wheat is only promising on the highest parts (near the escarpments north of Nakuru or around Menengai Volcano), otherwise it is too dry or too hot. Where it is too dry, a Livestock-Barley Zone LH 4 borders LH 3. Here ranching is the most important enterprise. The zone is better suited for fodder than to malt barley. Nowadays, however, this forage crop is scarcely cultivated because sufficient cheaper grazing is still available.

From the culmination of the Rift Valley near Menengai, the floor slopes gently down towards Nakuru in the south and towards Mogotio in the north. These areas have still some maize and sunflower potential (UM 4), but are not so favourable for these crops as the Kitale area, for example, because of the predominantly weak performance of the rainy season. Therefore, sisal is a safer crop, although the altitude is close to the upper limit for sisal. This zone stretches to the potential Livestock-Sorghum Zone UM 5 for the same reason (low and unreliable rainfall). The annual average rainfall is still 800–900 mm, but the 60 % reliability of the first rains is only 200–240 mm, and of the second rains only 250–300 mm. Between both seasons there are some middle rains, but they are scattered and also unreliable (July–August 210 mm, 60 % probability 170 mm).

In the slightly lower areas between Hyrax Hill and Longonot, scattered distribution of rainfall (see Diagram on Gilgil) makes additional irrigation essential for successful cultivation of crops. This is therefore a Ranching Zone. Irrigated crops are found around Lake Naivasha.

TABLE 1: RAINFALL FIGURES FROM VARIOUS STATIONS
having at least 10 years of records up to 1976

No. and altitude	Name of Station	Years of rec.	Kind of rec.	Ann. rainf. mm	Monthly rainfall in mm Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
8936004 1 676 m	Subukia	42	Average	943	17	25	42	138	132	76	133	159	70	46	58	46
			60 % rel.[1)]	845	6	4	14	93	108	50	120	136	52	36	30	18
9035000 2 163 m	Ogilgei Farm	54	Av.	892	25	34	61	127	114	81	102	122	64	45	74	43
			60 %	800	6	12	33	103	84	58	89	112	45	32	52	25
9035002 2 316 m	Londiani Forest Station	68	Av.	1 182	36	42	79	161	150	124	148	172	96	58	62	54
			60 %	1 060	9	22	35	132	130	107	135	149	84	42	33	28
9035011 2 377 m	Elburgon For. Station	59	Av.	1 076	32	44	78	152	123	86	130	129	78	68	92	63
			60 %	960	10	13	39	126	87	61	103	110	55	49	55	30
9035018 2 458 m	Molo Station	70	Av.	1 171	33	47	90	170	131	107	131	165	90	56	91	61
			60 %	943	5	14	38	117	98	69	92	121	45	37	48	27
9035021 2 160 m	Njoro; Plant Breeding Station	47	Av.	931	27	35	65	133	117	77	106	127	67	53	77	47
			60 %	832	9	16	40	116	86	62	94	109	50	43	51	29
9035022 1 936 m	Kampiga Molo Rongai	46	Av.	892	21	25	64	139	125	68	117	106	65	53	69	42
			60 %	800	7	3	22	120	97	49	102	76	58	44	38	22
9035031 2 776 m	Mariashoni Timber Co. Ltd.	47	Av.	1 233	37	52	88	178	133	98	149	171	82	68	107	76
			60 %	1 105	20	23	60	141	109	85	119	138	60	59	73	33
9035038 2 537 m	Mau Summit Station	41	Av.	1 025	25	39	58	147	116	98	134	161	84	45	66	51
			60 %	920	6	12	40	112	90	73	123	146	69	39	36	44
9035064 1 981 m	Upper Rongai, Delamere S.D.	46	Av.	999	34	30	80	158	118	73	136	114	72	51	79	55
			60 %	892	10	12	47	138	78	62	121	102	51	38	49	25
9035067 2 697 m	Keringet Estate	37	Av.	1 222	39	42	66	137	139	114	151	213	109	74	88	50
			60 %	1 100	5	10	21	85	118	87	120	167	87	50	55	23
9035073 1 890 m	Gogar Farms, Rongai	45	Av.	928	26	31	64	144	114	76	120	115	68	50	71	49
			60 %	832	6	10	32	118	82	65	94	102	48	36	43	24

1) These figures of rainfall reliability should be exceeded normally in 6 out of 10 years.

No. and altitude	Name of Station	Years of rec.	Kind of rec.	Ann. rainf. mm	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					Monthly rainfall in mm											
9035092	Njoro, Egerton	28	Av.	1 012	33	37	61	150	123	81	105	138	80	61	90	53
2 238 m	Agricult. College		60 %	908	15	18	38	129	91	66	93	115	61	50	62	34
9035093	Molo, Pyrethrum	28	Av.	1 177	43	39	66	176	129	100	134	169	94	59	96	70
2 500 m	Exp. Station		60 %	946	15	12	40	121	96	62	93	124	49	39	51	35
9035129	Molo, Marindas	25	Av.	1 209	44	45	71	166	127	97	139	208	97	60	87	64
2 804 m	Farm		60 %	1 086	28	31	38	115	68	80	121	164	65	39	53	13
9035240	Londiani, Keresoi	14	Av. 2)	1 707	76	63	113	185	195	193	223	244	160	87	87	76
2 680 m	For. St.															
9036000	Kijabe Hill Estate	49	Av.	1 108	30	28	54	132	155	104	161	182	96	56	63	48
2 057 m			60 %	994	5	5	8	93	128	79	132	159	80	38	33	18
9036002	Naivasha, D.O.	63	Av.	634	25	40	51	123	76	41	35	44	46	53	63	38
1 900 m			60 %	570	15	21	28	104	47	27	14	31	32	37	51	25
9036004	Ol Punyata	43	Av.	1 010	22	31	75	145	137	79	127	128	79	68	71	50
1 655 m			60 %	900	6	8	24	114	107	69	94	101	64	57	47	21
9036008	Highlands	32	Av.	861	20	23	58	135	120	78	91	98	72	58	60	50
1 905 m			60 %	717	3	5	22	96	93	54	71	76	54	44	47	26
9036010	Solai, Ol Bonata	56	Av.	1 024	20	31	62	157	143	82	126	113	87	80	81	41
1 829 m			60 %	920	6	7	30	130	122	65	92	93	65	63	53	23
9036011	Kedong Valley	46	Av.	710	45	42	76	175	130	33	17	19	20	34	55	65
1 890 m			60 %	606	23	20	50	126	76	15	6	9	9	20	34	37
9036020	Nakuru, Railway	66	Av.	807	21	31	53	134	112	66	88	100	62	52	51	38
1 850 m	Station		60 %	725	8	11	30	103	90	60	65	76	40	43	41	15
9036021	Nakuru, D.C.	30	Av.	843	16	24	60	127	107	80	109	110	67	54	60	30
1 836 m			60 %	753	6	9	27	110	84	66	94	82	45	43	41	19
9036032	Bahati For. Station	44	Av.	1 227	21	36	51	142	195	119	137	165	115	110	91	46
2 408 m			60 %	1 100	9	9	31	120	158	88	117	141	89	91	39	20
9036034	Gilgil, Railway	38	Av.	646	22	28	54	98	75	53	60	66	38	43	58	41
2 006 m	Station		60 %	549	7	13	25	75	43	29	40	41	13	42	49	21
9036059	Naivasha, Kangari	41	Av.	666	37	41	47	114	109	45	39	53	25	45	64	48
1 981 m	Farm		60 %	584	21	9	31	54	67	21	18	28	13	31	42	15
9036076	Glanjoro Farm Ltd.	51	Av.	918	20	34	60	134	129	84	98	120	74	54	72	38
1 920 m			60 %	820	5	14	39	108	92	61	82	104	48	39	54	26
9036081	Naivasha, Vet. Exp.	39	Av.	729	36	33	60	121	103	52	44	54	46	63	71	47
1 829 m	Station		60 %	657	26	26	54	85	62	42	25	35	40	58	73	29
9036109	Naivasha, Marula	35	Av.	653	32	35	43	107	93	38	43	56	35	54	71	48
2 042 m	Estates Ltd.		60 %	586	17	15	41	82	39	25	19	43	24	46	46	22
9036124	Eburu Settlement	42	Av.	802	29	37	66	145	117	69	65	73	43	46	63	49
2 438 m	Olobonge		60 %	636	13	5	7	102	60	46	34	41	36	24	33	20
9036147	Soysambu Est.	39	Av.	696	25	27	39	98	86	52	62	85	56	51	71	45
1 849 m	Elmenteita		60 %	620	16	9	33	70	63	46	40	66	29	42	39	21
9036150	Gilgil, Arthur Cole	49	Av.	711	22	38	56	116	83	44	49	64	40	55	86	58
2 134 m	Ltd.		60 %	615	5	12	38	78	61	33	37	57	14	43	54	26
9036151	Subukia Experimental	27	Av.	1 253	38	46	66	165	193	92	120	163	95	94	116	66
2 134 m	Pyrethrum Station		60 %	1 125	13	14	58	145	175	68	71	127	54	77	82	27
9036179	Naivasha Korongo	27	Av.	667	27	38	49	116	108	57	50	50	36	44	52	41
1 890 m	Farm		60 %	572	7	7	25	68	65	36	36	48	16	27	28	7
9036198	Nakuru, Hatfield	29	Av.	1 001	25	37	68	142	119	87	87	103	81	86	113	53
1 945 m			60 %	901	12	2	35	104	99	65	63	90	51	68	73	28
9036214	Longonot Farm	27	Av.	680	30	47	56	125	97	34	31	36	47	54	65	58
1 890 m			60 %	594	13	16	30	91	52	24	9	26	35	45	37	17
9036261	Nakuru, Met. Stat.	9	Av. 2)	936	34	45	88	141	110	70	93	98	95	64	66	31
1 880 m																

2) No reliability calculations for stations having less than 20 years of records

NAKURU DISTRICT

TABLE 2: TEMPERATURE DATA

No. and altitude	Name of Station	AEZ[1)]	Kind of records	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year	Years of rec.
				Temperature in C°													
9035021	Njoro,	LH	Mean max.	24.9	25.9	25.9	24.0	23.3	22.6	21.7	21.7	23.2	23.8	22.8	23.3	23.6	
2 160 m	Plant	3	Mean temp.	16.1	16.8	17.2	16.7	16.0	15.0	14.5	14.5	15.0	15.6	15.5	15.6	15.7	28
	Breeding	lp	Mean min.	7.4	7.7	8.5	9.4	8.7	7.5	7.4	7.3	6.9	7.4	8.2	7.9	7.9	
	Station		Abs. min.	2.8	3.9	4.4	4.4	4.4	2.2	1.7	1.7	1.7	2.8	2.2	3.3	1.7	
9035092	Njoro,	LH	Mean max.	23.3	23.9	24.0	21.9	21.6	21.1	20.2	20.2	21.7	22.2	20.8	21.6	21.9	
2 238 m	Egerton	2–3	Mean temp.	15.6	15.7	16.1	15.6	15.3	14.2	13.7	13.7	14.3	14.9	14.6	14.7	14.9	16
	College	hp	Mean min.	7.6	7.5	8.3	9.4	9.0	7.4	7.3	7.3	6.9	7.6	8.4	7.9	7.9	
			Abs. min.	3.3	3.3	3.9	5.0	4.4	2.8	3.3	2.8	3.3	2.8	4.4	3.3	2.8	
9035093	Molo,	UH	Mean max.	21.9	22.6	22.8	21.0	20.4	19.7	18.6	18.8	20.3	20.9	20.0	20.4	20.6	
2 500 m	Pyrethrum	2	Mean temp.	14.1	14.3	13.8	14.7	14.2	13.2	12.7	12.8	13.2	13.7	13.7	13.8	13.7	23
	Exp.	lp	Mean min.	6.4	6.1	6.9	8.5	7.9	6.7	6.8	6.8	6.1	6.5	7.5	7.2	6.9	
	Station		Abs. min.	1.1	1.1	2.2	4.3	2.8	1.7	1.7	0.6	2.3	2.5	1.4	1.7	0.6	
9035129	Molo,	UH	Mean max.	19.4	20.2	20.6	19.2	18.6	17.8	16.7	16.7	18.0	18.5	18.2	18.3	18.5	
2 804 m	Grasslands	2	Mean temp.	12.8	13.3	13.8	13.2	12.8	11.6	11.0	11.2	11.8	12.5	12.5	12.5	12.4	19
	Research	hp	Mean min.	6.2	6.4	7.0	7.2	7.1	5.4	5.3	5.7	7.5	6.6	6.9	6.8	6.4	
	Station		Abs. min.	–0.6	–0.6	1.7	0.6	1.1	–1.1	0.6	0.6	1.0	1.9	1.7	1.7	–1.1	
9036021	Nakuru	UM	Mean max.	28.4	29.4	28.9	26.7	25.6	25.0	24.1	24.3	25.9	26.4	25.8	26.5	26.4	
1 836 m	D.C.	4	Mean temp.	18.5	19.3	19.5	19.1	18.5	17.8	17.2	17.2	17.5	17.7	17.7	17.4	18.2	25
	(operating	hp	Mean min.	8.7	9.2	10.2	11.6	11.5	10.6	10.4	10.2	9.1	9.1	9.6	9.4	10.0	
	to 1956)		Abs. min.	3.3	3.6	5.0	6.7	6.1	5.6	5.2	5.0	5.4	5.1	5.0	4.4	3.3	
9036081	Naivasha,	LH	Mean max.	27.7	28.3	27.8	26.3	25.1	24.7	24.7	24.6	25.7	26.1	25.5	25.7	26.0	
1 829 m	Vet. Exp.	5	Mean temp.	17.5	17.5	17.8	17.3	16.9	16.3	15.9	16.1	16.3	16.8	16.6	16.7	16.8	20
	Station	lp	Mean min.	7.3	6.8	7.9	8.4	8.8	8.0	7.2	7.7	7.0	7.6	7.8	7.7	7.7	
			Abs. min.	2.8	2.8	4.4	2.2	3.3	2.2	2.2	2.8	1.7	4.4	3.3	4.4	1.7	
9036281	Naivasha,	LH	Mean max.	26.3	26.8	25.5	24.2	23.2	22.6	22.7	23.8	24.3	24.8	23.5	25.5	24.4	
1 936 m	Water	5	Mean temp.	16.8	17.6	17.3	17.0	16.2	15.1	15.1	15.6	15.5	16.6	16.2	16.3	16.3	7
	Develop-	lp	Mean min.	7.3	8.4	9.2	9.8	9.2	7.7	7.6	7.4	6.8	8.5	8.9	7.2	8.2	
	ment		Abs. min.	2.3	3.5	4.9	4.6	4.6	3.3	3.0	2.0	2.8	2.0	5.2	2.0	2.0	
9036151	Subukia,	LH	Mean max.	24.4	25.3	25.4	23.6	22.8	22.4	21.7	21.9	22.8	23.1	22.3	22.9	23.2	
2 134 m	Agricultural	2	Mean temp.	16.9	17.6	17.9	17.1	16.4	15.8	15.5	15.5	15.6	15.8	15.9	16.3	16.3	22
	Exp.	lp	Mean min.	9.4	10.0	10.4	10.6	10.0	9.2	9.4	9.2	8.3	8.6	9.6	9.7	9.5	
	Station		Abs. min.	3.9	4.1	4.4	5.6	5.0	4.4	3.7	4.3	4.5	5.0	4.4	4.4	3.7	
9036261	Nakuru,	LH	Mean max.	27.1	27.9	27.3	24.7	24.6	24.2	23.6	24.0	25.4	24.8	23.7	25.4	25.2	
1 880 m	Met.	3	Mean temp.	17.1	18.4	18.5	18.1	17.5	16.7	16.8	16.6	16.7	16.9	16.7	16.2	17.2	5
	Station	lp	Mean min.	7.1	8.9	9.7	11.6	10.5	9.2	10.0	9.3	8.0	9.0	9.8	8.0	9.3	
			Abs. min.	1.5	2.2	5.0	6.0	5.5	3.8	5.0	4.4	4.4	4.7	4.6	3.4	1.5	

1) AEZ = Agro-ecological zone; lp = lower places, hp = higher places within the zone

NAKURU DISTRICT

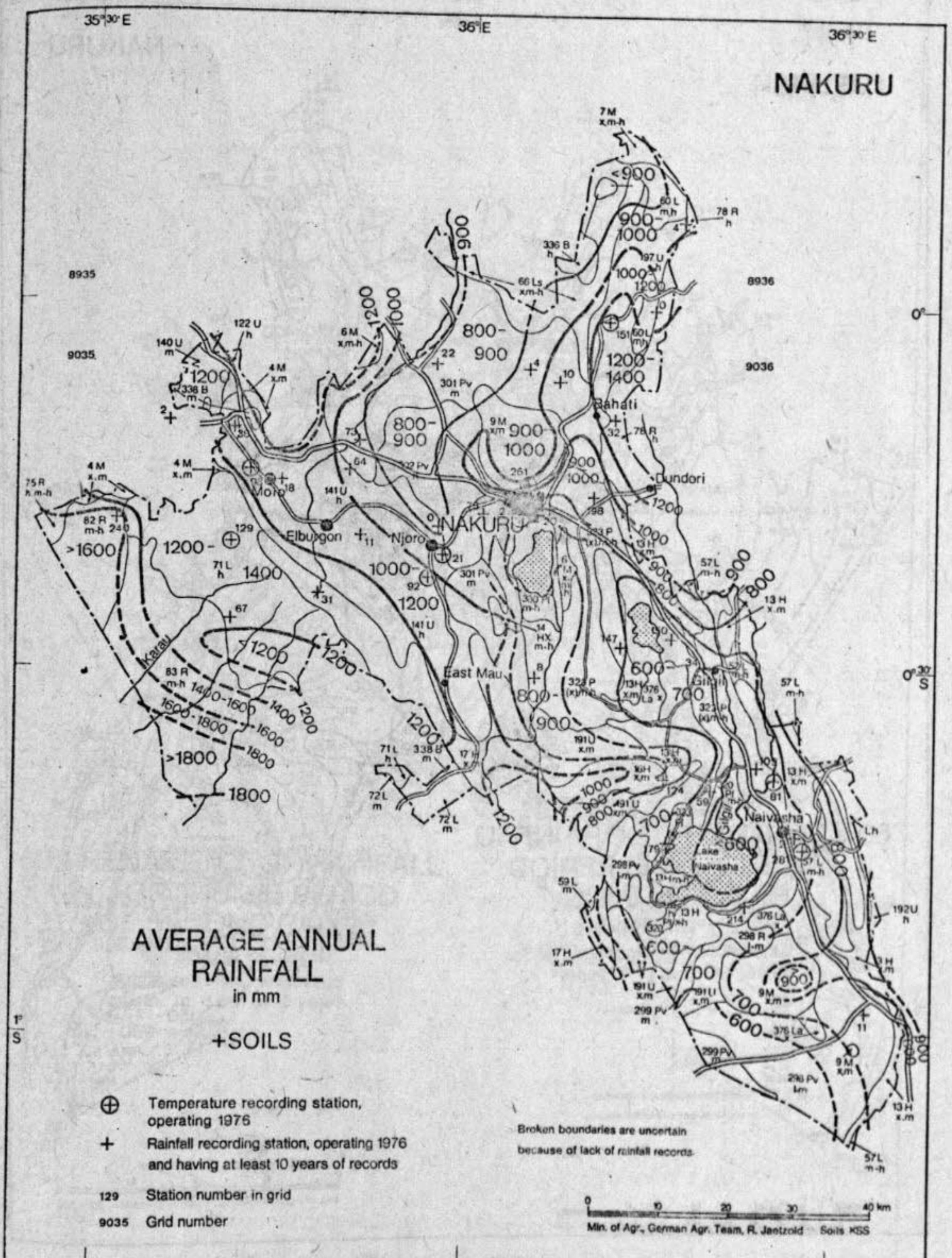
TABLE 3: CLIMATE IN THE AGRO-ECOLOGICAL ZONES

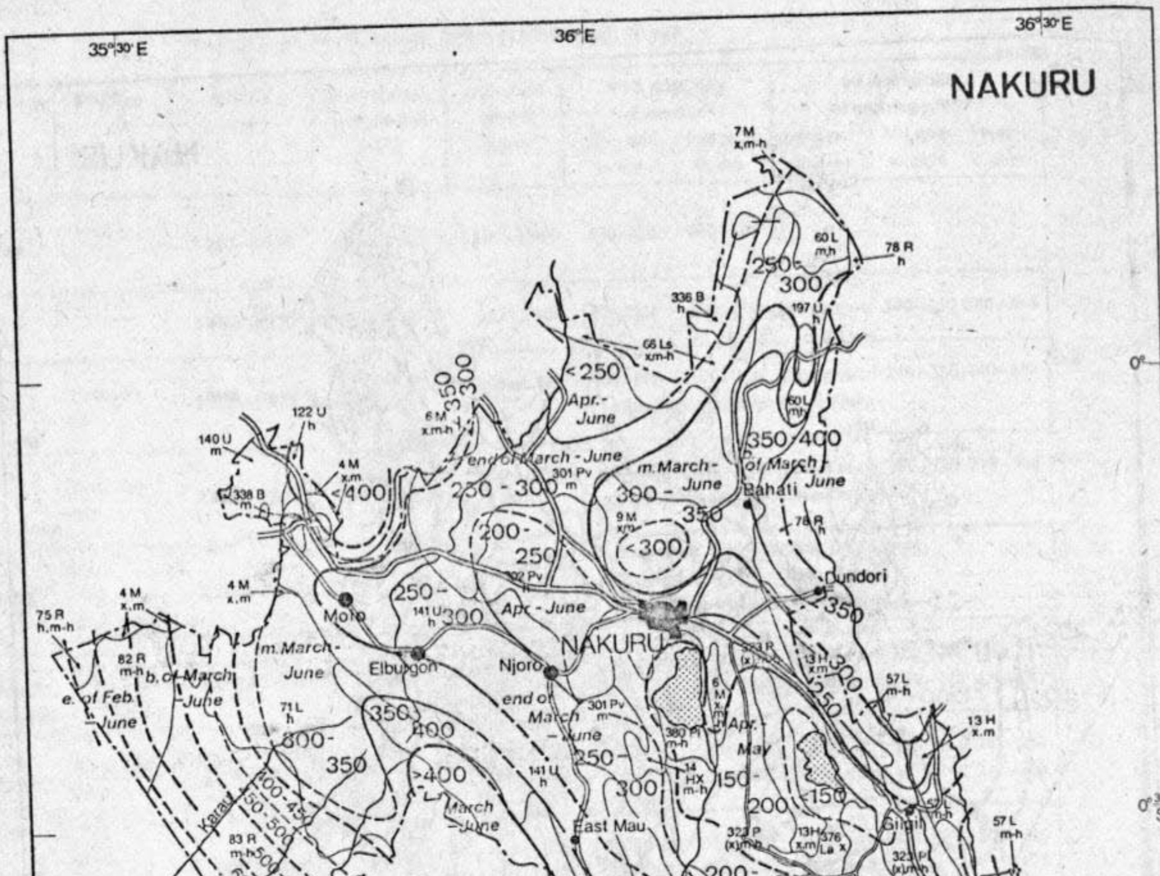
Agro-Ecological Zone	Subzone	Altitude in m	Annual mean temperature in °C	Annual av. rainfall in mm	60 % reliability of rainfall[1)]		60 % reliability of growing period		
					1st rains in mm	2nd rains in mm	1st rains[2)] in days	2nd rains in days	Total[3)] in days
TA I Cattle-Sheep Zone		2 980–3 050	10.5– 9.9	1 200–1 400	400–500	600–700			
UH 0 Forest Zone		2 400–2 970	14.5–10.6	1 200–1 900	400–850	600–700	100 or more	240–250	340–350
UH 1 Sheep-Dairy Zone	vl i or two vl i	2 400–2 970	14.5–10.6	1 200–1 800	400–800 Small, potential almost as above	600–700	100 or more	240–250	340–350
UH 2 Wheat-Pyrethrum Zone	vl i or two vl/l	2 580–2 800	13.7–12.0	1 100–1 400	300–500 Very small, see Nyandarua District	450–650	100 or more	170–200	270–300
UH 3 Wheat-Barley Zone	l/vl (l/vl) m i (vs/s) i	2 310–2 580	14.9–13.7		Very small, see Nyandarua District Very small, see Nyandarua District Very small, see Nyandarua District				
LH 2 Wheat/Maize-Pyrethrum Zone	vl or two vl/l or two	2 070–2 400	16.7–14.5	1 000–1 100 1 200–1 400	250–300 350–400	450–550 500–600	100 or more 100 or more	180–190 170–185	280–290 270–285
LH 3 Wheat/(Maize)-Barley Zone	vl/l or two (l/vl)	1 890–2 190	17.5–15.7	850–1 100 850– 950	250–300 230–250	350–500 350–450	90 or more 90 or more	150–160 130–140	240–250 220–230
LH 4 Cattle-Sheep-Barley Zone	(l) (s/m) i (vs)	1 890–2 010	17.5–16.6	800– 900 700– 800	200–300 230–300	350–500 130–200	80 or more 100–110	120–130 55– 65	200–210 155–175
LH 5 Lower High-land Ranch-ing Zone	u r i b r	1 840–2 010	17.8–16.6	700– 800 650– 700	150–200 150–200	100–230 100–150			
UM 3 Marginal Coffee Zone	vl/l or two	1 830–1 950	18.5–17.5	1 000–1 200	300–350	500–600	90 or more	150–160	240–250
UM 4 Sunflower-Maize Zone	l/vl or two (l) or two (l/m) i or two	1 600–1 830	21.0–18.6	950–1 100 850–1 000 800– 900	250–320 250–300 220–250	400–500 350–450 280–300	80 or more 70 or more 90 or more	140–150 140–150 85–105	220–230 210–220 175–195
UM 5 Livestock-Sorghum Zone	(m/l) i (s) i + i s + i (s/vs) + i (vs/s) + i	1 660–1 890	19.6–18.3	700– 950 750– 850 650– 750 600– 700	150–250 150–200 Very small, figures almost the same as above 150–250 150–200	200–380 150–300 100–200 50–150	90 or more 80 or more 70 or more 60 or more	65– 85 30– 50 30– 40 20– 30	155–175
UM 6 Upper Midland Ranching Zone	u r i b r	1 620–1 820	19.8–18.5	600– 700 550– 700	120–190 150–200	100–150 50–100			

1) Amounts in mm, surpassed normally in 6 out of 10 years, falling during the agro-humid period which allows growing of most cultivated plants.

2) More if growing cycle of cultivated plants continues into the period of second rains.

3) Only added, if rainfall continues at least for survival (> 0.2 E_0) of most long term crops.


NAKURU
35°30' E
36° E
36°30' E
0°
0°30' S
1° S
8935
9035
8936
9036
Nakuru
Molo
Elburgon
Njoro
Bahati
Dundori
East Mau
Gilgil
Naivasha
Lake Naivasha
Karau
AVERAGE ANNUAL
RAINFALL
in mm
+SOILS
Temperature recording station, operating 1976
Rainfall recording station, operating 1976 and having at least 10 years of records
129 Station number in grid
9035 Grid number
Broken boundaries are uncertain because of lack of rainfall records
0 10 20 30 40 km
Min. of Agr., German Agr. Team, R. Jaetzold Soils KSS

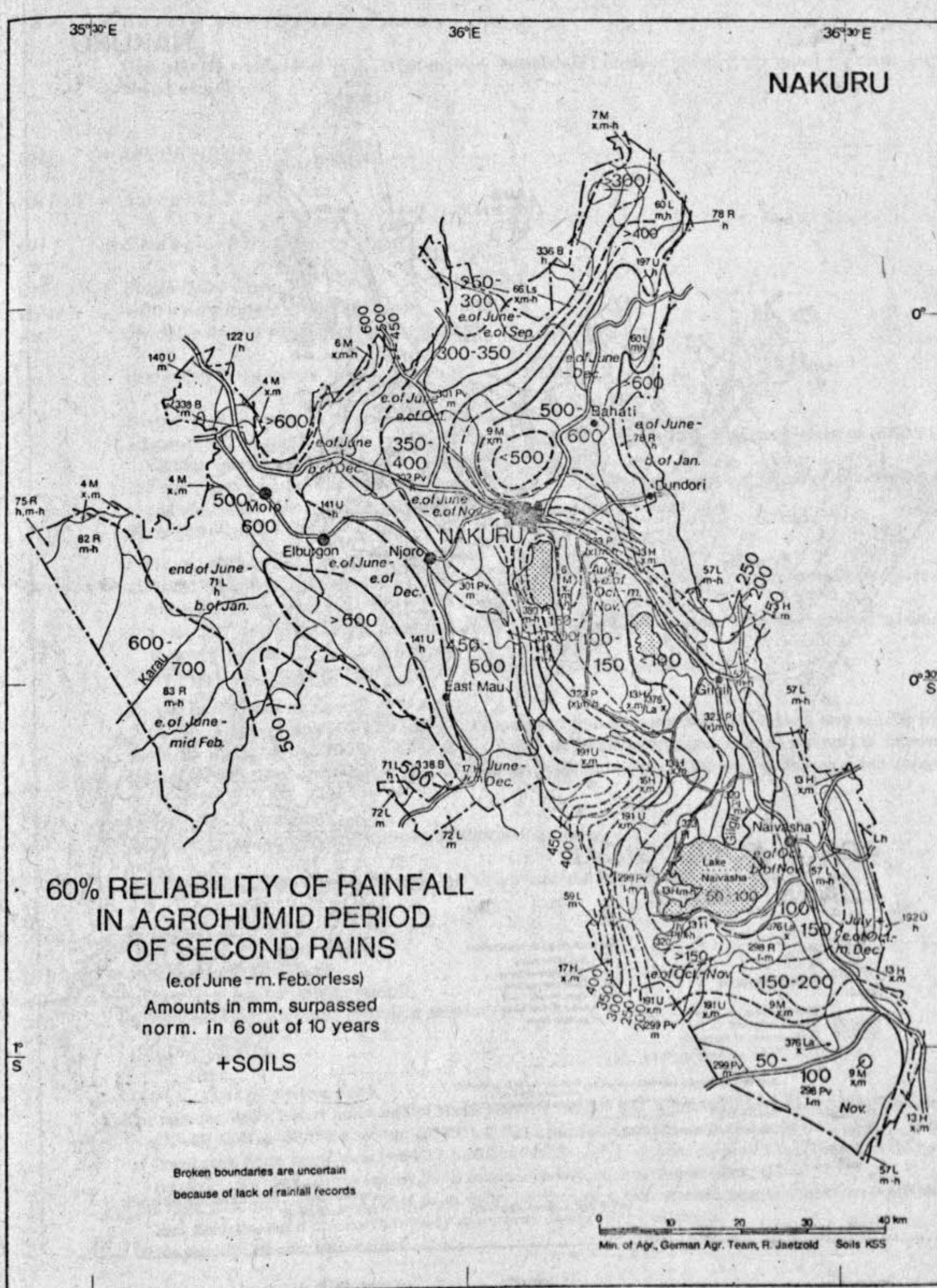


60% RELIABILITY OF RAINFALL IN AGROHUMID PERIOD OF FIRST RAINS

(e.of Feb.– e.of June or less)

Amounts in mm, surpassed norm. in 6 out of 10 years

+SOILS

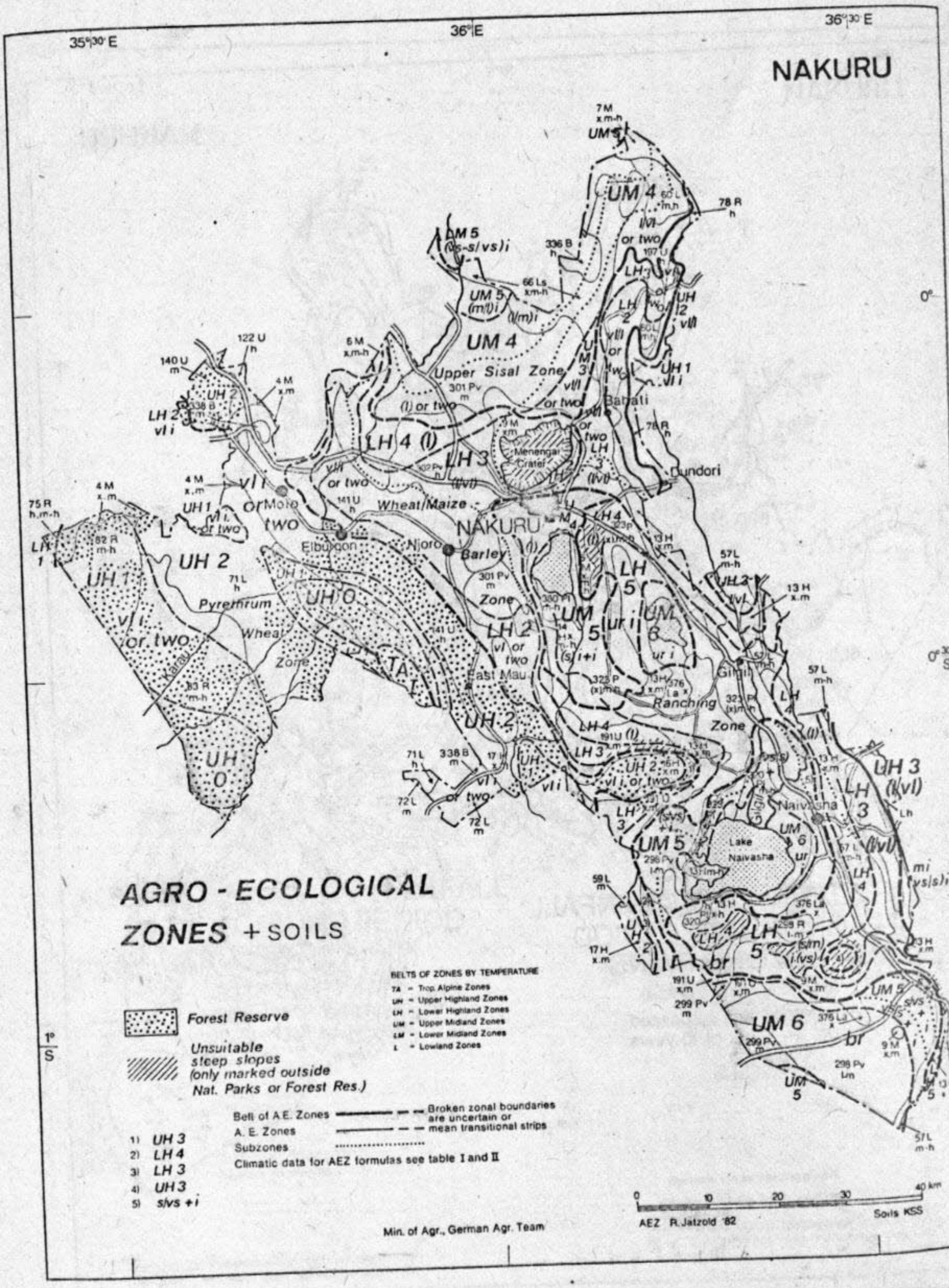


60% RELIABILITY OF RAINFALL IN AGROHUMID PERIOD OF SECOND RAINS

(e.of June - m. Feb.or less)

Amounts in mm, surpassed norm. in 6 out of 10 years

+SOILS



NAKURU
35°30' E
36° E
36°30' E
0°
0°30' S
1° S
AGRO - ECOLOGICAL
ZONES + SOILS
Forest Reserve
Unsuitable steep slopes (only marked outside Nat. Parks or Forest Res.)
BELTS OF ZONES BY TEMPERATURE
TA = Trop. Alpine Zones
UH = Upper Highland Zones
LH = Lower Highland Zones
UM = Upper Midland Zones
LM = Lower Midland Zones
L = Lowland Zones
Belt of A.E. Zones
A. E. Zones
Subzones
Broken zonal boundaries are uncertain or mean transitional strips
Climatic data for AEZ formulas see table I and II
1) UH 3
2) LH 4
3) LH 3
4) UH 3
5) s/vs + i
Min. of Agr., German Agr. Team
AEZ R. Jatzold '82
Soils KSS
0
10
20
30
40 km
Upper Sisal Zone
Wheat/Maize
Barley
Pyrethrum
Wheat
Zone
Ranching
Zone
Menengai Crater
Lake Naivasha
NAKURU
Molo
Elburgon
Njoro
East Mau
Bahati
Dundori
Gilgil
Naivasha

AGRO-ECOLOGICAL ZONES

TA = *TROPICAL-ALPINE ZONES*

TA I = *Cattle and Sheep Zone*

High altitude grasslands at about 3 000 m. Very suitable for Corriedale sheep, fairly suited for cattle and Merino sheep

UH = *UPPER HIGHLAND ZONES*

UH 0 = *Forest Zone*

UH 1 = *Sheep and Dairy Zone*

UH 1 vl i or two = *Sheep-Dairy Zone with a very long[1] cropping season, dividable in two variable cropping seasons*

Here mainly forest reserve

Good yield potential (av. 60–80 % of the optimum)
1st rains (to 2nd rains), start norm. March[1]: Oats (April–S.); peas, potatoes; m. mat. rapeseed (~60 %); cabbage, carrots, kohlrabi, celery, endive, rampion, leek, radish
2nd rains, start norm. end of June[1]: The same but normally crops of first rains not yet ready; planting from end of August onward yield expectations only fair
Whole year: Kales

Fair yield potential (av. 40–60 % of the optimum)
1st rains: Triticale, late or very late mat. maize like H 611, High alt. comp. or Cuzco in frost free lower places, higher places very marginal
2nd rains: M. mat. wheat like K. Leopard a. o. var. (June/Jy.–D./Jan.), m. mat. barley like Proctor; 3rd crop of potatoes (N.–F., ~40 %, on microclimatic frostfree slopes)
Whole year, best planting time end of March: Pyrethrum (50–60 %), strawberries

Pasture and forage
>0.8 ha/LU (lower places) to 1.2 ha/LU (drier upper places) on sec. pasture of Kikuyu grass, very suitable for Corriedale sheep, up to 2 700 m also for grade dairy cows and Merino; rye grass (Lolium perenne) to improve pasture for dairy (not to combine with wheat growing); Kenya white clover and rapeseed foliage as add. forage

UH 1 vl i = *Sheep and Dairy Zone with a very long cropping season and intermediate rains*

Small, potential almost the same as above, but rainy season still lesser divided, rainfall nearly trimodal

UH 2 = *Wheat-Pyrethrum Zone*

UH 2 vl i or two = *Wheat-Pyrethrum Zone with a very long cropping season, dividable in two variable cropping seasons*

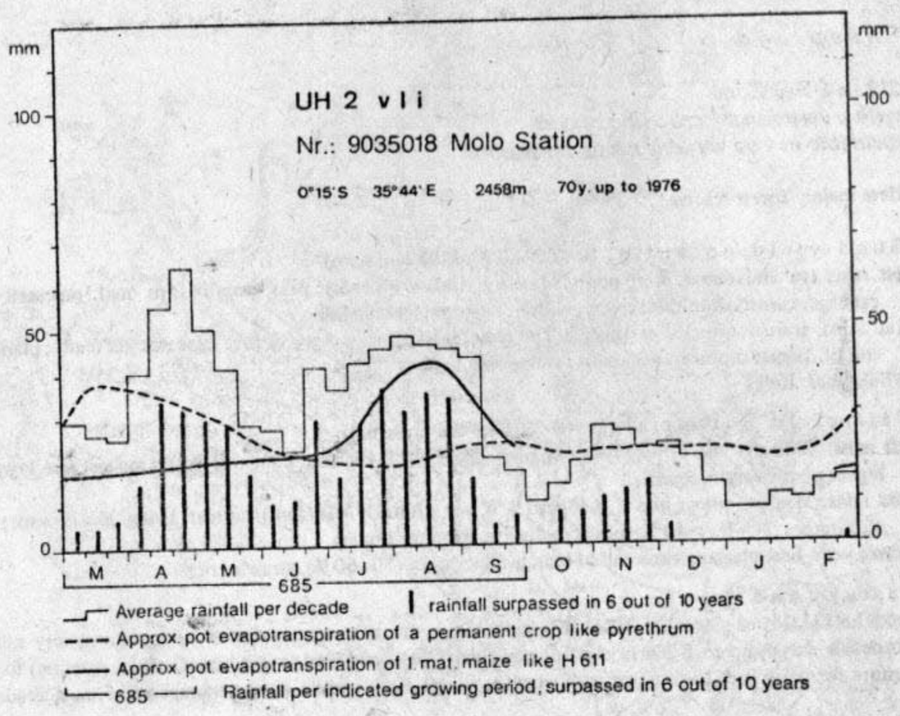
(See Diagr. Molo)

Good yield potential
1st rains (to 2nd r.), start norm. end of March: Late or medium mat. wheat like Kenya Bongo or K. Kongoni (70–80 %, May–N./D.) a. o. var. (R 200), l. mat. triticale (Apr.–O.), m. mat. barley (May–S./O.), oats; lima beans, horse beans, peas (~60 %), potatoes (March–July); m. mat. rapeseed (Apr./May–S); cabbages (nearly 80 %), kales, carrots (nearly 80 %), kohlrabi, celery, endive, rampion, leek, radish
2nd rains, start norm. b. of July: Oats, m. m. barley like Proctor; e. mat. rapeseed; peas, and the above vegetables excl. kohlrabi, but if planted from mid August onward only fair expectations
Whole year: Pyrethrum, strawberries

[1] Start and end of rainy seasons in whole district not very distinct, especially second rains, in some places there is even a third peak. So planting times are variable according to crops and their rotation.

Fair yield potential
1st rains: Very late mat. maize like H 611, High alt. comp. or Cuzco (risk by frosts in valleys and on higher plateaus)
2nd rains: Potatoes (Au.–N., 50–60 %), kohlrabi
Whole year: Plums, pears, apples (below 2 600 m)

Pasture and forage
About 0.8 ha/LU on sec. pasture of Kikuyu and tufted grass (if not overgrazed, otherwise Kikuyu grass is disappearing), suitable for Merino and Corriedale sheep and grade dairy cows; rye grass to improve pasture for dairy (not to combine with wheat cultivation) down to about 0.5 ha/LU with Kenya white clover and lucerne as add. forage, maize for silage in lower places



UH 2 vl/l = *Pyrethrum-Wheat Zone with a very long to long cropping season*

Very small, potential see Nyandarua District

UH 3 = *Wheat-Barley Zone*

UH 3 l/vl = *Wheat-Barley Zone with a long to very long cropping season*

Very small, potential see Nyandarua District

UH 3 (l/vl) = *Wheat-Barley Zone with a (weak) long to very long cropping season*

Very small, potential see Nyandarua District

UH 3 m i (vs/s)i = *Wheat-Barley Zone with a medium cropping season, intermediate rains, a (weak) very short to short one and intermediate rains*

Very small, potential see Nyandarua District

LH = *LOWER HIGHLAND ZONES*

LH 2 = *Wheat/Maize[2]-Pyrethrum Zone*

LH 2 vl or two = *Wheat/Maize-Pyrethrum Zone with a very long cropping season, dividable in two variable cropping seasons*

Good yield potential

1st rains, start norm. mid March: M. or late mat. wheat like Kenya Bongo (60–70 %, Apr./May–O./N.), late mat. maize like H 611–614 (Mch./Apr.–N./D., 80 % on deep soils); peas, horse beans; potatoes (Apr.–Aug.); sunflower Kenya White (60–70 %), linseed, rapeseed; cabbages, kales, cauliflower, carrots, beetroot, spinach, celery, lettuce

2nd rains, start norm. end of June: M. mat. barley like Proctor (June–O.); linseed; kales, cauliflower, carrots, beetroot, spinach, tomatoes, celery

Whole year: Black Wattle, New Zealand flax

Fair yield potential

1st rains: Finger millet; m. mat. beans like Cuarentino (lower places), lima beans (also higher places); leek, tomatoes, onions

2nd rains: Peas, potatoes (S.–D./J.); cabbages, onions, lettuce

Whole year: Pyrethrum, tea; apples, pears and plums above 2 200 m; strawberries

Pasture and forage

Around 1.2 ha/LU on highland savanna of Kikuyu, red oats and tufted grass[3] between Cedar forest remnants; obout 0.6 ha on art. pasture of Nandi Setaria > 2 000 m or Rhodes grass < 2 000 m; suitable for grade dairy cows; Silver leaf desmodium best add. forage

LH 2 vl/l or two = *Wheat/Maize-Pyrethrum Zone with a very long to long cropping season, dividable in two variable cropping seasons*

Almost the same potential as LH 2 vl less about 5 %, pyrethrum and wheat Kenya Bongo less suitable (–10 %)

LH 3 = *Wheat/(Maize)-Barley Zone*

LH 3 vl/l or two = *Wheat/Maize-Barley Zone with a very long to long cropping season, dividable in two variable cropping seasons*

(See Diagr. Njoro)

Good yield potential

1st rains, start norm. b. of March: M. mat. wheat like R 200, K. Tembo or other varieties (Mch./Apr.–S., 70–80 %), m. mat. durum wheat, late mat. triticale, m. mat. barley like Kenya Research, late mat. maize H 611 (higher places), H 612–614 (lower places); peas, linseed, rapeseed, late mat. sunflower like Kenya white (bird problems); cabbages, kales

2nd rains, start indistinctly around Jy./Aug.: M. mat. barley (Aug.–D.)

Whole year: Black wattle

Fair yield potential

1st rains: Potatoes; beans, cauliflower, beetroot, onions, carrots

2nd rains: M. mat. wheat (Aug.–end of D.); beans on lower places, lima beans; tomatoes, beetroot

Whole year: Avocadoes (lower places), strawberries, peaches

Pasture and forage

Around 1.4 ha/LU on highland savanna; about 1 ha/LU on art. pasture of Nandi setaria between 2 050 and 2 200 m, or Rhodes grass below that; feeding Rhodes grass, subterr. clover, Lotononis, maize silage and fodder barley down to about 0.25 ha/LU (in lower places); suited for grade dairy cows and grade cattle

LH 3 (l/vl) = *Wheat/(Maize)-Barley Zone with a (weak) long to very long cropping season*

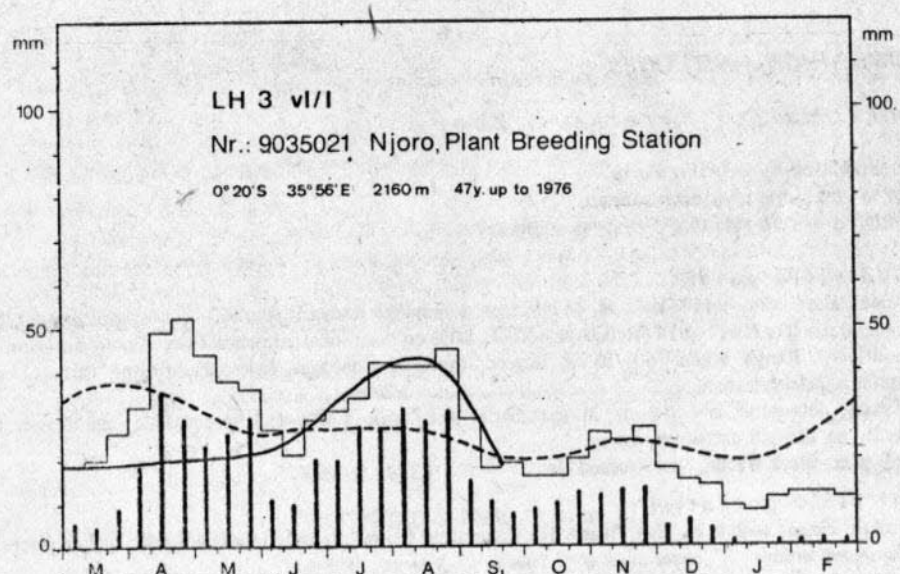
Good yield potential

1st rains, start norm. b. of April: M. mat. wheat (Apr.–S., 60–70 %), m. mat. barley (60–70 %)

Whole year: Black wattle (deep soils)

2) Wheat or Maize depending on farm scale and topography

3) The bad tufted grasses Eleusine jaegeri and Pennisetum schimperi are expanding if the areas are overgrazed



Average rainfall per decade | rainfall surpassed in 6 out of 10 years
Approx. pot. evapotranspiration of a permanent crop like pyrethrum
Approx. pot. evapotranspiration of l. mat. maize like H 612
615 Rainfall per indicated growing period, surpassed in 6 out of 10 years

Fair yield potential
1st rains: Late mat. Maize H 612–614 (A.–O./N., marginal on shallow soils); peas; linseed, late mat. sunflower like Kenya White; cabbages and other vegetables

Pasture and forage
About 1.5–2 ha/LU on nat. pasture of red oats and wire grass; down to 1.2 ha/LU on art. pasture of Nandi Setaria between 2 000 and 2 180 m, below 2 000 m Rhodes grass (var. Mbarara); suited for grade cattle; subterranean clover and fodder barley like B 106 as add. forage

LH 4 = *Cattle-Sheep-Barley Zone*

LH 4 (l) = *Cattle-Sheep-Barley Zone with a (weak) long cropping season*

Fair yield potential
1st rains, start norm. b. of April: M. mat. fodder barley (other crops mostly marginal, esp. maize).

The variability of rainfall is so high that crop failures occur from time to time. Ranching is therefore more advisable

Pasture and forage
More than 2 ha/LU on nat. pasture of short grass highland savanna; down to 1.4 ha/LU on art. pasture of Rhodes grass (var. Elmba most recommended); suited for grade cattle; subterr. clover and m. mat. fodder barley as add. forage

LH 4 (m/s) i(vs) = *Cattle-Sheep-Barley Zone with a (weak) medium to short cropping season, intermeditate rains, and a (weak) very short one*

Potential nearly the same as above, but e. mat. barley and var. Boma of Rhodes grass more suited

LH 4 s/m + (vs) = *Cattle-Sheep-Barley zone with a short to medium cropping season and a (weak) very short one*

Potential nearly the same as above, but smaller grazing capacity

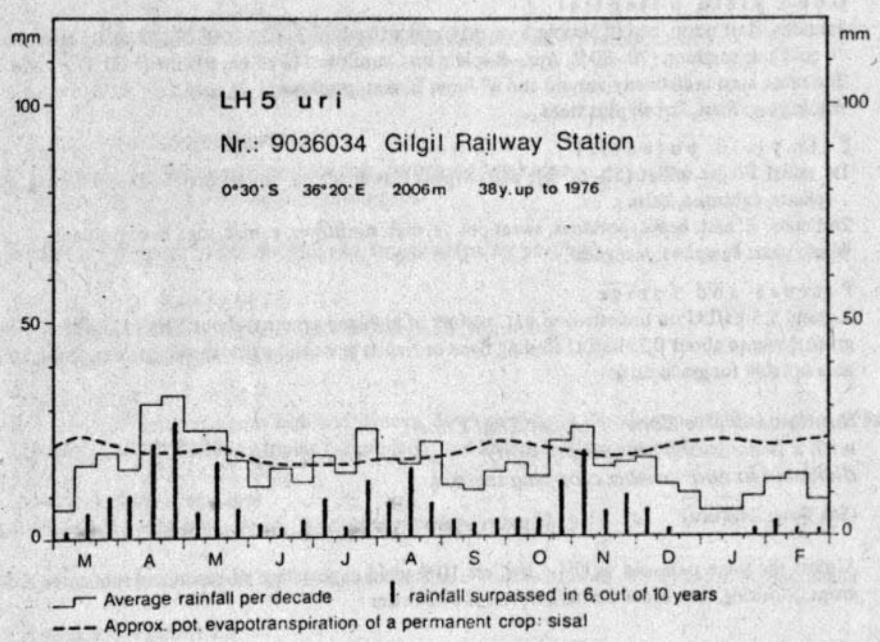
LH 5 = *Lower Highland Ranching Zone*

LH 5 uri = *Lower Highland Ranching Zone with unimodal rainfall and intermediate rains*

(See Diagr. Gilgil)

Not suited for rainfed agriculture except v. e. mat. barley (on good soils in higher places, fair to poor results)

Pasture and forage
About 3 ha/LU on highland short grass savanna; down to about 2 ha/LU on artifical pasture with Rhodes grass, with supplementary irrigation 1.2 ha/LU



LH 5 br = *Lower Highland Ranching Zone with bimodal rainfall*

Potential nearly the same as above, but chances for v. e. mat. barley only if seeding starts beginning to mid April. To establish Rhodes grass pasture is more difficult, and it is less stockable

UM = *UPPER MIDLAND ZONES*

UM 3 = *Marginal Coffee Zone*

UM 3 vl/l or two = *Marginal Coffee Zone with a very long to long cropping season, dividable in two variable cropping seasons*

Small area, situated on upper altitude limit of coffee cultivation

Good yield potential
1st rains, start norm. end of March: Late mat. maize like H 613–614 (~60 %), finger millet; m. mat. beans, lima beans; sweet potatoes, potatoes; late and m. mat. sunflower like Comet; cabbages, kales, egg plants
2nd rains, start indistinctly end of June: Beans, potatoes; onions (on light soils)
Whole year: Citrus on deep soils, castor, Macadamia nuts, guavas

Fair yield potential
1st rains: Cold tolerant sorghum
2nd rains: Sweet potatoes
Whole year, best planting time b. of April: Arabica coffee (on deep soils with good husbandry, esp. mulching, otherwise poor)

Pasture and forage
Around 1.2 ha/LU on sec. highland savanna; about 0.8 ha/LU on art. pasture of Rhodes grass; feeding Bana & Napier grass, Lotononis and barrel medicago down to about 0.25 ha/LU; suitable for grade cattle, for grade dairy cows with mentioned additional forage

UM 4 = ***Sunflower-Maize Zone or Upper Sisal Zone*** [4)]

UM 4 l/vl or two = *Sunflower-Maize Zone with a long to very long cropping season, dividable in two variable cropping seasons*

Good yield potential
1st rains, start norm. end of March: Late mat. maize like H 613–614 (~60 %), m. mat. maize like H 622 & 632, cold tol. sorghum (70–80 %, Apr.–S.); late mat. sunflower like Kenya White (~60 %); m. and late mat. beans
2nd rains, start indistinctly around end of June: E. mat. sunflower
Whole year: Sisal, Eucalyptus trees

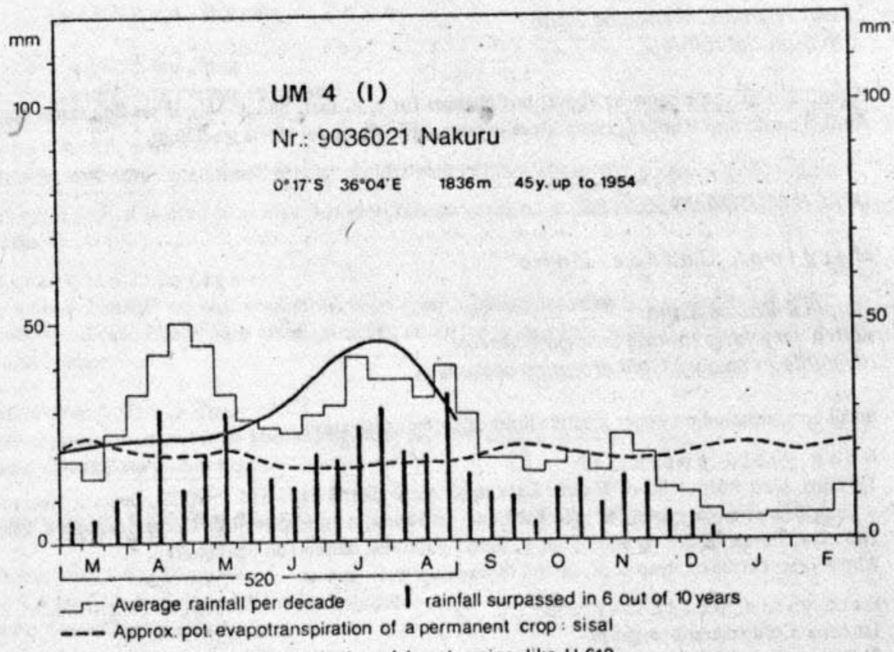
Fair yield potential
1st rains: Finger millet (50–60 %); pigeon peas (lower places, end of March–D.); potatoes, sweet pot.; egg plants, cabbages, kales
2nd rains: E. mat. beans; potatoes, sweet pot.; e. mat. sunflower, e. mat. soya beans; onions
Whole year: Pawpaws, mangoes

Pasture and forage
Around 1.5 ha/LU on undestroyed nat. pasture of highland savanna; about 1 ha/LU on art. pasture of Rhodes grass; down to about 0.35 ha/LU feeding Bana or Napier grass and barrel medicago, esp. for dairy cows; grazing area suitable for grade cattle

UM 4 (l) or two = *Sunflower-Maize Zone or Upper Sisal Zone with a (weak) long cropping season, dividable in two variable cropping seasons*

(See Diagr. Nakuru)

Almost the same potential as UM 4 l/vl less 10 % yield expectation of maize and sunflower, 5 % less of other crops. Stocking rates around 2 ha/LU; var. H 612 better



4) Sisal in drier subzones with weak rainy seasons and on soils with little water holding capacity; large scale cultivation

UM 4 (l/m)i or two = *Sunflower-Maize Zone or Upper Sisal Zone with a (weak) long to medium cropping season and intermediate rains, dividable in two variable cropping seasons and i. r.*

Small, potential see Baringo District. Here in large scale farms sisal more suited than there. Stocking rate > 3 ha/LU

UM 5 = *Livestock-Sorghum Zone*

UM 5 (m/l)i = *Livestock-Sorghum Zone with a (weak) medium to long cropping season and intermediate rains*

Very small, potential see Baringo District

UM 5 (s) i+i = *Livestock-Sorghum Zone with a (weak) short cropping season, intermediate rains and a second period of intermediate rains*

No good yield potential except with add. irrigation (partly possible)

Fair yield potential
1st rains, start norm. b. of April: Cold tol. sorghum (Apr.–Aug.)
Whole year: Sisal, Marama beans

Pasture and forage
2.5–4.5 ha/LU on short grass highland savanna, down to about 1.2 ha/LU on artificial pasture of Rhodes grass with hedges of salt bushes (Atriplex nummularia) and Mesquite (Prosopis juliflora)

UM 5 s + i = *Livestock-Sorghum Zone with a short cropping season and intermediate rains*

Very small. Potential almost the same as above plus e. mat. maize (40–50 %) and v. e. mat. beans

UM 5 (s/vs) + i = *Livestock-Sorghum Zone with a (weak) short to very short cropping season and intermediate rains*

No good yield potential

Fair yield potential
1st rains, start norm. mid April: Dwarf sorghum (40–50 %)
Whole year: Sisal (40–50 %), Marama beans[5)]

Pasture and forage
More than 2.8 ha/LU on short grass highland savanna, less if near groundwater; art. pasture and forage almost as above

UM 5 (vs/s) + i = *Livestock-Sorghum Zone with a (weak) very short to short cropping season and intermediate rains*

Nearly the same potential as above less 5 % in yield expectations and about 10 % in stocking rates

UM 6 = *Upper Midlands Ranching Zone*

UM 6 u r i = *Upper Midlands Ranching Zone with unimodal rainfall and intermediate rains*

Rain-fed agriculture uneconomical. With irrigation good potential for vegetables

Pasture and forage
More than 3.5 ha/LU on open short grass highland savanna; with palatable shrubs like salt bush higher capacity. Near Lake Naivasha supplementary irrigation easy, then cold tolerant sorghum and Columbus grass recommended

5) Edible tubers and seeds. Still experimental

SOIL DISTRIBUTION, FERTILITY AND MAJOR CHARACTERISTICS

Nakuru District is part of the central Rift Valley and includes several lakes, viz., Nakuru, Elmenteita and Naivasha. In addition, three extinct volcanoes rise above the volcanic plains and uplands, i.e. Menengai, Longonot and Suswa. East and west of the plains, escarpments mark the transition to higher plains and footridges. The Mau escarpment is the most imposing scarp. The underlying rock is volcanic but varies according to its age. In some areas, there are geysers where hydrothermal energy may be developed for generation of electricity (Hells Gate in the Naivasha area).

On the volcanoes, soils of units 9 M, 298 Pv and 376 La occur, lava fields may be included. Smaller areas are occupied by soils of units 4 M, 6 M and 7 M with inclusions of lava vents and have moderate to high fertility.

A variety of soils occur on the hills and minor scarps. The most extensive areas are those of units 13 H and 16 H. In addition, unit 17 H with a humic topsoil occurs. Associated with the escarpment are a number of plateaus on either side of the Rift Valley. Unit 57 L, of high fertility, occurs frequently. Unit 71 L, of high fertility, is found in large areas, and also unit 66 Ls of moderate to high or variable fertility. Northeast of Nakuru, unit 60 L with a very thick humic topsoil occurs.

Some of the higher ground in the Rift Valley has been described as uplands. In the Molo area, northeast and west of Nakuru, unit 141 U of high fertility is common. Unit 191 U of variable fertility is associated with the hills. Smaller areas are composed of soils of units 197 U with a humic topsoil and 338 B of low to moderate fertility.

Lacustrine plains are common around the lakes. Here, the soils of unit 320 Pl have a low fertility. Associated with this unit are soils of unit 323 Pl, of moderate to high fertility. They may have a humic topsoil. Smaller areas of the volcanic plains, south of Longonot and Suswa are composed of unit 299 Pv.

Bottomlands occur within some of the plateaus, e.g. unit 338 B of low to moderate fertility. In the extreme north of Nakuru District, some areas with unit 336 B of moderate to high fertility are found.

SOILS ON MOUNTAINS AND MAJOR SCARPS

Soils developed on olivine basalts and ashes of major older volcanoes

4 M
x, m[1] = well drained, shallow to moderately deep, dark reddish brown, friable, humic, rocky and stony clay loam (nito-humic CAMBISOLS, rocky phase)

6 M
x, m–h = well drained, very deep, dark reddish brown to dark brown, very friable and smeary, clay loam to clay, with thick, acid humic topsoil; in places shallow to moderately deep and rocky (humic ANDOSOLS, partly lithic phase)

7 M
x, m–h = well drained, shallow to moderately deep, dark reddish brown to dark brown; rocky and bouldery, clay loam to clay; in places with humic topsoil (nito-chromic CAMBISOLS; with haplic PHAEOZEMS, lithic phase, LITHOSOLS, eutric REGOSOLS and Rock Outcrops)

Soils developed on ashes and other pyroclastic rocks of recent volcanoes

9 M
x, m = somewhat excessively drained, shallow to moderately deep, brown to dark brown, firm and slightly smeary, strongly calcareous, gravelly to stony clay loam; in many places saline and/or sodic and with inclusions of lava fields (ando-calcaric REGOSOLS)

SOILS ON HILLS AND MINOR SCARPS

Soils developed on undifferentiated Tertiary volcanic rocks (olivine basalts, rhyolites, andesites)

13 H
x, m = well drained, shallow, dark reddish brown, friable, very calcareous, bouldery or stony, loam to clay loam; in many places saline (LITHOSOLS; with calcic XEROSOLS, bouldery and saline phase and Rock Outcrops)

14 H
x, m–h = complex of well drained to moderately well drained, shallow to moderately deep, dark brown, firm, stony, clay loam to clay; in places with humic topsoil (eutric REGOSOLS; with verto-luvic PHAEOZEMS, partly lithic phase)

Soils developed on ashes and other pyroclastic rocks of recent volcanoes

16 H
x, m = somewhat excessively drained, shallow dark brown to brown, friable and slightly smeary, rocky and stony clay loam (ando-eutric CAMBISOLS, lithic and stony phase; with Rock Outcrops)

17 H
x, m = complex of:
- well drained, deep to very deep, dark brown to greyish brown, friable and smeary clay loam, with thick humic topsoil (mollic ANDOSOLS)
- somewhat excessively drained, shallow dark brown to brown, friable and slightly smeary, rocky and stony clay loam (ando-eutric CAMBISOLS, lithic and stony phase; with Rock Outcrops)

SOILS ON PLATEAUS AND HIGH-LEVEL STRUCTURAL PLAINS

Soils developed on volcanic ashes and other pyroclastics of recent volcanoes

57 L
m–h = well drained, moderately deep to very deep, dark brown, friable and slightly smeary, clay loam to clay (ando-luvic PHAEOZEMS)

59 L
m = well drained, deep to very deep, very dark greyish brown, friable and smeary, loam to clay loam, with a thick humic topsoil (mollic ANDOSOLS)

60 L
m, h = complex of:
- well drained, deep to very deep, very dark greyish brown to dark brown, friable and slightly smeary clay loam (ando-luvic PHAEOZEMS)
- imperfectly drained, deep, very dark greyish brown to black, firm, moderately calcareous, slightly cracking clay (verto-luvic PHAEOZEMS)

SOILS ON STEP-FAULTED FLOOR OF THE RIFT VALLEY

Soils developed on Tertiary basic igneous rocks (olivine basalts, nepheline phonolites; older basic tuffs included)

66 Ls x, m–h = well drained, moderately deep, dark reddish brown to reddish brown, friable to firm and slightly smeary, bouldery and stony, clay loam to clay; in places calcareous (ando-chromic CAMBISOLS, bouldery phase; with calcic XEROSOLS)

SOILS ON PLATEAU/UPPER-LEVEL UPLAND TRANSITIONS

Soils developed on ashes and other pyroclastic rocks from recent volcanoes

71 L h = well drained, deep to very deep, dark brown, friable and smeary, sandy clay to clay, with acid humic topsoil (humic ANDOSOLS)

72 L m = well drained, deep to very deep, very dark greyish brown, friable and smeary, clay loam, with thick humic topsoil (mollic ANDOSOLS)

SOILS ON VOLCANIC FOOTRIDGES

Soils developed on Tertiary basic igneous rocks (basalts, nepheline phonolites; basic tuffs included)

75 R m–h = association of: – well drained, extremely deep, dark reddish brown, friable clay, with acid humic topsoil; on interfluves (humic NITOSOLS)
– well drained, shallow to moderately deep, dark reddish brown to dark brown, friable clay loam to clay, with acid humic topsoil; on valley sides (humic CAMBISOLS, partly lithic phase)

78 R h = well drained, extremely deep, dusky red to dark reddish brown, friable clay; with inclusions of well drained, moderately deep, dark red to dark reddish brown, friable clay over rock, pisoferric or petroferric material (eutric NITOSOLS; with nito-chromic ACRISOLS, partly pisoferric or petroferric phase)

Soils developed on Tertiary basic igneous rocks (basalts, nepheline phonolites; basic tuffs included) and with volcanic ash admixture

82 R m–h = association of: – well drained, extremely deep, dark reddish brown, friable and slightly smeary clay, with acid humic topsoil; on interfluves (ando-humic NITOSOLS)
– well drained, shallow to moderately deep, dark brown, friable, clay loam to clay, with acid humic topsoil; on valley sides (humic CAMBISOLS, partly lithic phase)

Soils developed on ashes and other pyroclastic rocks from recent volcanoes

83 R m–h = association of: – well drained, very deep, dark reddish brown, very friable and smeary, sandy clay loam to clay, with thick humic topsoil; on interfluves (mollic ANDOSOLS)

SOILS ON UPPER MIDDLE-LEVEL UPLANDS

Soils developed on various rocks and on volcanic ash admixture

140 U m = moderately well drained, moderately deep, reddish brown to red, firm clay loam, with humic topsoil (ando-luvic PHAEOZEMS)

SOILS ON LOWER MIDDLE-LEVEL UPLANDS

Soils developed on ashes and other pyroclastic rocks from recent volcanoes

141 U h = well drained, deep to very deep, dark reddish brown, friable and smeary, silty clay to clay, with humic topsoil (mollic ANDOSOLS)

SOILS ON UPLANDS, UNDIFFERENTIATED LEVELS

Soils developed on undifferentiated volcanic rocks (mainly basalts)

191 U x, m = well drained, shallow, dark brown, friable, strongly calcareous, stony loam, often strongly saline and moderately sodic; with stone mantle (desert pavement); (dissected older piedmont plain) (calcaric REGOSOLS, stone-mantle and saline-sodic phase)

Soils developed on basic igneous rocks (basalts, etc.) with predominant volcanic ash influence

197 U h = well drained, deep to very deep, dark reddish brown to dark red, firm clay; with inclusions of imperfectly drained, moderately deep, dark greyish brown clay (nito-ferric/chromic LUVISOLS; with gleyic LUVISOLS, partly lithic or pisoferric phase)

SOILS ON VOLCANIC PLAINS

Soils developed on ashes and pumice from recent volcanoes

298 Pv l–m = excessively drained to well drained, very deep, dark greyish brown to olive grey, loose to very friable, stratified, calcareous, fine sand to fine sandy loam or silt (ando-calcaric REGOSOLS)

299 Pv m = imperfectly drained, very deep, yellowish brown to olive grey, friable, slightly saline and slightly sodic, sandy loam to silt loam, with a brittle and strongly sodic deeper subsoil ((ando-) gleyic SOLONETZ, saline and fragipan phase)

301 Pv m = well drained, moderately deep to deep, brown to dark brown, very friable, loam to sandy clay loam (vitric Andosols)

302 Pv = as 301 but heavy clay loam

SOILS ON COASTAL PLAINS

Soils developed on lower-level lagoonal deposits

307 Pc = imperfectly to poorly drained, very deep, grey to brown, mottled, very firm clay (hardpan), slightly calcareous and strongly
h saline and sodic throughout or in deeper subsoil (gleyic SOLONETZ; with gleyic or verto-luvic PHAEOZEMS, saline-sodic phase)

SOILS ON LACUSTRINE PLAINS

Soils developed on sediments from volcanic ashes and other sources

320 Pl = imperfectly drained to poorly drained, very deep, dark greyish brown to dark brown, firm to very firm, slightly to moderately
m–h calcareous, slightly to moderately saline, but moderately to strongly sodic, silt loam to clay, often with humic topsoil (subrecent lake sides of the central Rift Valley) (SOLONETZ, undifferentiated, saline phase)

Soils developed on sediments mainly from volcanic ashes (Gamblian lake of the Central Rift Valley)

323 Pl = complex of: – well drained, moderately deep to deep, dark brown, friable and slightly smeary, fine gravelly, sandy clay loam
m–h to sandy clay, with humic topsoil (ando-haplic PHAEOZEMS)
– imperfectly drained, moderately deep to deep, strong brown, mottled, firm and brittle, sandy clay to clay (gleyic CAMBISOLS, fragipan phase)

SOILS ON BOTTOMLANDS

Soils developed on infill from undifferentiated volcanic rocks

336 B = imperfectly drained, deep, dark brown to olive grey, firm to very firm clay soils of varying calcareousness, salinity and sodicity; in
h many places cracking (VERTISOLS ans SOLONCHAKS, undifferentiated)

Soils developed on infill from volcanic ashes

338 B = imperfectly drained to poorly drained, moderately deep, dark greyish brown, mottled, very firm clay loam (hardpan), abruptly
m underlying a topsoil of acid humic friable loam (humic PLANOSOLS)

SOILS ON LAVA FLOWS

376 La = excessively drained, exceedingly bouldery to stony, extremely rocky land
x (Bouldery and Rock Outcrops)

1) Soil texture-classes

h	=	heavy
l	=	light
m	=	medium
x	=	stony or bouldery
v	=	varying texture
m-h	=	medium to heavy
m, h	=	medium and heavy (e.g. abruptly underlaying a topsoil of different texture)

Soil description from Kenya Soil Survey: Exploratory Soil Map and Agro-climatic Zone Map of Kenya, Scale 1:1 000 000. Expl. Soil Survey Rep. E1, Nairobi 1982. See this map also for colours; symbols simplified here.

POPULATION AND LAND

The results of the Census of September 1979 show that 522,709 people live in Nakuru District. Of this figure, more than 25 % (135,205 people) live in the 6 townships and 4 trading centres of the area, of which Nakuru Municipality[1)] with more than 92,000 inhabitants is the most important town in the province (Table 4). The percentage of the urban population is comparatively high here and industry and tourism play a role that should not be underestimated. The natural features in this region (Lake Naivasha, Lake Nakuru, Lake Elmenteita, Menengai Crater, Longonot and Suswa) are considerable tourist attractions.

Nevertheless, livestock and agriculture play by far the most important part in the economy of the district. For 387,504 rural persons, a total rural area of 576,200 ha is available. That is not much but for a small farmer in the better areas, it is adequate. The Elburgon divison with only 1.18 ha per household and 0.26 ha per person (UH 1, UH 2, LH 2, LH3), is a good example of this.

In most areas of the district, however, the ecological conditions are rather unsuitable for arable farming and livestock is the main economic activity. In Kijabe location (mainly UM 6, UM 5 and LH 5) 31.34 ha per household and 6.78 ha per person were available, not much for ranching. To a certain extent the Nakuru District can be compared with the Laikipia District, as in both districts, ranching plays a most important role, although here the land pressure is stronger and the population density much higher.

This used to be a large-scale ranching area, and some ranches still exist today, but the main part of the area (especially former forests and large-scale farms) is quite densely populated now. Problems such as soil erosion and degradation as a direct consequence of too high stocking rates occur more and more. That is why an improvement of the overall land use and agricultural productivity is necessary in order to stop the steady destruction of the natural potential. This is very important because the population is still growing quickly, and as far as can be predicted, livestock and agriculture will remain the basis of the economy in the future.

1) Not included are rural people living in the Municipality, but on the other hand there are some non-rural people outside in trading centres, schools etc.

NAKURU DISTRICT

TABLE 4: POPULATION PER LOCATION AND DIVISION
CENSUS 1979

Location/Division without township	Male	Female	Total	Number of households	Square kilometers	Density
Bahati	20083	21308	41391	8115	210	196
Solai	15288	14529	29817	6860	521	57
Subukia	16035	16943	32978	6466	285	115
Bahati Division	51406	52780	104186	21441	1017	102
Naivasha Township	6750	4741	11491	2856	10	1113
Naivasha	26600	23749	50349	12329	967	52
Kijabe	4835	4818	9653	2087	740	13
Gilgil	18733	16604	35337	8221	1039	34
Naivasha Division	50168	45171	95339	22637	2747	34
Molo/Mau Summit	16776	16784	33560	6678	195	171
Molo South	17226	16919	34145	6273	439	77
Rongai	17659	15754	33413	7002	565	59
Njoro	32794	33866	66660	13596	345	192
Elburgon	17068	16948	34016	7395	111	304
Mau Narok	8119	7735	15854	3912	159	99
Molo Division	109642	108006	217648	44856	1817	119
Olenguruone	6200	6485	12685	2433	108	116
Olenguruone Division	6200	6485	12685	2433	108	116
Nakuru Municipality	51301	41550	92851	23257	78	1184
Nakuru Municipality Division	51301	41550	92851	23257	78	1184
Nakuru District	268717	253992	522709	114624	5769	90

NAKURU DISTRICT

TABLE 5: COMPOSITION OF HOUSEHOLDS
PER
LOCATION AND DIVISION[a)]

LOCATION/DIVISION	No. of Households total	Farmers Family b)			Non-Relatives	Persons per Households total b)
		Adults >15 years	Children < 15years	Other Relatives		
Location:						
Bahati	8140	2.77	1.49	0.61	0.21	5.08
Solai	6861	2.57	1.12	0.44	0.21	4.35
Subukia	6436	2.77	1.55	0.58	0.23	5.21
Division Subukia	21437	2.69	1.40	0.54	0.22	4.86
Location:						
Naivasha	12306	2.39	0.85	0.47	0.23	0.40
Kijabe	2079	2.71	2.39	0.63	0.25	4.64
Gilgil	8206	2.38	0.97	0.45	0.40	4.20
Division Naivasha	22591	2.40	0.93	0.48	0.29	4.09
Location:						
Molo/Mau Summit	6982	2.68	1.35	0.44	0.33	4.80
Molo South	6254	2.89	1.48	0.54	0.54	0.45
Rongai	6978	2.74	1.15	0.45	0.44	4.78
Njoro	13567	2.73	1.40	0.51	0.26	4.91
Elburgon	7393	3.26	0.68	0.47	0.17	4.58
Mau Narok	3905	2.40	1.19	0.33	0.14	4.06
Division Molo	45079	2.71	1.32	0.47	0.30	4.80
Location Olenguruone	2429	2.86	1.57	0.53	0.22	5.18
Division Olenguruone	2429	2.86	1.57	0.53	0.22	5.18
Location Nakuru Municipality	23142	2.32	0.63	0.50	0.40	3.84
Division Nakuru Municipality	23142	2.32	0.63	0.50	0.40	3.84
DISTRICT: NAKURU	114678	2.58	1.12	0.49	0.30	4.49

a) Source: Central Bureau of Statistics (CBS)

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

DB X
KENYA

COAST PROVINCE

TAITA-TAVETA DISTRICT

Contents

District page

NATURAL POTENTIAL

INTRODUCTION

Taita District is a dry area, unsuitable for agriculture except in higher rain catchment areas (Taita Hills) and their foothills, and in Taveta Division where rainfall increases near Kilimanjaro or irrigation possibilities exist. The highest elevations of the Taita Hills may be included in the Lower Highland Zone. The effect of the southeastern trade wind are visible from the end of the first rains to September: the mountains are covered by clouds formed by condensation of moisture in the rising air. There would be enough moisture for pyrethrum cultivation (LH 2) but this part is very steep and has shallow soils.

The main part of the Taita Hills belongs to the Upper Midlands, zone 2 is missing, and we have only a Marginal Coffee Zone there (UM 3). Some valley bottoms are wetter and are suitable for vegetables; the surplus finds a ready market in Mombasa. The next zones downwards, UM 4 and LM 4, are mainly dominated by steep slopes so there is not much space for maize, sunflower, or cotton.

In the foothill zone, it is normally too dry for maize, but there is some scope for very early maturing new sorghum and millet varieties. Sisal is an alternative, although it tends to be marginal with the average annual rainfall quickly dropping below 500 mm a few kilometers away from the mountains.

The other green, mountainous "islands" in the "sea" of uncultivable thornbush (L 6) are smaller and less elevated but locally important, like the Kasigau or Sagala Hills. The Tsavo National Park is excluded for cultivation purposes and therefore not mapped here, but it would be almost all zone L 6, useless for farmers (see also WIJNGARDEN, W. van, ed.: Reconnaisance Soil and Vegetation Survey of the Tsavo Area. Kenya Soil Survey R 7, Nairobi 1980).

TAITA-TAVETA DISTRICT

TABLE 1: RAINFALL FIGURES FROM VARIOUS STATIONS

having at least 10 years of records up to 1976

No. and altitude	Name of Station	Years of rec.	Kind of rec.	Ann. rainf. mm	Monthly rainfall in mm Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
9337081	Taveta, Ziwani Sisal	31	Average	530	37	31	85	122	64	9	3	4	8	25	78	65
900 m	Estate		60% rel.[1)]	421	13	3	52	68	40	1	0	0	2	11	48	40
9338001	Voi, Met. Station	71	Av.	545	32	70	81	93	29	7	3	8	15	28	99	122
560 m			60 %	446	11	4	51	65	13	0	0	2	4	14	59	81
9338003	Wundanyi D.C.'s	71	Av.	1 332	57	43	146	268	140	41	31	52	59	100	218	176
1 460 m	Office, Boma		60 %	1 218	23	19	94	202	116	18	17	28	34	75	175	151
9338004	Tsavo Railway	34	Av.	351	23	21	48	58	15	2	1	2	4	7	68	102
465 m	Station		60 %	291	0	0	9	40	2	0	0	0	0	0	45	62
9338005	Wesu Hospital	36	Av.	1 415	43	41	136	282	189	35	35	55	68	121	234	176
1 675 m			60 %	1 131	12	10	57	239	157	0	29	24	4	65	226	97
9338006	Bura Cath. Mission	32	Av.	958	36	40	109	222	109	18	13	17	33	86	174	101
1 143 m			60 %	898	12	33	92	227	51	4	4	3	1	33	138	59
9338007	Maktau Station	38	Av.	451	13	28	93	97	42	8	6	5	12	25	66	57
1 095 m			60 %	364	0	12	63	57	27	0	0	0	0	3	57	21
9338017	Tsavo Mzima Springs	21	Av.	402	39	16	57	92	31	4	2	3	6	13	60	80
650 m			60 %	298	7	4	13	38	11	0	0	0	0	2	45	46
9338018	Rukanga Kasigau	24	Av.	709	35	25	111	97	70	26	13	28	25	58	118	103
610 m	Location		60 %	597	26	11	74	67	37	2	2	6	20	14	80	73
9338020	Maungu Railway	12	Av.	384	28	19	68	48	24	10	2	4	11	36	60	75
5,17 m	Station		60 %	305	0	0	0	12	12	0	0	0	0	10	55	76

1) These figures of rainfall reliability should be exceeded normally in 6 out of 10 years

TAITA-TAVETA DISTRICT

TABLE 2: TEMPERATURE DATA

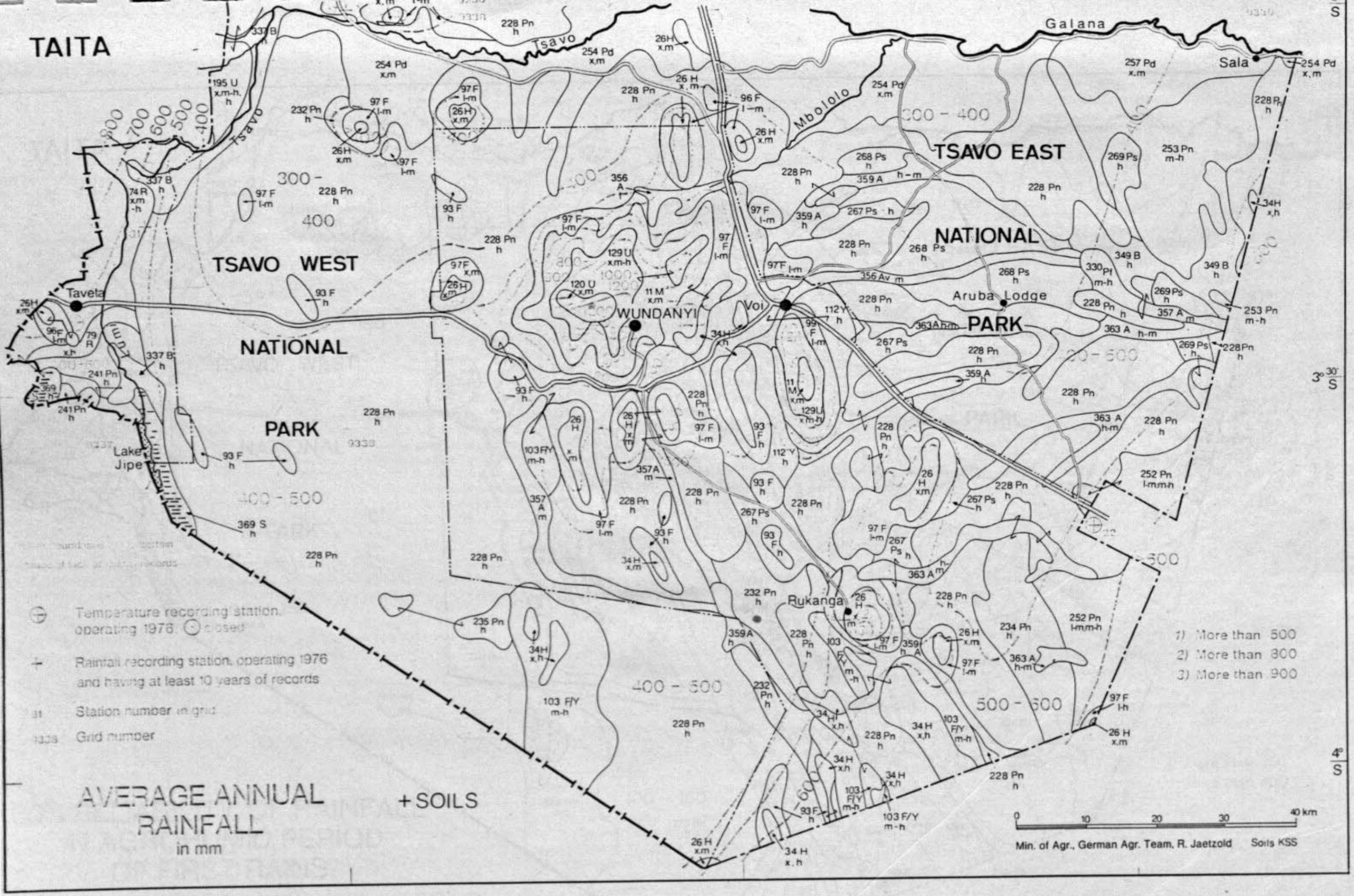
No. and altitude	Name of Station	AEZ 1)	Kind of records	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Year	Years of rec.
									Temperature in °C								
9338022 396 m	Bachuma Range Research Station	CL 6	Mean max.	33.0	33.2	33.6	32.0	29.6	28.3	27.8	27.5	28.8	30.4	31.6	31.6	30.6	5
			Mean temp.	26.4	26.6	26.9	26.0	24.4	22.9	22.5	22.2	23.2	24.7	25.8	26.0	24.8	
			Mean min.	19.8	20.1	20.3	20.0	19.2	17.5	17.2	17.0	17.6	18.9	20.0	20.3	19.0	
			Abs. min.	16.7	11.0	17.0	18.0	16.5	14.0	13.5	14.0	14.0	15.5	17.5	13.0	11.0	
9337110 770 m	Taveta Water Develop. Station	LM 5 lp	Mean. max.	31.9	32.7	32.1	30.2	27.8	26.9	26.8	27.4	29.9	31.3	31.6	31.4	30.0	5
			Mean temp.	22.3	24.0	24.4	23.8	21.5	20.6	20.0	20.2	21.7	22.7	23.0	23.0	22.3	
			Mean min.	12.6	15.2	16.7	17.4	15.2	14.3	13.3	13.0	13.5	14.1	14.3	14.6	14.5	
			Abs. min.	5.5	5.0	6.0	11.5	8.0	7.0	5.5	4.5	5.0	3.0	5.0	6.5	3.0	
9338001 560 m	Voi Met. Stat.	CL 5 hp	Mean max.	31.7	33.1	33.3	31.7	29.8	29.0	27.9	27.9	29.1	30.9	31.3	30.7	30.5	32
			Mean temp.	25.9	26.7	27.1	25.9	24.9	23.6	22.6	22.5	23.3	24.9	25.7	25.6	24.9	
			Mean min.	20.2	20.3	20.9	20.2	20.0	18.3	17.4	17.2	17.6	18.9	20.1	20.5	19.3	
			Abs. min.	15.5	13.0	15.4	17.7	12.7	13.4	12.8	9.6	12.9	14.1	15.0	16.0	9.6	
9338005 1 675 m	Wesu Hospital (operating to 1955)	UM 3 hp	Mean max.	23.1	24.4	24.2	22.3	20.1	18.9	17.9	18.1	19.6	21.6	22.5	22.1	21.2	15
			Mean temp.	18.3	18.8	18.6	17.6	16.1	14.6	13.7	13.7	14.5	16.0	17.1	17.5	16.4	
			Mean min.	13.5	13.3	13.1	12.9	12.1	10.4	9.6	9.3	9.5	10.5	11.8	12.9	11.6	
			Abs. min.	8.3	7.8	7.2	6.7	6.1	5.0	4.4	3.9	4.4	6.1	6.1	7.8	3.9	

1) AEZ = Agro-ecological zone; lp = lower places, hp = higher places within the zone

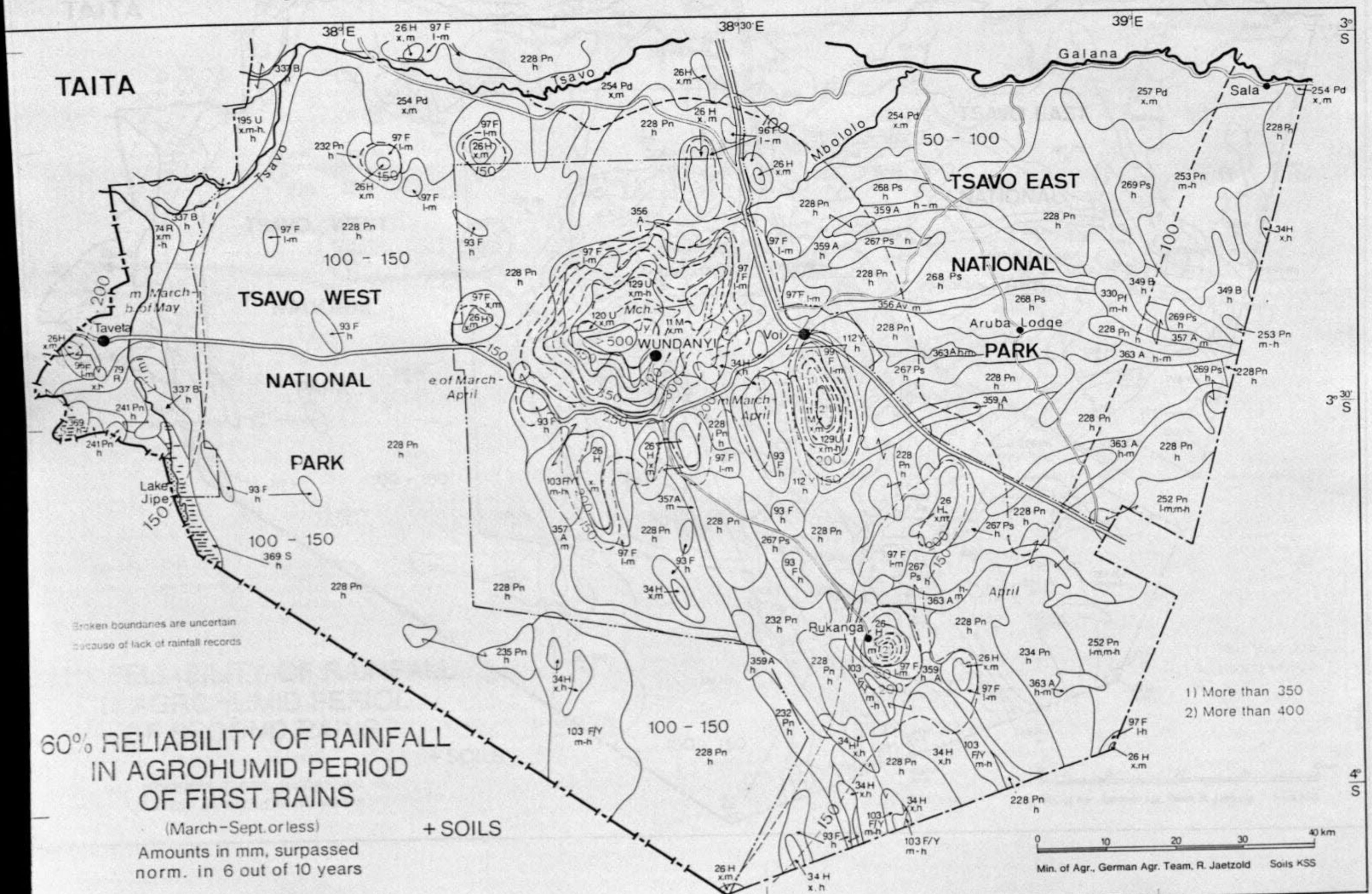
TABLE 3: CLIMATE IN THE AGRO-ECOLOGICAL ZONES

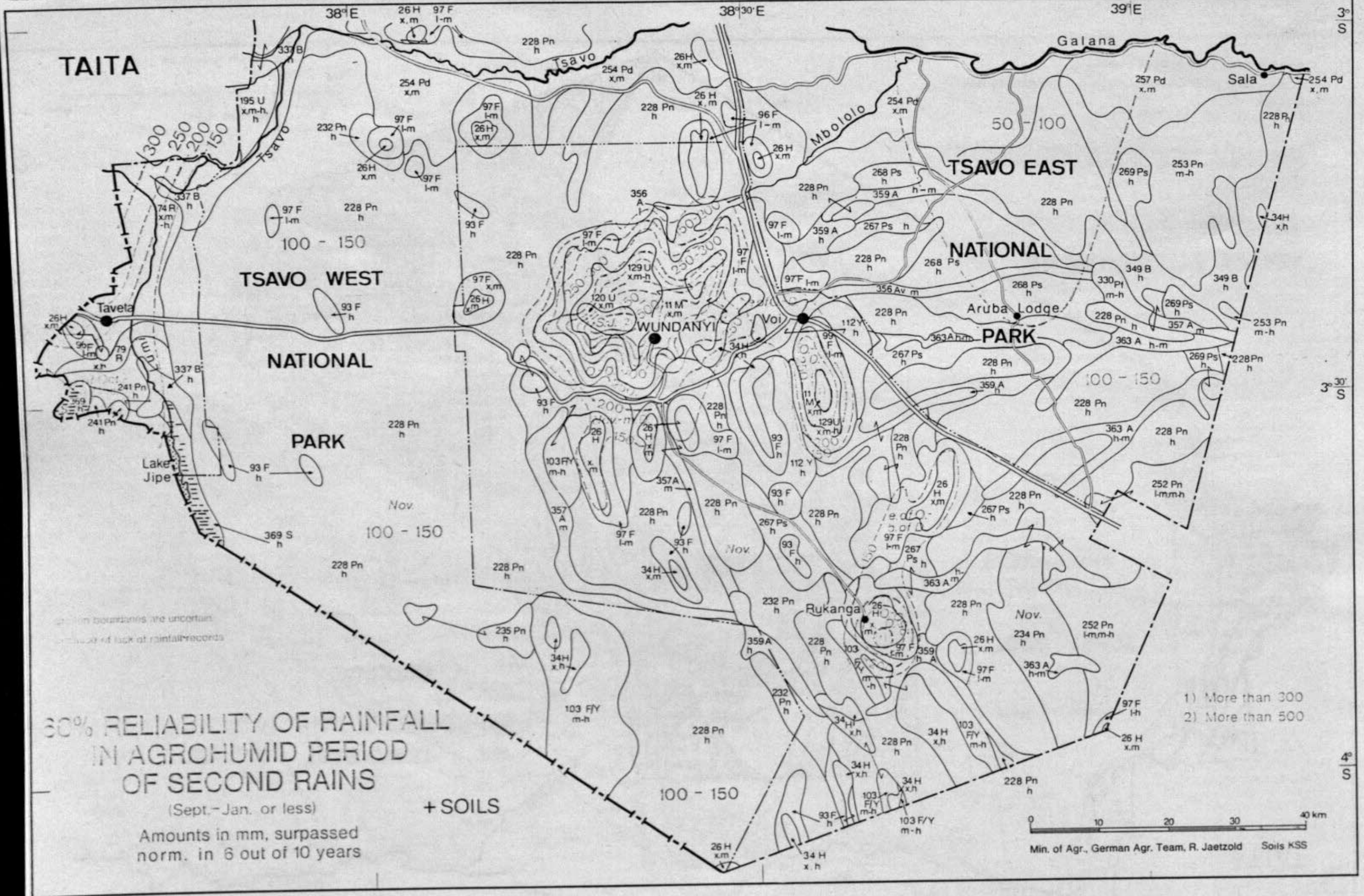
Agro-Ecological Zone	Subzone	Altitude in m	Annual mean temperature in °C	Annual av. rainfall in mm	60 % reliability of rainfall 1) 1st rains in mm	2nd rains in mm	60 % reliability of growing period 1st rains in days	2nd rains in days	Total 2) in days
LH 2 Wheat/Maize-Pyrethrum Zone	m + m/s	Very small							
UM 3 Marginal Coffee Zone	m/s + s/m	1 370–1 680	20.1–18.2	900–1 200	400–550	350–500	115–130	105–110	–
UM 4 Sunflower-Maize Zone	fs + s or s/vs	1 220–1 520	20.9–18.8	700–900	250–400	270–400	85–115	85–105	–
LM 4 Marginal Cotton Zone	s/vs + vs/s	910–1 220	22.9–20.9	600–800	190–360	180–300	75–85	55–75	–
	s/vs + s/vs				190–230	250–330	75–85	75–85	150–170 3)
LM 5 Lower Midland Livestock-Millet Zone	vs/s + vs	790–980	23.5–22.4	550–700	200–250	140–200	55–75	45–55	–
	vs/s + vs/s				Very small and unimportant				
	vs + i			480–620	140–200	120–150	45–55	< 45	–
LM 6 Lower Midland Ranching Zone	b r	No rainfed agriculture possible 4)							
L5 Lowland Live-stock-Millet Zone	(vs) + (vs/s)	610–790	24.6–23.5	550–680	125–200	160–210	40–55	50–75	–
	(vs)+i or i+(vs)			520–650	150–200	150–180	40–50	40–50	–
	(vs) + i			480–600	140–190	120–150	40–50	< 40	–
L 6 Lowland Ranching Zone	b r	No rainfed agriculture possible 4)							

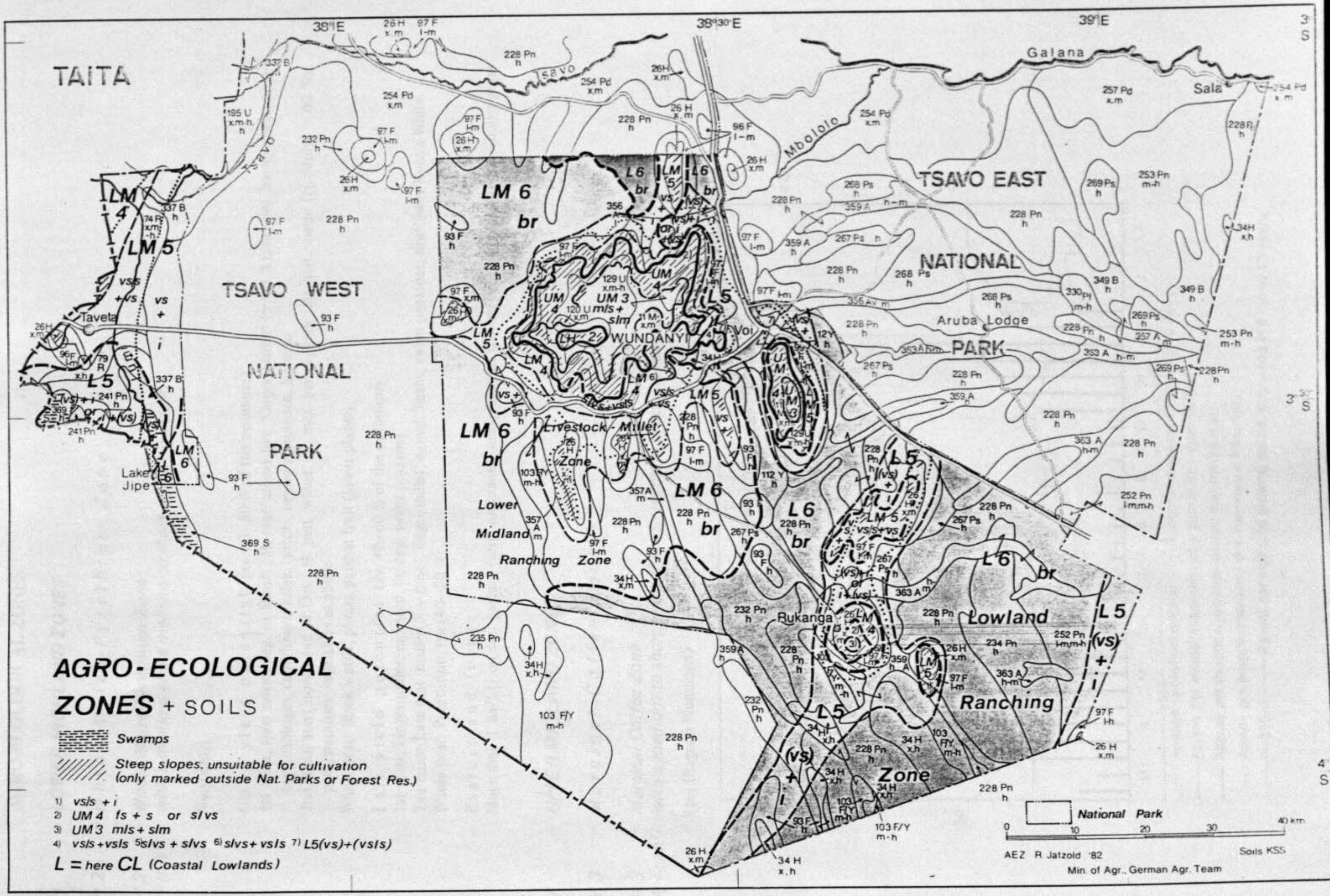
1) Amounts surpassed normally in 6 out of 10 years, falling during the agro-humid period which allows growing of most cultivated plants



TAITA
TSAVO WEST NATIONAL PARK
TSAVO EAST NATIONAL PARK
Taveta
Lake Jipe
WUNDANYI
Voi
Aruba Lodge
Rukanga
Sala
Galana
Tsavo
Mbololo
300 - 400
400 - 500
500 - 600
3° 30' S
4° S
1) More than 500
2) More than 800
3) More than 900
Temperature recording station, operating 1976, closed
Raintall recording station, operating 1976 and having at least 10 years of records
Station number in grid
Grid number
AVERAGE ANNUAL RAINFALL in mm
+ SOILS
0 10 20 30 40 km
Min. of Agr., German Agr. Team, R. Jaetzold
Soils KSS


TAITA
60% RELIABILITY OF RAINFALL
IN AGROHUMID PERIOD
OF FIRST RAINS
(March–Sept. or less)
+ SOILS
Amounts in mm, surpassed
norm. in 6 out of 10 years
Broken boundaries are uncertain
because of lack of rainfall records
1) More than 350
2) More than 400
TSAVO WEST
NATIONAL
PARK
TSAVO EAST
NATIONAL
PARK
Taveta
Lake Jipe
WUNDANYI
Voi
Aruba Lodge
Rukanga
Sala
Galana
Tsavo
Mbololo
100 - 150
50 - 100
38°E
38°30'E
39°E
3° S
3°30' S
4° S
0 10 20 30 40 km
Min. of Agr., German Agr. Team, R. Jaetzold
Soils KSS


TAITA
TSAVO WEST
NATIONAL
PARK
TSAVO EAST
NATIONAL
PARK
Taveta
Lake Jipe
WUNDANYI
Voi
Aruba Lodge
Rukanga
Sala
Galana
Tsavo
Mbololo
38°E
38°30'E
39°E
3° S
3° 30' S
4° S
50 - 100
100 - 150
Nov.
80% RELIABILITY OF RAINFALL
IN AGROHUMID PERIOD
OF SECOND RAINS
(Sept.-Jan. or less)
+ SOILS
Amounts in mm, surpassed
norm. in 6 out of 10 years
1) More than 300
2) More than 500
0 10 20 30 40 km
Min. of Agr., German Agr. Team, R. Jaetzold
Soils KSS


TAITA
TSAVO WEST
NATIONAL
PARK
TSAVO EAST
NATIONAL
PARK
Taveta
Lake Jipe
Wundanyi
Voi
Aruba Lodge
Rukanga
Galana
Mbololo
Tsavo
Sala
Lower Midland Ranching Zone
Livestock - Millet Zone
Lowland Ranching Zone
38°E
38°30'E
39°E
AGRO-ECOLOGICAL ZONES + SOILS
Swamps
Steep slopes, unsuitable for cultivation (only marked outside Nat. Parks or Forest Res.)
1) vs/s + i
2) UM 4 fs + s or s/vs
3) UM 3 m/s + s/m
4) vs/s + vs/s 5) s/vs + s/vs 6) s/vs + vs/s 7) L5(vs)+(vs/s)
L = here CL (Coastal Lowlands)
National Park
0 10 20 30 40 km
AEZ R. Jatzold '82
Min. of Agr., German Agr. Team
Soils KSS

AGRO-ECOLOGICAL ZONES

LH = *LOWER HIGHLAND ZONES*

LH 2 = *W h e a t / M a i z e - P y r e t h r u m   Z o n e*

LH 2 = *Wheat/Maize-Pyrethrum Zone*
m + m/s[1)] *with a medium and a medium to short cropping season*

Very small

G o o d   y i e l d   p o t e n t i a l (av. 60–80 % of the optimum)
1st rains, start norm. beg. of March: M. mat. wheat like Kenya Tembo (~ 60 %), m. mat. barley; peas, potatoes; cabbages, cauliflower, kales, carrots, beetroot, spinach, lettuces
2nd rains, start norm. end of Oct.: M. mat. wheat, m. mat. barley, very late mat. maize (N.–July, ~ 60 %); peas, potatoes; vegetables as above
Whole year: Black wattle, plums, passion fruit (lower places)

F a i r   y i e l d   p o t e n t i a l (av. 40–60 % of the optimum)
1st rains: Finger millet; rapeseed, linseed; sweet potatoes
2nd rains: Late mat. maize (N.–June), finger millet; e. mat. beans, sweet potatoes; sunflower Kenya White
Whole year: Pyrethrum, tea (40–50 %)

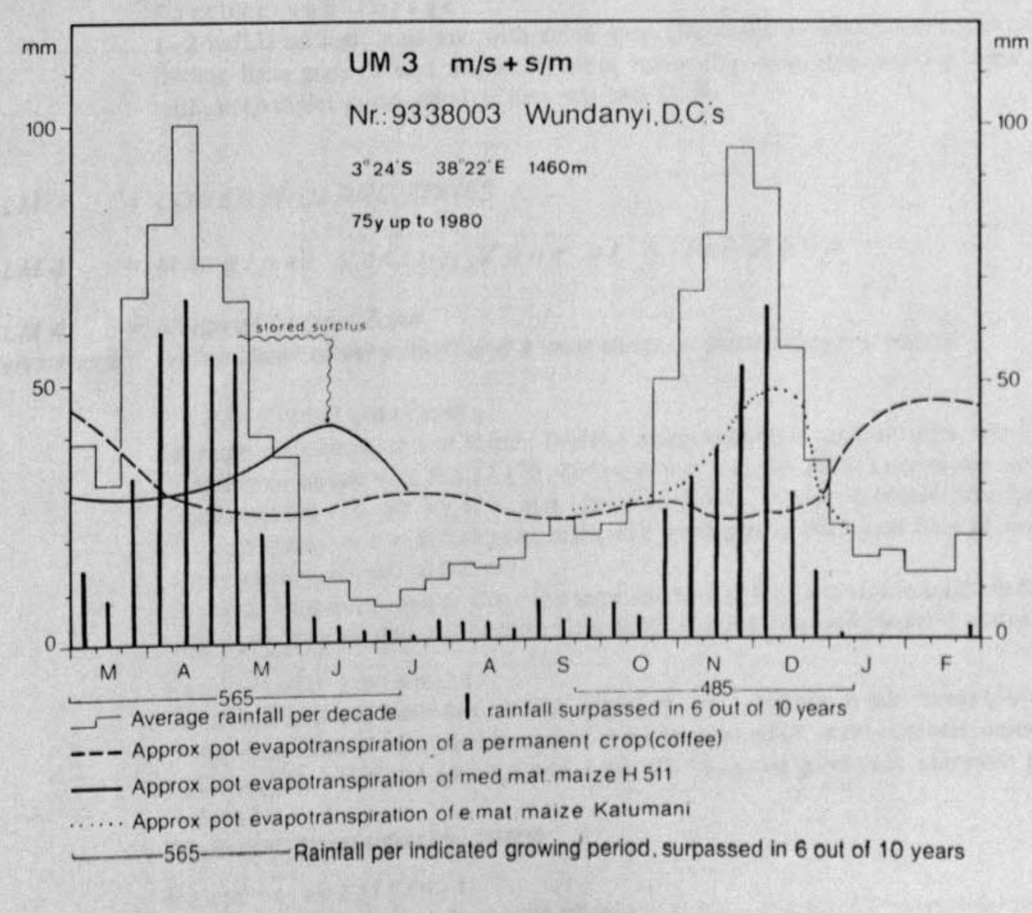
P a s t u r e   a n d   f o r a g e
More than 1 ha/LU on sec. pasture (orig. montane forest), around 0.6 ha/LU on art. pasture of Kikuyu grass

UM = *UPPER MIDLAND ZONES*

UM 3 = *M a r g i n a l   C o f f e e   Z o n e*

UM 3 = *Marginal Coffee Zone*
m/s + s/m[1)] *with a medium to short and a short to medium cropping season*

(see Diagram Wundanyi)



Good yield potential
1st rains, start norm. beg. of March: E. mat. maize like Katumani comp. B, e. mat. sorghum like 2 KX 17 or Serena below 1 500 m; m. mat. sunflower like Hybrid S 301 A; onions, cabbages
2nd rains, start norm. end of Oct.: Serena and ratoon sorghum; e. mat. sunflower like HS 345 or below 1 500 m Issanka
Whole year: Pineapples (lower places), Macadamia nuts, castor, sisal

Fair yield potential
1st rains: M. mat. maize like H 512 (~ 40 %), finger millet; e. mat. beans, sweet potatoes; kales, tomatoes
2nd rains: L. mat. maize (O.–June), Katumani maize; e. mat. beans; cabbages, kales, tomatoes
Whole year: Arabica coffee (lower places poor, there add. irr. profitable), bananas, pawpaws, citrus, passion fruit

Pasture and forage
0.7–1.2 ha/LU on sec. high grass sav. with zebra grass (Hyparrhenia rufa) and star grass (Cynodon dactylon, on better soils), down to about 0.25 ha/LU feeding Napier and Bana grass (if well manured), maize stalks, fodder legumes like stylo, and planting horse tamarinds (Leucaena leucocephala)

UM 4 = *Sunflower-Maize Zone*

UM 4 s + s = *Sunflower-Maize Zone with two short cropping seasons*

Good yield potential
1st rains, start norm. end of March: E. mat. foxtail and proso millet (70–80 %), Katumani maize (good to fair), Dryland composite maize, v. e. mat. sorghum like IS 8595, Serena sorghum below 1 500 m; dwarf sunflower and Hybrid S 345; e. mat. cowpeas (below 1 500 m), v. e. mat. beans
2nd rains, start norm. end of Oct.: The same but Serena sorghum up to 1 800 m, ratoon sorghum like 2 KX 17 (N.–June/July)
Whole year: Sisal

Fair yield potential
1st rains: finger millet; e. mat. beans, bonavist beans (dolichos); sweet potatoes, tomatoes, onions
2nd rains: The same and pigeon peas (2nd to 1st r.) up to 1 500 m
Whole year: Castor, cassava up to 1 500 m, Macadamia nuts, pawpaws, pineapples, citrus (fair to poor)

Pasture and forage
1–2 ha/LU on high grass sav. with zebra grass (Hyparrhenia rufa) predominant; down to about 0.3 ha/LU feeding Bana grass (if well manured), other forage like stylo, and planting horse tamarind (Leucaena) and saltbush (Atriplex nummularia) as best palatable shrubs

LM = *LOWER MIDLAND ZONES*

LM 4 = *Marginal Cotton Zone or Sisal Zone*

LM 4 s/vs + vs/s = *Marginal Cotton Zone with a short to very short and a very short to short cropping season*

Good yield potential
1st rains, start norm. end of March: Dryland comp. maize (on contour ridges, 60–70 %), e. mat. sorghum like Serena or ratoon of 2 KX 17 (70–80 %), e. mat. bulrush millet (awned var. preferred), e. mat. foxtail or proso millet (70–80 %); v. e. mat. dwarf sunflower, e. mat. sunflower like Issanka (~ 60 %); v. e. mat. tepary beans, v. e. mat. cowpeas, black and green grams, chick peas (late pl. on h. black soils); v. e. mat. pumpkins, v. e. mat. rai (oilseed)
2nd rains, start norm. end of Oct.: The same less about 10 %, and ratoon sorghum like 2 KX 17 (2nd to 1st r.)
Whole year, best pl. time end of Oct.: Sisal, buffalo gourds (on sandy soils)[5], castor, jojoba

Fair yield potential
1st rains: Katumani maize (on contour ridges), m. mat. sorghum; e. mat. beans (50–60 %), e. mat. soya beans, dolichos beans, e. mat. bambarra groundnuts (in light soils); sweet potatoes; onions, tomatoes
2nd rains: The same and cotton bimodal var. (O.–Aug., on good soils, otherwise poor), pigeon peas (2nd to 1st r.)
Whole year: Macadamia nuts, cassava

Pasture and forage
1.5–3 ha/LU on mixed medium grass savanna with red oats grass (Themeda triandra) predominant; if degraded

Good year [illegible]
1st [illegible] Kataoma [illegible]
2nd [illegible]
[illegible]

[illegible]

[illegible]

Culture and Usage
[illegible]

[illegible] — [illegible]

[illegible] — [illegible]

Good [illegible]
1st [illegible] Kataoma [illegible]
2nd [illegible]
[illegible]

[illegible]
1st rains [illegible]
2nd rains [illegible]
Whole year [illegible]

[illegible]

[illegible] — LOWER [illegible] ZONES

[illegible] — [illegible]

[illegible] — [illegible]
[illegible]

Good year [illegible]
1st rains [illegible]
2nd rains [illegible]
Whole year [illegible]

[illegible]
1st rains [illegible]
2nd rains [illegible]
Whole year [illegible]

Culture and Usage
[illegible]

nummularia) and horse tamarind (Leucaena leucoc.) as palatable shrubs; add forage: Glycine, siratro, stylo, moth bean vines, pods of applering acacias (Ac. albida = Gao tree)

LM 5 = *Lower Midland Livestock-Millet Zone or Marginal Sisal Zone*

Except some irrigation areas near Taveta

LM 5 = *Lower Midland Livestock-Millet Zone*
vs/s + vs *with a very short to short cropping season and a very short one*

Good yield potential
1st rains, start norm. end of March: E. mat. foxtail and proso millet; v. e. mat. pumpkins
2nd rains, start norm. b. of Nov.: V. e. mat. foxtail and hog millet (on light soils)[5]
Whole year: Buffalo gourds (on light soils)[5], Marama beans[5], Opuntia var. without prickles (fruit and vegetable, also fodder)

Fair yield potential
1st rains: Dryland comp. maize (~ 40 %)[2], e. mat. bulrush millet (awned variety recommended), dwarf sorghum; v. e. mat. tepary beans, black and green grams, v. e. mat. cowpeas, chick peas (late planted on h. bl. soils); dwarf sunflower, v. e. mat. bambarra groundnuts (on light soils), rai

Fair to poor yield potential
2nd rains: E. mat. bulrush millet, v. e. mat. dwarf sorghum; v. e. mat. moth beans, green grams, v. e. mat. cowpeas (40–50 %), chick peas (late planted on h. bl. soils), v. e. mat. bambarra groundnuts (light soils); v. e. mat. dwarf sunflower, v. e. mat. pumpkins
Whole year: Sisal, castor, jojoba

Pasture and forage
3.5–5 ha/LU; down to about 0.8 LU/ha with buffel grass (Cenchrus ciliaris), silage of fodder sorghum, hay of moth bean vines, Mesquite (Prosopis chilensis) and saltbush (Atriplex numm.) for browsing, Gao trees (Acacia albida) for pods

LM 5 = *Lower Midland Livestock-Millet Zone*
vs/s + vs/s *with two very short to short cropping seasons*

Potential almost as LM 5 vs/s + vs but in 2nd rains like in 1st rains

LM 5 = *Lower Midland Livestock-Millet Zone*
vs + i *with a very short cropping season and intermediate rains*

Good yield potential
First rains, start norm. end of March: V. e. mat. foxtail and hog millet
Whole year: Buffalo gourds (on light soils)[5], Marama beans[5]

Fair to poor yield potential
First rains: Dwarf sorghum, e. mat. bulrush millet (awned var.)[2]; green grams, moth beans, v. e. mat. cowpeas for spinach; v. e. mat. dwarf sunflower, v. e. mat. bambarra groundnuts (on light soils)
Whole year: Sisal, jojoba

Pasture and forage
4–6 ha/LU; forage as in LM 5 vs/s+vs

LM 6 = *Lower Midland Ranching Zone*

LM 6 = *Lower Midland Ranching Zone*
b r *with bimodal rainfall*

No rainfed agriculture possible except with runoff-catching techniques (see fig. 2, Machakos District) or Buffalo gourds and Marama beans. More than 4.5 ha/LU on short grass savanna or light bushland

L = *LOWLAND ZONES (here CL = COASTAL LOWLAND ZONES)*

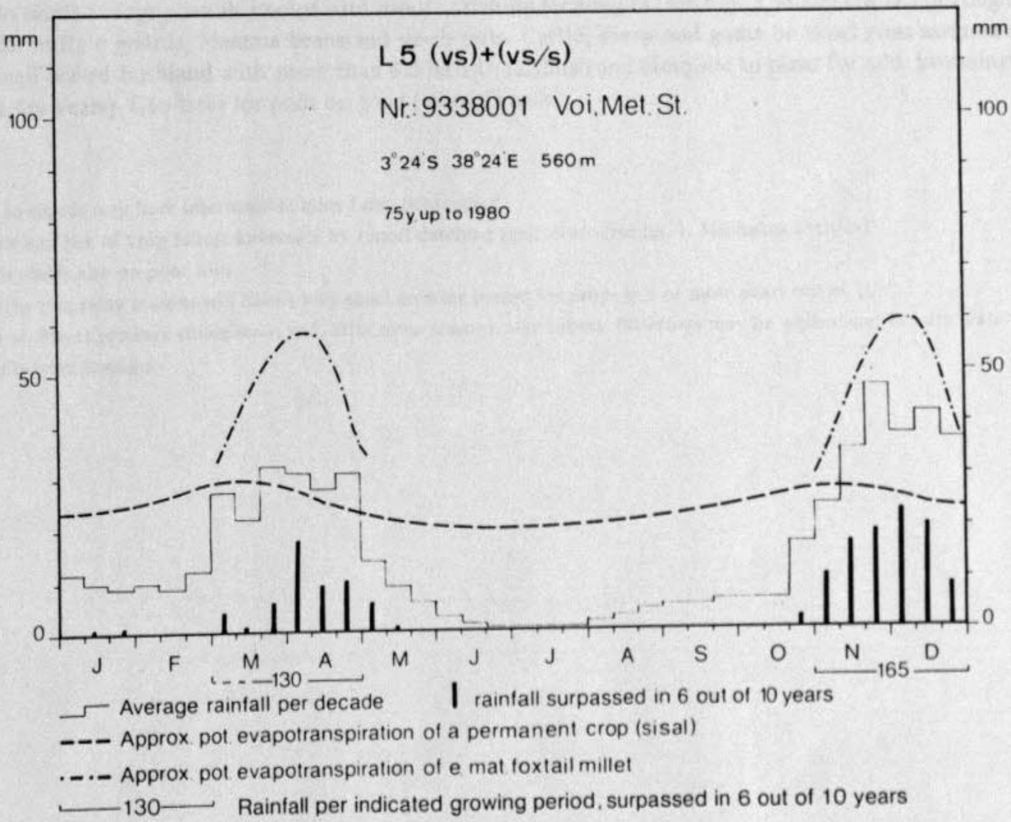
L 5 = *Lowland Livestock-Millet Zone or Marginal Lower Sisal Zone*

L 5 = *Lowland Livestock-Millet Zone*
(vs)+(vs/s) *with a (weak) very short and a (weak) very short to short cropping season*

Good yield potential
1st rains, start end of March: V. e. mat. foxtail and hog millet
2nd rains, start norm. b. of Nov.: E. mat. proso millet like Serere I; moth beans; v. e. mat. pumpkins
Whole year: Buffalo gourds (on sandy soils)[5], Marama beans[5]

Fair yield potential
1st rains: E. mat. foxtail and proso millet; v. e. mat. cowpeas and green grams, v. e. mat. bambarra groundnuts (on light soils, fair to poor)
2nd rains: E. mat. bulrush millet, dwarf sorghum, e. mat. foxtail millet (nearly 60 %); black and green grams, moth beans, v. e. mat. cowpeas, chick peas (late pl. on h. bl. soils); rai (oilseed), dwarf sunflower (fair to poor), v. e. mat. bambarra groundnuts (on light soils)
Whole year: Sisal, castor, ye-eb nuts[6], Opuntia

Pasture and forage
Almost as in LM 5 vs/s + vs

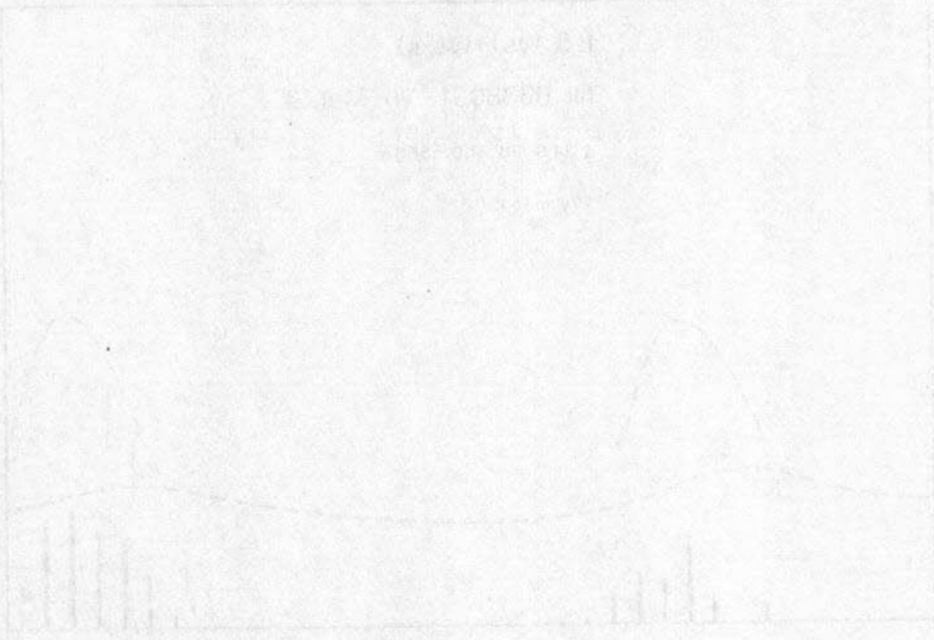


L 5 (vs) + i or i + (vs) = *Lowland Livestock-Millet Zone with a (weak) very short cropping season and intermediate rains or vice versa[4]*

Fair to poor yield potential
1st or 2nd rains[4]: Dwarf sorghum, e. mat. bulrush millet; cowpeas (40–50 %), green and black grams, v. e. v. e. mat. bambarra groundnuts[3]; dwarf sunflower
Whole year: Buffalo gourds (on light soils)[5], Marama beans[5], sisal, castor, ye-eb nuts[6]

Poor yield potential
Whole year: Cassava

Pasture and forage
Small leaved bushland predominating, about 3–5 ha/LU; Gao trees on good soils for pods, Mesquite and saltbush on all places for add. browsing



L 5 = *Lowland Livestock-Millet Zone*
(vs) + i *with a (weak) very short cropping season and intermediate rains*

Fair to poor yield potential
1st rains, start norm. b. of April: V. e. mat. foxtail millet (40–50 %), e. mat. bulrush millet; green grams
Whole year: Buffalo gourds (on light soils)[5], Marama beans[5], ye-eb nuts[6], sisal

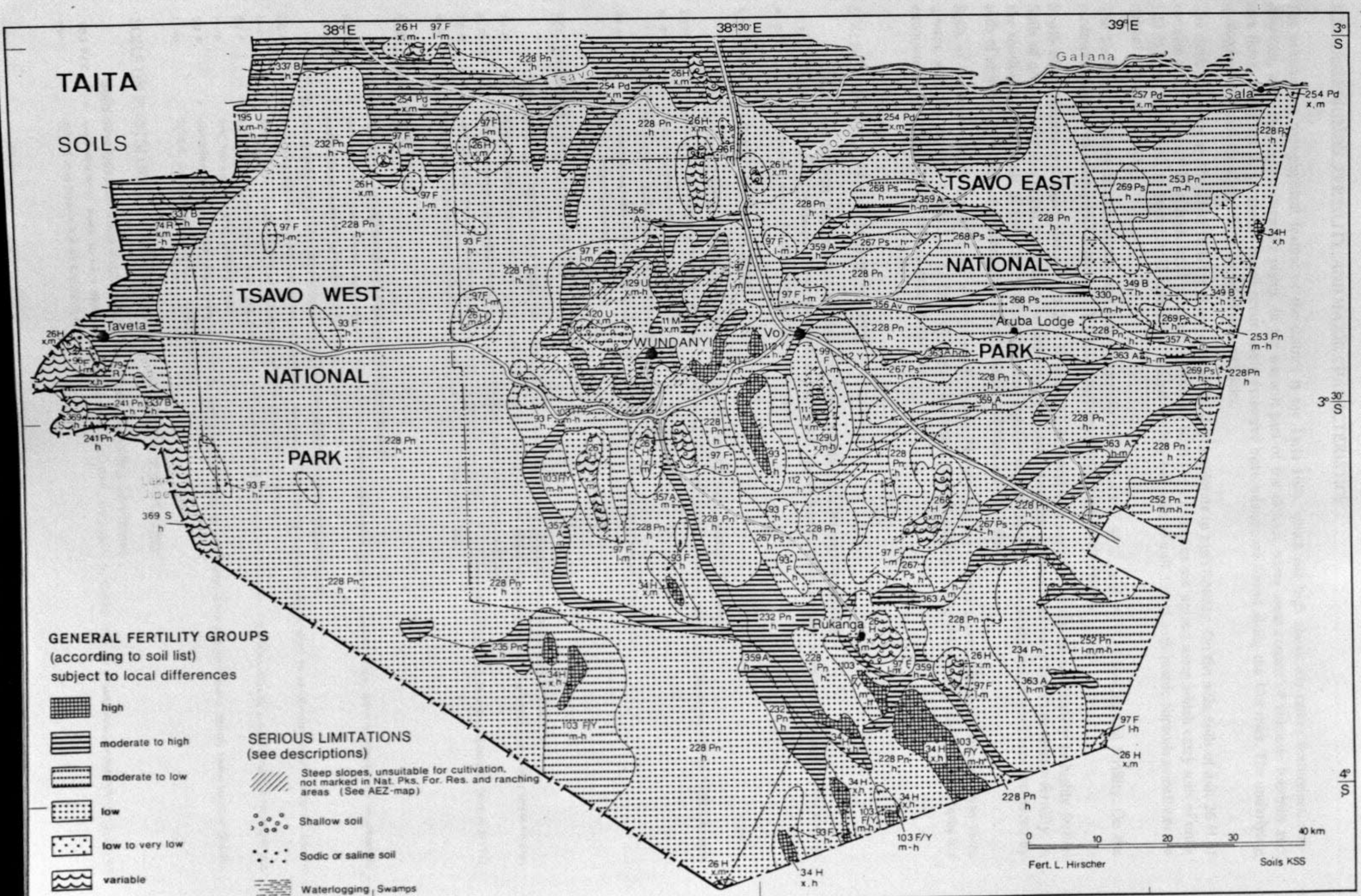
Pasture and forage
3.5–5.5 ha/LU on small-leaved bushland, forage as in LM 5

L 6 = *Lowland Ranching Zone*

L 6 = *Lowland Ranching Zone*
b r *with bimodal rainfall*

No rainfed crops possible except with runoff-catching techniques (see Fig. 2, Machakos D.) or tough perennials like buffalo gourds, Marama beans and ye-eb nuts. Cattle, sheep and goats on short grass savanna mixed with small leaved bushland with more than 4.5 ha/LU; saltbush and Mesquite to plant for add. browsing (especially in dry years). Gao trees for pods on good (alluvial) soils

1) Places exposed to clouds may have intermediate rains July–September
2) Yield improvable and risk of crop failure lowerable by runoff-catching agriculture (see fig. 1, Machakos District)
3) Gives reasonable yields also on poor soils
4) At least one of the two rainy seasons will have a very short growing period for crops in 6 or more years out of 10
5) Still experimental. Plants produce edible seeds and, after some seasons, also tubers. Bitterness may be washed out in salty water
6) Cordeauxia edulis from Somalia


TAITA
SOILS
38°E
38°30' E
39°E
3° S
3° 30' S
4° S
Galana
Tsavo
Mbololo
Sala
Taveta
Wundanyi
Voi
Aruba Lodge
Rukanga
TSAVO WEST NATIONAL PARK
TSAVO EAST NATIONAL PARK
GENERAL FERTILITY GROUPS
(according to soil list)
subject to local differences
high
moderate to high
moderate to low
low
low to very low
variable
SERIOUS LIMITATIONS
(see descriptions)
Steep slopes, unsuitable for cultivation, not marked in Nat. Pks. For. Res. and ranching areas (See AEZ-map)
Shallow soil
Sodic or saline soil
Waterlogging, Swamps
0 10 20 30 40 km
Fert. L. Hirscher
Soils KSS

SOIL DISTRIBUTION, FERTILITY, AND MAJOR CHARACTERISTICS

The outstanding topographical feature of the district is the Taita Hills, which rise high above the rather featureless, non-dissected, erosional and sedimentary plains. In the western part of the district, some areas consist of volcanic foothills and lava flows. In the south, piedmont plains occur, while extensive bottomlands are found along the Voi river. The underlying geology consists mainly of undifferentiated Basement rocks.

The dominant soils on the Taita Hills are those of unit 11 M of moderate to high fertility. On the hills, soils of unit 26 H of variable fertility and 34 H of high fertility occur. Associated with the mountains are upland areas which carry soils of units 120 U and 129 U. Soils of unit 129 U have a low natural fertility but soils of unit 120 U with humic topsoils sometimes are richer in plant nutrients.

The foothills bordering the mountains and hills carry soils of units 93 F, 97 F, and 99 F of low natural fertility. On the piedmont plains, soils of unit 103 Y and 112 Y occur which are low to moderately fertile.

South of the Galana and Tsavo rivers, units 254 Pd and 257 Pd occur as a complex: both are moderately to highly fertile. Soils of unit 253 Pn also occur extensively, which developed over pisocalcic material and have low to moderate fertility. In the southwest, some areas of unit 235 Pn of moderate to high fertility are found. In the northwest, a small area is covered by soils of unit 232 Pn which are moderately to highly fertile and have a humic topsoil.

Soils of the bottomlands occur in the west (unit 337 B and 349 B). The soils of the alluvial plains are divided into three groups, viz.: 359 A, 363 A and 357 A. They all have a moderate to high fertility. Around Lake Jipe, swamp conditions are encountered (unit 369 S) with soils of variable fertility.

SOILS ON MOUNTAINS AND MAJOR SCARPS

Soils developed on undifferentiated Basement System rocks, predominantly gneisses

11 M = well drained, moderately deep, reddish brown to brown, friable, stony sandy clay loam, with humic topsoil (humic CAMBI-
x, m[1]   SOLS: with eutric REGOSOLS and Rock Outcrops)

SOILS ON HILLS AND MINOR SCARPS

Soils developed on undifferentiated Basement System rocks, predominantly gneisses

26 H = somewhat excessively drained, shallow, reddish brown, friable, rocky or stony, sandy clay loam (eutric REGOSOLS; with
x, m   Rock Outcrops and calcic CAMBISOLS)

Soils developed on limestones and calcatic mudstones

34 H = somewhat excessively drained, shallow, dark grey, firm, moderately calcareous, stony clay
h   (orthic RENDZINAS)

SOILS ON VOLCANIC FOOTRIDGES

Soils developed on Tertiary basic igneous rocks (basalts, nepheline phonolites; basic tuffs included)

74 R = well drained, shallow to very deep, dusky red to dark brown, friable, rocky, bouldery, stony or gravelly, silty clay loam to clay
x, m–h   (nito-chromic CAMBISOLS and eutric CAMBISOLS, lithic and bouldery phase)

79 R = well drained, deep to extremely deep, dark reddish brown to dark brown, friable to firm clay; in places gravelly (eutric NITO-
x, h   SOLS and nito-chromic CAMBISOLS; with chromo-luvic PHAEOZEMS)

SOILS ON FOOTSLOPES

Soils developed on colluvium from crystalline limestones

93 F = well drained, very deep, dark reddish brown, firm, slightly calcareous, slightly cracking clay, with a slightly to moderately
h   sodic deeper subsoil (chromic LUVISOLS, sodic phase)

Soils developed on colluvium from undifferentiated Basement System rocks

96 F = well drained, very deep, yellowish red to dark reddish brown, friable, coarse loamy sand to sandy clay loam (chromic LUVI-
l–m   SOLS; with rhodic FERRALSOLS and luvic/ferralic ARENOSOLS)

97 F = well drained, very deep, dark red, friable, coarse, loamy sand to sandy clay (rhodic FERRALSOLS; with ferralic ARENOSOLS
l–m   and ferralo-chromic LUVISOLS)

99 F = complex of somewhat excessively drained to well drained, deep to very deep, dark red to brown, sandy loam to clay (ACRI-
l–m   SOLS, undifferentiated; with ARENOSOLS)

SOILS ON FOOTSLOPES AND PIEDMONT PLAINS UNDIFFERENTIATED

Soils developed on colluvium and alluvium from crystalline limestones

103 F/Y = well drained, deep to very deep, dark brown, friable to firm, clay loam to sandy clay; in places calcareous (chromic LUVI-
m–h   SOLS and haplic KASTANOZEMS)

SOILS ON PIEDMONT PLAINS

Soils developed on alluvium from undifferentiated Basement System rocks

112 Y = well drained, very deep, dark red, friable, sandy clay to clay
h (ferralo-chromic LUVISOLS)

SOILS ON UPPER-LEVEL UPLANDS

Soils developed on acid igneous rocks (rhyolites), with volcanic ash admixture

118 U = well drained, deep to very deep, dark reddish brown, friable and slightly smeary, silty clay loam, with thick humic topsoil
h (ando-luvic PHAEOZEMS)

Soils developed on undifferentiated Basement System rocks

120 U = complex of: - well drained, shallow, black to very dark brown, acid humic, very friable loam; in places rocky (RANKERS)
x, m - well drained, moderately deep, dark brown, friable clay loam, with a very thick acid humic topsoil (humic CAMBISOLS)

SOILS ON UPPER MIDDLE-LEVEL UPLANDS

Soils developed on undifferentiated Basement System rocks

129 U = well drained, moderately deep to very deep, dark red to reddish yellow, friable to firm, rocky sandy clay loam to clay
x, m–h (chromic ACRISOLS, rocky phase; with CAMBISOLS and FERRALSOLS)

SOILS ON UPLANDS, UNDIFFERENTIATED LEVELS

Soils developed on basic igneous rocks (basalts, etc.)

195 U = association of: - well drained, deep to very deep, dusky red to dark reddish brown, friable, stony clay loam to clay (chromic
x, m–h, h LUVISOLS; stony phase)
- imperfectly drained, deep to very deep, dark brown to very dark greyish brown, firm, calcareous, saline and sodic, stony, cracking clay (verto-luvic PHAEOZEMS, stony and saline-sodic phase)

SOILS ON NON-DISSECTED EROSIONAL PLAINS

Soils developed on Basement System rocks rich in ferromagnesian minerals

228 Pn = well drained, deep to very deep, dusky red to dark red, friable sandy clay
h (rhodic FERRALSOLS)

Soils developed on crystalline or sedimentary limestones and gypsiferous rocks (Plio-Pleistocene Wajir-El Wak beds)

232 Pn = well drained, moderately deep, dark reddish brown, friable clay
h (chromic CAMBISOLS)

Soils developed on undifferentiated Basement System rocks

234 Pn = well drained, deep to very deep, dark red to strong brown, friable, sandy clay to clay (rhodic and orthic
h FERRALSOLS)
235 Pn = imperfectly drained, deep, black to very dark grey, very firm, slightly to moderately sodic, cracking clay (pellic VERTISOLS,
h sodic phase)

Soils developed on undifferentiated Basement System rocks with predominant volcanic ash influence

241 Pn = moderately well drained, very deep, dark reddish brown to dark brown, firm, strongly calcareous, slightly saline and
h moderately sodic, slightly cracking clay (vertic LUVISOLS, saline-sodic phase)

Soils developed on gritty sandstones

252 Pn = well drained, deep, strong brown to dark brown, firm, sandy clay loam to clay, with a topsoil of loamy sand to sandy loam
l–m, m–h (orthic LUVISOLS; with orthic ACRISOLS)
253 Pn = well drained, deep, red, firm, sandy clay loam to clay
m–h (chromic LUVISOLS)

SOILS ON DISSECTED EROSIONAL PLAINS

Soils developed on undifferentiated Basement System rocks

254 Pd = complex of well drained, shallow to moderately deep, dark red to yellowish brown, non to moderately calcareous, stony sandy
x, m clay loam, over petrocalcic material or quartz gravel (calcic CAMBISOLS, lithic or petrocalcic phase; with chromic LUVISOLS, petric phase)

Soils developed on undifferentiated sedimentary rocks

257 Pd = complex of well drained, shallow, dark reddish brown to strong brown, non to moderately calcareous, firm, gravelly and stony
x, m loam to sandy clay loam, partly over petrocalcic material (chromic CAMBISOLS to orthic LUVISOLS lithic or paralithic phase; with calcic CAMBISOLS, petrocalcic phase)

TAITA-TAVETA DISTRICT

TABLE 6: AEZ-LAND AREA AVAILABLE PER LOCATION, DIVISION AND PER HOUSEHOLD AND PERSON[1)]

	in '00 ha = sqkm					in '00 ha = sqkm								in ha	
Location/Division without townships	Area total Census 79	Non-agricultural land: Unsuit. steep slopes	Forest Res., lakes, swamps	Others (roads, homesteads, rivers...)	Agricultural land	Area in agro-ecological zones AEZ: LH 2	UM 3	UM 4	LM 4	LM 5	LM 6	L 5	L 6	Agric. land per household	person
Taveta	680	6	F. 2 L. 8 Sw. 25	32	608				74	341	29	141	13	9.87	2.35
Taveta Division	680	6	35	34	626				74	341	29	169	13	10.17	2.42
Mbololo	204	15		9	180					17		129	34	6.63	1.30
Sagatta	674	45		13	616		10	5	38	38	49	106	370	37.20	7.90
Kasiqau	2 190	40	F. 2	43	2 105			2	45	59		591	1 408	183.03	33.88
Voi Division	3 068	100	2	65	2 901		10	7	83	114	49	826	1 812	107.00	20.93
Mbale	149	38		9	102	19	24	20	20	6			13	4.80	0.90
Weruga	552			25	472	14	52	22		79	271	34		9.50	1.80
Chawia	825	60		15	750		25		265	24	373		63	13.60	2.90
Bura	751	19		15	717			35		125	522		35	31.80	7.80
Mwanda	314	26		14	274	7	7	19		73	161		7	11.40	2.30
Wundanyi Division	2 591	198		78	2 315	40	108	96	285	307	1 327	34	118	14.20	3.10
Total rural Area	6 339	304	37	177	5 824	40	118	103	442	762	1 405	1 029	1 943	20.26	4.23

1) For official land statistics see supplementary publication to FM-Handbook, Vol. III A: Agriculture Land Statistics

AGRICULTURAL STATISTICS[1)]

Approximately 450 ha of **coffee** is grown in the Wundanyi region, producing the uneconomic yield of about 180 kg/ha per year. It is estimated that 1,000 ha of **cotton** is planted annually in the Taita area, of which probably one-third is irrigated; the irrigated cotton produces roughly 1,500 kg/ha, while on non-irrigated fields yields of 400–500 kg are achieved.

TAITA-TAVETA DISTRICT

TABLE 7: COFFEE
AREA – PRODUCTION – YIELDS[1)]

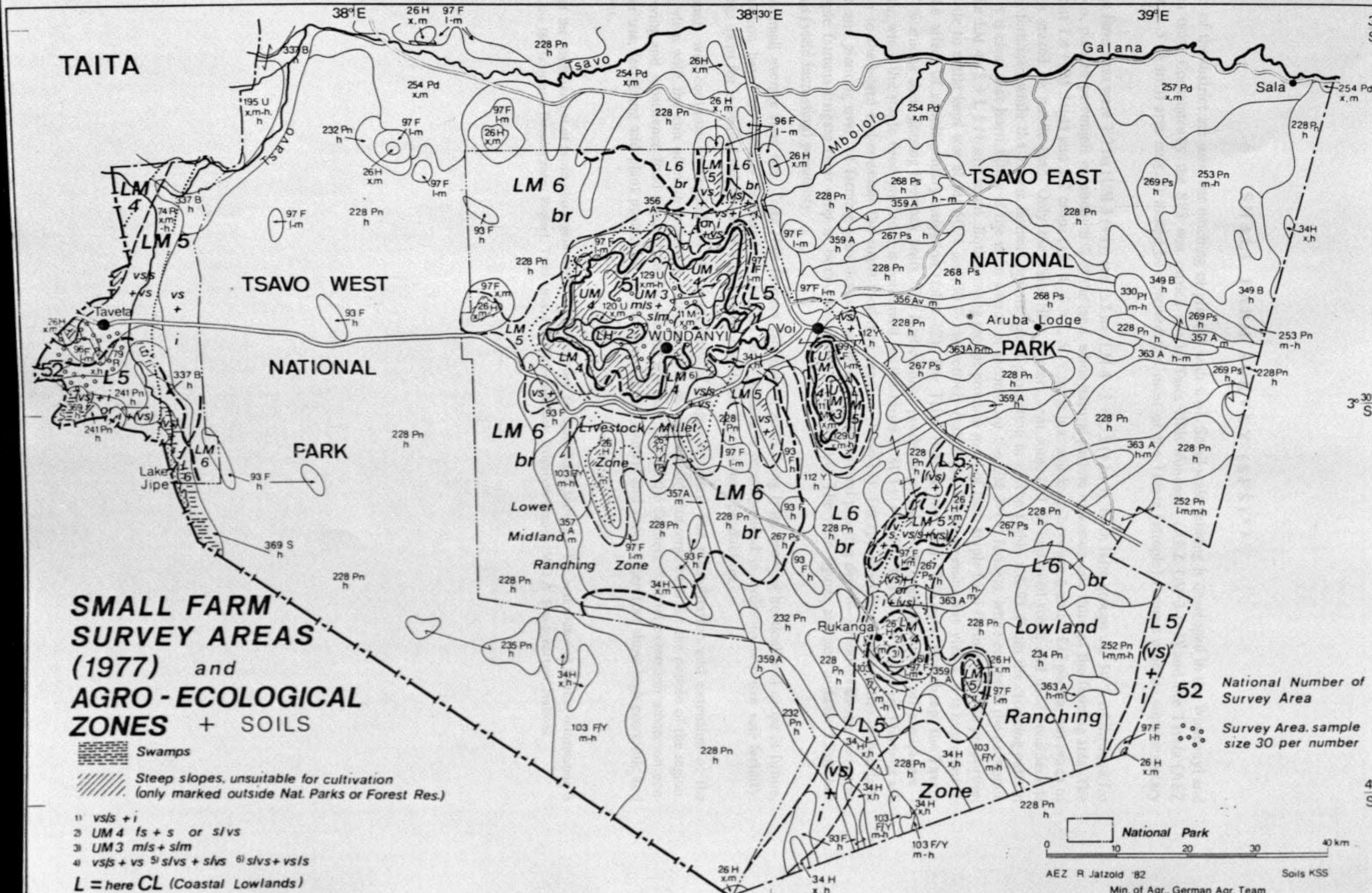
Co-operatives

Item	Unit	Year				
		74/75	75/76	76/77	77/78	79/80
Area	ha	451	451	451	451	451
Production	t	73	69	69	70	84
Yield	kg/ha	162	153	153	16	186

Estates – Nil

a) Source: C.B.K.

1) Because of the small number of farms, this region attracts little attention for agricultural statistics. The best source of further information is probably the Horticultural Development Project, Taita Hills, and the Small Scale Irrigation Branch, M.O.A. Headquarters, Nairobi.


TAITA
SMALL FARM
SURVEY AREAS
(1977) and
AGRO - ECOLOGICAL
ZONES + SOILS
Swamps
Steep slopes, unsuitable for cultivation
(only marked outside Nat. Parks or Forest Res.)
1) vs/s + i
2) UM 4 fs + s or s/vs
3) UM 3 m/s + s/m
4) vs/s + vs 5) s/vs + s/vs 6) s/vs + vs/s
L = here CL (Coastal Lowlands)
52 National Number of Survey Area
Survey Area, sample size 30 per number
National Park
0 10 20 30 40 km
AEZ R Jatzold '82
Soils KSS
Min. of Agr., German Agr. Team
TSAVO WEST
NATIONAL
PARK
TSAVO EAST
NATIONAL
PARK
Taveta
Lake Jipe
Wundanyi
Voi
Aruba Lodge
Rukanga
Sala
Galana
Tsavo
Mbololo
38°E
38°30'E
39°E
3° S
3°30' S
4° S
Livestock - Millet Zone
Lower Midland Ranching Zone
Lowland Ranching Zone

SMALL FARM SURVEY (SFS)[1)]

Large parts of the district are used for ranching or planted with sisal. Small-scale farming is developed in the Wundanyi and Taveta area only. Consequently the SFS was carried out in Taita Hills-Wundanyi (AEZ UM 3 (+4))and the Taveta (AEZ LM 4–5 + L 5 (+ irr.)) area only. It should be observed that most of the Taveta (sample) farmers practise supplementary irrigation.

The average farm sizes were 1.7 ha (UM 3 (+4)) and 2.3 ha (LM 4–5 + L 5 (+ irr.)). Both farm groups use 50 % of the land for annual crops, planted perennials on about 8 % of the land, while natural pasture makes up one-third of the farming area. The farmers plant 1.4 (UM 3+(4) and 1.2 crops (LM 4–5 + L 5 (+ irr.)) p.a. and keep between 6 and 7 LU per ha, but much of the stock is grazed on public land. Only the Taita Hills farmers kept some (20 %) improved stock and used considerable amounts of fertilizer, while the Taveta farmers practise plant protection in cotton (table 8 & 9). From the cropping pattern (table 10) it is clear that horticulture is the main source of income for the UM 3+(4) farmers, while cotton is the economic basis for the LM 4–5 + L 5 (+ irr.) farms. Both farming groups produce most of their staple food themselves. The proportion of male cattle to cattle kept was about 50 % and 30 % respectively (table 11). When assessing the yields, it is important to discount the effect of supplementary irrigation (table 12). The Taita Hills farmers had 12 % goats and sheep, the Taveta farmers 37 % among their grazing livestock units. The horticultural products are sold – throught boards or private traders – to Mombasa, while the staple food produced is consumed on the farms (UM 3+(4)). The LM 4–5 + L 5 (+ irr.) farmers sell their cotton to the board and consume the staple food they produce (table 13). The spread of farming activities such as land preparation and planting over of farming activities such as land preparation and planting over 6–8 months shows that most of the sample farmers irrigate their crop in both areas (graphs in table 14). The yield figures assessed in table 15 do not consider this (yield increasing) possibility.

Despite the small average farm size, Taita Hills farmers can make a good living from growing horticultural crops in future, Milk production based on heavily fertilized forage and zero grazing is recommended in order to improve soil fertility. Water storage dams for increased irrigation are essential for profitable horticultural production.

Taveta farmers will continue to depend on the availability of irrigation water. The rehabilitation and extension of the irrigation system with the aim of more economic water use, will provide a solid economic basis for the people of the region. Cotton growing and subsistence food production will remain the mainstay of the farmers. Special extension advice on economic water use, fertilizing and plant protection is welcomed by the farmers and should therefore show high economic and social returns.

1) Because of the small number of farms, this region attracts little attention for agricultural statistics. The best source of further information is probably the Horticultural Development Project, Taita Hills, and the Small Scale Irrigation Branch, M.O.A. Headquarters, Nairobi.

MISCELLANEOUS SURVEY [illegible]

Lower parts of the Rift [illegible] used for sampling [illegible] and [illegible]. Consequently the SSS was carried out [illegible] [illegible] should be [illegible] of the [illegible] supplementary [illegible].

The average farm size was [illegible] [illegible] [illegible] of the [illegible] and [illegible] the [illegible] [illegible].

Despite the small average farm size, [illegible] production based on [illegible] [illegible] to improve soil fertility [illegible].

[illegible] will continue to depend on the availability of [illegible]. The [illegible] and extension of the [illegible] [illegible].

[illegible]

Item	Unit	Farm Size & Land Use Livestock on Farm Farm Size Group		
		small	medium	large
Farm Size Total	ha	1.o	1.9	4.o
Land Use: Annual Crops[1] First Season				
Maize	ha	o.3	o.3	o.7
Beans	ha	-	-	o.2
Cotton	ha	o.2	o.6	o.7
Maize & Beans	ha	o.1	o.1	o.3
& Others	ha			
Total	ha	o.6	1.o	1.9
Second Season[1]				
Maize	ha	o.1	o.3	o.2
Beans	ha	o.1	-	o.4
Maize & Beans	ha	-	o.1	-
Total	ha	o.2	o.4	o.6
Permanent Crops[1]				
Bananas	ha	-	o.2	o.2
	ha			
	ha			
	ha			
Portion of total	%		11 %	5 &
Grazing & Forage	ha	o.2	o.5	1.2
portion of total	%	2o %	26 %	3o %
Other Land Use	ha	o.2	o.2	o.7
Livestock on Farm:				
Cattle: local	LU	1.1	2.6	5.o
improved	LU	-	-	-
Sheep & Goats	LU	o.7	1.4	3.o
Total	LU	1.8	4.o	8.o

Item	Unit	Intensity, Labour/Persons on Farm Home Consumption Farm Size Group		
		small	medium	large
Farming Intensity:				
Cropping Intensity	-	o.8	o.8	o.7
Portion of improved cattle kept	%			
Portion of Farmers owning a Plough	%			1o %
Labour on Farm:				
Family Adults	persons	1.8	2.4	2.2
Perm. Hired Labour	"	o.1	o.2	o.4
Children > 14 years	"	1.3	2.2	2.1
Persons living on Farm[2] -average household size-		Farmer's Family	Non-related Persons	Total
Adults > 14 years	persons	1.87	o.31	2.18
Children < 14 years	"	1.89	-	1.89
Subsistence Units	SU	3.oo	o.31	3.31
Home Consumption of Major Food produced on Farm		kg/year household	cal. person day	
Maize	kg	165o	2279	
Beans	kg	1o1	138	
	kg			
	kg			
	kg			
	kg			
	kg			
	kg			

Other Crops cultivated: Maize & Sorghum

1) Major crops only considered

2) Based on 1979 Census figures

TAITA-TAVETA DISTRICT

TABLE 9 a: ASSETS, LAND USE, FARMING INTENSITY, INPUTS

AEZ: UM 3 (+ 4)

Survey Area 51

Range	Assets			People on Farm		
	Land ha	Livestock head	Equipment pieces	Family Adults	Perm.Hrd. Labourers	Children > 14 No.
Avg. 0	1.7	13.2	1.2	2.4	0.3	1.9
Avg. 1	1.7	14.6	1.8	2.4	1.1	3.1
Up. Qu.	2.4	7.0	2.0	3.0	-	3.0
Lo. Qu.	0.8	2.0	-	2.0	-	-

Land Use

Range	Annual Crops		Perm. Crops		Pasture		Forage		Fallow		Other Use	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
Avg. 0	0.7	43	0.1	7	0.5	34	0.1	6	0.1	5	0.1	5
Avg. 1	0.7	28	0.2	9	0.6	25	0.4	19	0.4	15	0.1	4
Up. Qu.	0.8	57	0.2	9	0.8	50	-	-	-	-	0.1	7
Lo. Qu.	0.4	31	-	-	0.1	14	-	-	-	-	-	3
Total	20.2		3.2		15.8		2.7		2.5		2.6	

Farming Intensity

Range	Cropping Intensity crops/yr.	Stocking Rate		Improved Cattle % of total
		Farm Land LU/ha	Pasture & Forage LU/ha	
Avg. 0	1.4	2.1	5.7	22.2
Avg. 1			5.3	61.1
Up. Qu.	2.0	2.1	6.4	70.2
Lo. Qu.	1.0	0.6	0.6	-

Inputs Applied

Range	Improved Seed Used % of area	Fertilizer Applied pure nutrient kg/ha						Manure Applied t/ha		Plant Protection			
		N		P_2O_5		K_2O				Insecticide kg/ha		Fungicide kg/ha	
	AC	AC	PC	AC	PC	AC	PC	AC	PC	AC	PC	AC	PC
Avg. 0	40.0	5.0	2.0	10.1	0.5	0.6	-	0.4	-	1.5	-	0.7	0.7
Avg. 1	43.5	9.3	9.9	15.1	14.0	3.1	-	0.8	0.2	2.8	0.6	3.9	2.1
Up. Qu.	100.0	6.1	-	15.5	-	-	-	0.7	-	1.5	-	-	1.3
Lo. Qu.	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: Avg. 0 = average of all sample farms
Avg. 1 = average of farms, excluding zero entries
Up. Qu./Lo. Qu. = Upper/Lower Quartile, refers to individual farm, 50 % of all sample cases lie between these points
AC = Annual Crops
PC = Perennial Crops

TAITA-TAVETA DISTRICT

TABLE 10 a: CROPPING PATTERN

AEZ: UM 3 (+ 4) Survey Area 51

First rains
Annual & Semipermanent Crops

Crop	Average 0 ha	Average 1 ha	Upper Quartile ha	Lower Quartile ha	Total Sample Area ha	Total Sample Area %
Maize	0.1	0.6	0.00	0.00	3.8	17.9
Maize IPC	0.0	0.4	0.00	0.00	0.4	1.9
Beans	0.2	0.5	0.40	0.00	5.4	25.7
Bambara GNuts	0.0	0.0	0.00	0.00	0.0	0.2
Engl. Potatoes	0.0	0.1	0.00	0.00	0.2	0.8
Cabbage	0.1	0.2	0.12	0.00	2.1	9.8
Onions	0.0	0.0	0.00	0.00	0.1	0.4
Tomatoes	0.1	0.2	0.04	0.00	1.6	7.5
Cassava	0.0	0.4	0.00	0.00	0.8	3.8
Pineapples	0.0	0.1	0.00	0.00	0.1	0.4
Others	0.0	0.4	0.00	0.00	0.4	1.9
Maize & Sorgm	0.0	0.1	0.00	0.00	0.1	0.4
Maize & Beans	0.2	0.6	0.40	0.00	5.1	24.2
Maize & Others	0.0	0.3	0.00	0.00	1.1	5.3
Total					21.2	100.0

Second Rains
Annual & Semipermanent Crops

Crop	Average 0 ha	Average 1 ha	Upper Quartile ha	Lower Quartile ha	Total Sample Area ha	Total Sample Area %
Maize	0.0	0.5	0.00	0.00	1.4	11.9
Beans	0.1	0.5	0.00	0.00	2.5	21.1
Engl. Potatoes	0.0	0.1	0.00	0.00	0.1	0.7
Cabbage	0.1	0.3	0.20	0.00	2.3	19.4
Tomatoes	0.0	0.1	0.00	0.00	0.6	4.8
Cassava	0.0	0.4	0.00	0.00	0.8	6.8
Pineapples	0.0	0.1	0.00	0.00	0.1	0.7
Maize & Beans	0.1	0.4	0.20	0.00	4.0	33.7
Maize & Others	0.0	0.1	0.00	0.00	0.1	1.0
Total					11.8	100.0

Permanent Crops

Crop	Average 0 ha	Average 1 ha	Upper Quartile ha	Lower Quartile ha	Total Sample Area ha	Total Sample Area %
Cookng Bananas	0.0	0.0	0.00	0.00	0.0	2.0
Coffee	0.1	0.2	0.12	0.00	2.0	98.0
Total					2.0	100.0

Avg 0 = average of all sample farms
Avg 1 = average of all farms excluding zero entries
Up.Qu./Lo. Qu. = Upper/Lower Quartile, 50 % of all sample cases are in between these points
% columns = % of total farm land

TAITA-TAVETA DISTRICT

TABLE 10 b: CROPPING PATTERN

AEZ: LM 4–5 + L 5 (+ irr.)

Survey Area 52

First Rains
Annual & Semipermanent Crops

Crop	Average 0 ha	Average 1 ha	Upper Quartile ha	Lower Quartile ha	Total Sample Area ha	Total Sample Area %
Maize	0.4	0.6	0.68	0.00	10.8	30.2
Maize IPC	0.0	0.8	0.00	0.00	0.8	2.2
Beans	0.1	0.4	0.00	0.00	1.8	5.2
Cotton	0.5	0.7	1.00	0.00	15.8	44.5
Sugarcane	0.0	0.2	0.00	0.00	0.4	1.1
Maize & Sorgm	0.0	0.4	0.00	0.00	0.4	1.1
Maize & Beans	0.1	0.3	0.00	0.00	1.9	5.4
Maize & Others	0.1	0.9	0.00	0.00	3.6	10.2
Total					35.6	100.0

Second Rains
Annual & Semipermanet Crops

Crop	Average 0 ha	Average 1 ha	Upper Quartile ha	Lower Quartile ha	Total Sample Area ha	Total Sample Area %
Maize	0.2	0.7	0.40	0.00	6.6	50.3
Maize IPC	0.0	0.8	0.00	0.00	0.8	6.1
Beans	0.1	0.9	0.00	0.00	4.3	32.8
Cotton	0.0	0.4	0.00	0.00	0.4	3.1
Sugarcane	0.0	0.2	0.00	0.00	0.4	3.1
Maize & Beans	0.0	0.3	0.00	0.00	0.6	4.6
Total					13.0	100.0

Permanent Crops

Crop	Average 0 ha	Average 1 ha	Upper Quartile ha	Lower Quartile ha	Total Sample Area ha	Total Sample Area %
Sweet Bananas	0.0	.0.5	0.00	0.00	1.4	23.2
Cookng Bananas	0.2	1.0	0.00	0.00	4.8	76.8
Total					6.2	100.0

Avg 0 = average of all sample farms
Avg 1 = average of all farms excluding zero entries
Up.Qu./Lo. Qu. = Upper/Lower Quartile, 50 % of all sample cases are in between these points
% columns = % of total farm land

TAITA-TAVETA DISTRICT

TABLE 11 a: HERD COMPOSITION (GRAZING LIVESTOCK)

– in Head & Livestock Units –

AEZ: UM 3 (+ 4)

Oct. 77, Survey Area 51

Improved Livestock	Bulls	Steers	Oxen	Heifers	Cows	Sheep	Goats	Grazing LU Total	Pigs	Other L/Stock	L.U.s Total
Under 1 year, Average	0.10	-	-	0.27				0.09			0.09
Upper Qu.	-	-	-	-				-			-
1 - 2 years, Average	-	0.03	-	0.13				0.08			0.08
Upper Qu.	-	-	-	-				-			-
Over 2 years, Average	-	-	-		0.60			0.60			0.60
Upper Qu.	-	-	-		1			1.0			1.0
Subtotal (improved) Total	3	1	-	12	18			23.3			23.3
Average	0.10	0.03	-	0.40	0.60			0.77			0.77
Upper Qu.	-	-	-	1	1			1.3			-
Lower Qu.	-	-	-	-	-			-			-
LU Male Cattle =	5.4 % of total cattle,				Calves + Heifers =			66.7 % of dairy cows			
Unimproved Livestock:											
Under 1 year, Average	5.70	-	-	0.17		0.40	2.17	1.43	0.10		1.44
Upper Qu.	-	-	-	-		1	-	0.1	-		0.1
1 - 2 years, Average	0.07	-	-	0.30				0.16			0.16
Upper Qu.	-	-	-	-				-			-
Over 2 years, Average	0.67	-	-		0.80	1.33	0.27	1.11	0.07	21.03	1.12
Upper Qu.	-	-	-		1	1	-	-	-	-	-
Subtotal (unimp.) Total	193	-	-	14	24	52	73	81.3	5	631	82.0
Average	6.43	-	-	0.47	0.80	1.73	2.43	2.71	0.17	21.03	2.73
Upper Qu.	-	-	-	1	1	2	-	1.4	-	11	1.7
Lower Qu.	-	-	-	-	-	-	-	-	-	-	-
LU Male Cattle =	70.0 % of total cattle,				Calves + Heifers =			58.3 % of dairy cows			
LU Goats + Sheep =	15.4 % of total Grazing Livestock Units										
Improved + Unimproved Grazing L/Stock Total	196	1	-	26	42	52	73	104.5	5	631	105.3
Average	6.53	0.03	-	0.87	1.40	1.73	2.43	3.48	0.17	21.03	3.51
Upper Qu.	1	-	-	1	2	2	-	2.2	-	11	1.7
Lower Qu.	-	-	-	-	-	-	-	0.9	-	-	-
LU Male Cattle =	53.6 % of total cattle,				Calves + Heifers =			61.9 % of dairy cows			
LU Goats + Sheep =	12.0 % of total Grazing Livestock Units										

Livestock Unit (LU) key: Improved Stock = Under 1 year 0.25 LU, 1–2 yrs 0.5 LU, Over 2 years 0.8 LU, cows 1 LU

Unimproved Stock = Under 1 year 0.20 LU, 1–2 yrs 0.45 LU, Over 2 years 0.65 LU, cows 0.65 LU

Goats/Sheep/Pigs = Under 1 year 0.10 LU, Over 1 year 0.15 LU

TABLE 11 b: **HERD COMPOSITION (GRAZING LIVESTOCK)**

– in Head & Livestock Units –

AEZ: LM 4–5 + L 5 (+ irr.)

Oct. '77, Survey Area 52

Improved Livestock	Bulls	Steers	Oxen	Heifers	Cows	Sheep	Goats	Grazing LU Total	Pigs	Other L/Stock	L.U.s Total
Under 1 year, Average	-	-	-	-				-			-
Upper Qu.	-	-	-	-				-			-
1 - 2 years, Average	-	-	-	-				-			-
Upper Qu.	-	-	-	-				-			-
Over 2 years, Average	-	-	-	-	-			-			-
Upper Qu.	-	-	-		-			-			-
Subtotal(improved) Total	-	-		-	-			-			-
Average	-	-	-	-	-			-			-
Upper Qu.	-	-	-	-	-			-			-
Lower Qu.	-	-	-	-	-			-			-
LU Male Cattle =	0.0 % of total cattle,				Calves + Heifers =			0.0 % of dairy cows			
Unimproved Livestock:											
Under 1 year, Average	3.30	-	-	0.60		0.97	4.33	1.31	-		1.31
Upper Qu.	-	-	-	-		1	6	0.7	-		0.7
1 - 2 years, Average	0.17	0.07	-	1.33				0.70			0.70
Upper Qu.	-	-	-	-				-			-
Over 2 years, Average	0.17	-	0.07		1.97	2.07	9.63	2.60	-	9.37	2.60
Upper Qu.	-	-	-		2	3	12	0.1	-	5	0.1
Subtotal (unimp.) Total	109	2	2	58	59	91	419	138.5	--	281	138.5
Average	3.63	0.07	0.07	1.93	1.97	3.03	13.97	4.61	-	9.37	4.61
Upper Qu.	-	-	-	1	2	5	18	3.4	-	11	3.4
Lower Qu.	-	-	-	-	-	-	1	0.9	-	5	0.9
LU Male Cattle =	31.4 % of total cattle,				Calves + Heifers =			98.3 % of dairy cows			
LU Goats + Sheep =	36.3 % of total Grazing Livestock Units										
Improved + Unimproved Grazing L/Stock Total	109	2	2	58	59	91	419	138.5	-	281	138.5
Average	3.63	0.07	0.07	1.93	1.97	3.03	13.97	4.61	-	9.37	4.61
Upper Qu.	-	-	-	1	2	5	18	3.4	-	11	3.4
Lower Qu.	-	-	-	-	-	-	1	0.9	-	5	0.9
LU Male Cattle =	31.4 % of total cattle,				Calves + Heifers =			98.3 % of dairy cows			
LU Goats + Sheep =	36.3 % of total Grazing Livestock Units										

Livestock Unit (LU) key: Improved Stock = Under 1 year 0.25 LU, 1–2 yrs 0.5 LU, Over 2 years 0.8 LU, cows 1 LU

Unimproved Stock = Under 1 year 0.20 LU, 1–2 yrs 0.45 LU, Over 2 years 0.65 LU, cows 0.65 LU

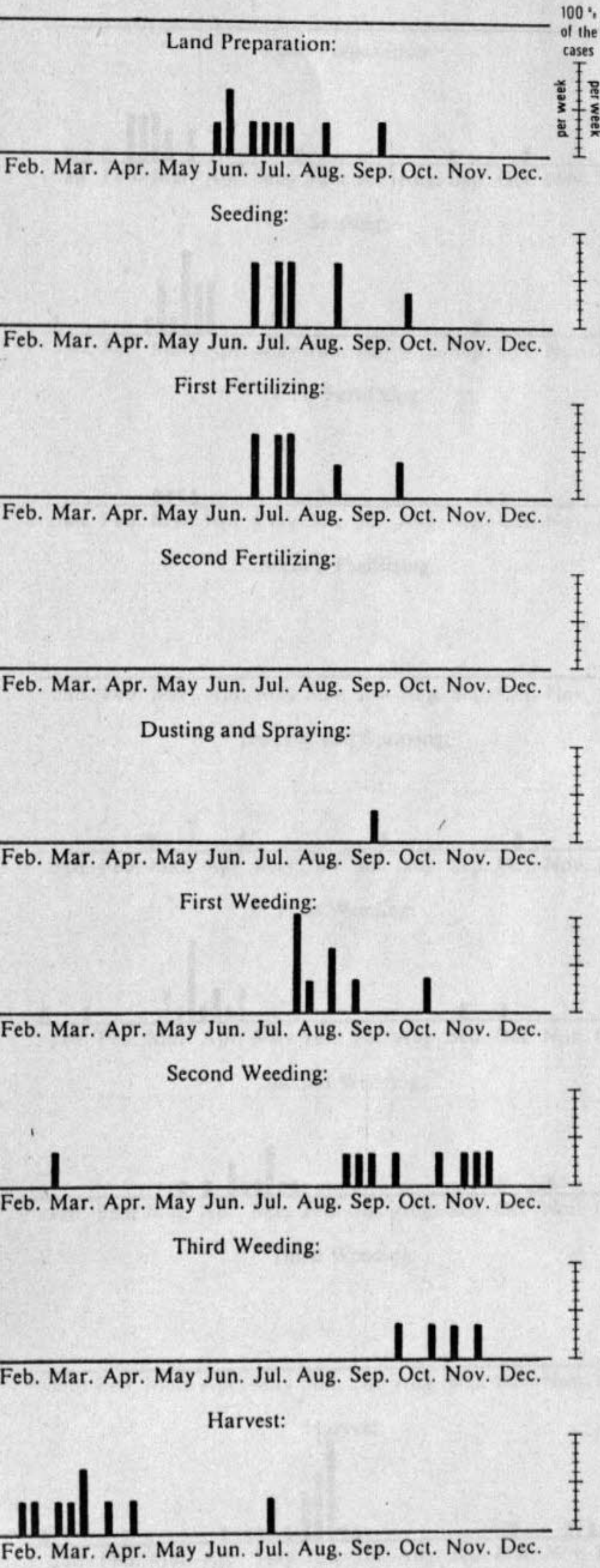
Goats/Sheep/Pigs = Under 1 year 0.10 LU, Over 1 year 0.15 LU

A-TAVETA DISTRICT

BLE 14 a: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 1 Maize Cases: 9

UM 3 (+ 4) Survey Area 51 Sample Size: 30

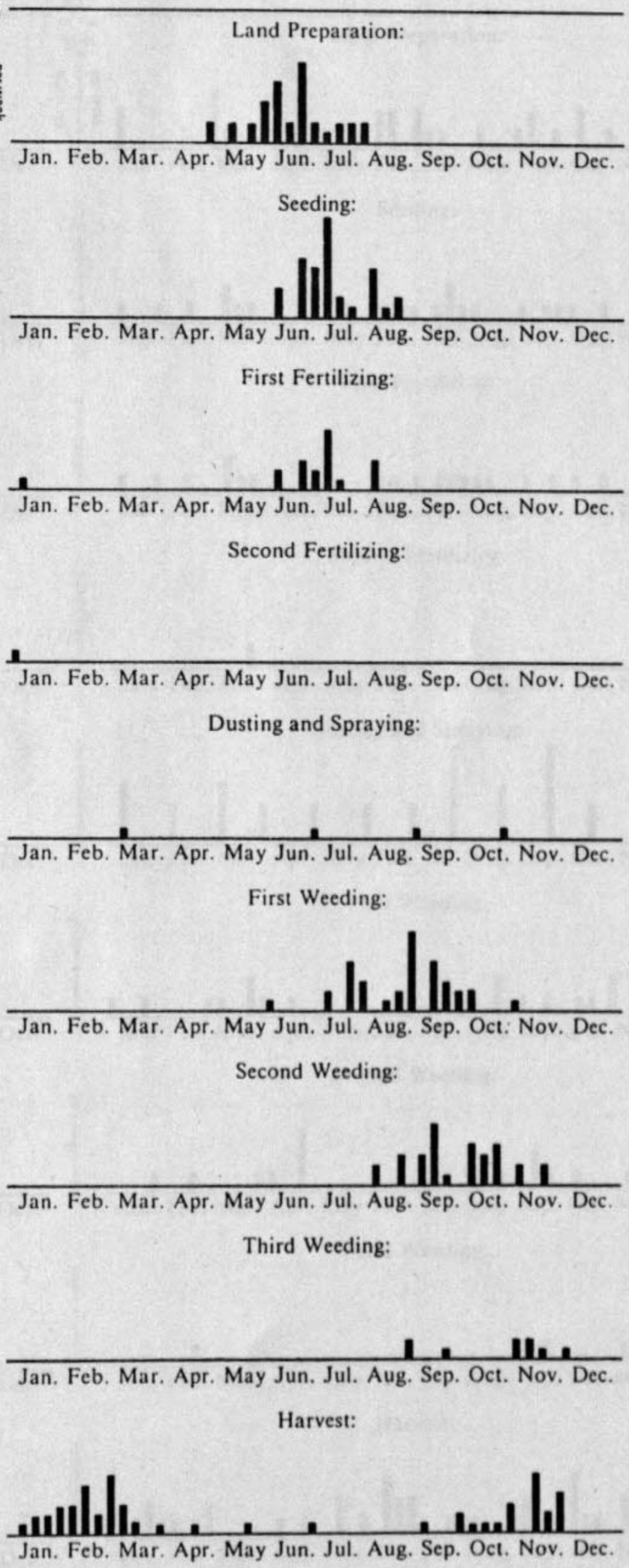


TAITA-TAVETA DISTRICT

TABLE 14 b: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 2 Maize & Beans Cases: 35 1)

AEZ: UM 3 (+ 4) Survey Area 51 Sample Size: 30



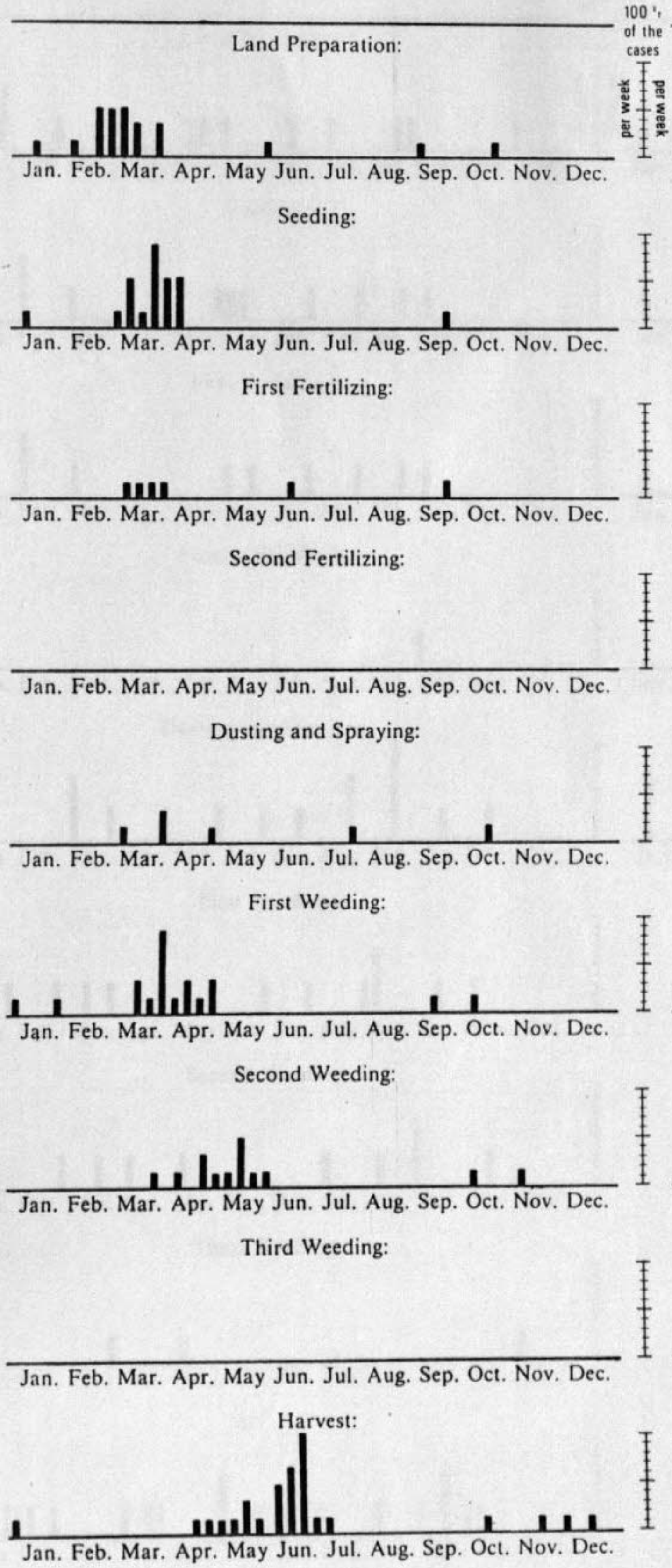
1) Maximum 30 per crop and season

TAITA-TAVETA DISTRICT

TABLE 14 c: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 10 — Beans — Cases: 18

AEZ: UM 3 (+ 4) — Survey Area 51 — Sample Size: 30

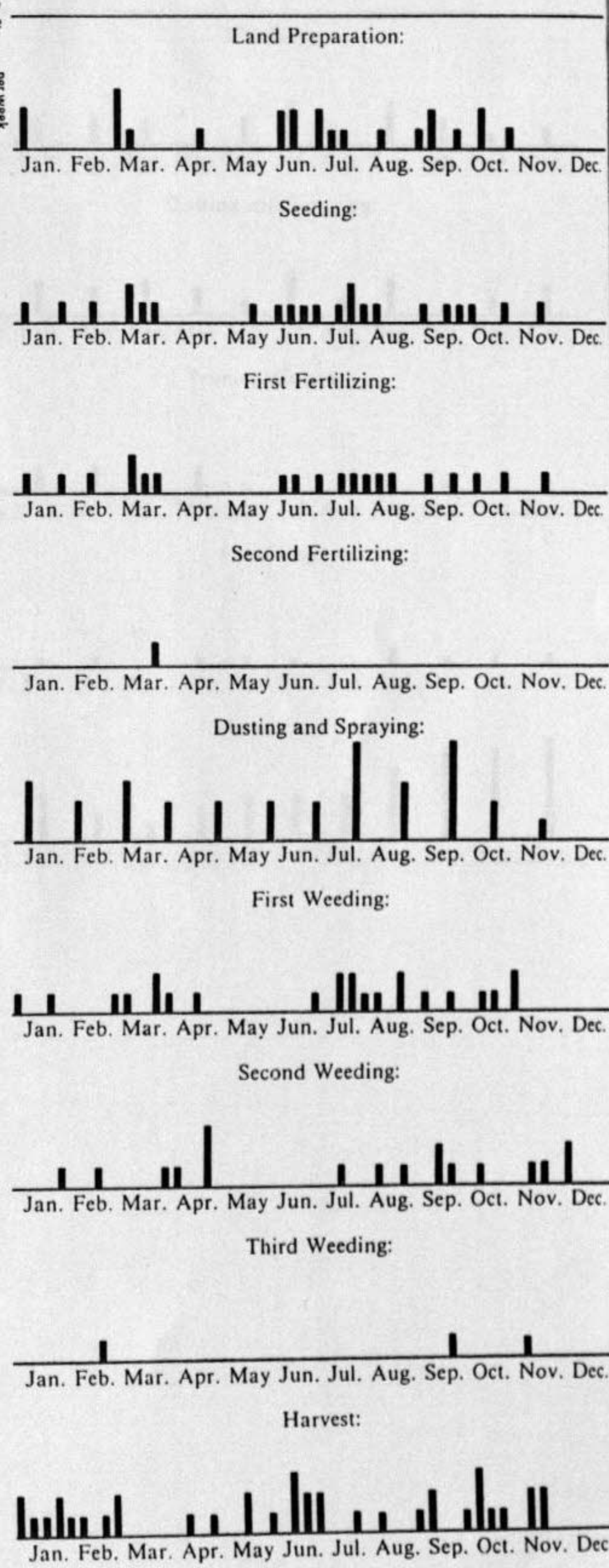


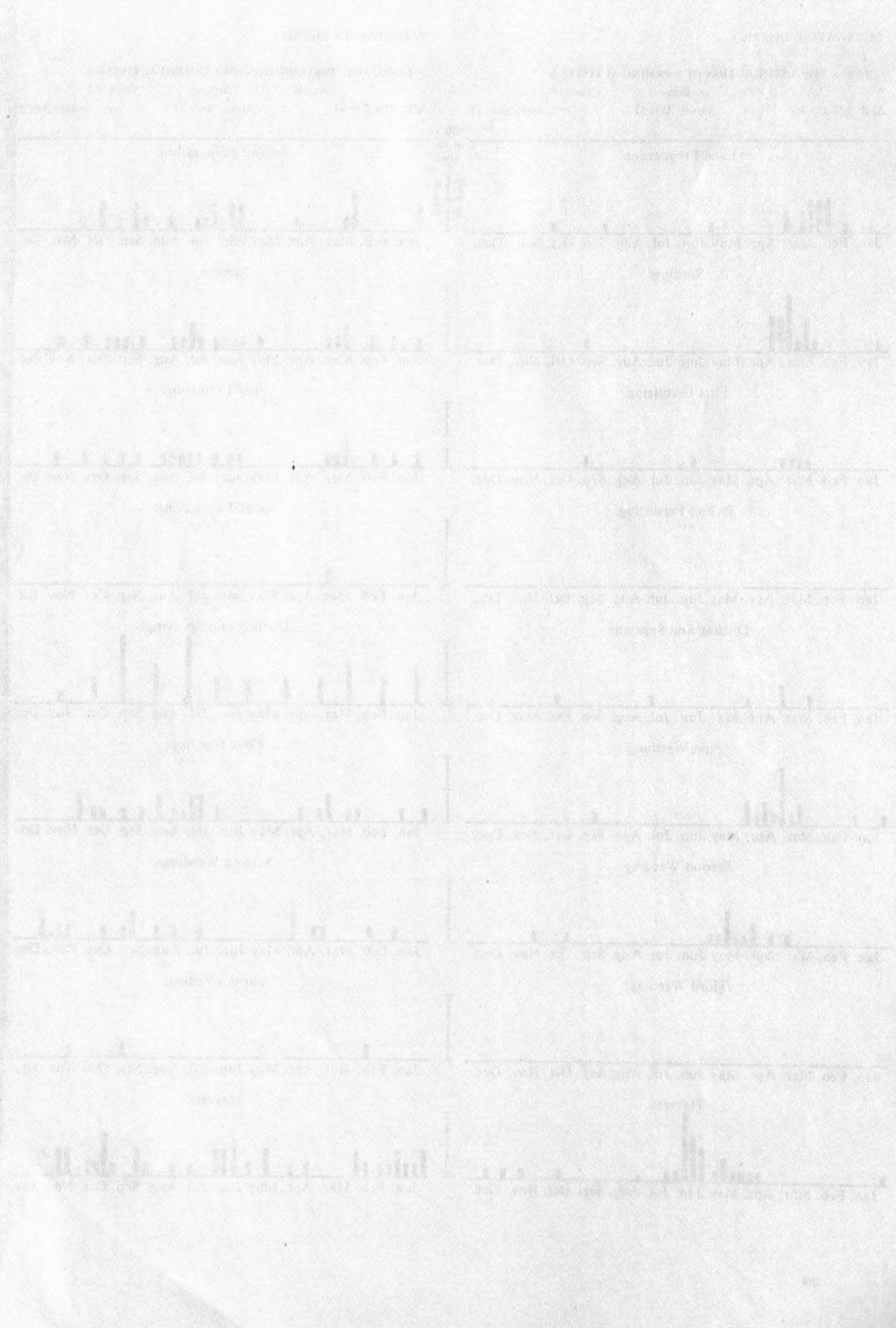
TAITA-TAVETA DISTRICT

TABLE 14 d: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 40 — Cabbage — Cases: 23

AEZ: UM 3 (+ 4) — Survey Area 51 — Sample Size: 30



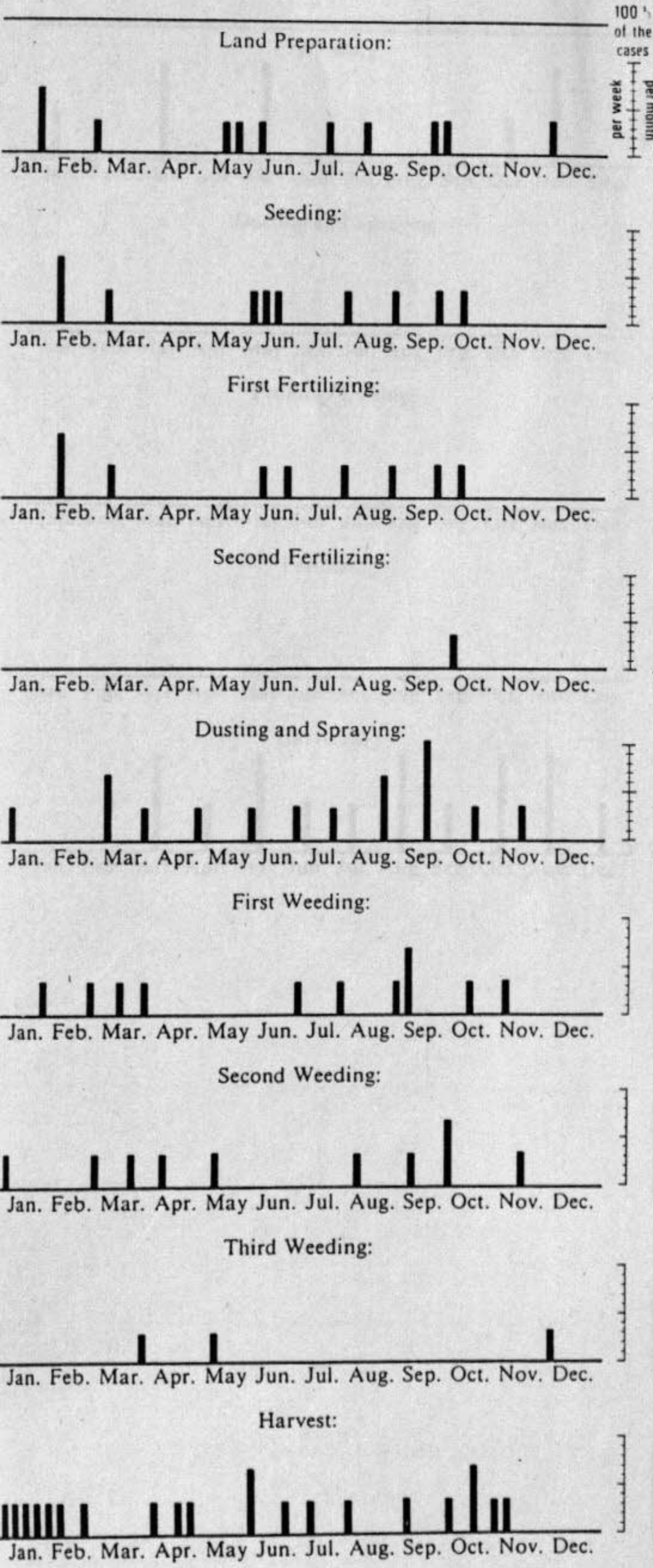


TAITA-TAVETA DISTRICT

TABLE 14 e: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 44 Tomatoes Cases: 11

AEZ: UM 3 (+ 4) Survey Area 51 Sample Size: 30

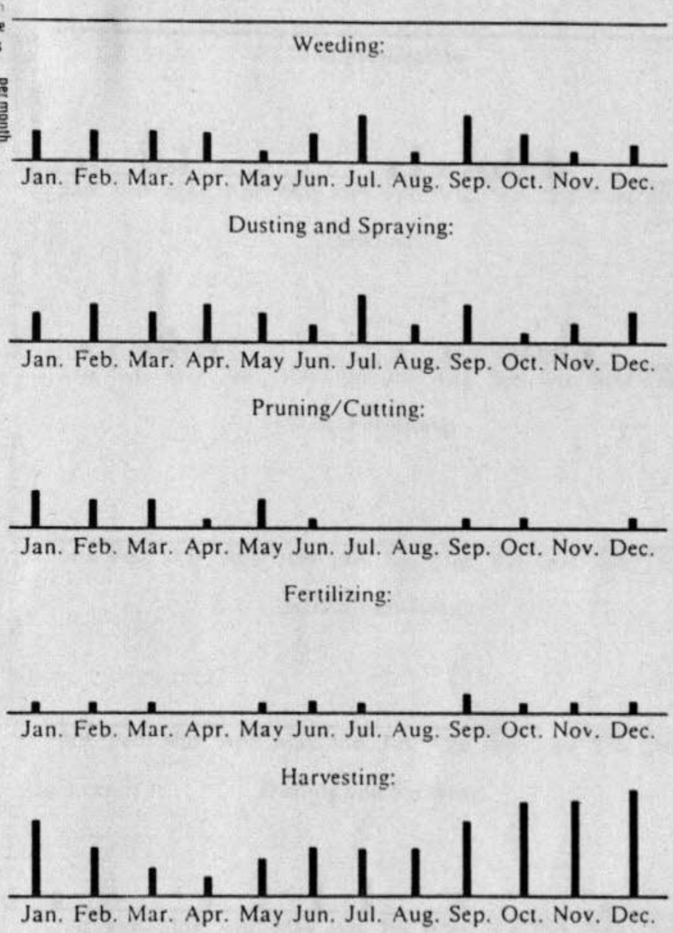


TAITA-TAVETA DISTRICT

TABLE 14 f: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 51 Coffee Cases: 12

AEZ: UM 3 (+ 4) Survey Area 51 Sample Size: 30

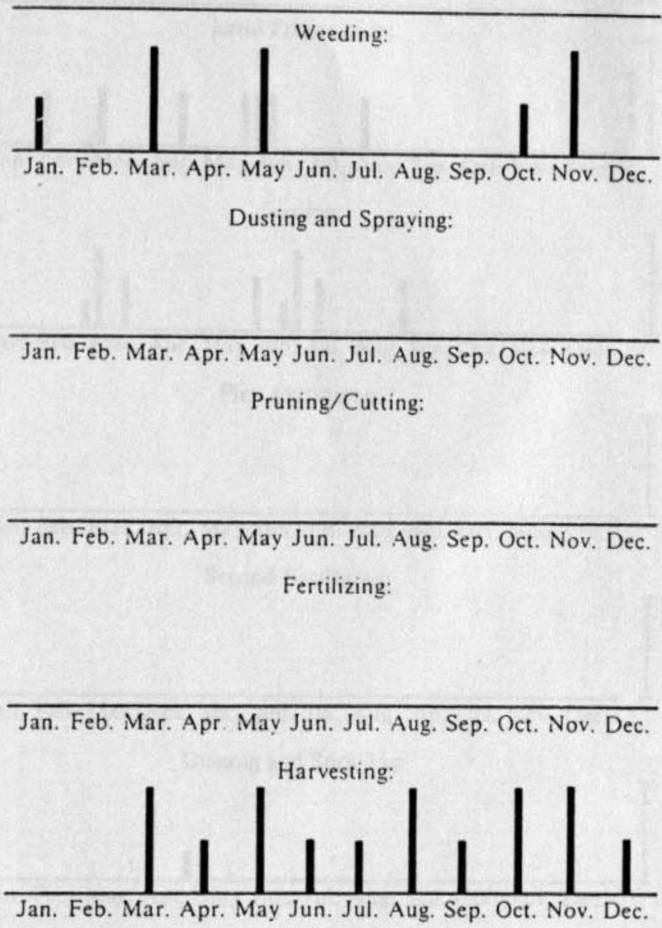


TAITA-TAVETA DISTRICT

TABLE 14 g: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 64 Cassava Cases: 2

AEZ: UM 3 (+ 4) Survey Area 51 Sample Size: 30

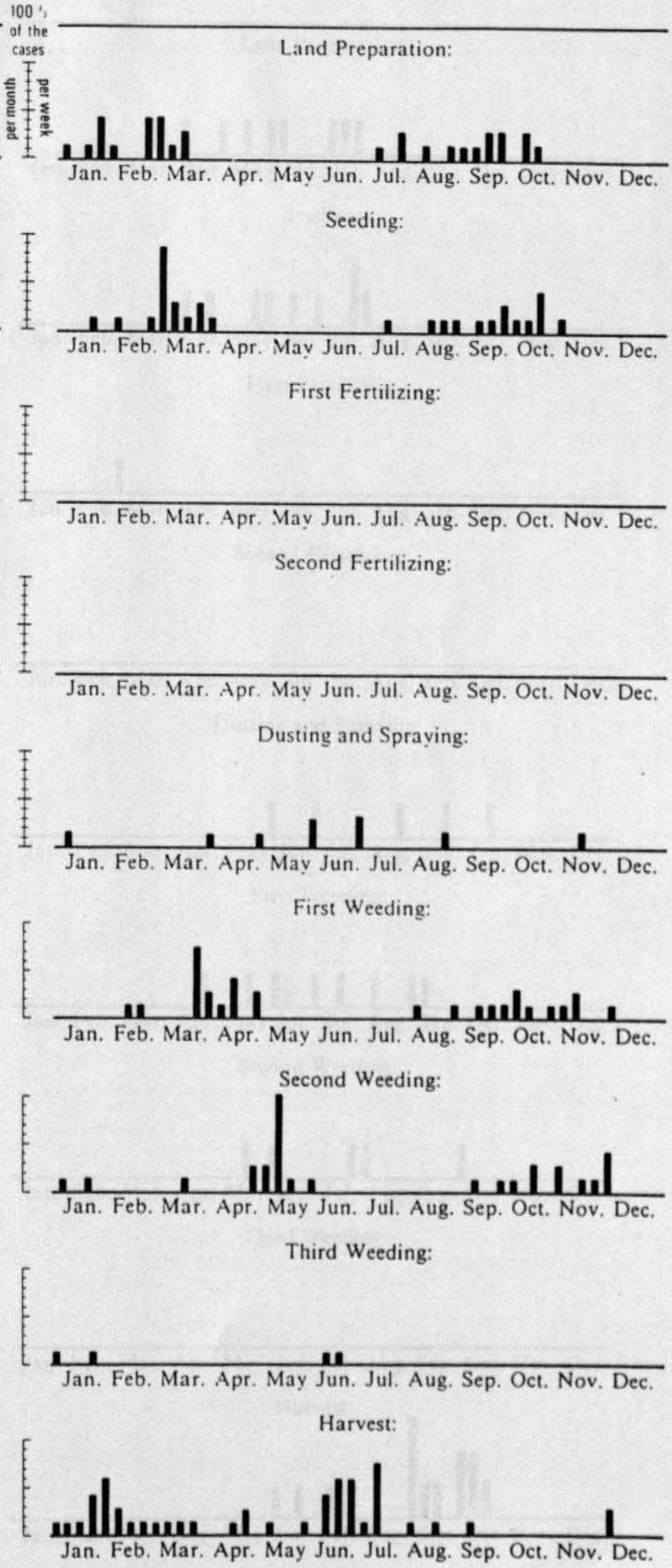


TAITA-TAVETA DISTRICT

TABLE 14 h: **DISTRIBUTION OF FARMING ACTIVITIES**

Crop 1 Maize Cases: 29

AEZ: LM 4–5 + L 5 (+ irr.) Survey Area 52 Sample Size: 30

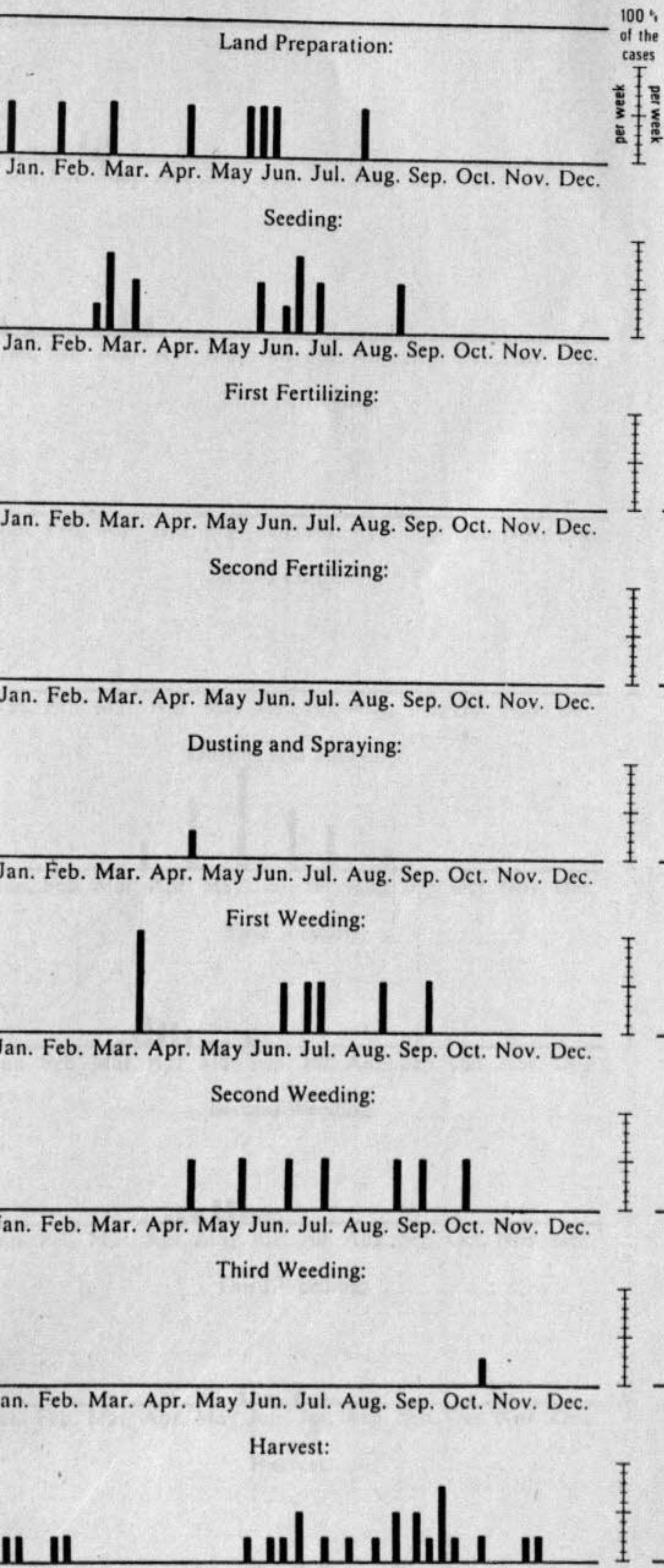


TAITA-TAVETA DISTRICT

TABLE 14 i: DISTRIBUTION OF FARMING ACTIVITIES

Crop 2 Maize & Beans Cases: 16

AEZ: LM 4–5 + L 5 (+ irr.) Survey Area 52 Sample Size: 30

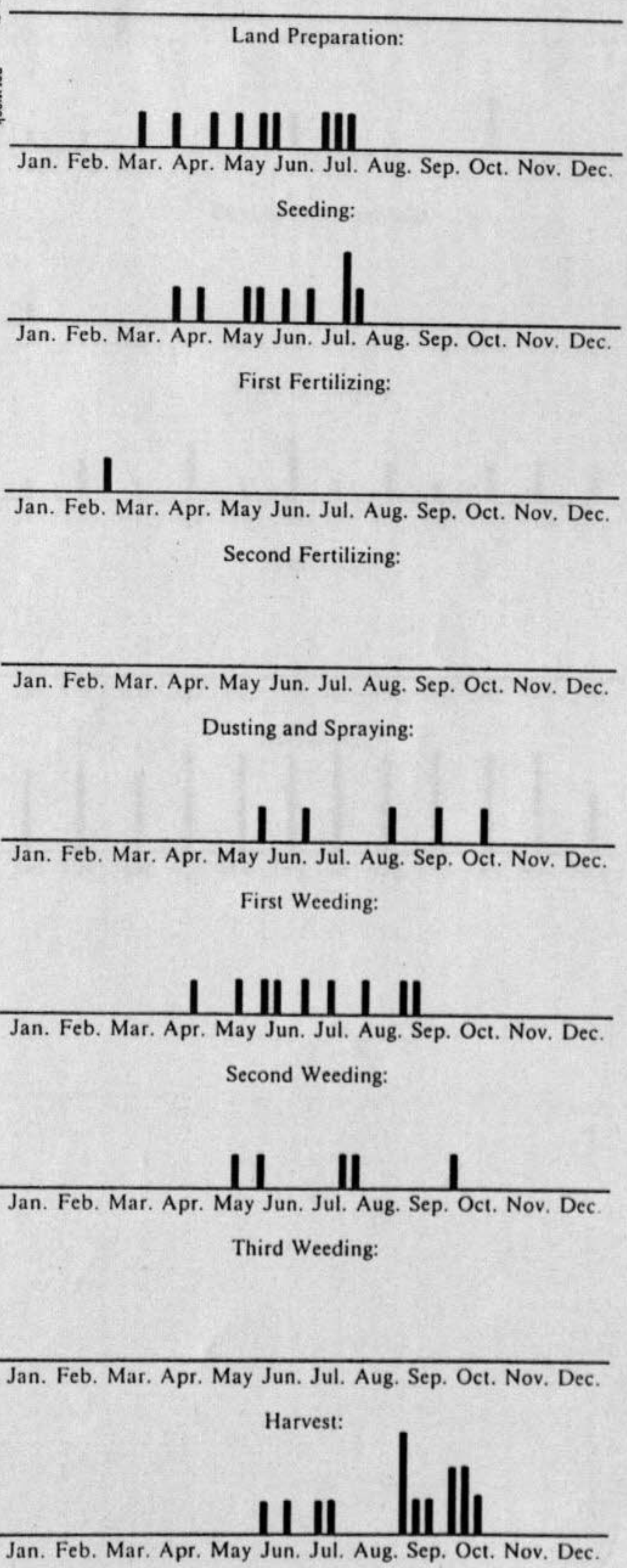


TAITA-TAVETA DISTRICT

TABLE 14 j: DISTRIBUTION OF FARMING ACTIVITIES

Crop 10 Beans Cases: 9

AEZ: LM 4–5 + L 5 (+ irr.) Survey Area 52 Sample Size: 30

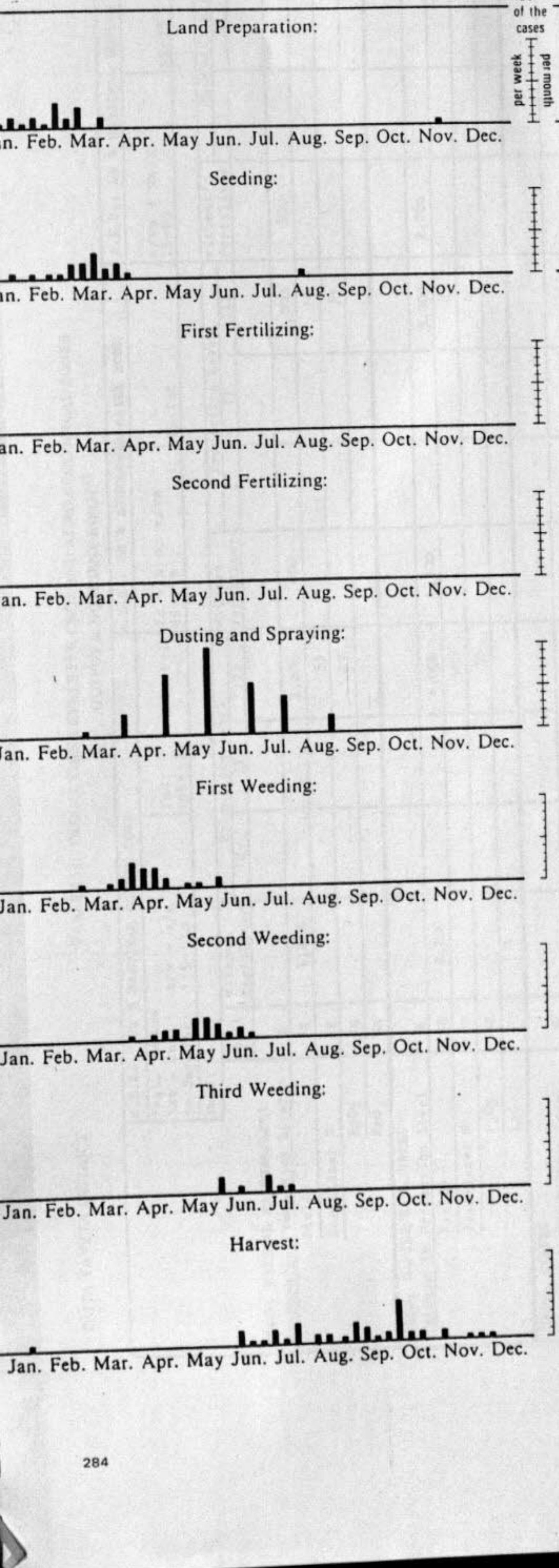


ITA TAVETA DISTRICT

ABLE 14k: DISTRIBUTION OF FARMING ACTIVITIES

Crop 35 Cotton Cases: 23

Z: LM 4–5 + L 5 (+ irr.) Survey Area 52 Sample Size: 30



TA DISTRICT

1: DISTRIBUTION OF FARMING ACTIVITIES

Crop 56 Cooking Bananas Cases: 5

+ L 5 (+ irr.) Survey Area 52 Sample Size: 30

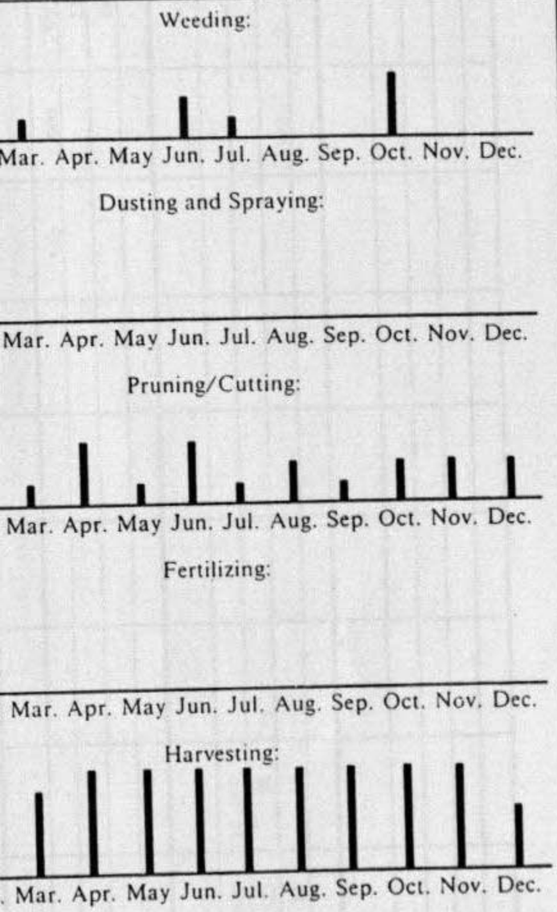


TABLE 15a: PRODUCTION LEVELS PER CROP AND AGRO-ECOLOGICAL ZONES OUTPUT & NUTRIENT INPUT[1]

		A.E.Z.: UM 3 MARGINAL COFFEE ZONE				A.E.Z.: UM 4 SUNFLOWER-MAIZE ZONE				A.E.Z.: LM 4 MARGINAL COTTON ZONE			
		Vegt. Period 1st + 2nd: in Days, 1st: m/s + s/m 115-130		2nd: 105-110	total: —	fs + s or s/vs 85-115		85-105	—	s/vs + vs/s 75-85		55-75	—
		Soil:											
	Unit	Without Fertilizer	Production Level I	Production Level II	Production Level III	Without Fertilizer	Production Level I	Production Level II	Production Level III	Without Fertilizer	Production Level I	Production Level II	Production Level III
CROP: NATURAL PASTURE/LEYS													
Farmers in Production Level	%												
Yields 2)	kg	1,200			2,200	800			2,000	800			2,000
Fertilizer N	kg				55				66				66
P_2O_5	kg				27				33				33
K_2O	kg												
CROP: NAPIER/BANA GRASS													
Farmers in Production Level	%												
Yields 2)	kg	2,200			4,000	1,500			3,000	2,200			4,000
Fertilizer N	kg				100				83				100
P_2O_5	kg				50				42				50
K_2O													
CROP: COFFEE													
Farmers in Production Level	%												
Yields	kg		300	500	700								
Fertilizer N	kg		30	50	70								
P_2O_5	kg		90	90	90								
K_2O	kg												
CROP: COTTON													
Farmers in Production Level	%												
Yields	kg									300	300	600	800
Fertilizer N	kg											33	55
P_2O_5	kg											24	40
K_2O	kg												
CROP: BANANAS													
Farmers in Production Level	%												
Yields	kg	5,500	4,000	7,000	12,000								
Fertilizer N	kg			23	98								
P_2O_5	kg			11	46								
K_2O	kg												
CROP:													
Farmers in Production Level	%												
Yields	kg												
Fertilizer N	kg												
P_2O_5	kg												
K_2O	kg												

1) for explanations see p. 16

2) in kg TDN

TAITA-TAVETA DISTRICT

TABLE 15b: PRODUCTION LEVELS PER CROP AND AGRO-ECOLOGICAL ZONES
OUTPUT & NUTRIENT INPUT

		A.E.Z.: UM 3 MARGINAL COFFEE ZONE				A.E.Z.: UM 4 SUNFLOWER-MAIZE ZONE				A.E.Z.: LM 4 MARGINAL COTTON ZONE			
		Vegt. Period 1st + 2nd: in Days,1st: m/s + s/m 115-13o		2nd: 1o5-11o	total: —	fs + s or s/vs 85-115		85-1o5	—	s/vs + vs/s 75-85		55-75	—
		Soil:											
	Unit	Without Fertilizer	Production Level I	II	III	Without Fertilizer	Production Level I	II	III	Without Fertilizer	Production Level I	II	III
CROP: MAIZE													
Farmers in Production Level	%												
Yields	kg	1,600	1,300	2,400	2,800	1,400	1,300	2,000	2,500	950	800	1,500	2,000
Fertilizer N	kg			20	30			15	28			14	26
P_2O_5	kg			22	34			17	31			15	29
K_2O	kg												
CROP: SORGHUM													
Farmers in Production Level	%												
Yields	kg									1,400	1,100	2,000	2,800
Fertilizer N	kg											18	42
P_2O_5	kg											16	38
K_2O													
CROP: MILLET													
Farmers in Production Level	%												
Yields	kg	1,200		1,000	1,500	900		800	1,400	1,000		800	1,500
Fertilizer N	kg				10				16				16
P_2O_5	kg				8				14				14
K_2O	kg												
CROP: MAIZE & BEANS													
Farmers in Production Level	%												
Yields	kg	1,600		2,400/300	2,800/400								
Fertilizer N	kg			34	49								
P_2O_5	kg			31	46								
K_2O	kg												
CROP: BEANS													
Farmers in Production Level	%												
Yields	kg					700	500	1,000	1,400	700	500	1,200	1,500
Fertilizer N	kg							14	34			30	48
P_2O_5	kg							11	25			18	28
K_2O	kg												
CROP: SUNFLOWER													
Farmers in Production Level	%												
Yields	kg	800	400	500	1,100	700	400	500	900	500		500	1,000
Fertilizer N	kg				10				7				17
P_2O_5	kg				15				10				25
K_2O	kg												

TABLE 15c: PRODUCTION LEVELS PER CROP AND AGRO-ECOLOGICAL ZONES
OUTPUT & NUTRIENT INPUT

		A.E.Z.: UM 3 MARGINAL COFFEE ZONE				A.E.Z.: UM 4 SUNFLOWER-MAIZE ZONE				A.E.Z.: LM 4 MARGINAL COTTON ZONE			
		Vegt. Period 1st + 2nd: m/s + s/m in Days,1st: 115-13o		2nd: 1o5-11o	total: —	fs + s or s/vs 85-115		85-1o5	—	s/vs + vs/s 75-85		55-75	—
		Soil:											
	Unit	Without Fertilizer	Production Level I	II	III	Without Fertilizer	Production Level I	II	III	Without Fertilizer	Production Level I	II	III
CROP: CABBAGE													
Farmers in Production Level	%												
Yields	kg	3,000	3,500	15,000	25,000								
Fertilizer N	kg		4	84	154								
P_2O_5	kg		4	84	154								
K_2O	kg												
CROP: SWEET POTATOES													
Farmers in Production Level	%												
Yields	kg	5,000	3,000	8,000	16,000	4,000	3,000	7,000	14,000	3,500	3,000	7,000	10,000
Fertilizer N	kg			24	88			24	80			28	52
P_2O_5	kg			21	77			21	70			24	45
K_2O													
CROP: CASSAVA													
Farmers in Production Level	%												
Yields	kg					4,000	3,500	6,000	8,000	3,000	3,800	6,000	9,000
Fertilizer N	kg							8	16		3	12	24
P_2O_5	kg							14	28		6	21	42
K_2O	kg												
CROP:													
Farmers in Production Level	%												
Yields	kg												
Fertilizer N	kg												
P_2O_5	kg												
K_2O	kg												
CROP:													
Farmers in Production Level	%												
Yields	kg												
Fertilizer N	kg												
P_2O_5	kg												
K_2O	kg												
CROP:													
Farmers in Production Level	%												
Yields	kg												
Fertilizer N	kg												
P_2O_5	kg												
K_2O	kg												