

THE REPUBLIC OF KENYA

LAND USE MAPPING

(TOPOGRAPHIC MAPPING PROJECT)

IN EAST KENYA

FINAL REPORT

ANNEX



MARCH 1984

JAPAN INTERNATIONAL COOPERATION AGENCY

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I. IMPLEMENTATION AND METHODOLOGY OF THE STUDY

This chapter covers the work flow and method of the thematic mapping carried out in the last 3 years of the Land Use Mapping Project in East Kenya, which would be helpful to the future projects of this kind.

I-I WORK FLOW

Fig. 1 shows the entire work flow. The following sections describe each step of the work flow.

1-2 RECONNAISSANCE SURVEY

The area to be surveyed is vast, and the eastern Tana River Delta Area is quite different in climate, landform, vegetation and other natural conditions from the western Ranching Project Area. So it was necessary to understand the outline of the entire project areas before the start of work so as to provide for the survey standards, policy and a plan for effective work execution.

In the first stage, the reconnaissance survey on the project areas was carried out. Before departure to the field survey, we studied the 1/50,000 scale topographic maps, aerial photos, and existing documents and data to get a preliminary knowledge of the survey areas and made a general survey plan. The survey period was 54 days, and eight team members and one counterpart from the Survey of Kenya participated in the survey.

The major survey items were as follows:

(1) Reconnaissance on geology, landform, vegetation, present land use, and drainage.

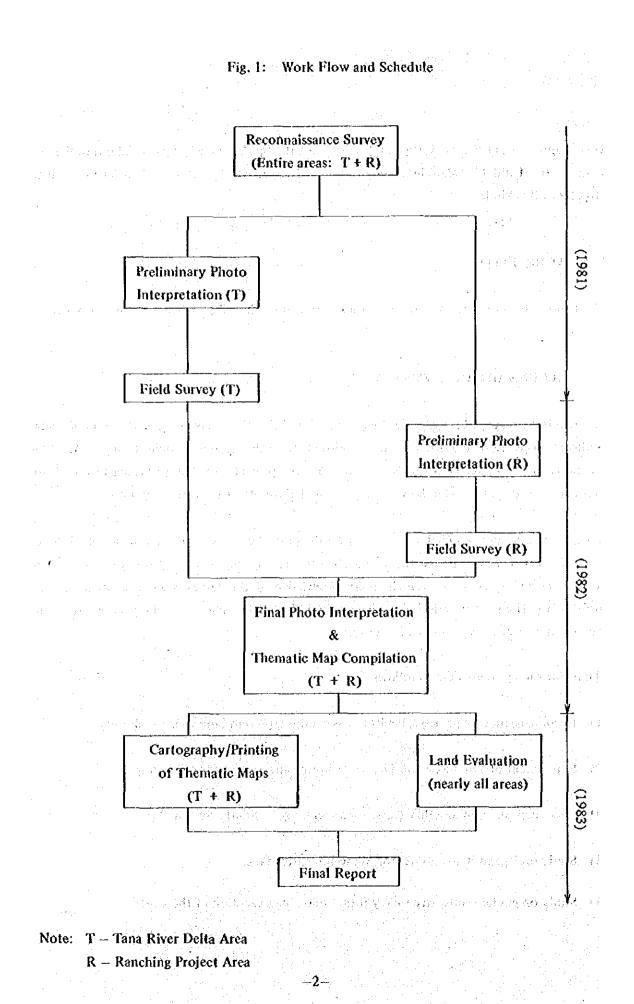
(2). Experiment of soil observation by auger boring and electrical prospecting.

(3) Reconnaissance on mobility conditions such as accessibility by vehicles.

(4) Study on legend items (draft) for use in thematic maps.

(5) Study on guide to effective survey in the following execution of the work.

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(6) Collection of reference books, documents and maps in Kenya.

I - 3 PRELIMINARY PHOTO INTERPRETATION

1-3-1 PRELIMINARY AERIAL PHOTO INTERPRETATION

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Aerial photo interpretation was performed based on the results of reconnaissance survey.

- (1) As for landform classification, vegetation and present land use, boundaries according to legend items (draft) were put on aerial photos.
- (2) Boundaries of surface geology and soil presumed from the interpreted landform boundaries were put on aerial photos.
- (3) Drainage was also put on aerial photos.
- (4) Those points to be identified in the field survey were marked on aerial photos for each theme. Morphometry for slope classification was performed from the 1/50,000 scale topographic maps.

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1-3-2 PREPARATION OF RECONNAISSANCE MAPS

The results of the pretiminary aerial photo interpretation were dropped onto the 1/50,000 scale topographic maps to make reconnaissance thematic maps.

1-3-3 PREPARATION OF LEGEND ITEMS (REVISED DRAFT) FOR THEMATIC

Legend items (revised draft) for thematic maps were prepared based on the results of the aerial photo interpretation.

1-4 FIELD IDENTIFICATION

The field survey was conducted to confirm and complement aerial photos and reconnaissance maps bearing the results of the preliminary photo interpretation. The survey period was about three months each in the 1st and 2nd years. The number of survey members was 14. Two counterparts from the Survey of Kenya (both in the 1st and 2nd years) and two counterparts from the Kenya Soil Survey (in the 1st year only) joined the field survey. Major survey items were as follows:

- (1) Checking on the preliminary aerial photo interpretation by field observation of geology, landform, drainage, vegetation and present land use.
- (2) As for geology complementary survey of parent materials of soil by auger boring and in a certain area, electric prospecting serving also as a check for shallow ground water.
- (3) Survey for component materials of landform by auger boring.
- (4) Vegetation sampling survey (139 pcs) for use as standard in making detailed vegetation classification.
- (5) Survey on soils by auger boring (320 points) and pit excavation (30 points) and collection of samples for analysis from pits (Tana River Delta Area only).
- (6) Hearings from local residents about vegetation, land use, flood, water utilization and other necessary items.

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- (7) Analysis of soil samples after return to Japan (a part of analysis conducted during stay on the spot).
- (8) Correction of reconnaissance thematic maps based on the results of the above survey.
- (9) Preparation of legend items (final draft) for thematic maps.

I-S CONSTITUTION OF MAP SPECIFICATIONS

In preparing thematic maps, it is an important problem to determine map specifications, i.e. legend items, colour design and sheet layout.

Since the start of reconnaissance survey in the 1st year, study and correction of legend items for thematic maps had been carried out in parallel with progress of the survey. In the 2nd year, study on color design corresponding to legend items and sheet layout started. After holding meetings with the Kenya side to discuss the matter, map specifications were finalized at the meeting held in February, 1983 (end of the 2nd year).

I-6 MAP COMPILATION

Through the final photo interpretation based on the results of the field survey, reconnaissance maps corrected on the basis of the results of the field identification were complemented and the thematic draft maps were compiled. Then, the original maps in a single colour for drafting were prepared.

I-7 DRAFTING AND PRINTING

Drafting from the original maps was carried out in accordance with the finalized colour design and sheet layout. Then, plate making and printing were conducted.

Fig. 2-4 show the work flows of drafting and printing for the thematic mapping. Colour separation applied in drafting the thematic maps is shown in Table 1-3.

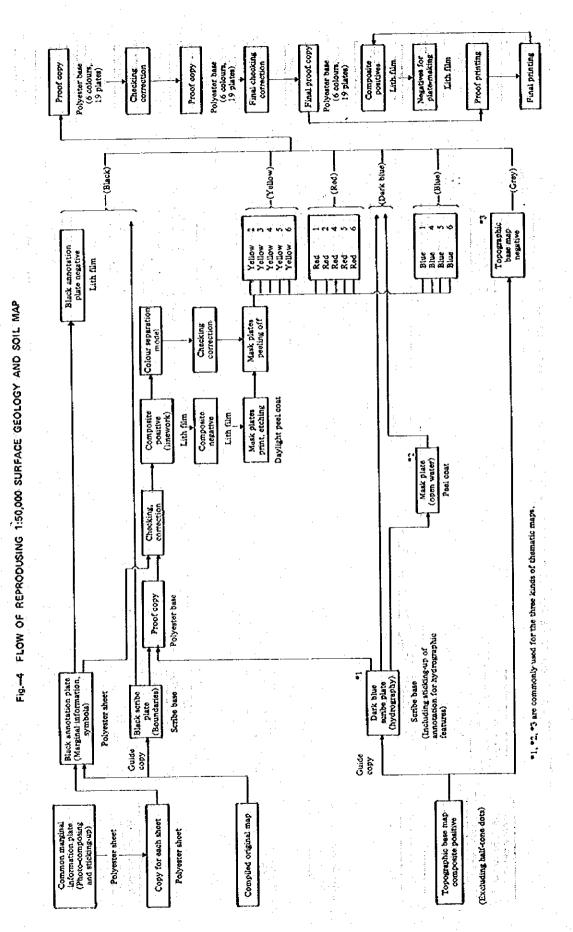
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FIG -2 FLOW OF REPRODUSING 1:50,000 AND 1:100,000 VEGETATION AND PRESENT LAND USE MAP

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Table 1 COLOUR SEPARATION OF 1:50,000 AND 1:100,000 VEGETATION AND PRESENT LAND USE MAP

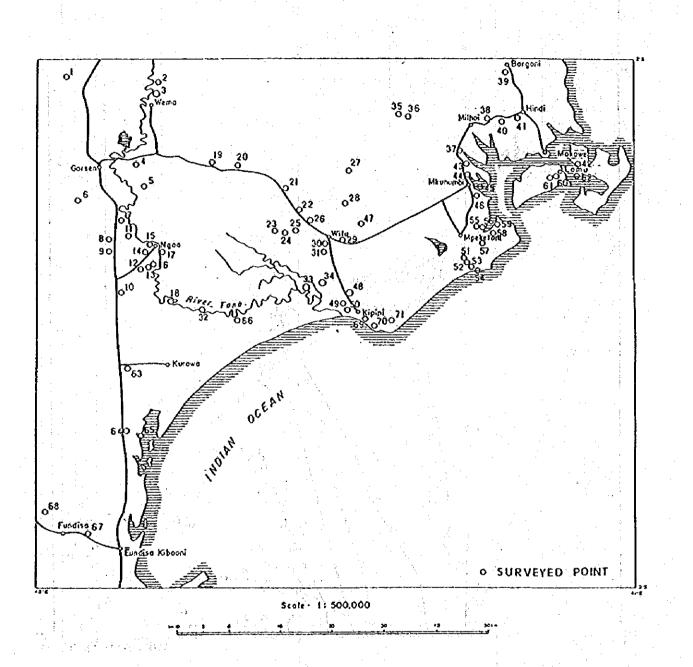
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Table 2 COLOUR SEPARATION OF 1:50,000 LANDFORM, SLOPE AND DRAINAGE MAP AND 1:100,000 LANDFORM AND DRAINAGE MAP

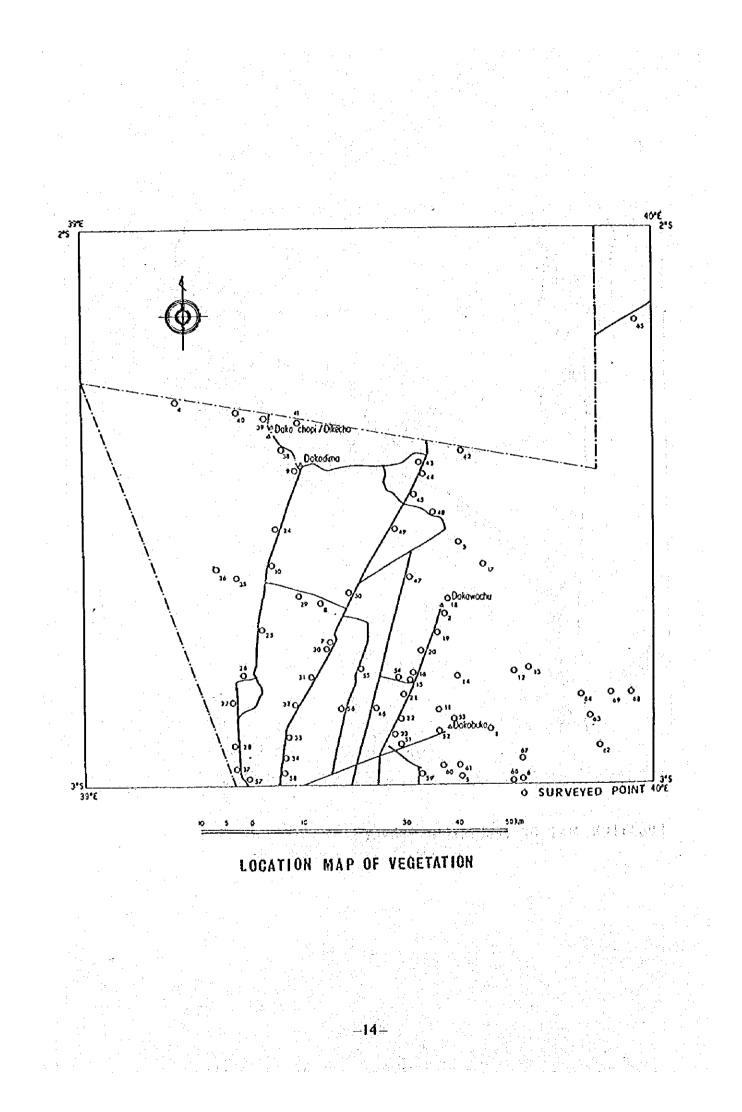
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Table 3 COLOUR SEPARATION OF 1:50,000 SURFACE GEOLOGY AND SOIL MAP

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SUMMARY TABLE OF THE DOMINANT SPECIES USING THE MODIFIED BRAUN BLANQUET COVER ABUNDANCE SCALE (2)

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PLANTS OF THE TANA AREA

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TREES, SHRUBS AND HERBS

1. Abutilon mauritianum

- 2. Acacia bussei
- 3. " brevispica
- 4, " mellifera
- 5. " nilotica
- 6. " reficiens
- 7. " tortilis
- 8. " zanzibarica
- 9. Achyranthes sp.
- 10. Adansonia digitata
- 11. Aloe dawei
- 12. Albizia sp.
- 13. Ammocharis tinneana
- 14. Asparagus buchanenii
- 15. " racomosus
- 16. Avicennia marina
- 17. Balanites orbicularis
- 18. Barleria acanthoides
- 19. Barringtonia racemosa
- 20. Borassus aethiopum
- 21. Boscia coriacea
- 22. Bothriocline somalensis
- 23. Brachystegia sp.
- 24. Bruguiera gymnorrhiza
- 25. Cadaba ruspolii
- 26. " sp.
- 27. Cardiogyne africana
- 28. Cassia sp.
- 29. Chlorophora excelsa
- 30. Cissus rotundifolia
- 31. Combretum hereroense
- 32. ** sp.
- 33. Commelina benghalensis
- 34. " sp.
- 35. Commiphora campestris
- 36. " riparia
- 37. " schimperi
- 38. Cordia crenata
- 39. " sp.

-19-

Croton dichogamus 40. 33 41. sp. Cynometra webberi 42. Diospyros comü 43. glabra Dobera 44. Dombeya sp. 45. Ecolium sp. 46. ,, striatum 47. Euclea divinorum 48. candelabrum 49. Euphorbia ** robechii 50. ,, 51. sp. ,, tirucalii 52. \$3. Ficus sp. 53 sycomorus 54. Ś5. Garcinia livingstonei Gomphocarpus sp. 56. bicolor Grewia 57. 58. ** similis ,, 59. sp. ,, 60. tenax villosa >> 61., Harrisonia abyssinica 62. 63. Heliotropium sp. Hermania uhligii 64. 65. Hibiscus sp. 66. Hyphaene coriacea Indigofera schimperi 67. 22 68. sp. Ipomoea batatas 69. 32 70. cairica Lannea stuhlmannii 71. 72. Lantana sp. 23 trifolia 73. Lawsonia inermis 74. 75. Maerua sp. Mangifera indica 76. Manilkara sansibarensis 11. Maytenus undatus 78. 79. Melia sp.

-20--

80. Ormocarpum sp. 81. Phoenix reclinata 82. Phyllanthus somalensis 83. Psidium guajava 84. Rhizophora mucronata 85. Rhus vulgaris 86. Salvadora persica Sansevieria conspicia 87. 1 **35** 14. 4 1 1 88. sp. 89, Securinega virosa 90. Sesbania sesban 91. Sida sp. 92. Sideroxylon inerma 93. Solanum incanum 94. Sphaeranthus sp. -95. Suaeda monoica 96. Syzygium cordatum 97. Tephrosia sp. 98. Terminalia brownii ** 99. sp. 100. spinosa 101. Thespesia danis 102. Tribulus sp. 103. Triumfetta flavescens 104. Vernonia sp.

GRASSES AND SEDGES

1. Bothriochloa glabra

2. "insculpta

3. Brachiaria brizantha

4. " sp.

5. Cenchrus ciliaris

6. 'Chloris pycnothrix

7. Chrysopogon aucheri

8. Cynodon dactylon

9. Plectostachyus

-21-

10. Cyperus articulatus

11. ^v sp.

12. Cyperus rotundas

13. Digitaria milanjiana

14. " sp.

15, Echinochloa colonum

16. " haploclada

17. " sp.

18. " staginina

19. Enteropogon macrostachyus

20. Eragrostis sp.

21. " superba

22. Eustachys paspaloides

23. Heteropogon contortus

24. Hyparrhenia fula

25. Leptothrium senegalense

26. Leptochloa obtusiflora

27. Mariscus sp.

28. Panicum infestum

29. " maximum

30. " sp.

31. Pennisetum purpureum

32. Schmidtia sp.

33. Schoenefeldia transiens

34. Setaria sp.

35. " sphacelata

36. Sporobolus helvolus

37. " marginatus

38. " sp.39. " spicatus

Jy. spicetos

PLANTS OF GALANA RANCHING AREA

TREES, SHRUBS AND HERBS

1. Albizia sp.

2. Abutilon maunitianum

3. Abutilon sp.

4. Acacia brevispica

5. " bussei

6. " horrida

-22-

7.	Acacia	mellifera
8.	**	nilotica
9.	»	reficiens
10.		seyal
11.	»	sp.
12.	**	zanzibarica
13.	Adenium	obesum
14.	Afzelia cu	anzensis
15.	Albizia sp).
16.	Alocasia s	sp.
17.	Aloe sp.	
18,	Anisotes	parvifolius
19.	Asparagus	buchanenii
20.	**	sp.
21.	Balanites	sp.
22.	Barleria a	acanthoides
23.	Blepharispe	ermum sp.
24.	Borassus a	ethiopum
25.	Boscia co	niacea
26.	Bothrioclin	e somalensis
27.	Brachysteg	ia spiciformis
28.	Bridelia o	cathartica
29.	Cadaba fa	rinosa
× 30.	ss gl:	andulosa
31.	Caesalpinia	sp.
32.	**	trothaei
33.	Canthium	schimperlanum
34.	Carissa ed	lulis
35.	Cassia sir	ngueana
36.	Cissus ro	tundifolia
37.	Clematis s	ip.
38.	Combretun	n exalatum
39.	**	hereroense
40.	>>	illairii
41.	2 (1)33 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	molle
42.	33	sp.
43.	Commelina	sp.
44.	Commipho	ra africana
45.	51	campestris
46.	**	erythraea
	entra. Antes estas	

•

47,	Commiphora riparia
48.	" schimperi
49.	" sp.
50.	Cordia sinensis
51.	" sp.
52.	Croton dichogamus
53.	" sp.
54.	Cucumis sp.
55.	Cynometra webberi
56.	Delonix elata
57.	Diospyros comii
58.	" sp.
59.	Dobera glabra
60.	Ecbolium striatum
61.	Echeveria sp.
62.	Elaeodendron aquifolium
63.	Encephalartos hildebrandtii
64.	" sp.
65.	Erythrina excelsa
66.	" sp.
67.	Euclea divinorum
68.	Euphorbia grandicornis
69.	" robecchii
70.	" sp.
71.	" tirucalli
72.	Gardenia jovis-tonantis
73.	Grewia bicoler
74.	" forbesü
75.	" ргаесох
76.	" similis
77.	" sp.
78.	" sulcata
79.	" tenax
80.	" villosa
81.	Heinsia crinita
82.	Hermania uhligii
83.	Hibiscus tiliaceus
84.	Indigofera schimperi
85.	" sp.
•	

--24--

86. Indigofera spinosa 87. Ipomoea cairica " 88. membassana 89. 35 sp. 90. 25 spathulata **91**. Lannea sp. 92. **2**2 stuhlmannii 93. Lantana sp. 94. Leucas sp. 95. Maerua denhardtiorum 33 96. sp. 97. Manilkara sulcata 98. Mariscus sp. 99. Melia volkensii Millettia lasiantha . 100. 101. 99 sp. 102. Nectaropetalum kaessneri 103. Ochna mossambicensis 104. Platycelyphium voense 105. Portulaca sp. 106. Psychotria amboniana 107. Pteris sp. 108. Rhizophóra mucronata 109. Rhoicissus revoilii 110. Rhus natalensis 111. ** sġ, " vulgaris 112. 113. Salacia sp. 114. Salsola dendroides 115. Salvadora persica 116. Sansevierla conspicia 117. 22 cylindrica 118. 23 sp. 119. Securinega virosa 120. Sesbania sesban 121. Sideroxylon inerme 122. Solanum Incanum 13 123. sp. 124. Sonneratia alba 125. Strophanthus sp.

-25--

126.	Strychnos	sp.
127.	Suregada	zanzibarensis
128.	Tephrosia	sp.
129.	Terminalia	parvula
130.	35	prunioides
131.	13	sp.
132.	35	spinosa
133.	Thespesia	danis
134.	Tinnea ae	thiopica
135.	Tribulus	sp.
136,	Uvaria lu	cida
137.	Ximenia	americana

GRASSES AND SEDGES

Aristida adoensis 1

** keniensis 2.

3. ,, sp.

Becium sp. 4.

Blepharis linariifolia 5.

6. : Bothriochloa glabra

7. Brachiaria brizantha

17 sp. 8.

9. Cenchrus ciliaris

" 10. śġ.

11. Chloris sp.

12. Cynodon dactylon

22 13. sp.

14. Cyperus sp.

15. Dactyloctenium sp.

16. Digitaria milanjiana

" ... sp. 17.

velutina 18. 22

Echinocloa haploclada 19. **

20. sp.

21. staginina

22. Enteropogon macrostachyus

11 23. sp.

24. Eragrostis ciliaris

-26-

25, Eragrostis sp.

26. " superba

27. Hyparrhenia rufa

28. Imperata cylindrica

29. Leptothrium senegalense

30. Leptochloa obtusiflora

31. Mariscus macropus

32. " sp.

33. Panicum infestum

34. " maximum

35. " sp.

36. Pennisetum sp.

37. Sacciolepis curvata

38. Schmidtia sp.

39. Schoenefeldia transiens

40. Setaria sp.

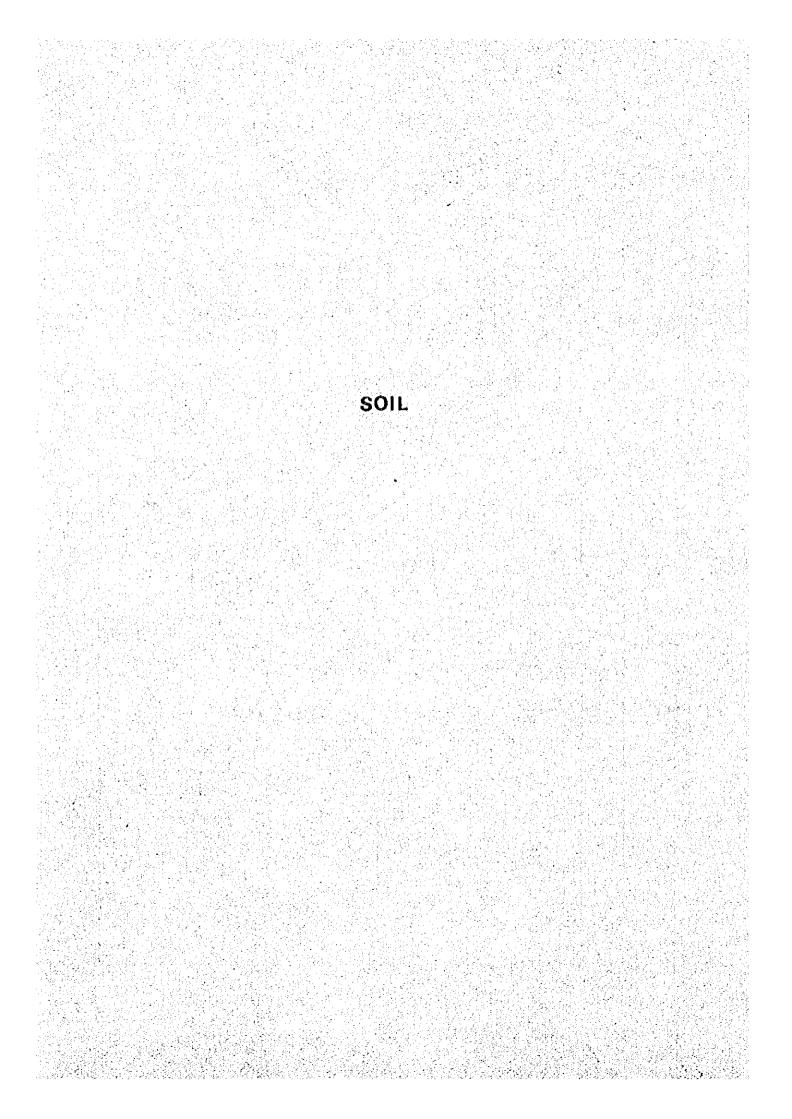
41. " sphacelata

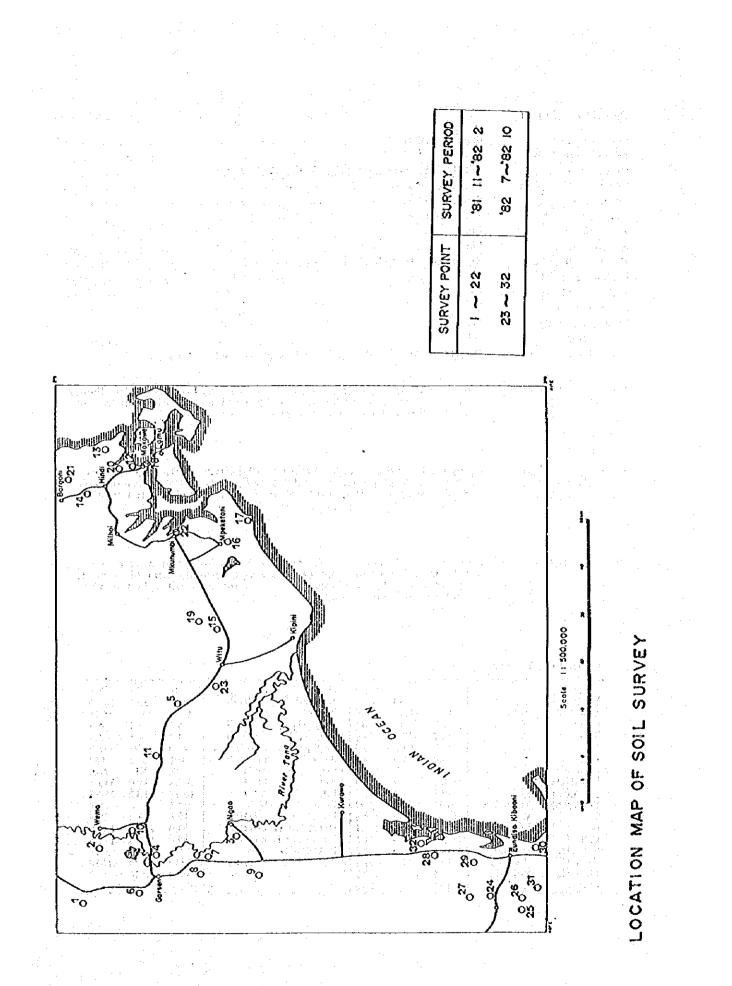
42. Sporobolus helvolus

43. " sp.

44. " spicatus

27





--29--

Unit PtJso, Profifie 1

Soil classification:	orthic Solonetz	
Agro-climatic zone:	VI.	
Observation:	179/1; Tana River District; E. 40°3'. 8.	2°4'; 37m.
Geological formation:	Lagoonal sands and clays.	•
Local petrography:	Sands and clays.	
Physiography unit:	Middle terrace,	
Relief-macro:	Flat.	
Relief-meso, micro:	Sink hole.	
Vegetation/Land use:	Bushed Grassland/Grazing.	
Evidence of erosion:	None detected.	
Surface stoniness:	Nil.	
Slope gradient:	0%	
Salinity/alkalinity:	Moderately sodic.	
Surface crack:	Nil.	·
Internal drainage class:	Moderately well drained.	

0-7cm.

7–35cm

Dusky red (2.5YR 5/1 dry, 2.5YR 3/1 moist); silty loam; strong, medium, crumb structure; soft when dry, friable when moist, slightly sticky and plastic when wet; common fine roots:

Bn

A

Dusky red (2.5YR 3/1 dry, 2.5YR 3/1 moist); silty loam, strong, very coarse, columnor structure; hard when dry, very firm when moist, sticky and very plastic when wet; few, small, spherical white concretions; few medium roots:

Btn

.

Dusky red (2.5Y 4/1 dry, 2.5YR 3/1 moist); clay loam; strong, very coarse, subangular blocky structure; extremely hard when dry, firm when moist, very sticky and very plastic when wet; frequent, small, spherical white concretions; few medium roots:

	•				the distance				
Horizon	- <u> </u>	A	Bn	Btn	Horizon		A	Bn	Bin
Depth	CED	5	30	80	Exch. Na	me/100g	0.40	3.66	10.50
Bulk density	g/cm ³	1.20	1.45	1.46	Base sat	%	100+	100+	100+
Gravel	%	ND.	ND.	< ND.	SiO,/A1,O,	mol/mol	5.2	5.1	5.3
Sand	%	36.5	29.0	24.0	SiO, /R, O,	mol/mol	4.2	4.1	4.3
Silt	. %	50.5	65.2	41.5	Fe, 0,	mmol/100g	37.59	36.97 -	39.47
Clay	96	13.0	5.8	34.5	Available P	ppm	. 498 :	328	458
Class	~	SiL	SiL	CL	CO,	me/1	ND.	ND.	ND.
pH-H.O (1:2	ia -	8.5	8.9	8.9	HCÔ,	me/1 :	302.8	396.0	- 349.4
pH-KCI (1:2		7.2	7.4	1.7	SO,	me/1	10.72	1.12	16.96
EC (1:2.5)	mmho/em	0.25	1.10	3.90	Floce, index	%	34.6	.)	76,8
C (1.2.5)	%	1.2	0.7	0.6	K (25%HC1)	me/100g	32.8	29.8	29.8
N N	~ %	0.315	0.070	0.041	Ca (25%HCI)		93.0	210.0	164.0
C/N	.	3.8	10.0	14.6	Mg (25%HC1)	me/100g	89.6	121.2	132.4
CEC pH7.0	me/100g	38.0	38.0	39.8	P (25%HC1)	ppm	1017	697	771
Exch. Ca	me/100g	35.8	29.8	28.2	P (sorption)	mg/100g	1740	1870	1530
Exch. Ma	me/100g	9.56	17.34	19.3	Ho	me/100g	0.22	0.26	0.22
Exch, K	me/100g	2.84	1.10	1.25					

LABORATORY DATA SHEET

35–140 cm⁺

-30-

Unit PrAve, Profile 2

Soil classification:	chromic Vertisols (sodic phase). The first share is a set of the	
Agro-climatic zone:	VI.		
Observation:	179/1, Tana River District; E.	40°13', S. 2°8'; 19m.	
Geological formation:	Recent alluvial deposits.		
Local petrography:	Sands, silts and clays.		1.1
Physiography unit:	Natural levees.	n en	•
Relief-macro:	Gently undulating.		
Relief-meso, micro:	Gilgai,		
Vegetation/Land use:	Bush thicket/Grazing.		· · ·
Evidence of erosion:	Non detected.	at the second second	1 ¹⁰
Surface stoniness:	Nil.		
Slope gradient:	0 ∿ 2%.		
Salinity/alkalinity:	Moderately sodic.	1	
Surface crack:	$0.5 \sim 1\mathrm{cm}$ width.	an a	
Internal drainage class:	Moderately well drained.		: ** *

Dark reddish brown (SYR 4/3 dry, SYR 3/3 moist); loam; strong, medium, crumb structure; hard when dry, firm when moist, sticky and very plastic; many fine roots;

Cni 15--85cm

Dark brown (7.5YR 3/3 moist); common red mottles; silty clay loam; strong, coarse, prismatic structure; extremely firm when moist, very sticky and very plastic when wet; few, small, spherical, white concretions; common fine, few medium roots;

Cn₂

.

Dark brown (7.5YR 3/3 moist); few red mottles; silty loam; strong, coarse, prismatic structure; very firm when moist, very sticky and very plastic when wet; frequent, small, spherical, white concretion; and few, small, spherical, black manganese nodules; slickenside; few medium roots;

Horizon		A	Cnl	Cn2	Horizon	a t	. <u>A</u>	Cnl	Cn2
Depth	¢m ·	10	50	100	Exch. Na	me/100g	1.86	3.22	े 7.91
Bulk density	g/cm²	1.52	1.61	1.59	Base sat	80	100+	100+	100+
Gravel	%	ND.	ND.	ND.	Si0, /A1, 0,	mol/mol	4.1	4.5	5.5
Sand	*	25.5	18.0	26.5	SiO, /R, O,	mol/mol	3.3	3.6	s, s. 4,5
² Silt	%	49.0	54.0	67.2	Fe,0,	mmol/100g	5,63	52.63	46:36
Clay	70	25.5	28.0	6.3	Available P	ppm	244	269	431
- Class		L	SICL	SiL	co,	me/1	ND.	ND,	ND.
pH-H,O (1:	251	7.8	8.8	8.0	HCO.	me/1	218.9	524.1	163.0
BI-KCI (1)		6.1	7.1	2	SO.	me/1	3,36	0.87	63.90
EC (1:2.5)	mmho/cm	0.22	0.25	7.60	Floce, Index	%	35.3	33.9	33.3
c	%	0.5	0.4	0.3	K (25%HCI)	me/100g	20.5	20,0	20.2
Ň	%	0.052	0.040	0 0 34	Ca (25% HCI)	me/100g	35.4	47.2	82.3
C/N	George de la com	11.5	10.0	8.8	Mg (25%HC1)	me/100g	77.6	83.4	88.2
CEC pH7.0	me/100g	36.0	36.0	34.8	P (25% HC1)	ppm	686	647	767
Exch. Ca	me/100g	26.58	30.55	34.8	P (sorption)	mg/100g	1140	1190	1460
Exch. Ma	me/100g	11.50	13.08	13.4	Hp	me/100g	.0.16	0.25	0.14
Exch. K	me/100g	1.31	0.96	0.78			L		

LABORATORY DATA SHEET

85-140cm⁺

--31---

Unit PcAzqf, Profile 3

Soil classifica	tion:	ferralic Arenosols.	en de la companya de	· :
Agro-climatio		V .		and the second
Observation:		179/3, Tana River District; E. 4	0°10'. S. 2°26'; 24m.	
Geological fo				and the second second second
Local petrog				an a
Physiography	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Dunes.		and the second
Relief-macro		Rolling.		1
Relief-meso,		Nil.	~ 1	1. 1
Vegetation/I		Grassland/fallow.	A second second second second	and the second
Evidence of				
Surface stoni	· · · · ·	Nil.		and a second second second
Stope gradier		2~5%.		
Salinity/alka				
Surface cracl			Book and the second second	
Internal drai		Some what excessively drained.		e la construction de la construc
Ap	0-15cm	Yellowish red (SYR 5/6 dry, 5	YR 4/6 moist); sand; sin and non-plastic when w	igle grain; loose when (ef: many fine roots:

Yellowish red (5YR 5/6 dry, 5YR 4/6 moist); sand; single grain; loose when dry and moist, non-sticky and non-plastic when wet; many fine roots; diffuse and smooth transition to:

B

1

15-130cm⁺

Yellowish red (5YR 5/8 dry, 5YR 4/8 moist); sandy loam; single grain; loose when dry and moist, non-sticky and non-plastic when wet; many fine and few medium roots;

Horizon		Ao	B	В	Horizon		Ар	B	
Depth	era	10	50	120	Exch. Na	me/100g	0.39	0.04	
- Bulk density		1.50	1.53	- 1.50		%	100+	·· 66.2	. 75.0
Gravel	%	ND.	ND.	ND.	SiO, /A1, O,	mol/mol	21.0	21.0	- 17.6
Sand	7	91.8	82.0	86.8	SiO, /R, Ò,	mol/mol	18.4	18.4	15.7
Sift	%	2.0	3.5	2.2	Fe, 0,	mmol/100g	6.89	6.89	8.15
	%	6.2	14.5	11.0	Available P	ppm	46	- 36	25
Class		5	- SL	LS	CO,	mc/1	ND.	ND.	ND.
pli-11,0(1:	5	6.7	5.2	5.5	HCO,	me/1	384.3	34.9	23.3
pH-KCI (1:2		5.4	3.9	3.8	SO,	me/1	0.69	.: 0.81	1.10
EC (1:2.5)	mmho/cm	0.08	0.04	0.04	Hoce, index	%.	- 11.3 .	13.8	45.5
C (1.2.0)	%	0.2	0.2	0.1	K (25%HC1)	me/100g	<3.0	<3.0	<3.0
Ň	ñ :	0.037	0.026	0.019	Ca (25%HC1)	me/100g	<3.0	<3.0	<3.0
C/N	~	5.4	7.7	5.3	Mg (25%HCI)	me/100g	<3.0	<3.0	<3.0
CEC pH7.0	me/100g	2.6	3.2	3.4	P (25%HC1)	ppm	3 133	122	122
Excb. Ca	me/100g	2.23	0.77	0.33	P (sorption)	mg/100g	< 50	<50	<50
Exch. Ma	me/100g	1.00	1.15	1.50	líp	me/100g	0.16	0.72	0.77
Exch. K	nie/100g	0.43	0.29	0.65				. ;	

LABORATORY DATA SHEET

-32-

Unit PrAje, Profile 4

Soil classification:	eutric Fluvisols.
Agro-climatic zone:	ν.
Observation:	179/3, Tana River District; E. 40°8'. S. 2°16'; 14m.
Geological formation:	Recent alluvial deposits.
Local petrography:	Sands, silts and clays.
Physiography unit:	Natural levees.
Relief-macro:	Flat, for the second
Relief-meso, micro:	Small depression.
Vegetation/Land use:	Grassland/Grazing.
Evidence of erosion:	Non detected.
Surface stoniness:	Nil.
Slope gradient:	0%
Salinity/alkalinity:	Nil.
Surface crack:	Nil at site, but big crack in adjacent field.
Internal drainage class:	Moderately well drained.

A 0–10cm

Reddish brown (7.5YR 7/6 dry, 5YR 4/3 moist); sand; single grain; loose when dry and moist, non-sticky and non-plastic when wet; many fine roots;

. . .

 $z^{*} > 4$

	structure; very hal plastic when wet; c	ommon fine roo	is;	si, very sir	cky and ter
				•	
1. 1.			· · · · · ·		
C ₂ 20–25cm	Yellowish red (5YR (dry, friable when n	6/8 dry, 5YR 4/ noist, slightly sti	6 moist); sand cky and slightl	i; single gra y plastic wi	in; soit when hen wet; com
gi shekara ngan ngan sa Alin Lina ngan ngangan ngan sa Alina	mon fine roofs.			-	

C₃ 25-40cm

1. . . .

. N

5 E 1 E 5 D Dark brown (10YR 7/4 dry, 10YR 3/3 moist); sand; single grain; toose when dry and moist, non-sticky and non-plastic when wet; common fine roots;

C₄ 40-125cm⁺

.

Dark reddish gray (SYR 4/2 moist); few red moltles; cracking clay loam; strong, coarse, prismatic structure; very firm when moist, very sticky and very plastic when wet; few, small, black ironstone nodules; common fine roots;

Enconinoiti -	JERE TAN DATA SA		÷	- · · · ·	·	<u></u>	
Horizon	A Ci	C3 Ito	rizón	1	A	∖CI	C3 -
Depth cm	5 15	30 Exc	h. Na	mc/100g	0.07	0.28	0.08
Bulk density g/cm3	1.35 1.21	1.34 Bas	e sat	14	100+	100+	100+
Gravel %	ND. ND.	ND. SIO	JA1.0.	mol/mol	14.9	4.8	9.3
Sand 7	91.0 27.0		,/R,O,	mol/mol	13.4	4.0	8.1
Silt %	3.0 49.0	2.0 1e,		mmol/100g	10.03	43.86	16.92
	6.0 24.0		itable P	ppm	107	256	176
		s co	· · · ·	mc/1	ND.	ND.	ND.
Class	8.7 8.4	8.8 HC		me/1	186.3	198.0	232.9
pH-ff,0(1:2,5)		7.8 50		me/1	0.44	1.57	0.62
pl1-KC1 (1;2.5)	7.1 7.1		ce, index	%	4.67	79.17	60.00
EC (1:2.5) mmho/c			25%HCI)	me/100g	3.1	24.0	4.8
C	0.1 0.3				36.5	83.8	22.8
N %	0.013 0.029		(25%11C1)		13.3	97.9	19.3
CIN	7.7 10.3		(25%HC1)		242	538	647
CEC p117.0 mc/100g			25%HCI)	ppm	80	1730	250
Exch. Ca me/100g			(noitoro	mg/100g			
Exch. Ma me/100g		1.91 Hp		me/100g	0.85	0.15	0.12
Exch. K me/100g	0.35 1.01	0.22					

-33-

LABORATORY DATA SHEET

Unit PcA2 qf, Profile 5

Soil classification:	ferralic Arenosols		
Agro-climatic zone:	¹ V		and the second second
Observation:	179/4 Tana River district; E	, 40°20', S. 2°/9' ; 17m	2000 a.g. 194
Geological formation:	Dune sands	and a second s	and the second second
Local petrography:	Sands		1. State 1.
Physiography unit:	Dunes		the second states of the
Relief-macro:	Undulating		
Relief-meso, micro:	Nil	and the second	
Vegetation/Land use:	Bushed Grassland/Grazing	and the second	a share the second
Evidence of erosion:	None detected		
Surface stoniness:	Nil		
Slope gradient:	1 ~ 2%		
Salinity/alkalinity:	Nil	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	and the second second second
Surface crack:	Nil a service service services	1. 1.1 41 ¹ .1.	e digere a
Internal drainage class:	Well Drained		a da an an tair an tair an tair

A 0–10cm

Very dusky red (2.5YR 2/3 dry, 25YR 2/2 moist); sandy loam; single grain; loose when dry, friable when moist, non-sticky and non-plastic when wet; many fine roots; clear and smooth transition to:

BA		10-40cm
Bu ₁	•	40-230cm

,

Red (10R 4/8 dry, 10R 4/6 moist); sandy toam; single grain; toose when dry, friable when moist, slightly sticky and non-plastic when wet; common fine roots; gradual and smooth transition to:

Dark red (10R 6/8 dry, 2.5YR 3/6 moist); loamy sand; moderate, medium, subangular structure, slightly hard when dry, friable when moist, slightly sticky and slightly plastic when wet; very few medium pores; few fine routs:

(auger boring from 100cm below)

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LABORATORY DATA SHEET

Horizon	e e Norte da	A A	- 8A	: Bul	Horizon		<u>A</u>	BA	Bul
A	¢m	5	- 30	150	Exch, Na	me/100g	0.08	0.14	0.04
	g/cm³	1.41	1.55	1.44	Base sat	%	100+	100+	100+
	<i>9</i> 0	ND.	ND.	ND.	SiO, /A1, 0,	mol/mol	9.9	9.0	9.7
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	83.0	78.5	81.5	SO./R.O.	mol/mol	91,	8.4	È ;≓ <b>8.8</b>
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	6.0	6.5	6.5	Fe,0,	mmol/100g	12.53	13.16	16.29
	<i>₩</i>	11.0	15.0	12.0	Available P	<u>ópm</u>	44	20	19
+	10	SL	SL	is	CO.	me/1	ND.	ND,	ND.
Class O (1-2	.	6.6	6.8	6.3	HCO.	me/1	23.3	34.9	34.9
pH-H,O(1:2.		5.3	5.1	4.8	SO.	me/1	0.46	0.51	0.09
pH-KČi (1:2.		0.09	0.04	0 04	Flore index	4	83.64	86.67	79.17
EC (1:2,5)	mmho/cm	0.04	0.3	0.2	X (25%HC1)	me/100g	<3.0	<3.0	<3.0
C	20		0.032	0.022	Ca (25%HC1)	me/100g	3.8	3.4	3.4
N	70 J	0.043		9.1	Mg (25%HCI)		4.7	6.8	5,3
C/N		9.3	9.4	2.9	P (25%HCI)	ppm	182	161	157
	me/100g	3.5	4.3		P (sorption)	mg/100g	<50	110	80
Exch. Ca	me/100g	2.90	2.67	2.01		me/100g	0.14	0.12	0.14
Exch. Ma	me/100g	1.15	1.54	1.00	Нразана на	meyroog	0.14	0.16	0.14
Exch. K	me/100g	0.52	0.42	0.30	<u></u>	M	l		

Unit PtJso, Profile 6

Soil classification:	orthic Solonetz (saline phase).	
Agro-climatic zone:	VI.	and Alexandree
Observation:	179/1, Tana River District; E. 40°4'. S. 2°14'; 28m.	1 to Jack and the
Geological formation:	Lagoonal sands and clays.	
Local petrography:	Sands and clays.	
Physiography unit:	Lower terraces.	and the second second
Relief-macro:	Flat to gently undulating.	1. S. M. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
Relief-meso, micro:	Micro depression.	a terano in tera
Vegetation/Land use:	Bushland.	and a share of the back
Evidence of erosion:	Non detected.	
Surface stoniness:	Nil.	
Slope gradient:	0 ∿ 1%.	e di gereti
Salinity/alkalinity:	Slightly saline and moderately sodic.	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
Surface crack:	NO. STATES AND A STATES	and the second stars
Internal drainage class:	Moderately well drained.	

A 0–10cm

10-45cm

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Gray (10YR 6/1 dry, 10YR 3/1 moist); loam; weak, fine, crumb structure; loose when dry, friable when moist, very sticky and very plastic; many fine roots; clear and smooth transition to:

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Dark gray (10YR 6/1 dry, 10YR 4/1 moist); common light reddish brown mottles; loam, moderate, medium, prismatic structure; slightly hard when dry, firm when moist, very sticky and very plastic when wet; frequent, small, spherical, white concretions, and frequent, small, spherical black manganese; common fine roots; clear and irregular transition to:

45--120cm⁺ Dark gray (10YR 6/1 dry, 10YR4/1 moist); few light reddish brown mottles; cracking clay; strong, very coarse, prismatic structure; extremely hard when dry, very firm when moist, very sticky and very plastic when wet; few, small, spherical, white concretions and frequent, small, spherical black manganese; few fine roots:

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Horizon		A	Btn	Btnz	Horizon		- A	Btn	Bth
Depth	cm	5	30	80	Exch. Na	me/100g	0.25	3.04	11.1
Bulk density	g/cm ³	1.17	1.51	1.47	Base sat	7	100+	100+	100
Gravel	76	ND.	ND.	ND.	SiO, /A1, O,	mol/mol	6.8	6.3	6.0
Sand	%	39.0	35.5	27.0	SiO, /R, O,	mol/mol	5.7	5.3	4.
Silt	%	47.5	47.5	32.5	Fe , O ,	mmol/100g	31.33	31.95	33.2
Clay	%	13.5	17.0	40.5	Available P	ppm	242	220	26.
Class	×.,	1	1 T	Ċ	co.	me/1	ND.	ND,	- NE
pH-H10(1:	N N - 1	8.4	9.1	8.9	HCO.	me/1	244.6	\$00.8	384.
pii-11003		7.2	7.5	7.8		me/i	1.70	0.42	60.7
	mmbo/cm	0.22	0.60	4.20	Flore, index	%	37.04		81.4
EC (1:2.5)			0.3	0.2	K (25%HC1)	me/100g	33.8	28.2	31.
U 8 69	76	0.7	0.037	0.030	Ca (25% IICI)	me/100g	94.9	172.5	169.
N	%	0.100			Mg (25%HCi)		93.6	114.7	132.
C/N	1.00.	7.0	8.1	. 6.7	P (25% HC1)		527	506	48
CEC pH7.0	me/100g	29.4	31.8	34.8		ppm 1100-	1490	1860	146
Exch, Ca	me/100g	34.8	28.4	23.5	P (sorption)	mg/100g	0.12	0.38	0.3
Exch. Ma	me/100g	9.37	16.85	16.24	Hp	me/100g	0.12	0.30	0.5
Exch. K	me/100g	2.14	, a 1.02 ⇒	1,45	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	4 N ()	Neg al la	1997 - E. A. F.	,

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Unit PrAje, Profile 7

Soil classification:	eutric Fluvisols. (sodic phase)	2 · * · · · · · · · · · · · · · · · · ·
Agro-climatic zone:	V	<u>i</u>
Observation:	179/3 Tana River district; E. 40°7'	;S. 2°23';18m
Geological formation:	Recent alluvial deposits	1. N
Local petrography:	Sands, silts and clays	
Physiography unit:	Valley bottom lands	
Relief-macro:	Flat	· · ·
Relief-meso, micro	Macro relief-land and depression	
Vegetation/Land use:	Glassland/Grazing	
Evidence of erosion:	None detected	
Surface stoniness:	Nil	1 - A
Slope gradient:	0%	́.,
Salinity/alkalinity:	Moderately sodic	
Surface crack:	Crack width 0.5 - 1cm	
Internal drainage class:	Moderately well drained	

A 0–13cm.

Brownish black (5Y 4/1 dry, 2.5Y 3/1 moist); loam; moderate, fine, crumb structure; loose when dry, friable when moist, very stick and very plastic when wet; few fine roots; clear and smooth transition to:

Cı			13-20cm.
	•	÷ .	a deservición de
	1.07		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Light gray (7.5Y 8/1 dry, 7.5Y 7/1 moist); sand; single grain; loose when dry and moist, non-sticky and non-plastic; common fine roots; clear and smooth transition to:

Cck	20-60cm.

Very dark gray (5Y 4/1 dry, 5Y 3/1 moist); slightly gravelly clay loam; moderate, medium, prismatic structure; very firm when moist, very slicky and plastic when wet; few, small, spherical, white concretions; common fine roots; clear and smooth transition to:

Cn

60--120cm[‡]

Very dark gray (25Y dry, 5Y 3/1 moist); slightly gravelly sandy loam; moderate, coarse, prismatic structure; extremely firm when moist, sticky and plastic when wet; very frequently, small, spherical, white concretions; very fine roots:

LABORATORY DATA SHEET

Horizon		A	Cck	Cal	Horizon		A	Cck	Ca
Depth	cm	10	40	90	Exch. Na	me/100g	1.03	2.04	2.14
Bulk density	g/cm3	1.18	1.49	1.62	Base sat	%	100+	100+	100+
Gravel	%	ND	ND.	ND.	SiO, /A1, O,	mol/mol	8.9	12.8	16.6
Sand	9	41.5	35.0	59.5	SiO. /R.O.	mot/mot	7.7	10.7	14.8
Silt	9	37.0	29.0	10.5	Fe, 0,	mmol/100g	19.42	18.17	13.16
Clay	%	21.5	36.0	30.0	Available P	ppni	152	54	50
Class		L	CL	SCL	. CO ₁	me/1	ND	ND.	ND.
pH-H,O(1:	2.5)	8.0	8.8	9.2	lico,	me/1	302.8	396.0	384.3
pH-KCi (i:		6.9	7.0	7.3	SO,	me/1	2.84	1.00	4.41
EC (1:2.5)	mmho/cm	0.39	0.20	0.42	Floce, index	No.	60.5	52.8	31.7
С	%	0.6	0.2	0.1	K (25%HC1)	me/100g	13.0	9.5	8.7
N	%	0.076	0.023	0.016	Ca (25%HCI)	me/100g	44.5	32.0	42.5
C/N		7.9	8.7	6.3	Mg (25%HC1)	me/100g	56.1	52.9	49.8
CEC p117.0	me/100g	35.7	30.0	22.5	P (25%HCI)	ppm .	281	168	161
Exch, Ca	me/100g	29.18	20.91	17.3	P (sorption)	mg/100g	1120	490	1340
Exch, Ma	me/100g	9.08	9.84	7.86	Нр	me/100g	0.11	0.12	0.24
Exch, K	me/100g	1.90	0.78	0.47					

-36-

Unit PtJxh, Profile 8

Soil classification: Agro-climatic zone: **Observation: Geological formation:** Local petrography: Physiography unit: Relief-macro: Relief-meso, micro: Vegetation/Land use: Evidence of erosion: Surface stoniness: Slope gradient: Salinity/alkalinity: Surface crack: Internal drainage class:

calcie Xerosols (sodie p	hase)	
V		
179/3; Tana River distr	ict; E. 4	0°5', S. 2°22'; 22m
Lagoonal sands and cla		a ka para ka ga
Sands and clays		see a staat
Middle terraces		and the set for the
Flat	-	in in a chaid
Nil a ser la basa de la se		and the second second
Bushland/Grazing	÷	e di la come de c
None detected		in the last of
Nil		·
0%		and the state of the
Slightly sodic		1997 - April 1997
Nil		. Y
Moderately well drained	a tera	Eglérique de l'Astropolet

0-15cm.

Dark grayish brown (7.5YR 4/2 dry, 10YR 4/2 moist); sandy clay loam; mo-derate, medium, prismatic structure; hard when dry, firm when moist, sticky and plastic when wet; common fine roots; clear and smooth transition to:

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15-55cm Bek

新闻新闻之后的 法律师公共的 Brownish gray (7.5YR 4/1 moist); few reddish yellow mottles; cracking sandy loam; strong medium, prismatic structure; very firm when moist, sticky and plastic when wet; frequent lime mycelia; common fine roots; clear and irregular transition to:

55-120cm⁺ Bn

Brownish gray (7,5YR 5/1 moist); few reddish yellow mottles; cracking sandy loam; strong, very coarse, prismatic structure; very firm when moist, sticky and plastic when wet; frequent lime mycelia; few fine roots:

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florizon		A	Bck	Bn	Horizon .		A	Bck	. Br
Depth	cm	10	35	80	Exch. Na	me/100g	0.20	0.73	3.70
Bulk density	g/cm ³	1.70	1.73	1.98	Base sat	%	100+	100+	100
Gravel	6	ND.	ND,	ND.	SiO, /A1, 0,	mol/mol	23.3	19.3	18 (
Şand	%	68.5	61.5	59.5	\$i0,/R10,	mol/mol	20.0	16.9	16.
Süt	Æ	10.5	22,5	28.5	1'e,0,	mmol/100g	14,41	10.03	10.6
Сізу	%	21.0	16.0	12.0	Available P	ppm	161	97	6
Class		SCL	SL.	SL .	co,	me/1	ND.	ND.	ND
pll-11,0 (1.2		7.1	9.1	8.7	HCO,	me/I	163.0	302,8	279.
pII-KCI (1-2		6.0	7.5	1.7	so,	me/1	3.20	3.66	72.60
EC (1:2.5)	ត្រារក្នុង០/cm	0.18	0.24	2.50	Floce, Index	%	71.4	34.4	75.
Ne Koge	k N	0.6	0.02	0.1	K (25%HCI) Ca (25%HCI)	mc/100g	16.0	4.2	3.1
C/N	<i>1</i> 0	8.3	9.1	77	Mg (25%HC1)	me/100g me/100g	27.3	44.7	116.8
CEC pH7.0	mc/100e	16.2	19.2	20.0	P (25% f(C1)	ppm	256	140	- 54,1 - 115
Exch. Ca	mc/100g	14.75	27.9	27.7	P (sorption)	ing/100g	510	1360	1620
Exch. Ma	me/100g	4.19	8112	19.25	Ho	me/100g	0.07	0.17	0.20
Exch. K	me/100g	1 07	0.34	0.32		and I oug		V.17	0.20

Unit PtJxK, Profile 9

Agro-climatic zone: Observation:	179/3 Tana River district; E. 4	0°6', S. 2°29' ; 25m	
Geological formation:	Lagoonal sands and clays		
Local petrography:	Sands and clays		and the second
Physiography unit:	Middle terraces	and the second second	and a start of the
Relief-macro:	Undulating		
Relief-meso, micro:	Micro depression	÷	and the second
Vegetation/Land use:	Bushed grassland/Grazing		a di sana sa
Evidence of erosion:	None detected	and the second	
Surface stoniness:	Nil		the second s
Slope gradient:	$0 \sim 2\%$		
Salinity/alkalinity:	Nil	and the second	and the part of
Surface crack:	Nil		the second second
Internal drainage class:	Moderately well drained		and the state
÷.,			

AB	15-30cm
1. S.	the second second
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Yellowish brown (10YR 5/4 moist); sandy loam; weak, medium, granular structure; friable when moist, slightly sticky and plastic when wet; many fine roots; clear and wave transition to:

Bck1 30-65cm

Dull grayish brown (2.5Y 4/4 dry, 2.5Y 4/2 moist); sandy loam; moderate, coarse, subangular blocky structure; slightly hard when dry, friable when moist, sticky and plastic when wet; frequent lime mycelia; common fine roots; diffuse and irregular transition to:

Bck₂

65-120cm⁺

Dull grayish brown (25Y 4/4 dry, 2.5Y 4/2 moist); sandy loam; moderate, coarse, subangular blocky structure; hard when dry, very firm when moist, sticky and plastic when wet; frequent lime mycelia; few fine roots:

LABORATORY DATA SHEET

지수가 가지 않는 것 같아요. 가지 않는 것 같아요.			
Horizon	A AB Bckl	Horizon	A AB BC
Depth cm	5 20 50	Exch. Na me/100g	0.24 0.16 0.0
Bulk density g/cm3	1,56 1.62 1.62	Base sat %	100+ 100+ 100
Gravel %	ND. ND. ND.	SiO, /AI, O, mol/mol	19.7 19.6 18
Sand %	72.0 68.0 65.0	SiO, /R, O, mol/mol	17.3 17.1 15
Silt %	11.0 15.0 33.5	Fe,O, mmol/100g	0.03 10.03 10.0
Clay %	17.0 17.0 1.5	Available P ppm	976 1053 19
Class	SL SL SL	CO ₁ me/1	ND. ND. N
pH-H,O(1:2.5)	6.9 8.2 8.0	HCO, me/1	209.6 302.8 279
pH-KCI (1:2.5)	6.0 7.3 7.5	SO4 me/l	2.60 6.76 27.0
EC (1:2.5) mmho/cm	0.35 0.32 2.50	Floce index %	86.5 85.3 -
C %.	0.6 0.5 0.2	K (25%HC1) me/100g	11.0 10.5 9
N %	0.064 0.048 0.029	Ca (25%HC1) me/100g	20.0 43.3 210
C/N	9.4 10.4 6.9	Mg (25%HCI) me/100g	27.1 35.3 39
CEC pH7.0 me/100g	13.8 17.0 16.2	P (25%HC1) ppm	838 1112 2
Exch. Ca me/100g	3.69 27.22 51.3	P (sorption) mg/100g	870 800 229
Exch. Ma me/100g	3.16 3.22 2.54	Hp me/100g	0.11 0.09 0.1
Exch. K me/100g	1.84 2.00 2.80		

Unit PrAve, Profile 10

Soil classification: Agro-climatic zone:	chromic Vertisols
Observation:	179/1 Tana River district; E. 40°10', S. 2°12' ; 17m
Geological formation:	Recent alluvial deposits and an and an and an and and and and an
Local petrography:	Sands, silts and clays
Physiography unit:	Flood plains
Relief-macro:	Flat
Relief-meso, micro:	Micro depression by plowing
Vegetation/Land use:	Cropland (Rice, Maize)
Evidence of erosion:	None detected
Surface stoniness:	Nil
Slope gradient:	0%
Salinity/alkalinity:	Nil 1. Second Alexandro Contractor de la co
Surface crack:	Crack 0.5 \sim 1.0cm width
Internal drainage class:	Moderately well drained

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Ap 0-30cm

 $\mathbf{C_1}$

Dark reddish brown (SYR 3/3 moist); common orange mottles; cracking silty clay loam, moderate, medium, angular blocky structure; very firm when moist, very sticky and very plastic when wet; many fine roots; oradual and somnot transition to: gradual and smmoth transition to:

PERCENCES FOR STREET 1997 - 18 4 1 - 18 1 Dark reddish brown (5YR 3/2 moist); common orange mottles; cracking silty clay loam; moderate, coarse, prismatic structure; very firm when moist, very sticky and very plastic when wet; few, small, spherical, black manganese nodules; many fine roots; gradual and smooth transition to:

C₂ 70-120cm⁺

30-70cm

a Charles and a second Brown (7.5YR 4/3 moist); few orange mottles; cracking silty clay; moderate, very coarse; angular blocky structure; very firm when dry, very sticky and very plastic when wet; frequent, small, spherical, black manganese nodules; very few fine roots:

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and the second second LABORATORY DATA SHEET

		<u>1233333</u>							
Horizon		Ap	<u> </u>	C2	Horizon		Ар	<u>C1</u>	<u> </u>
Depth	cm .	5	- 50	90	Exch. Na	me/100g	0.67	1.13	1.41
Bulk density	g/cm ³	1.12	1.32	1.47	Base sat	7	97.01+	100+	100+
Gravel	X	ND.	ND.	. ND.	Si0,/A1,0,	mol/mot	2.9	3.0	3.2
Sand	12	5.0	8.5	7.0	SiO, /R, O,	mol/mol	2.3	2.3	2.5
Silt	*	61.0	54,5	52.5	Fe, O,	mmol/100g	74.56	75.19	73.31
Clay	7	34.0	37.0	40.5	Available P	ppm	117	64	98
Class		SICL	SiCL	SiC	ĊŎ,	me/t	ND.	ND.	ND.
ell-II,0 (I:2	5)	6.2	7.1	7.2	ilico.	me/1	ND.	23.3	104.8
plf-KCl (1:2	.5 }	4.9	5.6	5.6	SO.	me/1	1.36	2.24	2 74
EC (1:2.5)	minho/cm	0.35	0.33	0.27	Floce, index	90	83.2	85.1	44.4
C	7	1.7	0.6	0.6	K (25%HCI)	: mc/100g	29.8	28.8	27.3
Ň	%	0.160	0.07	0.064	· Ca (25%RCI)		40.3	35,5	34.8
CIN		10.6	8.6	9,4	Mg (25%HCI)		100.0	99.9	96.5
CEC pH7.0	me/100g	42.8	39.8	36,8		ppm	1126	806	929
Exch. Ca	me/100g	28.50	27.47	27.91		mg/100g	1880	1600	1710
Exch. Ma	ine/100x	11.01	11.34	12 02	Hp	me/100g	0.11	0.09	0.09
Exch. K	me/100g	1.34	0.90	0.68					

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Unit PtJbk, Profile 11

Soil classification:	calcie Cambisols (saline-sodie phase)	
Agro-climatic zone:	v	
Observation:	179/4 Lamu district; E. 40°/7', S. 2°17' ; 11m	S. Santa a
Geological formation:	Lagoonal sands and clays	
Local petrography:	Sands and clays	
Physiography unit:	Middle terraces	and the second
Relief-macro:	Flat to gently undulating	and the second sec
Relief-meso, micro:	Small depression	
Vegetation/Land use:	Porest/Grazing	an an Although Although
Evidence of erosion:	None detected	
Surface stoniness:	Nil	g the state of a
Slope gradient:	1~2%	and the set of the
Salinity/alkalinity:	Slightly saline and moderately sodic	$(1,1,2,\ldots,n) \in \mathbb{R}^{\frac{1}{2}} \times \mathbb{R}^{\frac{1}{2}}$
Surface crack:	Nil Sector Sec	- 1
Internal drainage class:	Moderately well drained	1

triable when moist, slightly sneky and very roots; clear and smooth transition to:

Bn		25-45cm					
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1.11			1.1				
	1.1	÷		•			
					÷ ÷		

Dark olive brown (2.5YR 3/3); cracking silty loam; moderate, medium, sub-angular blocky structure; very friable when moist, sticky and very plastic when wet; few, small, powdely soft line, and very few gypsum; common medium roots; gradual and smooth transition to:

Bckn	• •	45-80cm	Brown (10YR 4/3 moist); silty loam; moderate, medium, subangular blocky structure; very friable when moist, sticky and very plastic when wet; fre- quent, small, powdely soft lime and few gypsum; moderate slickenside; few medium roots; gradual and irregular transition to:

By

80–120cm⁺

Yellowish brown (10YR 5/2 moist); silty clay; moderate, medium, sub-angular blocky structure, very friable when moist, sticky and very plastic when wet; few, small, powdery soft lime and few gypsum:

LABORATOR	Y DATA SHE	ET	e di seri si seri seri seri seri seri seri			e mat Les	n Stall Stall		
Horizon		A	Bn	Bckn	Horizon		A	•Вл	Bckn
Depth	cm	5	40	60	Exch. Na	me/100g	0.92	3.06	1.77
Bulk density	g/cm ¹	1:15	1.57	1.38	Base sat	%	100+	100+,	100+
Gravel	%	ND.	ND.	ND.	Si0, /A1, 0,	mot/mol	7.1	6.5	5.8
Sand	*	50.5	40.5	37.0	Si0,/R,0,	mol/mol	\$.9	5.1	4.8
Silt	26	40.5	50.5	60.8	Fe,0,	mmol/100g	28.82	35.09	33.83
Clay	26	9.0	9.0	2.2	Available P	ppm	68	88	87
Class		L	SiL	SiL	· co,	me/1	ND.	ND.	ND.
pil-11,0 (1.)		6.3	8,4	8.5	1100,	me/1	209.6	279.5	174.7
pH-KCl (1:2		5.7	7.4	1.1	SO,	me/l	6.40	108.0	142.2
EC (1:2.5)	mmho/cm	0.60	2.30	7.00	Floce, Index	%	55.6	55.6	
C	6	2,5	0.5	0.1	K (25%HCI)	me/100g	13.0	11.5	ii 11.3
N	<i>%</i>	0.230	0.047	0.018	Ca (25%HC1)	me/100g	38.2	180.5	171.5
C/N		10,9	10.6	5.6	Mg (25%HC1)	me/100g	51,8	90.1	97.6
CEC pH7.0	me/100g	34.8	28.0	30.6	P (25%HCI)	ppm	535	369	2741
Exch. Ca	me/100g	29.06	29,3	34.5	P (sorption)	mg/100g	1060	1740	: 1590
Exch. Ma	me/100g	8.16	16.79	21.80	Нр	me/100g	0.09	0.27	0,21
Exch. K	me/100g	1.35	0.90	0,71					

-40-

Unit PcA2qa, Profile 12

Soil classification: Agro-climatic zone:		rric phase)	
Observation:		. 40°51', S. 2°14' ; 5.5m	
Geological formation:			n an
Local petrography:	Sands	$[n] = \{n_i\}_{i \in I}$	and the second sec
Physiography unit:	Dunes	the second state of the second	
Relief-macro:	Flat		
Relief-meso, micro:	Micro depression		
Vegetation/Land use:	Grassland/Village		and the state of the
Evidence of erosion:	None detected		1990 - A. S.
Surface stoniness:	Nil	. :	
Slope gradient:	0%		and the g
Salinity/alkalinity:	Nil	1.1	get en an ar
Surface crack:	Nil		e de serve
Internal drainage class:	Somewhat excessively	drained	a service and the service of the ser

÷.

0-35cm A

Dark brown (2.5YR 5/1 dry, 10YR 3/3 moist); sand; weak, medium, crumb structure; loose when dry, very friable when moist, non-sticky and non-plastic when wet; many fine and medium roots; gradual and smooth transition to:

1.68.00 Sec. Brown (10YR 4/4 dry, 7.5YR 4/3 moist); many brown moltles; sand; weak, fine, prismatic structure; soft when dry, very friable when moist, non-sticky and non-plastic when wet; frequent, small, irregular, black iron-stones; few coarse pores; few fine roots; gradual and irregular transition to:

1.2.1

i a est الحرب والمعارية والمعالم والمحاقق ر ز ر فر ر Dull yellow (25Y 6/3 moist); many brown mottles; sandy loam; weak, fine, prismatic structure; firm when moist, non-sticky and non-plastic when wet; very frequent, small, irregular, black ironstones (manganes concre-Bs₂ ... -55-100cm tions); very few fine roots:

Bs3

Bsi

100-120cm⁺ Light brownish gray (2.5Y 6/2 moist); many brown mottles; loam; moderate, fine prismatic structure; extremely firm when moist, slightly sticky and slightly plastic when wet:

LABORATOR	RY DATA SH	EET			n zakol. Belaren eta			
Horizon		A	Bsl	B.2	Horizon		A	Bst Bs2
Depth	cm	10	40	80	Exch, Na	me/100g	0.05	0.08 0.26
Bulk density	g/cm³	1.37	1.49	1,52	Base sat	%	100+	100+ 100+
Gravel	%	ND.	ND.	ND.	SiO, /A1, 0,	mol/mol	13.3	13.5 10.6
Sand	%	90.0	88.0	81.0	SiO, /R.O.	mol/mol	12.1	12.3 9.8
Silt	%	6.0	6,0	7.0	Fe,0,	mmol/100g	5.64	6.89 12.53
Clay /	%	4.0	6.0	12.0	Available P	ppm	14	12 2
Class		S	S	SL	co.	me/1	ND.	ND, ND.
pH-H,O (1:2		6.5	6.6	6.5	HCO.	me/1	116.5	ND, 477.5
pH-KCl (1:2		5.3	4.7	4.5	so,	me/1	1.16	0.30 0.06
EC (1:2.5)	៣៣៦០/៣	0.06	0.03	0.05	Floce, index	%		25.0 29.2
C	%	0.3	0.1	0.5	K (25% HC1)	me/100g	<3.0	<3.0 <3.0
N	%	0.026	0.014	0.010	Ca (25% HCI)		5.8	<3.0 7.0
C/N		11.5	2.1	10.0	Mg (25%HCI)		<3.0	<3.0 3.6
CEC pH7.0	me/100g	2.6	1.7	3.2	P (25%HC1)	ppm	126	98 165
Exch. Ca	me/100g	2.10	1.04	1.62	P (sorption)	mg/100g	260	90 940
Exch. Ma	me/100g	0.47	0.57	1.36	Hp	me/100g	0.12	0.15 0.13
Exch. K	me/100g	0.25	0.23	0.26				

ΰÝ 6471

35--55cm

41

Unit Pilge, Profile 13

Soil classification:	cambic Arenosols		an a
Agro-climatic zone:	IV		(1,1) = (1,1
Observation:	180/2 Lamudistrict; E 40°53	', S.2°10'; 6m	and the second
Geological formation:	Lagoonal sands and clays		아이는 아이는 물고 있
Local petrography:	Sands		and the second second
Physiography unit:	Middle terraces		$N = 2\pi i \pi i$
Relief-macro:	Flat		
Relief-meso, micro:	Nil	the second state	
Vegetation/Land use:	Bushland thicket/Grazing		and stand and
Evidence of erosion:	None detected	- -	en en en en tal que j
Surface stoniness:	Nil		
Stope gradient:	0%		
Salinity/alkalinity:	Nil		general and Harris
Surface crack:	Nil		and the provide of the
Internal drainage class:	Well drained	지 않는 것 같은 것 같이 많이 많이 했다.	te Politika eta aleksar
4 			

A 0–14cm

Very dark grayish brown (2.5Y 6/2 dry, 2.5Y 3/2 moist); loamy sand; single grain; loose when dry and moist, non-sticky and non-plastic when wet; many fine roots; gradual and smooth transition to:

Bu	10-80cm				
a di second	All and a second	1.1			
		1.1			
· · · ·		11			
	and the second				

Darkgrayish brown (2.5Y 7/2 dry, 2.5Y 4/2 moist); sand; weak, fine, angular blocky structure; slightly hard when dry, loose when moist, non-sticky and non-plastic when wet; few medium pores; common fine roots; clear and smooth transition to:

Bu₂

ų i

80-120cm⁺

Yellowish brown (10YR 6/4 dry, 10YR 5/4 wet); common brown mottles; sandy loam; moderate, fine, angular blocky; hard when dry, firm when moist, non-sticky and non-plastic when wet; very few fine roots:

57 Base sat	me/100g	0.04	0.01	
	~ 1			-0.04
5 SO MIO	%	100+	100+	81.4
	mol/mol	17.9	6 14.9 %	12.4
5 SIO, /R, O,	mol/mol	17.0	14.3	11.7
25 Fe O.	mmol/100g	3.8	3,8	6.9
0 Available P	ppm	263	36	58
	me/1	ND.	ND.	ND.
	me/1	ND.	23.3	163.0
	me/1	0.26	0.40	0.20
	%	20.0		60.0
	me/100g	<3.0	<3.0	<3.0
	me/100x	20.0	5.2	<3.0
		<3.0	<3.0	<3.0
	ppm	239	140	256
	mg/100g	\$50	420	750
			. / / .	0.49
	mer roog	0.12	y.25	0.47
	54 Hp 27	54 Hp me/100g	54 Hp me/100g 0.12	54 Hp me/100g 0.12 0.29

ABORATORY DATA SHEET

Unit PtJqa, Profile 14

Soil classification:	albic Arenosols	
Agro-climatic zone:	IV States and states	
Observation:	180/2 Lamu district; B. 40°48', S. 2°7'; 15m	
Geological formation:	Lagoonal sands and clays	and the second second second
Local petrography:	Sands and second s	
Physiography unit:	Middle terraces	New York Street Barry
Relief-macro:	Flat to gently undulating the state strengther and	
Relief-meso, micro:	Weak depressions	
Vegetation/Land use:	Forest/Grazing	, Angelan and State
Evidence of erosion:	None detected	
Surface stoniness:	Nil	and the second
Slope gradient:	1 - 2%	
Salinity/alkalinity:	Nil	
Surface crack:	Nil	
Internal drainage class:		A an a second second second

A 07-18cm

Brownish black (10YR 2/2 dry, 7.5YR 3/1 moist); sandy loam; weak, medium, subangular blocky; soft when dry, very friable when moist, nonsticky and non-plastic when wet; few coarse pores, many fine roots; gradual and wave transition to:

E(?) 18-40cm

Dull brown (10YR 7/3 dry, 7.5YR 5/3 moist); few reddish yellow mottles; sandy loam; weak, medium, subangular blocky structure; slightly hard when dry, very friable when moist, non-sticky and non-plastic when wet; common medium roots; clear and wave transition to:

B 40-120cm⁺ Yellow (10YR 7/6 moist); many reddish yellow mottles; sandy loam; weak, medium, angular blocky structure; firm when moist, non-sticky and nonplastic when wel; common medium roots:

Horizon	A E B	Horizon	AEB
Depth cm	10 30 70	Exch. Na me/100g	0.11 0.05 0.02
Bulk density g/cm ³	1.47 1.55 1.55	Base sat %	100+ 100+ 100+
Gravel %	ND. ND. ND.	SiO, /A1, O, mol/mol	120.4 125.3 53.5
Sand %	77.0 78.5 77.5	SiO, /R, O, mol/mol	92.9 95.7 44.8
Silt %	3.5 4.5 3.5	Ic, O, mmol/100	3.8 3.8 5.6
Clay %	19.5 17.0 19.0		16 7 1>
Class	SL SL SL		ND. ND. ND
pff=H,O(1:2.5)	6.8 6.0 6.4	HCO, me/1	104.8 46.6 46.6
* pH-KCI (1:2.5)	5.9 4.4 5.1	SO, me/j	0.18 0.78 0.34
EC(1:2.5) mmho/cm	0.11 0.04 0.03	Floce index %	74.4 82.4 90.5
C	0.8 0.1 0.1	K (25%HC1) me/100g	<3.0 <3.0 <3.0
N	0.062 0.017 0.009	Ca (25%HCI) mc/100g	7.0 15.0 <3.0
C/N	12.9 S.9 11.1	Mg (25%HC1) me/100g	3.5 <3.0 <3.0
CEC pH7.0 me/100g	4.3 1.0 0.8	P (25% IfCt) ppm	129 87 91
Exch. Ca me/100g	3.07 0.80 0.62		50 <50 <50
Exch. Ma me/100g	1.02 0.41 0.41	lip mc/100g	0.09 0.22 0.11
Exch. K me/100g	0.26 0.16 0.06		0.03 0.12 0.11

e LABORATORY DATA SHEET - ATT / A Characteria and a

Unit PiJga, Profile 15

Soil classification:	albic Arenosols (pesoferric p	ohase)	
Agro-climatic zone:	IV	and the second second	
Observation:	180/3 Lanu district; E. 40°	32', S. 2 ⁶ 22'; 20m	<u>i</u> a stra de
Geological formation:	Legoonal sands and clays	ne se konstruction	
Local petrography:	Sands		
Physiography unit:	Middle terraces		 A star star star
Relief-macro:	Flat to gently undulating	$(1-B) = \frac{1}{2} \left(\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} \right) \left(\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} \right)$	and the second
Relief-meso, micro:	Micro depression		
Vegetation/Land use:	Forest/Grazing	the second second	一、"我们是你们的时候我。"
Evidence of erosion:	None detected		1 - La Charles - Charles
Surface stoniness:	NI	1 <u>- 1</u>	
Slope gradient:	0 - 1%		
Salinity/alkalinity:	Nil		$(g^{(1)}) \to (g^{(1)}) \oplus (g^{(1)}) \oplus (g^{(1)})$
Surface crack:	Níl		• • • • • • • • •
Internal drainage class:	Well drained		$(1,1,2,\dots,2^{n-1}) \in \operatorname{Alg}(A_{n+1},2,\dots,A_{n+1})$

0-20cm A

20-50cm

Black (7.5Y 4/1 dry, 7.5Y 2/1 moist); loamy sand; moderate, fine, crumb structure; soft when dry, loose when moist, non-sticky and non-plastic when wet; few coarse pores; common fine roots; gradual and smooth transition to:

E(?)

Olive brown (SY 7/3 dry, 2.5Y 4/6 moist); sand; weak, medium, subangular blocky structure; soft when dry, loose when moist, non-sticky and non-plastic when wet; common medium roots; diffuse and wave transition to:

Light yellowish brown (2.5Y 5/4 dry, 10YR 6/4 moist); many reddish yellow mottles; loamy sand; moderate, medium, angular blocky structure; hard when dry, loose when moist, non-sticky and non-plastic when wet; few coarse pores, common medium roots; gradual and smooth transition to: Bs₁ 50-90cm ę

Bs₂

90-120cm⁺ Reddish yellow (7.5YR 6/6 moist); few reddish yellow mottles; loamy sand; moderate, medium, angular blocky structure; hard when dry, loose when moist, non-sticky and non-plastic when wet; few coarse pores;

LABORATORY DATA SHEET

	· · · · · · · · · · · · · · · · · · ·			and the second	1. A.	e e transferance e	• • •	1. 1
Horizon		A	E Bsl	Horizon		A	È.,	<u> </u>
Depth	cm :	5	30 60	Exch. Na	me/100g	0.03	0.04	0.05
Bulk density	g/cm ¹	1.50	1.61 1.54	Base sat	%.	100+	100+	100+
Gravel	6	ND.	ND. ND.	Si0,/A1,0,	mol/mol	51.5	75.6	40.4
Sand	7	85.0	90.5 88.0	Si0,/R,0,	mol/mol	43.2	57,9	32.7
Silt	*	10.0	2.5 1.5	Fe,0,	mmol/100g	5.6	6.3	8.8
Clay	7	5.0	7.0 10.5	Available P	ppm	33	4	1
Class	11 - A - A	LS	S LS	co,	me/t	ND.	ND,	ND,
rH-B.0 (1.2	2.5)	7.4	7.1 6.7	lico.	me/1	279.5	116.5	81.5
pH-KCI (1-2	.5)	6.7	5.8 5.3	SO,	me/1	0.50	0.38	0.38
EC (1:2.5)	mmho/cm	0.07	0.04 0.04	Floce, index	%	64.0	28.6	38,1
C	Å	11	0.2 0.1	K (25%HC1)	mc/100g	<3.0	<3.0	<3.0
N	%	b.076	0.020 0.017	Ca (25% 11C1)	me/100g	9.5	<3.0	<3.0
C/N		14.5	10.0 5.9	Me (25%HC1)	me/100g	3.1	<3.0	3.7
CEC pH17.0	me/100g	1 7.8	1.7 2.4	P (25%HC1)	ppm	101	- 16	108
Exch. Ca	me/100g	8.08	1.11 1.09	P (sorption)	mg/100g	220	<\$0	<50
Exch. Ma	mc/100g	1.85	1.05 1.50	ilo	me/100g	0.11	0.12	0.14
Exch. K	me/100g	0.27	0.22 0.23			Ĭ	et die o	92.1.2

44

Unit PtPle, Profile 16

Soil classification:	chromic Luvisols	the state of the	a de la companya de l
Agro-climatic zone:	IV		and the second
Observation:	180/3 Lamu district; E. 40°43', S. 2°24'	;11m	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -
Geological formation:	Calcareous lagoonal sands and clays		
Local petrography:	Calcareous sands and clays	an an Ar	2001 (1000 - 1000 - 1000)
Physiography unit:	Middle terraces	a a la	and the second product of the
Relief-macro:	Flat	$\mathbb{E}_{k} \in \mathbb{E}_{k}^{(k)} \times \mathbb{E}_{k}^{(k)}$	the state of the state
Relief-meso, micro:	Nil	e y ^e res i	
Vegetation/Land use:	Cropland (Bananas, Mangos)	e de la composición d	
Evidence of erosion:	Non detected	- N	
Surface stoniness:	Very few stone	1	
Slope gradient:	0%		
Salinity/alkalinity:	Nil	1.4	
Surface crack:	Nit	1. S. 1. S.	
Internal drainage class:	Well drained		$= \left\{ \left\{ \left\{ f_{i}, f_{i} \right\} : \left\{ f_{i}, f_{i} \right\} \right\} \in \left\{ \left\{ f_{i}, f_{i} \right\} \right\} \right\} \right\}$

Ap

0-10cm Black (SYR 2/3 dry, SYR 2/1 moist); sandy loam; weak, fine, crumb structure; slightly hard when dry, friable when moist, slightly sticky and plastic when wet; few medium pores; many fine roots; gradual and smooth transition to:

AB 10-3

10-35cm Dusky red (2.5YR 3/4 dry, 2.5YR 3/2 moist); sandy loam; moderate, medium, subangular blocky structure; hard when dry, firm when friable, slightly sticky and plastic when wet; few medium pores; few fine roots, gradual and smooth transition to:

35-50/80cm Red (2.5YR 4/6 moist); sandy clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky and very plastic when wet; few medium pores, few fine roots; abrupt and irregular transition to:

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50/80-80cm⁺ Hard coral limestone

LABORATORY DATA SH	EET						
Horizon	Ар	AB Bt	Horizon		Ap	AB	B
Depth cm	5	25 50	Exch. Na	me/100g	0.09	0.03	0.07
Bulk density g/cm	3.15	1.34 1.36	Base sat	%	100+	100+	97.0
Gravel %	ND.	ND. ND.	Si0, /A1, 0,	mol/mol	12.7	7.6	6.8
Sand %	68.0	61.0 55.5	SiO,/R,O,	mol/mol	10.6	6.6	5.9
Silt 7	20.0	21.0 17.0	1e.0.	_mmol/100g	19.4	25.1	26.9
Clay %	12.0	18.0 27.5	Availabk P	ppm	256	141	68
Class	SL	SL SCL	lco.	me/1	ND.	NÐ.	ND.
pH-H,O(1:2.5)	1.2	7.8 6.6	HCO.	me/1	116.5	163.0	58.2
pH∔KČI (1:2.5)	6.2	6.5 5.1	SO.	me/1	0.05	ND.	0.12
EC (1:2.5) mmho/cm	0.08	0.05 0.05	Flore, index	%	79.2	58.3	78.2
C	1.6	0.6 0.3	K (25%HCI)	me/100g	6.7	7.6	6.8
N %	0.130	0.072 0.054	Ca (25%HCI)		22.8	25.8	<u>i 11 i</u>
C/N	12.3	8.3 5.6	Mg (25%11C1)		8.8	9.8	9.3
CEC pH7.0 me/100g	15.6	11.6 12.8	P (25%HC1)	mqq	1021	975	1000
Exch. Ca me/100g	14.54	12.25 9.61	P (sorption)	mg/100g	260	170	400
Exch. Ma me/100g	2.78	1.95 2.03	Hp	me/100g	0.11	0.09	0.09
Exch. K me/100g	0.83	0.70 0.70	1r			0.07	0.07

45-

Unit PcA2qc, Profile 17

Soil classification:	cambic Arenosols	ni. Shekara na sana sa	
Agro-climatic zone:	IV		
Observation:	180/3 Lamu district; E. 40°44',	S. 2°27'; 26m	
Geological formation:	Dune sands		i sa i ji s
Local petrography:	Sands		
Physiography unit:	Dunes		and the second
Relief-macro:	Rolling		
Relief-meso, micro:	Nil		
Vegetation/Land use:	Shrubland/Grazing		8 1 ³ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Evidence of erosion:			in the second
Surface stoniness:	Nil	and the state of the	
Slope gradient:	7 – 8%	÷ :	
Salinity/alkalinity:	Nil		
Surface crack:	Nil	: •	$q_{\rm eff} = q_{\rm eff} + 2 \pi r^2 + 2 \pi r^2$
Internal drainage class:	Somewhat excessively drained		(1,1,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,2

0-10cm

A

B

e.

j

1

Very dark grayish brown (2.5Y 4/2 dry, 2.5Y 3/2 moist); loamy sand; single grain; loose when dry and moist, non-sticky and non-plastic when wet; many fine and common medium roots; clear and smooth transition to:

10-140cm⁺

Brownish yellow (10YR 8/6 dry, 10YR6/6 moist); loamy sand; single grain; loose when dry and moist, non-sticky and non-plastic when wet; many fine and common medium roots:

LABORATORY DATA SHEET

							and the second		
Horizon		A	В	₿	Horizon	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A 1	B :	B
Deoth	cra	5	40	80	Exch. Na	me/100g	0.06	0.03	0.09
Bulk density	g/cm³	1.33	1.35	1.33	Base sat	%	100+	100+	: 100+
Gravel	%	ND.	ND.	ND.	SiO, /A1, 0,	mol/mol	11.3	11.1	12.3
Sand	%	85.5	82.0	99.0	SiO, /R, O,	mol/mol	9.8	9.8	11.0
Silt	%	0.7	13.0	0.4	Te,O,	mmol/100g	15.0	12.5	10.0
Clay	%	13.8	5.0	0.6	Available P	ppm	182	78	68
Class		LS	LS	S	co,	me/1	ND,	ND.	ND.
pH-H,O(1:	2.5)	8.5	8.6	8.9	HCÔ,	me/1	442.5	267.9	256.2
pH-KCI (I:2		8.0	8.4	8.7	SO,	mell	0.10	0.07	0.03
EC (1:2.5)	mmho/cm	0.16	0.13	0.10	Floce, index	%	81.9		
C	%	0.6	0.2	0.1	X (25%HCl)	me/100g	<3.0	<3,0	<3.0
พ่	%	0.052	0.022	0.009	Ca (25%HCI)	me/100g	335.0	413.5	490.0
C/N 1		11.5	9.1	-11.1	Mg (25%HC1) me/100g	17.0	20.6	29.6
CEC pH7.0	me/100g	2.3	0.7	0.4	P (25%HCI)	ppm	485	358	274
Exch, Ca	me/100g	14.5	q5.4	16.78	P (sorption)	mg/100g	< 50	510	280
Exch. Ma	me/100g	1.62	1.72	1.44	Нр	me/100g	0.14	0.13	0.10
Exch. K	me/100g	0.10	0.04	0.03					1. B. 1

-46-

Unit TA₁ge, Profile 18

Soil classification:	eutric Gleysols (saline phase)). Na stanika stani	
Agro-climatic zone:	IV.		and the state of the
Observation:	IV. 180/2 Lamu District; É. 40°	53', S. 2°15'; 2m.	1
Geological formation:	Beach sands and muds of coa		and the standard second
Local petrography:	Sands.	apprendent of the second	
Physiography unit:	Sand flats	the sector of the	and the second
Relief-macro:	Flat.	4 - 2 - ⁴	1. J. J. M.
Relief-meso, micro:	Nil.		$\frac{1}{2} \left(\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \right) + \left(\left(\frac{1}{2} \right)^2 + \left(\frac{1}{2} \right)^2 \right) + \left(\frac{1}{2} \right)^2 + \left(\frac{1}{$
Vegetation/Land use:	Bush land.	도망 그 가 가 안 가 하지?	a successful and a second
Evidence of erosion:	None detected.	an an hear a se	the second second second
Surface stoniness:	Nil.		1
Slope gradient:	0%		
Salinity/alkalinity:	Moderately saline.	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	(1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,
Surface crack:	Nil,	Eller Alter de	
Internal drainage class:	Poorly drained.	A present of the second	e and set with the set

0-10cm Dark brown (7.5YR 4/4 moist); many dark brown mottles; sandy clay loam; Az massive; loose when moist, non-sticky and non-plastic when wet; many fine roots; gradual and smooth transition to: ÷ • • . 11110

10-30cm Dark brown (7.5YR 4/4 moist); many dark brown mottles; loamy sand; massive; loose when moist; non-sticky and non-plastic, when wet; few, small, black, manganese nodules; many fine roots; gradual and smooth transition to: Bz f e com 3.4.

Bgz

30-80cm⁺ Dark brown (7.5YR 4/4 molst); many yellow orange and many peil yellow mottles; many olive black humus substance; massive; loose when moist, non-sticky and non-plastic when wet; few, small, black, manganese nodules:

्रात्र के स्वारंग के प्रारंग के प्रारंग के साथ के प्रारंग के स्वारंग के स्वारंग के प्रारंग के प्रारंग के प्रारं अन्तर के संपर्ध के स्वारंग के प्रारंग के साथ के साथ के स्वारंग के साथ के साथ के साथ के साथ के साथ के साथ के प्र अन्तर के स्वारंग के प्रारंग के साथ के साथ के साथ के साथ की साथ की स्वारंग के साथ के साथ के साथ के साथ के साथ के a the second sec And the second seco

Horizón		Az	Bz Bgz	Horizon		AL	Be Bet
Depth	Cm	5	20 80	Exch. Na	me/100g	0.59	1.16 0.89
Bulk density	g/cm ³	1.50	1.61 1.54	Base sat	2	100+	100+ 100+
Gravel	00	ND.	ND. ND.	SiO,/A1,0,	mol/mol	16.4	14.3 , 14.6
Sand	70	74.5	82.5 89.5	SiO, /R, O,	mol/mol	15.4	13.3 13.7
Silt	80 82	2.5	4.0 8.5	Fe, 0,	mmol/100g	5.6	6.9 6.3
Clay	de la	23.0	13.5 11.0	Available P	ppm :	- 12	17 11
Class	1	SCL	LS SL	CO, 13	me/1	ND.	ND. 🗄 ND.
pH-H,O(1:	2.5)	8.0	1.7 7.7	HCO, 😣 👘	me/i	279.5	81.5 116.5
PH-KCI (I:		7.8	7.4 7.3	so,	me/1	9.00	51.00 46.80
EC (1:2.5)	mmho/cm	6.50	9.60 9.70	Floce, index	%	37.0	22.2 61.8
C	%	0.3	0.2 0.1	K (25%HC1)	me/100g	<3.0	3.5 3.1
Ň	%	0.024	0.018 0.010	Ca (25%HC1)	me/100g	<3.0	3.2 <3.0
C/N		12.5	11.1 10.0	Mg (25%HCI)	me/100z	5.1	8.5 7.5
CEC pH7.0	me/100g	1.8	2.7 2.1	P (25%HC1)	ppm -	· 119	175 172
Exch. Ca	me/100g	0.8	0.88 0.75	P (sorption)	mg/100g	<\$0	<50 <50
Exch, Ma	me/100g	1.69	1.91 1.46	Hp	me/100g	0.08	0.11 0.09
Exch. K	me/100g	0.40	0.7661	1. S. 1997		Ng sa tan	

LABORATORY DATA SHEET

--47---

Unit BAvp, Profile 19

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 C_1

Soil classification:	pellic Yertisols.		ang sa sa sa sa sa
Agro-climatic zone:	IV. 180/3 Lamu District; E. 40°		
Observation:	180/3 Lamu District; E. 40°	33', S. 2°19'; 14m.	and the second
Geological formation:	Recent alluvial deposits.		e trategie in a specification of the
Local petrography:	Sands, silts and clays.		1
Physiography unit:	Bottomland.		(1 + 1) = (1 + 1) + (1 +
Relief-macro:	Flat.		••••••••••••••••••••••••••••••••••••••
Relief-meso, micro:	Gilgai.	· · ·	
Vegetation/Land use:	Grassland/Grazing.		
Evidence of erosion:	None detected.		
Surface stoniness:	Ni).		
Slope gradient:	0%		
Salinity/alkalinity:	Nil.		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
Surface crack:	Crack 10cm width.	· · ·	$\mathcal{J}_{i} = \{i_{i}, \dots, i_{i}\} \in \mathbb{C}^{n}$
Internal drainage class:	Imperfectly drained.	and the second sec	an di seri dan Patrice. T

0-20cm

Balck (7.5YR 1.7/1 moist); cracking clay; strong, coarse, prismatic structure; very hard when dry, extremely firm when moist, very sticky and very plastic when wet; few, big, irregular, white concretions; many fine roots; gradual and wave transition to:

20-50cm

Black (7.5YR 1.7/1, moist); common brownish yellow mottles; cracking clay; strong, coarse, angular blocky structure; very hard when dry, extremely firm when moist, very slicky and very plastic when wet; few, big, irregular, white concretions; moderate slickenside; few medium roots; gradual and wave transition to:

之内

 C_2

Very dark gray (N 3/0 moist); many browish yellow mottles; cracking clay; strong, coarse, prismatic structure, very hard when dry, extremely firm when moist, very sticky and very plastic when wet; few, big, irregular, white concretions, moderate slickenside, few fine roots: 50-120cm⁺

Horizon	A	C1 C2	Horizon	A	C1 C2
Depth cm	- 15	30 80	Exch. Na mc/100g	0.88	0.78 0.73
Bulk density g/cm ³	1.03	1.62 1.82	Base sat %	90.7	100+ 100+
Gravel %	ND.	ND. ND.	SiO,/A1,O, mol/mol	4.3	4.8 6.1
Sand %	29.0	6.0 17.5	SiO, /R, O, Mol/mol	4.0	4.2 5.3
Silt %	21.5	17.0 16.0	Fe O mmol/100g	19.4	31.3 28.8
Clay %	49.5	77.0 66.5	Available P ppm	14	3 24
Class	C	C C	• CO, me/1	ND.	ND. ND.
pl1-11, O (1:2,5)	5.9	6.4 7.2	HCO, me/1	58.2	46.6 139.8
pH-KCI (1:2.5)	4.4	5.1 5.6	SO, me/1	0.41	0.14 . 1.92
EC (1:2.5) minho/cm	0.14	0.16 0.16	Floce index %	91.9	79.2 45.1
C %	2.2	0.5 0.3	K (25%IIC1) nie/100g	4.1	3.5 <3.0
N %	0.270	0.070 0.034	Ca (25%HC1) me/100g	19.5	13.7 14.7
C/N	8.1	7.1 8.8	Mg (25%HCI) me/100g	12.9	14.4 15.5
CEC pH7.0 ine/100g	30.6	19.6 16.8	P (25%HC1) ppm	140	122 119
Exch. Ca me/100g	17.52	13.01 12.25	P (sorption) ing/100g	900	790 180
Exch. Ma me/100g	7.98	7.10 5.86	Hp me/100g	0.36	0.13 0.09
Exch. K me/100g	1.36	0.75 0.27			

LABORATORY DATA SHEET

48

Unit PcA2 qa, Profile 20

Soil classification:	alabic Arenosols.	an an an tao
Agro-climatic zone:	IV.	
Observation:	180/2 Lamu District; E. 40° 51', S. 2° 11'; 7m.	
Geological formation:	Dune sands.	and the second
Local petrography:	Sands.	
Physiography unit:	Interlevee lowland.	
Relief-macro:	Flat to very gently undulating.	
Reliet-meso, micro:	Nil.	
Vegetation/Land use:	Bushed grasland/Grazing.	
Evidence of erosion:	None detected.	
Surface stoniness:	Nil.	
Slope gradient:	1~2%.	
Salinity/alkalinity:	Nil,	
Surface crack:	Nil.	
Internal drainage class:	Some what excessively drained.	1

Dark grayish brown (10YR 6/2 dry, 10YR 4/2 moist); sandy loam; moderate, fine to medium, subangular blocky structure; slightly hard when dry, very friable when moist, non-slicky and non-plastic when wet; few, fine pores; many very fine roots; clear and smooth transition to:

Bu₁ 20-60cm

Grayish brown (10YR 7/2 dry, 10YR 5/2 moist); sandy loam; moderate, medium, sub-angular blocky structure; slightly hard when hard, loose when moist; non-sticky and non-plastic when wet; very few fine pores; common very fine, few medium roots; gradual and smooth transition to:

Bu₂ 60-110cm⁺ Light gray (10YR 8/1 dry, 10YR 7/2 moist); few strong brown mottles; sandy loam; weak, medium, sub-angular blocky; loose when dry and moist, non-sticky and non-plastic when wet; many fine pores; very few fine and medium roots:

Horizon		A	Bul Bu2	S Horizón 1005		A	Bul	Bu 2
Depth	CD1	5	55 100	Exch. Na	me/100g	<10.01>	0.01>	0.01
 Bulk density 	g/cm ³	1.45	1.56 1.52	Base sat	% , 11, 17, 7	100+	100+	96.7
Gravel a second	2	ND	ND, ND,	SiO, /A1, 0,	mol/mol	39.0	32.0	32.9
🖞 Sand 👘	1/2	75.5	81.0 83.0	. SiO, /R, O,	niel/niol	36.7	30,4	31.2
Silt	1.	2.5	2.0 2.0	Fe,O,	_ mmol/100g	2.5	2.5	2.5
Ċlay	76	19.0	17.0 15.0	Available P	ppm :	6	1	8
Class	- / / / / 	SL	SL SL	CO,	me/t	ND.	ND.	ND.
<u>ा भा-मे,0(1:</u>	2.5)	6.0	6.4 6.4	licó,	me/3	23.3	11.6	ND.
oll-SCI (1:		47	5.2 5.0	SO.	me/1	0.36	0.63	0,18
EC (1:2.5)	mmho/cm	0,04	0.02 0.02	Floce, index	%	89.5	88.2	
C	<u>'</u>	0.2	0.1 0.04	K (25%BCI)	me/100g	<3.0	<3,0	<3.0
N	76	0.024	0.009 . 0.005	Ca (25%11C1)	me/100g	<3.0	<3.0	<3.0
C/N	37.7	8.3	11.1 8.0	Mg (25%HC1) me/100g	<3.0	<3.0	<3.0
CFC pH7.0	me/100z	0.8	0.5 0.3	P (25%)(C1)		76	- 59	69
Exch. Ca	mc/100g	0.46	0.32 0.14	P (sorption)	mg/100g	<50	<50	<50
Exch. Ma	me/100g	0.45	0.16 0.09	Hp 2 A	me/100g	0.27	0.15	0.12
Exch. K	me/100g	0.06	0.04 0.05			1	•	

LABORATORY DATA SHEET AN ADDRESS OF

Unit PrAqa, Profile 21

Soil classification:	albie Arenosols.		The second second second
Agro-climatic zone:	v.		
Observation:	180/2 Lamu District; E. 40°49', S	5, 2 [°] 1'; 7m.	• • • • • • • • •
Geological formation:	Recent alluvial deposits.		
Local petrography:	Sands, silts and clays.		(, ,)
Physiography unit:	Valley bottom lowlands.		
Relief-macro:	Undulating.	$(x_1,y_2,y_3) \in \mathbb{R}^{n_1}$	
Relief-meso, micro:	ND		
Vegetation/Land use:	Wooded bush land.	till state to the	
Evidence of erosion:	None detected.		et al la transferencia
Surface stoniness:	Nil.	÷	· · · · ·
Slope gradient:	1~2%.		•
Salinity/alkalinity:	Nil.	2	a ser a ser a ser a
Surface crack:	Nil,	10^{-1}	at a state
Internal drainage class:	Somewhat excessively drained.	and the second states	a an
		· · · · · · · · · · · · · · · · · · ·	• •

A

Grayish brown (2.5Y 7/3 dry, 2.5Y 5/2 moist); common teddish yellow mottles; sand; massive; hard when dry, friable when moist; non-sticky and non-plastic when wel; few medium pores; gradual and smooth transition to:

BA

10-60cm

0-10cm

Light yellow (2.5Y 8/3 dry, 2.5Y 7/3 moist), common reddish yellow mottles; sand; massive; hard when dry, friable when moist, non-sticky and nonplastic when wet; few medium pores; common fine roots; gradual and smooth transition to:

,Bu

60-120cm White (2.5Y 8/2 moist); common reddish yellow mottles; loamy sand; moderate, fine, sub-angular blocky structure; friable when moist, non-sticky and non-plastic when wet; common medium roots; clear and smooth transition to:

Bg

120-140cm⁺ Light gray (5Y 7/2 moist); common yellowish red mottles; loamy sand; moderate, medium, sub-angular blocky structure; non-sticky and nonplastic when wet; few medium roots:

	and the second		· · · · · · · · · · · · · · · · · · ·		1. The second			
Horizon		A	Bu Bg	Horizon		A	Bu	Bg
Depth	cm	5	90 130	Exch. Na	me/100g	0.06	0.05	1.29
Bulk density	g/cm ³	1.63	1.37 1.72	Base sat	%	100+	100+	100+
Gravel	%	ND.	ND. ND.	SiO,/A1,O,	mol/mol	25.0	26.9	10.4
Sand	%	93.0	84.5 83.0	SiO, /R, O,	mol/mol	23.2	25.2	9.5
Silt	%	2.0	2.5 4.0	Fe, 0,	mmol/100g	4.4	3.8	11.9
Clay	%	5.0	13.0 13.0	Available P	ppm	4	1	3
Class		S	LS LS	со,	me/1	ND.	ND.	ND.
pH-H,O(I.:	2.5)	5.8	6.4 5.0	HCO,	me/1	NÐ.	93.2	23.3
pR-KCi (1.3	2.5}	4.4	5.0 3.7	SO,	me/1	3.56	0.84	1.78
EC (1:2.5)	mmho/cm	0.04	0.03 0.29	Floce, index	%	14.0	4.6	11.5
C C	%	0.2	0.04 0.1	K (25%HCI)	me/100g	<3.0	<3.0	<3.0
N Second	%	0.015	0.005 0.082	Ca (25%HC1)		<3.0	<3.0	<3.0
С/Н		13.3	8.0 1.2	Mg (25%HC1)	me/100g	<3.0	<3.0	5.4
CEC pli7.0	me/100g	1.0	0.2 4.8	P (25%HC1)	ppm	87	50	76
Exch, Ca	me/100g	0.73	0.13 1.46	P (sorption)	mg/100g	<50	<50	<50
Exch. Ma	me/1003	0.43	0.07 2.50	Hp	me/100g	0.21	0.12	0.37
Exch, K	me/100g	0.05	0.01 0.05					

LABORATORY DATA SHEET

-50--

Unit PtJqa, Profile 22

Soil classification: Agro-climatic zone: Observation: Geological formation: Local petrography: Physiography unit: Relief-macro: Relief-meso, micro: Vegetation/Land use: Evidence of erosion: Surface stoniness: Slope gradient: Salinity/alkalinity: Surface crack: Internal drainage class: albić Arenosols (pesoferric phase) IV.

Lagoonal sands and	clays.
Sands.	
Lower terraces.	
Flat.	the formation of the second second
Nil.	e e e e e e e e e e e e e e e e e e e
Bushed grassland.	이 아파리 사람이 집을 위한 것이다.
None detected.	
Nil.	
0%	
Nil.	and the second
Nil.	
Moderately well,	

0-20cm Blac

Black (7,5YR 4/1 dry, 7.5YR2/1 moist); loamly sand; moderate, coarse, subangular blocky structure; soft when dry, very friable when moist, nonsticky and non-plastic when wet; few medium pores; many fine, common big roots; clear and smooth transition to:

AB 20–35cm

Dark brown (7.5YR 6/2 dry, 7.5YR 4/2 moist); common, very dark brown mottles; sand; massive, slightly hard when dry, very friable when moist; non-sticky and non-plastic when wet; frequent, small, spherical, black manganese nodules; few fine pores; common fine, common big roots; gradual and irregular transition to:

E(?) 35-60cm

Duli brown (7.5YR 8/2 dry, 7.5YR 5/3 moist); many very dark brown mottles; sand; massive; slightly hard when dry, very friable when moist, non-sticky and non-plastic when wet; very few, big, spherical, black manganese nodules; common medium pores, few fine and common medium roots; gradual and smooth.

Bs

А

60-120cm⁺

Light brown (7.5YR 6/4 moist); many brownish yellow mottles; sandy loam; moderate, coarse, angular blocky structure, firm when moist, non-sticky and non-plastic when wet; frequent, big, spherical, black, manganese nodules; common medium pores; few fine, common medium roots:

Horizon	A E 85	Horizon	A E Bs
Depth cm ,	5 45 90	Exch. Na me/100g	0.08 0.11 1.24
Bulk density g/cm	1.32 1.48 1.58	Base sat %	100+ 100+ 94.9
Gravel %	ND. ND. ND.	SiO, AI, O, mol/mol	10.7 16.2 14.9
Sand %	83.5 90.5 77.0	SiO, /R, O, mol/mol	10.2 15.0 12.5
Silt %	5.5 2.5 3.5	Fe,O, mmol/100g	6.3 6.9 16.9
Clay %	11.0 7.0 19.5	Available P ppm	24 3 3 3
Class	LS SL	CO, me/1	ND. ND. ND.
pH-H,O(1:2.5)	7.2 6.9 5.4	HCO, me/1	165.8 349.4 23.3
pH-KC1 (1:2.5)	6.5 5.3 4.2	SO. me/i	0.08 1.35 0.44
EC (1:2.5) nimho/cm	0.14 0.05 0.41	Floce index %	72,7 35.7 64.1
C %	1.2 0.2 0.1	K (15%HCI) me/100g	<3.0 <3.0 <3.0
N %	0.092 0.019 0.018	Ca (25%HC1) me/100g	5.5 . <3.0 12.2
CAN	13.0 10.5 5.6	Mg (25%HC1) me/100g	3.9 <3.0 4.1
CEC pH1.0 me/100g	5.3 1.3 4.3	P(25%HCI) ppm	112 94 105
Exch. Ca me/100g	4.20 0.71 1.40	P (sorption) mg/100g	80 <50 450
Exch. Ma me/100g	2.45 0.76 2.36	Hp me/100g	0.11 0.13 0.22
Exch. K me/100g	0.33 0.23 0.08		1

LABORATORY DATA SHEET

-51--

Unit PcA2 be, Profile 23

Soil classification:	eutric Cambisols	n en trajego de la constante en el	
Agro-climatic zone:	IV	· · ·	
Observation:	179/4 Lamu district; E. 40	°13', S. 2°23'; 12m	
Geological formation:	Dune sands	and the first of the second	all and the second
Local petrography:	Sands		
Physiography unit:	Dunes	3	
Relief-macro:	Very gently undulating		
Relief-meso, micro:	Nil		in the second second
Vegetation/Land use:	Wooded bushland/Grazing		the data second second
Evidence of erosion:	None detected		and the second second
Surface stoniness:	Nil	17. T	and the set of the set of the
Slope gradient:	0 – 2%		and the second
Salinity/alkalinity:	Nil		
Surface crack:	Nil		: :
Internal drainage class:	Well drained	and the second sec	

A

0-10cm

10-30cm

30-90cm

Black (10YR 3/1 dry, 10YR 1.7/1 moist); sand; moderate, fine, crumb structure; soft when dry, very friable when moist, non-sticky and non-plastic when wet; many fine roots; clear and smooth transition to:

AB.

Very dark brown (10YR 3/2 dry, 10YR 2/2 moist); sand; moderate, fine, angular blocky structure; soft when dry, very friable when moist, nonsticky and non-plastic when wet; many fine roots; clear and smooth transition to:

Bu

1

Dark yellowish brown (10YR 3/4 moist); loamy sand; moderate, medium, subangular blocky structure; very friable when moist, non-sticky and nonplastic when wet; few, small, spherical manganese nodules; common medium roots; clear and smooth transition to:

Bg

90-120cm⁺ Reddish yellow (7.5YR moist); very many grayish mottles; sandy clay loam; moderate, medium, subangular blocky structure; friable when moist, nonsticky and non-plastic when wet; few fine roots:

Horizon		A	Bu	Bg	Horizon		'A	Bu	Bg
Depth	¢m	5	70	110	Exch. Na	mé/100g	0.17	0.18	2.09
Bulk density	g/cm ³	1,50	1.57	1 73		%	100+	100+	100+
Gravel	%	ND.	ND.	ND.		mol/mol	11.21	11.05	8.26
Sand	%	87.5	85.5	67.8	SiO, /R, O,	mol/mol	10.39	10.17	7.31
Silt	%	7.3	5.5	8.2	Fe, O,	mmo1/100g	9.08	10.02	18.47
Clay	%	5.2	9.0	24,0	Available P	ppm	27	6	12
Class		S	LS	SCL	CO,	mie/i	ND.	ND.	ND.
pH-B,O(1:2	2.5)	6.6	6.1	6.6	HCO.	mie/1	144.0	52.4	333.9
pH-KCI (1:2	2.5)	5.9	4.4	5.0	SO.	me/1	0.76	0.26	11.3
EC (1:2.5)	mmho/cm	0.10	0.04	0.15	Floce, index	%	3.8	22.2	0
С	%	1.2	0.2	0.2	K (25%HC1)	me/100g	<3.0	<3.0	<3.0
N	%	0.076	0.023	0.026	Ca (25%HCl)	me/100g	6.0	<3.0	4.7
C/N	지수는 가지?	15.8	8.7	1.7	Mg (25%HC1)	me/100g	4.0	3.0	8.0
CEC pH7.0	me/100g	7.0	3.7	9.3		ppm	178	113	127
Exch. Ca	me/100g	6.40	1.32	3,50	P (sorption)	mg/100g	650	530	. Š75
Exch. Ma	me/100g	2.35	1.64	4.27	Hp	me/100g	0.07	0.39	0.09
Exch, K	me/100g	0.40	0.21	0.20	그래 한 국민 이 영화		<u></u> , , , , , , , , , , , , , , , , , , ,		

LABORATORY DATA SHEET

Unit HObe, Profile 24

Soil classification:	chromic Cambisols		1. Jan 197 (14 -
Agro-climatic zone:	IV		
Observation:	187/3 Kilifi district; E. 40)°2', S. 2°54'; 135m	
Geological formation:	Pliocene sediments		and the second
Local petrography:	Sandy clays and bright re-	d sands	the second second
Physiography unit:	Hill		and the second
Relief-macro:	Rolling		
Relief-meso, micro:	Nil		
Vegetation/Land use:	Crop land (Maize)	e de la constante de la constan	and the wards
Evidence of erosion:	None detected		1
Surface stoniness:	Nil	- 	
Slope gradient:	5%	: .	
Salinity/alkalinity:			
Surface crack:	Nil		
Internal drainage class:	Welldrained		gan genter in s

Ap 0–15cm

Dusky red (10R 4/6 dry, 10R 3/4 moist); silty loadm, moderate, medium, crumb structure; soft when dry, very friable when moist, very sticky and very plastic when wet; many fine roots; gradual and smooth transition to:

B 15-120cm⁺

Red (10R 4/8 moist); silt; weak, coarse, subangular blocky structure; very friable when moist, very plastic and sticky when wet; common medium roots:

LABORATORY DATA SHEET

Horizon	4.1	Ap	8 8	Horizon	Ap	B B
Depth	Cm	1 10	50 100	Exch. Na me/100g	0.12	0.23 0.21
Bulk density.	g/cm ³	0.92	0.90 1.19	Base sat %	100+	100+: 100+
Gravel	%	9.0		SiO,/A1,O, mol/mol	2.64	2.48 2.51
Sand	%	27.0	10.2 19.0	SiO, /R, O, mol/mol	2.13	2.01 2.02
Silt	%	66.8	84.1 75.5	Fe,O, mmol/100g	61.99	68.26 68.26
Clay	%	6.2	5.7 5.5	Available P ppm	84	56 30
Class	() 전 · · · · · · · · · · · · · · · · · ·	SiL	Si SiL	CO, me/1	ND.	ND. ND.
pH-H,O(1:	2.5) 👘 👘	2.9	8.1 8.2	HCO, me/1	163.7	130.9 130.9
∴ pH_KCI (I::	2.5)	7.3	7.4 7.6	SO in me/1	0.28	2.24 2.09
EC (1:2.5)	minho/cm	0.25	0,20 0.25	Floce index %	35.5	100 100
1 C (1973) - 1	%	3.4	0.8 0.8	K (25%HC1) me/100g	4.0	<3.0 <3.0
6 N - 56 - 5	%	0.340	0.089 0.085	Ca (25%HC1) mé/100g	40.3	31.0 56.6
C/N		10.0	9.0 9.4	Mg (25%HC1) me/100g	8.6	7.4 8.3
CEC pH7.0	me/100g	28.0	15.0 13.4	P (25%HC1) ppm	262	207 185
Exch. Ca	me/100g	27.33	22.11 28.38	P (sorption) mg/100g	1,322	1,131 1,211
Exch, Ma	me/100g	3.41	2.96 3.92	Hp me/100g	0.07	0.07 0.08
Exch. K	me/100g	1.60	0.45 1.04			

-53--

Unit HDbk, Profile 25

Soil classification:	calcie Cambisols (sodie phase)	a ku aga a tin tan san s	the true of the second
Agro-climatic zone:	IV		the second second
Observation:	187/3 Killifi district E. 40°1', S. 2	2°56*, 130m	
Geological formation:	Pliocene sediments		
Local petrography:	Sandy clays and bright red sands	*	
Physiography unit:	Hill	6 La	and the second
Relief-macro:	Undulating		
Relief-meso, micro:	Nil	1	$(x_{1},y_{2}) \in A$
Vegetation/Land use:	e autre Breerreite	$\chi^{1} = (\gamma_{1}, \beta_{1}, \dots, \beta_{n}, \beta_{n})$ (2.1)	 A 1 (1) - 414 (2) - 12 (1)
Evidence of erosion:	None detected	ti sus adali	
Surface stoniness:	Nil	÷ 4	and the second
Slope gradient:	2%	· · · ·	eta di tali
Salinity/alkalinity:			the second s
Surface crack:	Crack $0.5 - 1$ cm width	· · · · · · · · · · · · · · · · · · ·	• 1 ¹¹⁴
Internal drainage class:	Moderately well drained	utera 1≹aut	A part of the second second
		e de la seconda de	

A

0-10cm

Black (10YR 2/1 moist); loam; moderate, medium, crumb structure; friable when moist, sticky and very plastic when wet; many fine roots; clear and smooth transition to:

Bk

10-55cm Black (2.5Y 2/1 moist); few gravelly sandy loam, moderate, medium, subangular blocky structure; friable when moist, very sticky and very plastic when wet; few big and common medium roots; gradual and smooth transition to:

Bn

55-110cm⁺ Black (2.SY 2/1 moist); few gravelly loam; strong, coarse, angular blocky structure; firm when moist, very sticky and very plastic when wet; few, medium, powdery, white concretions; moderate slickenside; few big roots:

LABORATORY DATA SHEET

Horizon	A Bk Br	Horizon	A Bk Bn
Depth cm	5 40 80	Exch. Na me/100g	0.34 2.23 5.54
Bulk density g/cm ³	1.33 1.52 1.54	Base sat %	100+ 100+ 100+
Gravel %	ND. ND. ND	SiO,/A1,O, mol/mol	8.73 7.97 7.82
Sand %	51.0 56.5 51.0	SiO,/R,O, mol/mol	7.43 6.73 6.66
Silt %	34.0 32.0 27.5		22.54 25.67 24,74
Clay %	15.0 11.5 21.5	Available P opm	64 62 30
Class	L SL 1	CO. me/1	ND ND ND
pH-B,O(1:2.5)	7.7 8.5 8.1	HCO, me/1	242.2 202.9 314.2
pH-KC1 (1:2.5)	7.0 7.3 7.3		2.65 5.54 16.83
EC (1:2.5) mmho/cm	0.30 0.40 1.9		66.7 52.2 90.7
C %	2.0 0.8 0.6		<3.0 <3.0 <3.0
N %	0.130 0.044 0.02		34.0 86.3 63.3
C/N	15.4 18.2 22.		14.4 17.8 16.2
CEC p117.0 me/100g	30.3 30.0 31.0		129 147 104
	23.82 36.11 27.90		1,412 1,469 1,322
	6.48 7.18 7.0		0.04 0.11 0.05
	1.02 0.29 0.24		
Exch. K me/100g	1 1.05 0.27 0.2		

-54-

Unit Hoic, Profile 26

		· · · · · · · · · · · · · · · · · · ·	1
Soil classification:	chromic Luvisols	and the standard second	an a
Agro-climatic zone:	IV		a and the second
Observation:	187/3 Kilifi district; E.40°3',	S. 2°57' : 45m	
Geological formation:			and the second second
Local petrography:	Sandy clays and bright red sa	nds i Brennet i volgene i o	
Physiography unit:	HiB data set		i se en
Relief-macro:	Undulating	en subsystematik	A
Relief-meso, micro:	Small depression	1.2	and the second second
Vegetation/Land use:	Cropland (Maise, Cassava)	and the proof	a de la presenta
Evidence of erosion:	None detected	지 않는 것 같은 것 같아.	the standard and
Surface stoniness:	Nil	and a second	1. .
Slope gradient:	0~2%	(1,1) = (1,1) + (1,1)	
Salinity/alkalinity:			المعيني المراجع
Surface crack:	Nil	and the second second	· . ,
Internal drainage class:			
	· .		

Ap 0-5cm

Dark reddish brown (SYR 3/3 dry, SYR 2/3 moist); sandy loam; strong, coarse, crumb structure; hard when dry, firm when moist, very sticky and plastic when wet; many fine roots; clear and smooth transition to:

 $\sim 10^{-1}$

	and the second	Reddish brown (SYR 4/4 moist); sandy loam; strong, medium, angular blocky structure; firm when moist, very sticky and plastic when wet; common fine roots; clear and smooth transition to:
Bt ₁	25-45cm	Reddish yellow (SYR 6/8 moist); loam; moderate, medium, angular blocky structure; friable when moist, sticky and plastic when wet; few medium roots; gradual and smooth transition to:
		ne for search i fearge an each e cleanaig an search ann an thair ann an thair an thair ann an thair ann an thai Tha cleanaigh search a fearge ann an thair ann Thair ann an thair a

Bt₂

45-120cm⁺

Yellowish red (SYR 5/8 moist); sandy clay loam; moderate, medium, angular blocky structure; very friable when moist, sticky and plastic when wet; few, small pores; few big, common fine roots:

LABORATORY DATA SHEET

 $\left| \cdot \right|_{t \in \mathbb{R}}$

	a state and the second seco	and the second secon	Contractory of the	
ApAu	B12 Horizon		Ap	Au B12
5 15	80 Exch. Na	me/100g	0.12	0.08 0.18
1.16 1.49	1.51 Base sat	%	100+	100+ 100+
6.1 16.0	6.2 SiO, /A1, C	a mòl/mol	8.11	7.26 6.43
60.0 53.0	50.2 SiO, /R, O,	mol/mol	7.09	6.62 5.60
33.0 35.5	26.3 Fe,O,	mmot/100g	20.35	22.54 25.67
7.0 11.5	23.5 Available P	ppm	129	42 19
SL SL	SCL CO,	me/t	ND	ND ND
8,0 8.1	8.1 HCO,	me/1		425.5 148.4
7.5 7.3	7.1 SO	me/1	1 1 1 0 7 0	2.96 3.07
0.33 0.24	0.18 Floce, Inde.	x %		73.9 93.6
2.1 1.4	0.3 K (25%HC)	l) me/100g		4.0 <3.0
0.200 0.140	0.032 Ca (25%HC	1) me/100g		21.0 11.4
10.5 10.0	9.4 Mg (25%110	(1) me/100g	1 · · · ·	6.3 5.0
20.0 17.0	11.0 P(25%)IC1) opm		192 138
24.20 17.72	12.07 P (sorption)	mg/100g		272 811
3.19 2.72	2.86 IIp	me/100g		0.07 0.07
1.98 2.31	0.71			v.ur
	S IS 1.16 1.49 6.1 16.0 60.0 53.0 33.0 35.5 7.0 11.5 SL SL 8.0 8.1 7.5 7.3 0.33 0.24 2.1 1.4 0.200 0.140 10.5 10.0 20.0 17.0 24.20 17.72 3.19 2.72	5 15 80 Exch. Na 1.16 1.49 1.51 Base sat 6.1 16.0 6.2 SiO, /A1, O 60.0 53.0 50.2 SiO, /A1, O 60.0 53.0 50.2 SiO, /R, O, 33.0 35.5 26.3 Fe, O, 7.0 11.5 23.5 Available P SL SL SL CO, 8.0 8.1 8.1 HCO, 7.5 7.3 7.1 SO, 0.33 0.24 0.18 Floce, Inde 2.1 1.4 0.3 K (25%HIC) 0.200 0.140 0.032 Ca (25%HIC) 10.5 10.0 9.4 Mg (25%HIC) 24.20 17.72 12.07 P (sorption) 3.19 2.72 2.86 Hp	5 15 80 Exch. Na me/100g 1.16 1.49 1.51 Base sat % 6.1 16.0 6.2 SiO ₂ /A1 ₂ O ₃ mol/mol 60.0 53.0 50.2 SiO ₂ /A1 ₂ O ₃ mol/mol 30.0 35.5 26.3 Fe ₂ O ₃ mol/mol 30.0 35.5 26.3 Fe ₂ O ₃ mmol/100g 7.0 11.5 23.5 Available P ppm SL SL SCL CO ₃ me/1 7.5 7.3 7.1 SO ₄ me/1 0.33 0.24 0.18 Floce, Index % 2.1 1.4 0.3 K (25%HC1) me/100g 0.200 0.140 0.032 Ca (25%HC1) me/100g 10.5 10.0 9.4 Mg (25%HC1) ppm 24.20 17.72 12.07 P (sorption) mg/100g 3.19 2.72 2.86 Hp me/100g	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

Unit PrA3bk, Profile 27

Kilifi district; B. 40°3', S, 2°53'; 29m eposits	
	12.1
nosits	
New real second s	, t.,
sands and gravels	. :
	÷
o very gently undulating	
	÷.
/Grazing	
detected	
	e de
$0.5 \sim 1.0$ cm width	N
rained	·
s to est 29 k	to very gently undulating est/Grazing e detected 2% ek 0.5 ~ 1.0cm width

8-0CI

8-35cm

35-70cm

Very dark grayish borwn (2.5Y 4/2 dry, 2.5Y 3/2 moist); lew gravely loam; strong, coarse, crumb structure; hard when dry, friable when moist, sticky and very plastic when wet; many fine roots; clear and smooth transition to:

i.

Bn

Dark grayish brown (2.5Y 4/2 moist); few red mottles; few gravelly loam; strong, medium, angular blocky structure; very friable when moist, sticky and very plastic when wet; many fine, few medium roots; clear and irregular transition to:

Bek

Olive gray (SY 4/2 moist); few gravelly silty loam; moderate, medium, angular blocky structure; friable when moist, very sticky and very plastic when wet; few big roots; gradual and smooth transition to:

Bnz

70-110cm⁺ Olive gray (5Y 4/2 moist); common gravelly silty loam; moderate, medium, angular blocky structure; friable when moist, very sticky and very plastic when wet, few fine roots:

LABORATORY DATA SHEET

Itorizon		A	Bu Baz	Rorizon		A	Bu	Bnz
Depth cr	n	5	30 80	Exch. Na	me/100g	0.17	1.38	7.40
	cm ³	1.24	1.54 1.49	Base sat	%	100+	100+	100+
Gravel %		3.6	26.0 ND,	Si0, /A1, 0,	mol/mol	5,83	5.20	s \$.01
Sand %		48.0	41 0 39.0	SiO, /R, O,	mot/mol	5.05	4.48	4.29
		39.8	47.0 55.0	Fe, 0,	mmol/100g	25.67	26.61	28,81
Clay %	4	12.5	12.0 6.0	Available P	ppm	106	21	136
Class		L	L SiL	CO,	me/1	ND	ND	ND
pl1-lf, Q (1:2.5)		8.2	8.3 8.0	lico,	me/1	275.0	461.5	166.9
pH-KC1 (1-2.5)		7.3	7.4 7.3	SO,	me/l	0.17	2.38	34.86
		0.30	0.46 4.2	Floce, index	%	96.0	75.0	100
С %		2.3	1.2 0.7	K (25%HCI)	me/100g	6.2	3.4	<3.0
N %		.180 0	096 0.038	Ca (25%HCI)	mc/100g	118,5	275.5	228.5
C/N		12.8 (p)	12.5 18.4	Mg (25%HC1)	me/100g	25.5	20.0	; 27.8
	e/100g	31.0	28.0 30.0	P (25%HC1)	ppm	219	226	299
Exch. Ca m	c/100g 3	9.04 4	4.05 32,88	P (sorption)	mg/100g	1,642	1,544	1,797
Exch. Ma m	e/100g	6.99	8.56 9.58	IIp	me/100g	0.12	0.11	0.13
Exch, K m	e/100g	1.56	0.50 0.29	*	Sec. Sec.	32	1.1	i se i c

Unit BAge, Profile 28

Soil classification: Agro-climatic zone: Observation: Geological formation: Local petrography: Physiography unit: Relief-macro: Relief-meso, micro: Vegetation/Land use: Evidence of erosion: Surface stoniness: Slope gradient: Salinity/alkalinity: Surface crack: Internal drainage class:

eutric Gleysols (sodic phase) IV 187/3 Kilifi district; B. 40°5', S. 2°50'; 6m Alluvial deposits Sands, silts and clays Bottom land Flat e , ég Nil Bushland/Grazing 1 None detected Nil 0% Weak crack Poorly drained

A 0-10cm

Light olive brown (2.5Y moist); many orange mottles; sandy clay loam; massive; sticky and very plastic when wet; many fine roots; clear and smooth transition to:

Bg 10-90cm⁺

Gray (N 5/0 moist); many orange mottles; clay; massive; very sticky and very plastic when wet; few, small, spherical, black manganese nodules; common medium roots:

LABORATORY DATA SHEET

			· · · · · · · · · · · · · · · · · · ·				<u> </u>	
Horizon	A	Bg	Bg	Retizon		A	Bg	Bg
- Depth i cm	1 S	30	80 -	Exch. Na	mic/100g	0.35	2.62	3.05
Bulk density e/cm	3 1.39	1.58	1.61	Base sat	2	100+	100+ %	100+
Gravel %	ND.	ND.	ND.	SiO, /A1, O,	mòl/mòl	7.03	5.29	5.02
Sand See 94		36.0	37.0	SiO, /R, O,	mól/mol	6.19		4.42
Silt %	11.5	14.0	11.0	ie, 0,	mmol/100g	21.60	26.61	27.87
Clay %	34.0	50.0	52.0	Available P	ppm	17	15	21
Class	SCL	C	C	CO.	me/1	ND	ND .	ND
pH-H, O (1:2.5)	8.0	8.1	6.6	lico,	me/1	255.3	375.6	58.9
pH-KCI (1:2.5)	6.8	6.4 ,	5.0	SO.	me/1	1.31	7.8	0.39
	o/cm 0.2	0.16	1.35	Floce, index	%	86.8	28.0	5.8
1 C %	0.7		0.2	K (25%HCI)	me/100g	<3.0	<3.0	<3.0
en Nelle en Ale - Alecte	0.045	0.024 0	.019		me/100g	15.6	15.7	10.3
C/N	15.6	12.5	10.5			5.1	9.7	8.8
CEC pH7.0 me/1	00. 12.4	16.7	16.0	P (25%HC1)	ppm	143	159	217
Exch. Ca me/1		10.76 1	0.06		mg/100g	987	1.008	1.097
Exch. Ma me/1		5.74	4.92	llp	mc/100g	0.06		0.07
Exch, K me/1		0.24	0.20		incrite of		V.V.	0.01

Unit PcSe, Profile 29

Soil classification:	Rendzinas		a gan a sa
Agro-climatic zone:	IV	- 12	the Alexandree
Observation:	187/3 Kilifi district; E. 40°4', S.	2°53';18m	1
Geological formation:	Lagoonal calcareous sandstones		
Local petrography:		the second second second	
Physiography unit:	Raised coral reef	$\mathbb{E}_{\mathcal{A}} = \mathbb{E}_{\mathcal{A}}$	and a second second
Relief-macro:	Undulating		
Relief-meso, micro:	Nil	- 1	
Vegetation/Land use:	Wooded bushland	and the state of the second	지 말 나는 나는 것이 같이 있어?
Evidence of erosion:	None detected	and the second	an an the bar
Surface stoniness:	Fairy rocky		and a second second
Slope gradient:	$0 \sim 2\%$		1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -
Salinity/alkalinity:			and the states
Surface crack:	Nil		an a
Internal drainage class:	Well drained	the set of the set of the	化合理 化均衡 植物 经分配
-			

0-10cm A

Red (2.5YR 5/8 dry, 2.5YR 4/6 moist); sandy loam; weak, medium, crumb structure; soft when dry, very friable when moist, slightly sticky and slightly plastic when wet; many fine roots; clear and smooth transition to:

 $\{ j \in I \}$

B

С

,

10-20cm

Red (2.5YR 5/8 dry, 2.5YR 4/6 moist); sandy loam; moderate, medium, subangular blocky structure; soft when dry, very friable when moist, slightly sticky and slightly plastic when wet; many fine roots; clear and smooth transition to:

20-110cm⁺ Calcareous sandstone with some pockets of soil:

LABORATORY DATA SHEET

1						
Horizon	A	ВС	Horizon		A	B, C
Depth cm	5	15 80	Excb. Na	me/100g	0.18	0.14 0.18
Bulk density g/cm3	1.27	1.37 1.37	Base set	%	100+	100+ 100+
Gravel %	1.2	16.7 55.7	\$i0,/A1,0;	mol/mol	6.93	6.59 6,35
Sand %	62.0	66.0 70.0	SiO,/R,O,	mol/mol	6.29	6.00 5.70
Silt %	33.0	26.0 25.0	Fe10,	mmol/100g	16.28	16.28 16,28
Clay %	5.0	8.0 5.0	Available P	ppra –	52	50 39
Class	SL	SL SL	CO,	me/1	ND.	ND. ND.
pH-H,O(1:2.5)	8.2	8.3 8.3	HCO,	me/1	383.0	284.8 58.9
pH-KCI (1:2.5)	15	7.6 7.6	SO,	me/1	0.11	0.03 <0.02
EC (1:2.5) mmho/cm	0.21	0.20 0.20	Floce, index	%	90.0	56 3 80,0
C %	1.0	0.6 0.5	K (25%HC1)	me/100g	3.4	3.0 <3.0
N %	0.086	0.078 0.044	Ca (25%HC1)	me/100g	20.2	60.6 366.0
C/N Part 2 Part	1 11.6	7.7 11.4	Mg (25%HC1)	me/100g	7.1	8.3 11.1
CEC pH7.0 me/100g	11.0	8.3 7.4	P (25%HC1)	ppm.	217	214
Exch. Ca me/100g	18.55	28.00 33.81	P (sorption)	mg/100g	875	782 .1.063
Exch. Ma me/100g	1.98	2.04 .1.83	Нр	me/100g	0.06	0.07 0.18
Exch. K me/100g	0.97	0.63 0.42				
			Notes and the			

-58-

Unit TA1 oe, Profile 30

Soil classification: Agro-climatic zone:	eutric Histosols (saline-se IV	odic phase) `	
Observation:	187/3 Kilifi district : B. 4	l0°5', S. 2°59' ; 1m	
Geological formation:	Beach sands and muds o		
Lócal petrography:	Sands		
Physiography unit:	Mangrove swamps	and the state of a state of a	
Relief-macro:	Flat	and the second	
Relief-meso, micro:	Nil		
Vegetation/Land use:	Forest/Salt work	e sur le sur la service de la	
Evidence of erosion:	None detected		e presidente de la companya de la co
Surface stoniness:	Nil	-	and the second second
Slope gradient:	0%	•	
Salinity/alkalinity:			1
Surface crack:	Nil	. : - ([*]	and a second
Internal drainage class:	Very poorly		

sandy 0-5cm Very pale brown (10YR 7/4 moist); sand; massive; no roots; clear and smooth top

Anz S-10cm

Very pale brown (10YR 7/4 moist); many reddish yellow mottles; sandy loam; massive; slightly sticky and non-plastic when wet; many fine and many medium roots; clear and smooth transition to:

14

Hnz 10–60cm

1512

Grayish brown (2.5Y 5/2 moist); common reddish yellow mottles; silty loam; many humic material; massive; many fine, common medium and common big roots:

na tradicio de la construição da construição de sector de la construição de la construição de la construição d A sector de la construição de la constru A sector de la construição de la constru

Horizon	Sandy	Anz	IInz	Horizon		Sandy	Anz	Haz
Depth cm	top S	10	40	Exch. Na m	c/100g	1.54	6.57	13.62
Bulk density g/cm ³	1.55	1.04	0.65	Base sat 🛛 🛠		100+	100+	100+
Gravel 🛠	ND.	ND.	ND.		ol/mol	15.52	8.18	4.34
Sand you want the second	91,0	59.0	17.5	SiO ₁ /R ₁ O ₁ m	ol/mol	14.88	7.11:	3.64
Silt %	5.0	34.5	63.5	le,0, m	mol/100g	3.76	20.35	36.95
Ctay X	4.0	6.5	19.0	Available P pp	១៣	40	192	376
Class volation and the contract	S	SL	S. SiL	CO, m	e/1	- ND.	ND.	ND.
3 pH=H ₂ O (1:2.5) < 1 = 5	8.7	8.1	8.2	HCÖ, Sala inte	c/1	353.5	353.5	235.7
pH-KCI (1:2.5)	8.7	8.1	8.0	SO4 m	e/1	102.80	61.00	102.16
EC (1:2.5) mmho/cm	8.20	12.10	19.50	Floce, index 🖇		67.5	12.3	0
1C . 24 7 %	0.3	1.2			e/100g	<3.0	8.2	18.0
N grad % to the	0.018	0.068	,0.135	Ca(25%HCI) mi	e/100g	11.0	13.6	9.8
C/N	16.7			Mg (25%HC1) m	e/100g	8.2	29.2	56.3
CEC pH7.0 mc/100g	2.1	3.8	25.0	P (25%HCI) pp	om ,	138	424	608
Exch. Ca me/100g	4.04	5.47	5.03	P (sorption) mg	g/100g	530	1.015	1.469
Exch. Ma me/100g	2.14	6,60	14.93	Hp me	e/100g	0.07	0.08	0.04
Exch, K me/100g	0.59	2,48	5.20		44 E - 1			

 $(1,1) \in \{1,2\}$

LABORATORY DATA SHEET

Station State

Unit PtIso, Profile 31

Soil classification:	orthic Solonetz		a tha an
Agro-climatic zone:	IV	2.4	
Observation:	187/3 Kilifi district; E. 40°3',	\$. 2°59' ; 35m	
Geological formation:	Lagoonal sands and clays	and a second	
Local petrography:	Sands and clays		e di second
Physiography unit:		and the second	
Relief-macro:	Gently undulating		and the second second
Relief-meso, micro:	Nil	× •	, 1997 - Athen
Vegetation/Land use:			
Evidence of erosion:	None detected		e e le figura da esta
Surface stoniness:	Nil	6. S	and the second second
Slope gradient:	$0 \sim 2\%$		
Salinity/alkalinity:			and the second second
Surface crack:	Nil	(*)	and the second second
Internal drainage class:	Moderately well		ter to signal determine

Ap

0-10cm

10-20cm

Very dark brown (10YR 3/2 dry, 10YR 2/2 wet); loamy sand; strong, medium, crumb structure; soft when dry, friable when moist, slightly sticky and slightly plastic when wet; many fine roots; clear and smooth transition to:

AB

Dark brown (10YR 4/3 dry, 10YR 3/3 moist); sand; moderate, medium, prismatic structure; loose when dry and moist, non-plastic and non-sticky when wet; many fine roots; clear and wave transition to:

Bini	20-80cm	Brown (10YR 5/3 moist); many brown mottles; sandy clay loam; strong, medium, prismatic structure; firm when moist, sticky and plastic when wet; few, small, spherical, black manganese nodules; common medium and few fine roots; gradual and smooth transition to:

Btn₂

80-110cm⁺ Olive yellow (2.5Y 6/6 moist); few gray mottles; sandy clay loam; moterate, medium, prismatic structure; friable when moist, sticky and strong plastic when wet; few, small, spherical, black, manganese nodules:

LABORATORY DATA SHEET

Horizon	Ap Bini Bin2	ltorizon .	Ap Bin1 Bin2
Depth cm	5 50 100	Exch. Na me/100g	0.07 0.85 3.07
Bulk density g/cm ³	1.31 1.84 1.87	Base sat %	100+ 100+ / 100+
Gravel %	ND. ND. 2.3	SiO,/A1,O, mol/mol	18.57 11.69 10.39
Sand %	85.0 68.0 64.0	SiO,/R,O, mol/mol	16.75 10.18 9.08
Silt %	9.0 7.0 10.5	Fe, O, mmol/100g	8.14 16.28 17.22
Clay %	6.0 25.0 25.5	Available P ppm	101 15 35
Class	LS SCL SCL	CO, me/l	ND. ND. ND.
pH-II,O(1:2.5)	8.2 6.2 8.6	HCO, me/1	255.3 147.3 294.6
pH-KCI (1:2.5)	7.4 4.7 7.3	SO, me/1	0.08 1.72 25.70
EC (1:2.5) mmho/cm	0.12 0.20 0.8	Floce index %	68.3 28.0 25.5
C	0.7 0.3 1.3	K (25%HC1) me/100g	<3.0 <3.0 <3.0
N %	0.054 0.017 0.012	Ca (25%HC1) me/100g	80 7.8 19,8
C/N	13.0 17.6 108.3	Mg (25%HC1) me/100g	<3.0 65.0 116.0
CEC pH7.0 me/100g	6.2 11.7 .12.0	P (25%IIC1) pom	182 68 96
Exch. Ca me/100g	7.10 7.62 13.20	P (sorption) mg/100g	650 598 980
Exch. Ma me/100g	0.98 4.27 5.58	Hp me/100g	0.03 0.12 0.08
Exch. K me/100g	0.31 0.38 0.24		

-60-

Unit PtJlf, Profile 32

e e e

Soil classifie	cation:	ferric Luvisols (sodic phase)
Agro-climat	ic zone:	
Observation	l i	187/3 Kilifi district; E. 40°5', S. 2°49'; 9m
Geological f	ormation:	Lagoonal sands and clays
Local petro	graphy:	Sands and clays
Physiograph	y unit:	Lower terraces
Relief-macr	o: ,	Flat
Relief-meso	micro:	Nil
Vegetation/	Land use:	Cropland (Maize, Beans)
Evidence of	erosion:	None detected
Surface stor	iness:	
Slope gradle	nt:	0%
Salinity/alk	and the second	
Surface crac		n Nil - Charles and a state of the state of
Internal dra		Some what excessively drained
	0	
	0.0	DIACTUD ALC IN ACTUDATE IN A CONTRACT OF A
Ap	0–3cm	Red (SYR 7/6 dry, 2.5YR 4/6 moist); sand; single grain; loose when dry and moist, non-sticky and non-plastic when wet; clear and smooth transition
$(x,y) \in \mathbb{R}^{n}$		to:
an an an	a taka sa sa	
ABp -	3–20cm	Reddish yellow (SYR 6/8 moist); sand weak, medium, subangular blocky
* * [*]		structure; very friable when moist, slightly sticky and non-plastic when wet; many fine roots; clear and smooth transition to:
		wet, many fulle roots, clear and smooth transition to:
	ange de la companya d	
Bn	20120cm ⁺	Light red (2.5YR 6/8 moist); loamy sand to sandy clay loam; weak, medium,
		subangular blocky structure; very friable when moist, slightly sticky and
		non-plastic when wet; common medium roots:

LABORATORY DATA SHEET

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Horiton		AB	В	В	Horizon		AB	B	B
Depth	ന	10	30	80	Exch. Na	me/100g	0.05	0.18	0.42
Bulk density	g/cm ³	1.44	1.54	1.53	Base sat	%	100+	.100+	89.79
Gravet	%	ND.	ND.	ND.	Si0, /A1, 0,	mol/mol	11.86	10.93	8.90
Sand	%	89.0	84.5	70.0	SiO, /R, Ò,	mol/mol	10.77	9.91	7.98
Silt	%	4.8	2.5	7.5	Fe, 0,	mmol/100g	11.27	12.12	16.28
Clay	%	6.2	13.0	22.5	Available P	ppm	17	· · · · ·	4
Class		S	ાડ	SCL	CO,	me/1	ND.	ND.	ND
pH-H,O(I:	2.5)	7.0	6.6	6.0	HCO.	me/1	68.7	67.8	78.6
pH-KCI (1:	2.5)	5.1	4.4	4.0	SO,	me/1	0.16	0.83	0.30
EC (1:2.5)	mmho/cm	0.04	0.03	0.05	Floce, index	%	35.5	38.5	28.9
C	%	0.2	0.1	0.2	K (25%HCI)	me/100g	<3.0	<3.0	<3.0
N	%	0.013	0.015	0.018	Ca (25%HCI)	me/100g	<3.0	<3.0	<3.0
C/N		15.4	6.7	11.3	Mg (25%HC1)	me/100g	<3.0	<3.0	3.8
CEC pl17.0	me/100g	2.2	3.1	4.7	P (25%HCI)	ppm -	108	99	90
Exch. Ca	me/100g	1.39	1,08	1.41	P (sorption)	mg/100g	272	118	560
Exch, Ma	me/100g	0.54	1.72	1.94	Hp	me/100g	0.10	0.20	0.71
Exch. K	me/100g	0.20	0.18	0.45		-		v	0.7

--61--

Legend	Pit No.	Legend	Pit No.
HLSqf	3	PcA1qc	17 ⁻¹⁰
HLSbk	25	PcA2qf	3, 5
HO1c	26	PcA2qc	13, 17
НОЪК	25	PcA2be	23
НОЪс	24	PcA2bk	\mathbf{n}
PtJqf	3	PcA ₂ C ₁	20, 28
PtJqa	14, 15, 22	PcLqf	3
PtJqc	13	PcLe	
PtJso	1, 6, 31	PcL1c	16
PtJxk	8, 9	PcSqf	3
PtJlc	16	PcSe	29
PtJbk	11	PcJge	18
PtJC ₁	13, 14, 15, 28	PcJso	1. 19 1 6 1
PtJ'lc	16	PcJC ₁	15, 28
PrAvp	19	TA ₁ oe	30
PrAve	2, 10	TA ₁ ge	18
PrAj(e-v)	4	BAvp	19
PrAqa	21	BAso	6
PrAso	6	BAge	28
PrAC ₁	4, 10	BAC ₁	14, 28
PrA ₃ bk	27	BAC ₂	19, 28
PcAge	28	SAge	28

Pit number of data used for evaluation

-62-

Laboratory data Soil unit	ĊEC me/100g	Hp me/100g	Exch-K me/100g	Avail P ppm	P sorp. %	C %
eutric Histosols	18	0.05	4.0	289	46	1.9
pellic Vertisols	27	0.28	1.2	10	32	1.6
chromic Vertisols	36~43	0.10.2	1.1~1.3	117∿257	43∿70	0.5~1.
eutric-vertic Fluvisols	16	0.14	0,53	180	26	0.2
eutric Gleysols	2~15	0.1	0.30.6	15~16	var.	0.300.
albic Arenosols	126	0.1~0.2	0,1~0.3	4∿24	1∿3	0,201.
ferralic Arenosóls	314	0.10.4	0.420.5	28.41	224	0.200.
cambic Arenosols	1∿3	0.100.2	0.1~0.3	113	13217	0.310.
Rendzinas	9	0.1	0.7	51	30	0.7
orthic Solonetz	8v38	0.10.3	0.31.5	72 ∿36 8	24168	0.612.
calcic Xerosols	18v34	0.1	0.6~1.5	119	31240	0.30.
chromic Luvisols	13v17	0.1	0,7~2,0	53~179	10~19	0.9~1.
calcic Cambisols	29∿34	0.1	0.5~1.3	63~85	44∿58	1,5~2.
chromic Cambisols	22	0.1	1.0	70	46	2.1
eutric Cambisols	7	0.1	0.4	77	24	1.2

-63--

Converted data for evaluation (1)

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and the second	1. A. 1. A. 1. A.		1		
Laboratory data Soil unit	Ca me/100g	Mg me/100g	K me/100g	P ppm	U.S. Soil Taxonany Classification
eutric Kistosols	11	44	8	499	Tropofibrists
pellic Vertisols	18	13	4	134	Pellusterts
chromic Vertisols	40 41	81 100	20 30	var.	Chromusterts
eutric-vertic Fluvisols	48	44	11	476	Tropof luvents
eutric Gleysols	3∿16	7∿8	<3	153\156	Tropaquents
albic Arenosols	3∿7	324	<3	87∿112	Ustipsamments
ferralic Arenosols	324	316	<3	128∿168	Quartzipsamments
cambic Arenosols	var.	3~19	<3	173~400	Quartzipsamments
Rendzinas	47	7.9	<3	215	Rendolls
orthic Solonetz	var.	23∿114	var.	144∿772	Natrargids
calcic Xerosols	36∿78	33∿39	6~11	var.	Calcixeroll
chromic Luyisols	22\25	6∿10	3∿7	1940990	Paleustalfs
calcic Cambisols	62~234	17∿58	3~13	141~425	Ustropepts
chromic Cambisols	36	8.0	<3	235	Eutropepts
eutric Cambisols	6.0	4.0	<3	178	Eutropepts

Converted data for evaluation (2)

Notes

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Analysis data is converted into this data as the layer from top to 30 cm to be used for evaluation.

var variable

						· 	
·		reas of soil eros	ion resistance ci	ass by soit (kn	n ²)		
Class	Very High Resistance	High Resistance	Moderate Resistance	Slight Resistance	Very Slight Resistance	Total	
HLSqf	0	0	0	- 6.4	0	6.4	1
HLSbk	0	0.1	176.1	0	0	176.2	
HOle	0	10.5	105.7	0	0	116.2	
HObk	0	0	59.5	0	0	59.5	
HObe	0	0	5.7	0	0	5.7	
PtJof	0	0	187.3	0	0	187.3	
PtJqa	0	52.9	8.0	0	0	60.9	
PtJqc	0	0	816.6	0	0	816.6	
PtJso	0	0	340.2	0	0	340.2	1
PtJxk	0	0	137.4	0	0	137.4	
PtJlc PtJ5k	0	48.6 204.2	0 0.1	0	0	48.6 204.3	1
PtJC,	0	204.2	145.1	0	0	204.3 145.1	
PtJ'lc	0	92.0	0	0	0	92.0	
PrAvp	0	4.9	0	0	0	4.9	
PrAve	0	463.7	0,2	0	0	463.9	
PrAj(e-v)	0	0.2	119.9	Ŭ.	0 -	120.1	
PrAqa	0	0	3.6	0	· <u>Ó</u> . ·	3.6	
PrAso	0	Ó	24.1	0	0	24.1	
PrAC,	0	5 0 (1 -	23.9	Ö	0	23.9	
PrA, bk	0	143.2	27.2	0	0	170.4	
PcAge	0	0	11.3	0	0	11.3	· ·
PcA, qc	0	22.2	0	0	0	22.2	
PcA, qf	0	0	219.1	36,1	0	255.2	
PcA, qc	0	56.0	282.5	6.2	0	344.7	
PcA, be PcA, bk	0	0 8.3	136,5 0	0	0	136.5	
PcA, C,	0	8.5 0	i1.9	0	0	8.3 11.9	
PcLqf	0	0	6.6	1.2	· · 0	7.8	
PcLe	0. EF	0	56.1	0	0	56.1	
Pelle	0	14.8	0	0	0	14.8	· .
PeSqf	0	0	0	0.3	0	0.3	
PcSe	0	0	0.2	0	0	0.2	
PcJso	0	0	10.2	0	0	10,2	· .
PcJge	0	0	23.9	0	0	23.9	
PeJC,	0	0 5	13.8	0	0	13.8	
TA ₁ oe	0	0	236.0	0	0	236.0	
TA, ge	0	0	95.9	0	0	95.9	
ВАур	0	19.8	0	0	0	19.8	
BAso	0	0	0.6	0	0	0.6	
BAge	0	0	2.6	0	0	2.6	
BÁC,	U	0	10.9	0	0	10.9	
BAC, SAge	0 0	0	73.4	0	0	73.4	
TÓTAL	0	1,141.4	59.1 3,431.2	0 50.2	0	59.1 4,622.8	7
(Water 17		<u> </u> +.1+ נו	-65-	50.6	<u> </u>	7,022.0	1

1	Areas of so	oil erosion	resistance class	by soil ((km²) –

	a de proceso						
	Class Soil	Highly Suitable	Moderately Suitable	Marginally Suitable	Unsuitable	TOTAL	
	HLSqf	0	0	6.4	0	6.4	
	HLSbk	0	0	176.2	0	176.2	:
	HOle	0	0 -	116.2	0	116.2	
	HObk	0	0	59.5	Ó :	59.5	
	HObe	0	0	5.7	0	5,7	
	PtJqf	0	0	187.3	0	187.3	
	PtJqa	0	0	60.9	0	60.9	
	PtJqc	Ó	0	815.9	0.7	816.6	
	PtJso	0	51.4	156.8	132.0	340.2	
	PtJxk	0	0	117.2	20.2	137.4	
ан 1914 - Ал	PtJle	0	0	48.6	0	48.6	
	PtJbk	0	20.9	183.3	Ó.1	204,3	
	PtJC ₁	0	0:	145.1	0	145.1	
	PtJ'lc	0	. O :	92.0	0	92.0	
	РгАур	0	0	4.7	0.2	4.9	
·	PrAve	0	0.2	461.8	:1.9	463.9	
÷ .	PrAj(e v)	0	54.6	64.4	1.1	120,1	
. •	PrAqa	0	0	. 3.6	· 0	3.6	
:	PrAso	0	0 .*	21.6	2.5	24.1	
	PrAC ₁	0	0	23.5	0.4	23.9	
	PrA, bk	0	0	170.4	• 0	170.4	
	PcAge	0	0	0	11.3	11.3	
	PcA, qc	0	0 🖓	22.2	0	22.2	
	PcA, qf	0	0	245.8	9.4	255.2	
1.1	PcA, qe	0	0	321.3	23,4	344.7	· ·
	PcA, be	0	0.3	136.2	0	136,5	
	PcA, bk	0	5.9	2.4	0	8.3	1
	PcA ₂ C ₁	0	0 :	0	11.9	11.9	
	PcLqf	0	0	7.8	0	7.8	
	PcLe	0	0	0	56.1	56.1	÷.
	PcLlc	0	0	14.8	0	14.8	
	PcSqf	0	0	0.3	0	0.3	1
	PcSe	0	0	0	0.2	0.2	1 °
	PcJso	0	a 0 1 0	10.2	0	10,2	
	PcJge	0	· · · · ·	0	23.9	23.9	-
${\mathcal I}_{i,j}$	PcJC	0	0	0	13.8	13.8	· ·
. 1	TA ₁ 0e	0	0.41	0	236.0	236.0	,
	TA ₁ ge	0	0	0	95,9	95.9	- :
• •	ВАур	0	0	19.8	0	19.8	
11	BAso	0	0.6	0	0	0.6	
	BAge	0	0	0.	2.6	2.6	
${\boldsymbol u}^{(1)}$	BAC,	0	0	0	10.9	10.9	
2 - E	BAC,	0	0	0	73.4	73.4	·
i .	SAge	0	0	0	59.1	59.1	• * .
19 A	TOTAL	0	133.9	3,701.9	787.0	4,622.8	J

Areas of rainfed agriculture suitability class by soil (km²)

ter 17.2 km²) -66-(Water 17.2 km²)

	Highly Suitable	Moderately Suitable	Marginally Suitable	Unsuitable	TOTAL
HLSgf	0	0	0	6.4	6.4
HLSbk	0	0	24,6	151.6	176.2
HOle	0	0	9.1	107.1	116.2
HObk	0	Ũ	7.0	52.5	59.5
HObe	0	Ő	0.7	5.0	5.7
PtJqf	0	0	0	187.3	187.3
PtJga	Õ	0	50,1	10.8	60.9
PtJqc	0	Ŭ O	0	816.6	816.6
PtJso	Ó	0	16.6	323.6	340.2
PtJxk	0	Ó	136.8	0.6	137.4
PtJk	0	Ó	48.6	0.0	48.6
PiJbk	0	111.3	0.1	92.9	204.3
PIJC,	0	0	0.1	1. 1.	
PtJ'le	0			145.1	145.1
		0	72.4	19.6	92.0
PrAvp	0.3	4.6	0	0	4.9
PrAve D. N.C.	0	459.5	1.0	3.4	463,9
PrAj(e-v)	0	0	110.6	9.5	120.1
PrAqa	0	0	0	3,6	3.6
PrAso	0	0	0	24.1	24.1
PrAC ₁	0	23.7	0	0.2	23.9
PrA, bk	0	38.3	82.4	49.7	170.4
PcAge	0	0	0	11.3	11.3
PcA, qc	0	0	0	22.2	22.2
PcA, qf	0	0	4.8	250,4	255,2
PcA ₂ qc	0	0	0	344.7	344.7
PcA, be	0	0	0	136.5	136.5
PcA, bk	0	7.4	0	0.9	8.3
PcA ₁ C ₁	0	0	0	11.9	11.9
PcLqf	0	. 0	0	7.8	7.8
PcLe	0	0	52.1	4.0	\$6.1
Pelle	0	0	14.5	0.3	14.8
PcŠqf	0	0	0	0,3	0.3
PcSe	0	0	0	0.2	0.2
PcJso .	0	0	0	10.2	10.2
Pelge	0	0	0	23.9	23.9
PeJC,	0	0	0	13.8	13.8
TA, oe	0	0	0	236.0	236.0
TAige	0	0	0	95,9	95.9
BAvp	18,6	1.2	0	. 0	19.8
BAso	0	0	0	0.6	0.6
BAge	0	0	0	2.6	2.6
BAC	0	0	0	10.9	10.9
BAC,	0	0	0	73.4	73.4
SAge	0	0	Ŭ,	59.1	5 9.1
TOTAL	18.9	646.0	631.4	3,326,5	4,622.8
(Water 17		-6'			

Areas of irrigated agriculture suitability class by soil (km²)