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A COMPARISON OF SOIL INVENTORIES OF KENYA AT SCALES 1:5M (FAO SOIL MAP OF THE WORLD) AND 1:1M (KENSOTER)

LAND SUITABILITY FOR GRAVITY IRRIGATION OF PADDY RICE AND UPLAND CROPS IN KENYA

SOIL MAP OF KENYA AT A SCALE OF 1:5M

DRAFT, JUNE 1995

By: E.J. Van Waveren

Land and Water Development Division
Food and Agriculture Organization of the United Nations

The conclusions given in this report are considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

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TERMS OF REFERENCE

The production of a report that (i) Compares the basic soil inventory of Kenya as produced by the UNEP/ISRIC SOTER (Soil and Terrain Database) exercise that was recently completed at a scale of 1:1M with the FAO/Unesco Soil Map of the country at a scale of 1:5M. Differences and similarities in terms of soil types and soil and landform characteristics between these two inventories should be highlighted, particularly in view of an evaluation for irrigated crops in the country;
(ii) contains an evaluation of the soil and terrain suitability for gravity irrigation for paddy rice and upland crops;
(iii) includes an updated 1:5M Soil Map of Kenya (print).

E.J. Van Waveren, 1995. *A Comparison of Soil Inventories of Kenya at Scales 1:5M (FAO Soil Map of the World) and 1:1M (KENSOTER); Land Suitability for Gravity Irrigation of Paddy Rice and Upland Crops; Soil Map of Kenya at a Scale of 1:5M.* Land and Water Development Division. Food and Agriculture Organization of the United Nations. 129 pp., 17 Tables, 2 Appendices, 1 Annex, 1 Map. (DRAFT).

ABSTRACT

The soil and terrain information of the 1:5M FAO Soil Map of Kenya was compared with the information as provided by the 1:1M KENSOTER database. The soil unit distributions, slope class distributions and textural class distributions were compared at a national level and at a 1:5M mapping unit level. Attention was also paid to differences between the physiographic and lithologic characterizations of the mapping units according to the two datasets.

A land evaluation for irrigated crops was carried out on basis of the 1:1M KENSOTER dataset and the results were compared with the land suitability information for Kenya determined on basis of the 1:5M Soil Map. Again comparisons were made at national level and at mapping unit level.

A 1:5M soil map of Kenya was produced on basis of the available 1:1M KENSOTER database. The map was produced in digital format, and includes an attribute database which provides selected soil and terrain characteristics of each soil unit and KENSOTER unit per mapping unit, and links to the KENSOTER databases.

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- Ms. Jacqueline Resink (ISRIC) for data processing in Arc/Info and production of the printed 1:5M Soil Map of Kenya
- Mr. Vincent Van Engelen (ISRIC) for background information on (KEN)SOTER and valuable advice on soils in Kenya

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SUITRICE.DBF	Land suitability for gravity irrigated paddy rice per Soil Map of the World mapping unit based on the KENSOTER dataset
KEN5SOIL.DBF	KENSOTER soil component information per mapping unit of the revised 1:5M Soil Map of Kenya
KEN5UNIT.DBF	Aggregated soil and terrain information per soil unit of the revised 1:5M Soil Map of Kenya

IDRISI Image Files:

KENYA1M2.IMG	KENSOTER mapping unit (1:1M)
KENSOTID.IMG	KENSOTER polygons
KENYAR5M.DBF	Revised 1:5M Soil Map of Kenya

See the image documentation files (*.DOC) for further specifications on the image files

CONCLUSIONS

Soil and Terrain Inventory

On basis of the results of the comparative study on the soil and terrain characteristics of Kenya as derived from the 1:5M FAO Soil Map of the World and the 1:1M Soil and Terrain Inventory of Kenya (KENSOTER) the following major conclusions can be drawn:

1 The Soil Map of the World covers the range of FAO soil groups that occur in Kenya, with Phaeozems as an important exception.

2 The proportional and geographical distributions of the soil groups and soil units as indicated on the Soil Map of the World do not correspond well with the 1:1 M dataset. Major discrepancies are:

   The occurrence of Solonetz, Cambisols, Planosols, Arenosols, and Ferralsols in Kenya has been considerably underestimated on the Soil Map of the World.

   The occurrence of Lithosols, Luvisols, Xerosols, Yermosols, and Solonchaks in Kenya has been substantially overestimated on the Soil Map of the World.

   The geographic distributions of Solonetz, Ferralsols, Luvisols, Planosols, and Arenosols in Kenya differ significantly from the distributions as indicated on the Soil Map of the World.

3 The dominant slope gradients of the soil units have been considerably overestimated on the Soil Map of The World.

4 The soil texture of a large proportion of the soil units is incorrectly indicated on the Soil Map of the World.

Land Suitability Assessment

A comparison of the land suitability assessments for irrigated crops on basis of the 1:5M Soil Map of the World and the 1:1M KENSOTER databases showed that:

6 The evaluation results on basis of the Soil Map of the World are inaccurate at mapping unit level. In consequence of this the geographic distribution of suitable land for irrigation in Kenya as mapped on basis of the Soil Map of World is also largely incorrect.

7 The evaluation on basis of the Soil Map of the World results in an overestimation of the total area of suitable land for irrigated upland crops and an underestimation of the total area of suitable land for paddy rice.

8 The land evaluation results derived from the Soil Map of the World can not be improved by systematic corrections. In order to provide more accurate land suitability assessments, updating of the soil and terrain information of the Soil Map of the World is essential.

INTRODUCTION

The terms of reference of this contract essentially specify two separate exercises:

(i) An assessment of the reliability of the soil and physiographic information at a scale of 1:5M for Kenya as provided by the FAO Soil Map of the World (FAO/Unesco, 1977), including an assessment of the accuracy of the land suitability information which was determined on basis of this soil and terrain information.

(ii) The construction of an updated soil map of Kenya at a scale of 1:5M.

The detailed soil and terrain information required for both exercises was provided by the Soil and Terrain Inventory of Kenya (KENSOTER) at a scale of 1:1M. This digital database has recently been developed by the Kenya Soil Survey following the UNEP/ISRIC SOTER prodedures (Kenya Soil Survey, 1995).

Full descriptions of the 1:5M and 1:1M databases used in study are given in Chapter 1. This Chapter also includes a section on soil classification aspects related to the correlation of the FAO/Unesco (1974) Legend of the Soil Map of the World with the revised FAO (1990) Legend, which has been applied in KENSOTER.

The availability of the Soil Map of the World and the KENSOTER database in digital formats facilitated a detailed comparison of soil types, and soil and terrain characteristics. The results are presented in Chapter 2.

To determine the accuracy of the land suitability assessments for Kenya based on the 1:5M Soil Map of the World, a land evaluation for irrigated upland crops and paddy rice was carried on basis of the 1:1M KENSOTER database and compared to the available land suitability information for Kenya at a scale 1:5M (Nachtergaele, 1995). The results are documented in Chapter 3.

The updated soil map of Kenya was constructed on basis of the 1:1M KENSOTER dataset, using the FAO revised Legend to the Soil Map of the World (1990). A physiographic approach was used to aggregate the KENSOTER polygons into the revised 1:5M mapping units. The updated soil map includes attribute files with aggregated soil and terrain characteristics per soil unit and with selected information on each of the KENSOTER units included in the mapping unit.
These datafiles are also linked to the KENSOTER databases, which provides access to the detailed soil unit, soil profile and terrain information of the KENSOTER database. The revised soil map at a scale of 1:5M is described in Chapter 4. This Chapter also includes a description of the mapping units.

It must be realized that KENSOTER is still in development and that in particular the soil components have not yet been fully defined for all KENSOTER units. However, when required the attribute files of the revised 1:5M soil map can easily be updated through the link with the KENSOTER databases.

LIST OF CODES

List of soil unit, phase, slope class and textural class codes used in this report

FAO (1974) Soil Units

A	Acricols	
Af		Ferric
Ag		Gleyic
Ah		Humic
Ao		Orthic
Ap		Plintic
B	Cambisols	
Bc		Chromic
Bd		Dystric
Be		Eutric
Bf		Ferralic
Bg		Gleyic
Bh		Humic
Bk		Calcic
Bv		Vertic
C	Chernozem	
Ch		Haplic
Ck		Calcic
E	Rendzina	
F	Ferralsol	
Fh		Humic
Fo		Orthic
Fr		Rhodic
Fx		Xanthic
G	Gleysol	
Gc		Calcaric
Gd		Dystric
Ge		Eutric
Gh		Humic
Gm		Mollic
Gp		Plinthic
H	Phaeozems	
Hg		Gleyic
Hh		Haplic
Hl		Luvic
I	Lithosols	
J	Fluvisols	
Jc		Calcaric
Jd		Dystric
Je		Eutric
Jt		Thionic
K	Kastanozems	
Kh		Haplic
L	Luvisols	
Lc		Chromic
Lf		Ferric
Lg		Gleyic
Lk		Calcic
Lo		Orthic
Lp		Plintic
Lv		Vertic
M	Greyzems	
Mg		Gleyic
Mo		Orthic
N	Nitosols	
Nd		Dystric
Ne		Eutric
Nh		Humic
O	Histosols	
Od		Dystric
Oe		Eutric
Q	Arenosols	
Qa		Albic
Qc		Cambic
Qf		Ferralic
Ql		Luvic
R	Regosols	
Rc		Calcaric
Rd		Dystric
Re		Eutric
S	Solonetz	
Sg		Gleyic
Sk		Calcic
Sm		Mollic
So		Orthic
T	Andosols	
Th		Humic
Tm		Mollic
To		Orthic
U	Rankers	
V	Vertisols	
Vc		Chromic
Vp		Pellic
W	Planosols	
Wd		Dystric
We		Eutric
Wh		Humic
Ws		Solodic
X	Xerosols	
Xe		Eutric
Xh		Haplic
Xk		Calcic
Xl		Luvic
Xy		Gypsic
Y	Yermosols	
Yh		Haplic
Yk		Calcic
Z	Solonchaks	
Zg		Gleyic
Zo		Orthic
Zt		Takyric

FAO 1990 Soil Units

AC	Acrisols	
ACf		Ferric
ACh		Haplic
ACp		Plintic
ACu		Humic
AL	Alisols	
ALh		Haplic
AN	Andosols	
ANh		Haplic
ANm		Mollic
ANu		Humic
AR	Arenosols	
ARb		Cambic
ARh		Haplic
ARl		Luvic
ARo		Ferralic
CH	Chernozems	
CHh		Haplic
CHk		Calcic
CL	Calcisols	
CLh		Haplic
CLl		Luvic
CLp		Plinthic
CM	Cambisols	
CMc		Calcaric
CMd		Dystric
CMe		Eutric
CMg		Gleyic
CMo		Ferralic
CMu		Humic
CMv		Vertic
CMx		Chromic
FL	Fluvisols	
FLc		Calcaric
FLe		Eutric
FLt		Thionic
FR	Ferralsols	
FRh		Haplic
FRr		Rhodic
FRu		Humic
FRx		Xanthic
GL	Gleysols	
GLd		Dystric

GLe		Eutric
GLm		Mollic
GR	Greyzems	
GRh		Haplic
GY	Gypsisols	
GYk		Calcic
HS	Histosols	
HSs		Terric
KS	Kastanozems	
KSh		Haplic
LP	Leptosols	
LPd		Dystric
LPe		Eutric
LPm		Mollic
LPq		Lithic
LPu		Humic
LV	Luvisols	
LVf		Ferric
LVg		Gleyic
LVh		Haplic
LVk		Calcic
LVv		Vertic
LVx		Chromic
LX	Lixisols	
LXf		Ferric
LXh		Haplic
NT	Nitisols	
NTh		Haplic
NTr		Rhodic
NTu		Humic
PH	Phaeozems	
PHh		Haplic
PHl		Luvic
PL	Planosols	
PLd		Dystric
PLe		Eutric
PLu		Humic
RG	Regosols	
RGc		Calcaric
RGd		Dystric
SC	Solonchaks	
SCg		Gleyic
SCh		Haplic
SCk		Calcic
SCn		Sodic
SN	Solonetz	
SNg		Gleyic
SNh		Haplic
SNk		Calcic
SNm		Mollic
VR	Vertisols	
VRd		Dystric
VRe		Eutric

<u>Phases</u>

st	stony
ru	rudic
li	lithic
pe	petric
sk	skeletic
pc	petrocalcic
pg	petrogypsic
pf	petroferric
fr	fragipan
sa	saline
so	sodic
ta	takyric
ye	yermic

<u>Slope Classes</u>

a	0 - 8%
a1	0 - 2%
a2	2 - 8%
b	8 - 30%
b1	8 - 16%
b2	16 - 30%
c	> 30%

<u>Textural Classes</u>

1 or C	Coarse
2 or M	Medium
3 or F	Fine

CHAPTER 1. DATABASES

1.1. Soil Map of The World Database at a Scale of 1:5M.

The spatial information was provided by the rasterized version of the digitized Soil Map of the World (SMW). The tabular mapping unit information (attributes) was provided by the expansion file AFRIC1.DAT.

Spatial Information

The rasterized spatial information of the SMW is stored in a binary file named WRLDBIN1.IMG dated 10.03.95. The raster base has a resolution of 5' x 5'. To allow processing of this image file with IDRISI a documentation file WRLDBIN1.DOC was defined with the following specifications:

Datatype	:	integer
Filetype	:	binary
Columns	:	4320
Rows	:	2160
Ref.system	:	lat/long
Ref.units	:	deg(rees)
Resolution	:	0.0833333 (automatically calculated)
Min.X	:	-180
Max.X	:	+180
Min.Y	:	-90
Max.Y	:	+90

Because this SMW image does not delineate the individual countries, a 1:5M image of Kenya with the same resolution was extracted from this image using the country delineation from the KENSOTER map. This resulted in an image of Kenya with the following specifications:

Datatype	:	integer
Filetype	:	binary
Columns	:	96
Rows	:	120
Ref.system	:	lat/long
Ref.units	:	deg(rees)
Resolution	:	0.0833333 (automatically calculated)
Min.X	:	34
Max.X	:	42
Min.Y	:	-5
Max.Y	:	+5

The limited number of rows and columns already indicates that the 5' (0.083333 x 1 degree) resolution, which is appropriate for global studies, is very low for studies at a national level of countries the size of Kenya, with each pixel representing an area of approximately 9.3 x 9.3 km on the equator.

Mapping unit Information

A total of 76 SMW units, including an inland water unit, have been mapped for Kenya. A list of the mapping units, with their areal coverage and composition of the soil associations is given in Table 2. Full information including the slope and textural classification, is given in the Annex to this report.

Out of the 76 mapping units only 71 are represented on the raster image. Due to the low resolution the five smallest mapping units are excluded. These units are: Rc20-ab, Xh15-3a, Ne17-2/3c, Ne39-2a, and Nh2-2/3c.

The attribute data, as stored in the expansion file to the SMW, includes classified soil and physiographic information according to the Legend to the Soil Map of The World (FAO/Unesco, 1974), and the areal coverage of the units. This mapping unit information is organized by country. The original expansion file has an ASCII format, and to allow for further data manipulation the file was converted into a Dbase format with a field structure similar to the ASCII file. The structure of this file in given in Table 1.

Table 1. Structure of SMW Attribute File (KENYA5M.DBF)

	Field Name	Type	Width	Dec	Description
1	ID	num	2	0	IDRISI mapping unit ID (0,,76)
2	COUNTRYCOD	num	3	0	country code
3	COUNTRY	char	20		country name
4	UNITCODE	num	5	0	mapping unit number
5	MAPUNIT	char	20		mapping unit code
6	PHASE1	char	2		dominant phase
7	PHASE2	char	2		subordinate phase
8	MISCLU1	char	1		
9	TOTALAREA	num	6	0	total area of mapping unit in km2
10	PROPAREA	num	7	3	proportional area in country (%)
For each soil unit in the mapping unit association (up to 8) the following fields (n= 1,,8)					
	SOILUNITn	char	2		soil unit code
	AREAn	num	3	0	% of mapping unit association
	UNITn_1A	num	3	0	% with texture class 1 and slope class a
	UNITn_1B	num	3	0	% with texture class 1 and slope class b
	UNITn_1C	num	3	0	% with texture class 1 and slope class c
	UNITn_2A	num	3	0	% with texture class 2 and slope class a
	UNITn_2B	num	3	0	% with texture class 2 and slope class b
	UNITn_2B	num	3	0	% with texture class 2 and slope class c
	UNITn_3A	num	3	0	% with texture class 3 and slope class a
	UNITn_3B	num	3	0	% with texture class 3 and slope class b
	UNITn_3C	num	3	0	% with texture class 3 and slope class c
	UNITn_NO	num	3	0	% with unclassified texture or slope

Table 2. Soil Map of the World. Composition of Mapping Units in Kenya

Id	Mapping unit	Area		Dominant Soil Unit		Co-dominant, Associated and Included Soil Units									
		km2	%	unit	%	unit	%	unit	%	unit	%	unit	%	unit	%
1	Be49-3c	679	0.1	Be st	50	Ao	20	I	20	Vp	10				
2	Fo48-2ab	5742	1	Fo	50	Fp	30	Ap	10	Vc	10				
3	Gh7-2a	5692	1	Gh	60	Od	30	Je	10		0				
4	Gm15-2a	993	0.2	Gm	40	Je	20	Oe	20	Ge	10	Vc	10		
5	I-R	19674	3.3	I	50	RO	50								
6	I-R-bc	24604	4.2	I st	50	RO	50								
7	I-Re-3a	9135	1.5	I sa	50	Re	50								
8	I-V	1377	0.2	I	50	V	50								
9	I-c	1778	0.3	I											
10	Jc6-2a	2159	0.4	Jc	50	Zo	30	Oe	10	Re	10				
11	Lf18-2a	1349	0.2	Lf li	70	Re	30								
12	Ne12-2c	4032	0.7	Ne	50	Be	30	I	10	Vp	10				
13	Qc19-1c	311	0.1	Qc li	80	Qa	10	Re	10						
14	Qc8-1a	8613	1.5	Qc	70	Ge	30		0						
15	Qc9-1b	477	0.1	Qc	60	Ge	20	I	20						
16	Rc2-3c	1221	0.2	Rc li	50	I	30	Jc	10	Xh	10				
17	Rc20-ab	32	0	Rc li	90	Jc	10								
18	Rc22-2b	22989	3.9	Rc li	30	I	20	Jc	20	Je	10	Qc	10	Zo	10
19	Re59-2c	5733	1	Re li	80	I	10	Je	10						
20	Re59-a	16788	2.8	Re li	80	I	10	Je	10						
21	Re63-2c	15561	2.6	Re li	60	I	30	Je	10						
22	Vc34-3a	5036	0.9	Vc	50	Ge	30	Lf	10	Re	10				
23	Xh15-3a	276	0	Xh	60	Jc	20	Xk	20						
24	Xk19-2a	6701	1.1	Xk	90	Zo	10								
25	Yh17-2c	1371	0.2	Yh li	50	I	30	Je	10	Vc	10				
26	Yh19-2a	53459	9	Yh	50	Zo	30	I	10	Re	10				
27	Yh20-2b	35554	6	Yh	50	Xl	30	Jc	10	Re	10				
28	Yk2-3a	18412	3.1	Yk pc	80	I	10	Vc	10						
29	Zo9-3a	37292	6.3	Zo so	40	So	30	Jc	10	X	10	Zg	10		
30	Qc20-1a	1526	0.3	Qc	35	Re	15	DS	50						
31	Af32-1/2a	579	0.1	Af li	40	Ap	30	Gp	10	I	10	Vp	10		

Id	Mapping unit	Area		Dominant Soil Unit		Co-dominant, Associated and Included Soil Units									
		km2	%	unit	%	unit	%	unit	%	unit	%	unit	%	unit	%
32	Bc14-2bc	10313	1.7	Bc st	50	I	20	Rd	20	Ap	10				
33	Bc15-2ab	1714	0.3	Bc pc	60	Be	30	I	10						
34	Bh14-3c	737	0.1	Bh	40	Ne	30	I	10	Je	10	O	10		
35	Bk25-2a	6960	1.2	Bk	50	Be	30	Vp	10	We	10				
36	Bk31-2a	2232	0.4	Bk	60	Be	30	Vp	10						
37	Fo34-3a	3940	0.7	Fo pe	60	Vc	30	Re	10						
38	Fo42-2b	117	0	Fo	30	Af	20	N	20	I	10	Je	10	O	10
39	Fo43-2b	3326	0.6	Fo	30	Af	20	Fx	20	I	10	Je	10	O	10
40	Fo47-2ab	3564	0.6	Fo	50	Ap	20	Fx	20	Gp	10				
41	Fo49-2a	3512	0.6	Fo	60	Fp	30	Gp	10						
42	Fo50-2a	169	0	Fo	80	Ap	10	Vp	10						
43	Fp10-2a	285	0	Fp	50	So	20	Vp	20	Gp	10				
44	Fr7-2a	5906	1	Fr	60	Fo	30	Vp	10						
45	Fr9-2a	4749	0.8	Fr	50	Fo	30	Gp	10	Vp	10				
46	G7-2a	148	0	G	60	Jd	30	Z	10						
47	I-A-R-bc	834	0.1	I st	34	A	33	RO	33						
48	I-Bk-R-bc	4454	0.8	I st	34	Bk	33	RO	33						
49	I-R	7360	1.2	I st	50	RO	50								
50	I-Re-T-c	219	0	I st	34	Re	33	T	33						
51	I-U-c	1917	0.3	I	50	U	50								
52	I-V-b	4515	0.8	I	50	V	50								
53	Lf17-2ab	93338	15.8	Lf	80	I	10	Zo	10						
54	Lf86-2a	16871	2.9	Lf	70	Vp	30								
55	Nd37-2/3ab	306	0.1	Nd	50	Fo	20	Lf	20	I	10				
56	Ne17-2/3c	19	0	Ne	60	Nd	30	I	10						
57	Ne29-2bc	2423	0.4	Ne	90	We	10								
58	Ne30-2ab	3525	0.6	Ne	50	Fo	30	Ap	10	Gp	10				
59	Ne31-2ab	7133	1.2	Ne	80	I	10	Vp	10						
60	Ne38-2ab	279	0	Ne	50	Bc	30	I	10	Vp	10				
61	Ne39-2a	151	0	Ne pc	50	Bk	30	E	10	I	10				
62	Nh2-2/3c	38	0	Nh	50	Th	30	I	10	O	10				
63	Nh2-2c	20125	3.4	Nh	50	Th	30	I	10	O	10				
64	Qc30-1/2a	237	0	Qc	30	Af	20	Qf	20	I	10	Je	10	Vp	10
65	Qc37-1a	8041	1.4	Qc	40	Af	20	Qf	20	I	10	Vp	10		

Id	Mapping unit	Area		Dominant Soil Unit		Co-dominant, Associated and Included Soil Units									
		km2	%	unit	%	unit	%	unit	%	unit	%	unit	%	unit	%
66	Qf35-1/2bc	6783	1.1	Qf	50	Af	30	Ap	10	Gp	10				
67	Tm10-2bc	3812	0.6	Tm	60	Ne	30	Ge	10						
68	Tm11-1/2ab	2484	0.4	Tm	70	To	30								
69	Tm9-2c	4028	0.7	Tm	50	I	30	Je	10	O	10				
70	To7-2/3a	603	0.1	To	50	Bc	20	Tv	20	I	10				
71	Vc39-3a	780	0.1	Vc	90	Vp	10								
72	Vp45-2/3a	7699	1.3	Vp	50	Be	20	Vc	20	I	10				
73	Vp49-3a	4356	0.7	Vp so	60	Go	30	Je	10						
74	We4-2a	2229	0.4	We	60	Gp	30	Fo	10						
75	X7-2ab	18381	3.1	X	30	Re	20	Y	20	Jc	10	Xk	10	Zo	10
76	WATER	11773	2												

1.2. KENSOTER Database at a Scale of 1:1M

The KENSOTER database provided the 1:1M soil and terrain data set required for this study. KENSOTER comprises spatial information of the SOTER units at scale 1:1M and the attribute data files.

Spatial Information

The KENSOTER map is essentially an update of the Exploratory Soil Map of Kenya (ESMK) at scale 1:1M (Sombroek, Braun & Van Der Pouw, 1980). A small number of additional mapping units have been defined and the boundaries of few ESMK units have been modified. The delineations of the KENSOTER mapping units therefore largely coincide with the unit boundaries on the ESMK.

For this study a rasterized version the KENSOTER map with a 1' resolution was used. The image has the following specifications:

Datatype	:	integer
Filetype	:	binary
Columns	:	480
Rows	:	600
Ref.system	:	lat/long
Ref.units	:	deg(rees)
Resolution	:	0.016667 (automatically calculated)
Min.X	:	34
Max.X	:	42
Min.Y	:	-5
Max.Y	:	+5

Initially, the KENSOTER map was rasterized with a 5' resolution similar to the image resolution of the Soil Map of the World. However, it was found that this low resolution resulted in too much loss of information. Particularly the narrow, elongated units tend to disappear on such low resolution raster bases and these units often represent alluvial deposits, which are of particular importance for land evaluation for irrigation.

Mapping unit Information

The non-spatial KENSOTER database is structured according to the SOTER Procedures Manual (Van Engelen & Wen, 1995) whereby the SOTER unit is defined by one or more terrain components, and each terrain component in turn consists of one or more soil components.

The database includes a number of interlinked, but physically separate datafiles:

TERRAIN.DBF	General terrain information of SOTER unit
TERRCOMP.DBF	List of terrain components and their proportional area per SOTER unit.
TCDATA.DBF	Specific terrain component information
SOILCOMP.DBF	Proportion of each soil component within a SOTER unit/terrain component combination and its position within the terrain component.
PROFILE.DBF	General information of reference soil profiles
HORIZON.DBF	Horizon descriptions and measured data of each reference soil profile

The KENSOTER database consists of 397 KENSOTER (map) units, excluding water bodies and towns/cities. Most of these KENSOTER units have not been further subdivided on basis of terrain components. About one third of the KENSOTER units includes more than one soil component. This results in a total of unique 553 KENSOTER unit/terrain component/soil component combinations.

The non-spatial KENSOTER database is still in development. For this study the April 1995 version was used (Kenya Soil Survey, 1995).

Regarding the data quality of the KENSOTER version used, the following general remarks can be made:

Soil components in KENSOTER are defined by a single reference profile, which supposedly represents the modal values of the soil attributes of this soil component. Information on the variability of soil attributes within the KENSOTER units is scarcely available as the minimum and maximum measured values of the soil attributes are at present only available for a few units. This present setup makes KENSOTER very sensitive to the quality of the soil profile information, as the soil characterization of large areas of land, the minimum size of a SOTER unit at scale 1:1M is 25km2, may completely depend on a single soil profile description.

The information of 40% of the soil components was found to be incomplete, often because no reference profile has been assigned to the soil component. Most of the

SOTER units with incompletely described soil components are found in parts of Kenya which have not been systematically surveyed, and for which soil profile descriptions might not be available. Missing information includes relevant soil characteristics for the land evaluation procedure applied in this study, such as the soil classification and soil texture.

The total proportional area of soil components in KENSOTER units was not always 100%, often due to undefined soil components.

The soil classification of a number of reference profiles was found not to be in accordance with the profile information.

The classification of the general lithology is inconsistent and in some cases clearly erroneous. For example, alluvial units are often not classified as alluvium, and Basement System rock is classified in many cases as granite, rather than gneiss.

Where possible, errors in the classification of the soil and terrain characteristics which are essential for this study were corrected. The 1:1M Exploratory Soil Map of Kenya (ESMK) was used to complete the soil classification and textural information of the soil components in the KENSOTER database.

For practical purposes all relevant information per SOTER unit/terrain component/soil component combination was stored in a single datafile UNIT1M.DBF. This datafile contains the following fields:

Soter unit identifier
Terrain component identifier
Soil component identifier
FAO 1974 classification and phase
FAO 1990 classification and phase
Position of the soil component
Rock outcrop class
Surface stoniness
Soil depth
Drainage
Slope gradient (%)
Slope gradient class
Textural class of upper 30cm of the soil
Flag indicating the source of soil information (KENSOTER or ESMK)

Selected fields of this file are listed in Appendix 1.

Soil Classification

The KENSOTER database uses the revised FAO legend (1990). However the classification of a large part of the soil components has not been completed yet. For this study, the revised FAO classification and textural characteristics of these incomplete SOTER soil components were extrapolated from available KENSOTER information on comparable soil components and the information of corresponding units of the ESMK. On basis of the available information the following general guidelines were applied for the classification of Luvisols, Lixisols, Acrisols, Alisols, Calcisols, and gleyic and stagnic properties. It must be emphasized that these guidelines refer specifically to Kenya and are not necessarily applicable in a wider context.

Luvisols, Lixisols, Acrisols and Alisols.

Chromic, Orthic, Gleyic and Vertic Luvisols remain Luvisols in the revised FAO legend. Available information on soil components classified as Chromic Luvisol, Orthic Luvisol, Gleyic Luvisol, or Vertic Luvisol shows that most of these soils have CEC's of more than 24 cmol/kg clay.

Ferric and Plinthic Luvisols are classified as Lixisols in the Revised FAO legend. The available KENSOTER information on the soil components classified as Ferric Luvisol or Plinthic Luvisol shows that these soils have a low CEC of less than 24 cmol/kg clay.

Ferric, Humic and Plinthic Acrisols are also considered Acrisols in the revised FAO legend. The available information on the soil components classified as Plinthic, Humic or Ferric Acrisol shows that these soils have low a CEC of less than 24 cmol/kg clay.

Orthic Acrisols are also considered Acrisols in the revised FAO classification. The available information on the soil components classified as Orthic Acrisol shows that 70% of these soils have a low CEC of less than 24 cmol/kg clay.

Gleyic and stagnic properties. It was decided that all soil components which have gleyic properties according to the ESMK, are considered to have gleyic properties in the revised classification system, unless the available terrain component information gives sufficiently strong indications that stagnic properties are more appropriate.

Calcisols and calcic soils. Calcisols were classified according to the following guidelines:

> Soil components classified as Calcic Cambisols by the 1974 classification system were classified as: Petric Calcisols when, according to the ESMK, a petrocalcic horizon is present within 100 cm of the surface; As Eutric Leptosols when according to the ESMK the soil components are less than 30 cm deep, or are having less than 20% of fine earth over a depth of 75 cm from the surface; Or otherwise as Haplic Calcisols.
>
> Soil components classified as Calcic Luvisols by the 1974 classification system were classified as: Petric Calcisols when, according to the ESMK, a petrocalcic horizon is present within 100 cm of the surface; or as Luvic Calcisols when the ESMK indicates the presence of a calcareous argillic horizon; or otherwise as Calcic Luvisols.
>
> Soil components classified as Calcic Xerosols by the 1974 classification system were classified as Haplic Calcisols.

To allow the comparison of the soil SMW and the KENSOTER datasets, all soil components also had to be classified according to the FAO/Unesco 1974 legend. For soil components with insufficient data the information of the corresponding ESMK soil units was used.

The ESMK soil classification system is a slightly modified version of the FAO/Unesco 1974 legend. The modifications are summarized in Box 1. The FAO/Unesco (1974) classification of the ESMK units was obtained on basis of the following rules:

All Nitisols were classified as Nitosols, except Mollic Nitisols which key out as Luvic Phaeozems.

Very deep, Niti-chromic Luvisols were classified as Eutric Nitosols.

Cambic and Orthic Rendzinas were classified as Rendzinas.

Vertic Gleysols were classified as Mollic, Humic, Calcaric, Dystric or Eutric Gleysols.

Chromic Acrisols were classified as Orthic Acrisols.

Calcic, Chromic and Ferric Luvisols with an aridic moisture regime were classified as Luvic Xerosols.

Box 1. ESMK Legend. Summary of Modifications Made to the FAO/Unesco Legend (Sombroek, Braun & Van Der Pouw, 1980).

Diagnostic Properties:

Ferric Properties. The definition of ferric properties has been narrowed down. Ferric properties require:

- Many coarse mottles with hues redder than 7.5YR or chromas more than 5, or both;
- And/or discrete nodules, up to 2 cm in diameter, the exteriors of the nodules being enriched and weakly cemented or indurated with iron and having redder hues or stronger chromas than the exterior

Consequently, contrary to the FAO/Unesco Legend, ferric properties have not been classified on basis of a low CEC (of less than 24 me/100 gr clay) only.

Vertic properties. The use of vertic properties has been widened and Vertic Gleysols were introduced.

Major Soil Groups:

Lithosols. The depth limitation of Lithosols has been set to 25cm.

Nitosols. The Nitosols have been replaced by more narrowly defined Nitisols with the following characteristics:
- An argillic B horizon with a high clay content (more than 40%) and a moderately low silt percentage (silt/clay ratio less than 0.35); the requirements of sufficient clay increase within a vertical distance of 30 cm may be waived if all of the following characteristics are present:
- A gentle clay bulge extending beyond 150 cm depth and only a gradual increase in clay percentage from A to B horizon (ratio B/A usually between 1.0 and 1.2);
- Many shiny ped faces, especially in the deeper B horizon (more than 10% of the surface area), which can only partly be ascribed to illuviation argillans.
- Moderately to strongly developed, very fine to medium, angular blocky structure;
- Very friable or friable when moist
- High aggregate stability (practically no water dispersable clay in horizons with low organic matter content)
- Clay activity of less than 24 me/100g

Xerosols/Yermosols. The following guidelines have been used regarding the classification of Xerosols/Yermosols:
- The distribution of the Xerosols and Yermosols has been restricted to the arid areas in the northeast and northwest of Kenya
- Soils with a decalcified argillic B horizon and/or ferralic properties have been excluded from the Xerosols/Yermosols.
- No distinction has been made between Xerosols and Yermosols and both were grouped as Xerosols.

Ironstone Soils have been introduced and include all soils with a massive ironstone layer within 50cm.

Soil Units:

Cambic and *Orthic Rendzinas* have been distinguished. Cambic Rendzinas are those Rendzinas that have less than 5% calcium carbonate in the surface horizons, while Orthic Rendzinas comprise all other Rendzinas.

Mollic Nitisols. Mollic Nitisols have been introduced as a new soil unit.

Vertic Gleysols. Vertic Gleysols have been introduced as a new soil unit

Chromic Acrisols, Chromic Luvisols, Chromic Cambisols. Chromic Acrisols have been introduced as new soil unit. Also the definition of Chromic has been modified and refers to red B horizons with a hue of 5YR and a chroma of more than 4, or a hue redder than 5YR.

CHAPTER 2. COMPARISON OF THE SOIL AND TERRAIN INVENTORIES

2.1. Method

The 1:5M SMW and 1:1M KENSOTER datasets were compared at a national level and at the SMW map unit level, in order to obtain information on differences in both the proportional distribution and the geographical distribution of soil and terrain characteristics. The FAO/Unesco 1974 soil classification was used to compare the soil resource information.

The comparison at SMW mapping unit level required information on the distribution of SOTER units per SMW mapping unit. This information was obtained by superimposing the KENSOTER image on the SMW image.

To allow the overlay of the two themes, the 5' resolution of the SMW image first had to be transformed into a 1' resolution similar to the KENSOTER image. The overlay resulted in a new image with 1790 unique SMW-KENSOTER unit combinations. To reduce the 'noise' this image was filtered twice using a mode filter which resulted in a final image with 1474 SMW - KENSOTER combinations. This image was used to prepare a table with the SOTER unit distribution per SMW mapping unit.

On basis of the distribution table a datafile was generated with the KENSOTER soil components and their terrain and soil characteristics for each SMW mapping unit. This datafile provided the required information for the comparative study, of which the results are summarized and discussed in this Chapter. The Annex to this report gives detailed information in tabular format on the soil unit distribution, and slope and textural distribution according to the two datasets per SMW mapping unit. For practical reasons KENSOTER soil components with a proportional coverage of less than 1% of the SMW mapping unit are not included.

2.2. Soil and Terrain Information at National Level

Soil Unit Classification

The proportional distributions of the major soil groups in Kenya according to the SMW and the KENSOTER map are given in Table 3. The proportional distributions of the soil units are listed in Table 4. The tables show considerable differences in proportional and geographical distribution of the major soil groups and the soil units between the two datasets.

KENSOTER indicates that the total areas of Solonetz, Cambisols, Planosols, Arenosols and Ferralsols in Kenya are considerably larger than suggested on the SMW. While on the other hand the total areas of Lithosols, Luvisols, Xerosols and Yermosols, and Solonchaks are substantially overestimated on the SMW. Phaeozems have not been mapped on the SMW, but occur extensively in Kenya according to KENSOTER.

Table 3. Proportional Distributions of FAO Soil Groups (1974) in Kenya According to the SMW and KENSOTER

Major Soil Grouping	1:5M %	1:5M '000 km2	1:1M %	1:1M '000 km2
Acrisols (A)	1.5	9	2.1	12
Cambisols (B)	3.4	19	8.5	48
Chernozems (C)	-		0.1	1
Rendzinas (E)	-		0.2	1
Ferralsols (F)	4.4	25	7.2	41
Gleysols (G)	2.1	12	1.7	10
Phaeozems (H)	-		3.7	21
Lithosols (I)	13.4	76	3.5	20
Fluvisols (J)	4.1	23	3.5	20
Kastanozems (K)	-		0.1	1
Luvisols (L)	15.6	88	9.1	52
Greyzems (M)	-		0.1	1
Nitosols (N)	4.2	24	3.4	19
Histosols (O)	0.8	5	0.2	1
Arenosols (Q)	3.2	18	6.0	34
Regosols (R)	9.7	56	6.7	38
Solonetz (S)	2.0	11	15.6	90
Andosols (T)	2.4	13	1.8	10
Rankers (U)	0.2	1	0.3	2
Vertisols (V)	4.8	27	4.0	23
Planosols (W)	2.5	14	5.7	32
Xerosols (X)/				
Yermosols (Y)[1]	16.3	92	10.42.	60
Solonchaks (Z)	9.0	51	3	13
Lava			2.0	11

Ferralsols. According to KENSOTER, the total area of Ferralsols in Kenya is approximately 41000 km2, almost twice the area indicated on the SMW. Most of these Ferralsols are Rhodic rather than Orthic (see Table 4). The geographic distribution of Ferralsols on the 1:1M KENSOTER map differs considerably from the distribution according to the SMW. KENSOTER shows extensive areas of Ferralsols in eastern Kenya (in SMW unit LF17-2ab), and a comparatively limited distribution in western Kenya. The occurrence of Ferralsols is confined to old, stable surfaces of the nondissected erosional plains developed on Basement System rock, and the occurrence of Ferralsols in the highlands of western and central Kenya is therefore more limited than suggested by the SMW.

Solonetz. According to KENSOTER, the total area of Solonetz is approximately 90,000 km (16% of Kenya). Most Solonetz are Orthic, and Orthic Solonetz are by far the largest soil unit in Kenya

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[1] Includes Yermosols

(see Table 4). The Solonetz cover large parts of the sedimentary plains and alluvial deposits in eastern and northern Kenya (in SMW mapping units LF17-ab, Yh19-2a, Lf86-2a, Zo9-3a), and alluvial deposits in northwestern Kenya. The SMW shows a very limited occurrence of Solonetz (11,000 km2), mainly in northeastern Kenya (mapping unit Zo9-3a).

Planosols. According to KENSOTER, the distribution of Planosols is closely related to that of the Solonetz, and Planosols cover considerable parts of the sedimentary plains in eastern Kenya and alluvial deposits in northwestern Kenya. The, mostly Solodic, Planosols have a total coverage of 32,000 km2. The SMW shows a much more limited occurrence of, only Eutric, Planosols on Tertiary volcanics in the Rift Valley (mapping unit WE4-2a), with a total area of 14,000 km2.

Arenosols. According to KENSOTER, Arenosols cover 34000 km2, or 6% of Kenya, which is more than twice the area indicated on the SMW. The Arenosols are mainly Cambic and Ferralic (see Table 4). The geographic distribution of Arenosols in Kenya also differs from the SMW: the occurrence of Arenosols on the coastal plains is considerably less than indicated on the SMW, and instead the largest proportion of Arenosols is found in the arid northeastern and northern parts of Kenya on sedimentary rocks, gneisses and alluvium, in mapping SMW units Xk19-2a, Yh19-2a, Yh20-2b, Yk2-3a, which according to their description do not include any Arenosols.

Phaeozems. No Phaeozems have been mapped in Kenya on the SMW. However, according to the KENSOTER dataset, Phaeozems occur widely in southwestern Kenya and central Kenya. The total area of Phaeozems in Kenya is approximately 21,000 km2, or 4% of the country. Most Phaeozems have argillic B horizons and key out as Luvic (see Table 4).

Xerosols/Yermosols. On the SMW, Xerosols and Yermosols cover 92,000 km2, or 16% of Kenya. According to KENSOTER this is an overestimation, and 60,000 km2 (10%) would be more realistic. This overestimation is of course related to the underestimation of the proportions of Solonetz and Arenosols in the arid part of the country on the SMW.

Lithosols. Lithosols are common soils in the northwestern part of Kenya. The SMW estimates the total area on 76,000 km2, or just over 13% of Kenya. The KENSOTER dataset shows that the proportions of very shallow soils in the Lithosol and Regosol mapping units on the SMW have been systematically overestimated (mapping units I-R, I-R-bc, I-C, I-Re-3a, I-Bk-R-bc, I-U-c, I-V-b, Rc22-2b, Re59-a, Re63-2c) and that the area of Lithosols in Kenya does probably not exceed 20,000 km2. The overestimation of very shallow soils in these units is in line with the systematic overestimation of slope gradients on the SMW (see next Section).

Luvisols. On the SMW, Ferric Luvisols are the dominant soil unit in the largest part of southeastern Kenya (mapping units LF17-2ab, LF86-2a) where they cover nearly 80,000 km2. The KENSOTER dataset shows a much smaller proportion of mainly Chromic and Ferric Luvisols in Kenya with a total coverage of 52,000 km2, and with a different geographical distribution. KENSOTER shows that Luvisols are common soils in southern, southwestern and central parts of Kenya on parent materials enriched with volcanic ash. Their occurrence southeastern Kenya is limited, and dominant soil units here are Rhodic Ferralsols and Orthic Solonetz.

Table 4. Proportional Distributions of FAO Soil Units (1974) in Kenya According to the SMW and KENSOTER.[2]

Unit	1:5M	1:1M	Diff.
A	-	0.3	0.3
Af	0.8	0.1	-0.7
Ag	-	+	
Ah	-	0.1	0.1
Ao	+	1.3	1.3
Ap	0.6	0.5	-0.1
Bc	1.1	1.6	0.5
Bd	-	0.2	0.2
Be	1.1	2.3	1.2
Bf	-	0.1	0.1
Bg	-	0.1	0.1
Bh	0.1	0.8	0.7
Bk	1.1	3.4	2.3
Bv	-	0.1	0.1
Ch	-	+	
Ck	-	+	
E	+	0.2	0.2
Fh	-	0.3	0.3
Fo	2.6	0.7	-1.9
Fr	1	6.1	5.1
Fx	0.2	0.2	0
Gc	-	0.1	0.1
Gd	-	0.1	0.1
Ge	0.8	1.3	0.5
Gh	0.6	+	-0.6
Gm	0.1	0.1	0
Gp	0.5	-	-0.5
Hg	-	+	
Hh	-	0.2	0.2
Hl	-	3.4	3.4
I	13.4	3.5	-9.9
Jc	2.7	2.7	0
Jd	+	-	
Je	1.5	1.6	0.1
Jt	-	+	
Kh	-	0.1	0.1
Lc	-	4.0	4.0
Lf	15.6	2.9	-12.7
Lg	-	1.1	1.1
Lk	-	0.4	0.4
Lo	-	0.9	0.9
Lp	-	+	
Lv	-	0.2	0.2
Mg	-	+	

Unit	1:5M	1:1M	Diff.
Mo	-	0.1	0.1
Nd	+	0.3	0.3
Ne	2.4	0.3	-2.1
Nh	1.8	2.8	1.0
O	0.5	-	-0.5
Od	0.3	0.2	-0.1
Oe	0.1	-	-0.1
Qa	+	+	0
Qb	-	0.9	0.9
Qc	2.2	1.7	-0.5
Qf	0.9	3	2.1
Ql	-	0.3	0.3
Rc	1.3	3.9	2.6
Rd	0.4	0.1	-0.3
Re	8.2	2.7	-5.5
S	-	0.7	0.7
Sg	-	0.1	0.1
Sk	-	1.2	1.2
Sm	-	0.7	0.7
So	2.2	13.0	10.8
Th	1.1	0.8	-0.3
Tm	1.1	1.1	0
To	0.2	-	-0.2
U	0.2	0.3	0.1
V	0.5	-	-0.5
Vc	1.5	0.7	0.8
Vp	2.8	3.2	0.4
Wd	-	0.1	0.1
We	0.4	0.6	0.2
Wh	-	0.1	0.1
Ws	-	4.8	4.8
X	1.6	-	-1.6
Xe	-	0.2	0.2
Xh	0.1	1.7	1.6
Xk	1.4	4.2	2.8
Xl	1.9	4.1	2.3
Xy	-	0.3	0.3
Y	0.7	-	-0.7
Yh	8.6	-	-8.6
Yk	2.6	-	-2.6
Z	+	0.1	0.1
Zg	0.7	0.2	-0.5
Zo	8.3	1.7	-6.6
Zt	-	0.3	0.3

[2] + indicates a proportional occurrence of less than 0.01%

Solonchaks. According to the SMW, Solonchaks occur frequently in the arid and semiarid northern and eastern parts of Kenya and cover a total 51,000 km2. The KENSOTER dataset shows a considerably more limited occurrence of, mainly, Orthic Solonchaks (see Table 4) in this part of the country, covering an area of approximately 13,000 km2.

Nitosols. The total area of Nitosols in Kenya as indicated on the SMW is comparable to the total area indicated by KENSOTER. However, KENSOTER shows that the distribution of Nitosols is largely confined to the volcanic footridges and other Tertiary volcanics in southwestern and central Kenya, and that most of the Nitosols have a humic topsoil (Umbric A horizon). Contrary to the information on the SMW, Nitosols do not widely occur in southern Kenya, e.g. the area northwest of Amboseli (mapping unit NE31-2ab).

Slope Distribution

The dominant slope of each soil unit on the SMW is stored in the expansion file. Three slope classes are distinguished:

a. Dominant slopes ranging between 0 - 8%;
b. Dominant slopes ranging between 8 - 30%;
c. Dominant slopes exceeding 30%

In KENSOTER the actual value of the dominant slope of the soil component is recorded. In order to enable a comparison of the datasets, the dominant slope gradient values were classified in four classes:

a1. Dominant slopes ranging between 0 - 2%;
a2. Dominant slopes ranging between 2 - 8%;
b. Dominant slopes ranging between 8 - 30%;
c. Dominant slopes exceeding 30%

The subdivision of class a into classes a1 and a2 is relevant for the land evaluation procedure and will be further explained in Section 3.1.

Table 5. Slope Class Distributions in Kenya According to the SMW and KENSOTER

Slope class		SMW	KENSOTER
a1	0 - 2%	53%	60%
a2	2 - 8%		25%
b	8 - 30%	34%	12%
c	> 30%	13%	3%

The slope class distributions as derived from the 1:5M SMW and the 1:1M KENSOTER map are compared in Table 5. It can be concluded that according to the KENSOTER dataset the total areas of level (A1) and gently sloping (A2) land are considerably larger than suggested by the SMW and together cover 85% of Kenya. The proportion of very steep land with a slope gradient exceeding 30% is very limited and covers 3% of Kenya, which is 10% less than indicated on the SMW.

From the above can be concluded that, according to KENSOTER, dominant slope gradients have been considerably overestimated on the SMW. The slope class distributions at SMW mapping unit level are compared Section 2.3, and systematically listed in the Annex to this report.

Textural Class Distribution

The textural classification of the soil units refers to the upper 30cm of the soil. The legend to the SMW (FAO/Unesco, 1974) distinguishes three classes:

1. Coarse textured: sands and sandy loams with less than 18% clay and more than 65% sand;
2. Medium textured: sandy loams, loams, sandy clay loams, silt loams, silty clay loams and clay loams with less than 35% clay and less than 65% sand; the sand fraction may be as high as 82% if a minimum of 18% clay is present.
3. Fine textured: clays, silty clays, sandy clays, clay loams and silty clay loams with more than 35% clay.

KENSOTER provides the particle size class, as well as the particle size distribution in percentages clay, silt, and very coarse, coarse, medium, fine and very fine sands for each horizon of a reference profile. To allow a comparison with the SMW textural information, the average texture of the upper 30cm of each of the reference profiles was calculated and classified into the above defined three classes.

The proportional distributions of textural classes on the SMW and KENSOTER differ considerably as is shown in Table 6. The SMW suggests that topsoils in Kenya are predominantly medium textured. According to KENSOTER, the distribution is more balanced and significant areas of soils with coarse textured, or fine textured topsoils occur in Kenya.

Table 6. Textural Class distributions in Kenya According to the SMW and KENSOTER

Textural Class		SMW	KENSOTER
1	Coarse	3%	23%
2	Medium	86%	40%
3	Fine	11%	34%
N/A			3%

The textural class distributions of the individual SMW mapping units are discussed in the next Section and systematically listed in the Annex to this report.

2.3 Soil and Terrain Information at SMW Mapping Unit Level

In this Section the soil and terrain characteristics of the SMW at 1:5M scale are compared to the 1:1M KENSOTER dataset. The results are presented per SMW mapping unit. The soil associations of the mapping units according to both datasets are described in terms of a dominant soil, and one or more associated soils and inclusions. Associated soils cover at least 20% of the mapping unit, inclusions cover less than 20% of the mapping unit. Comparing the information of the two datasets, it should be kept in mind that:

Due to the difference in scale the mapping unit composition according to the KENSOTER dataset will generally include a considerably larger number of soil units. In consequence of this the proportions of the dominant soil, associated soils and inclusions are generally low compared to the SMW map unit composition.

For practical reasons soil units in the 1:1M soil association which cover less than 2.5% of the mapping unit are not listed in this Section. Reference is made to the Annex to this report for a comprehensive list of soil units per SMW mapping unit.

Due to the low resolution of the raster base of the SMW, the shape of very small, or narrow, elongated and winding units (e.g. alluvial soils) are generally poorly represented. Consequently the superimposing of these mapping units on the 1:1M map may result in a considerable amount of erroneous inclusions or exclusions of KENSOTER units in such mapping units.

From the results as presented in the next Section the following general conclusions can be drawn:

The dominant soil group was correctly indicated in 20% of the SMW mapping units. In 40% of the mapping units the dominant soil group has a more subordinate position in the soil association. In the remaining 40% of the mapping units the dominant soil group does not occur.

The dominant slope class was correctly indicated in 30% of SMW mapping units.

The dominant textural class was correctly indicated in 20% of the SMW mapping units.

For basic statistics on the soil distributions, textural classifications and slope class distributions of both datasets reference is made to the Annex of this report.

1. Be49-3c (679 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER describes the physiography and lithology of this unit as plateaus and plains with medium-gradient hills and mountains developed on predominantly igneous and metamorphic rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Be st	Ao, I	Vp	c	f/m
1:1M	Hl	-	Re, Bc, Lc, Vp	a1	f

According to the SMW the soil association is dominated by stony Eutric Cambisols, associated with Lithosols and Orthic Acrisols on predominantly steep land. KENSOTER indicates a strong underrepresentation of the proportions of level land with well developed soils, namely Luvic Phaeozems, in this SMW mapping unit.

Remarks: This unit has a minor occurrence in Kenya

2. Fo48-2ab (5742 km2)

This SMW mapping unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on predominantly igneous and metamorphic rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo	Fp	Ap, Vp	a	m
1:1M	Fo	Nh, Fr	Vp, Hl, Vc, Ao, Wd, Ge	a1	f

The slope class distribution and general soil characterization of this mapping unit are in accordance with KENSOTER, with Orthic Ferralsols as the dominant soil unit and other deeply weathered soils in association. The most notable difference is the absence of plinthic soils (Plinthic Ferralsols and Acrisols) in KENSOTER.

3. Gh7-2a (5692 km2)

This SMW mapping unit comprises soils developed on alluvial and lacustrine deposits. KENSOTER characterizes the physiography of this unit as alluvial plains, with less than 10% dunes.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Gh	Od	Je	a	m
1:1M	Je		Qc, So, Gc, Hh, Vp, Ws, Xh	a1	c

The slope class distribution of this mapping unit is in accordance with KENSOTER. On the SMW poorly drained Humic Gleysols in association with Dystric Histosols make up the larger part of the mapping unit. KENSOTER indicates that the soils are generally coarser textured and better drained (Eutric Fluvisols, Arenosols), with inclusions of imperfectly drained, fine textured soils.

4. GM15-2a (993 km2)

On the SMW this unit represents recent alluvial and lacustrine deposits. KENSOTER characterizes the physiography of the largest part of this unit as alluvial plain.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Gm	Je, Oe	Ge, Vc	a	m
1:1M	Qc so	Jc so, Je		a1	c/m

The slope class distribution of this mapping unit is in accordance with KENSOTER. However, the soils are generally sodic, and coarser textured and better drained than indicated on the SMW. Poorly drained Mollic Gleysols and Eutric Histosols are replaced by sodic Cambic Arenosols and sodic Calcaric Fluvisols in the soil association.

5. I-R (19674 km2)

This SMW mapping unit comprises soils developed on basalt and other basic rock types. KENSOTER characterizes the physiography of this unit as flat to gently undulating plains with high-gradient hills, with alluvial deposits covering approximately 20% of the unit.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	-	I, rock		b	m
1:1M	Rc st	I	So, Jc, Je, Qc, Sm	a	m/c

According to KENSOTER, the largest part of the unit is less steep than indicated on the SMW. The soil characterization of the larger part of the unit is in accordance with the 1:1m dataset, although the soils are deeper than suggested by the SMW and comprise stony Calcaric Regosols and Lithosols, instead of Lithosols and rock. The alluvial soils are not described in the 1:5M mapping unit.

6. I-R-bc (24604 km2)

This SMW mapping unit comprises soils developed on Precambriam schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as flat to undulating plains with high-gradient hills developed on sedimentary and metamorphic rocks (KENSOTER).

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	-	I, rock		b	m
1:1M	Rc so st		Be, Qc, Fr, Re, Bc, Bh, I	a2	m/c

7. I-Re-3a (9135 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on igneous rocks and lava flows.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	-	I sa, Re	-	a/b	f/m
1:1M	-	Xk st, Rock	So, Rc, Zo	a2	m

Both the SMW and the 1:1M dataset indicate associations of predominantly shallow soils. However, KENSOTER shows a clear distinction between the deeper, stony soils (Calcic Xerosols) and the lava flows, and therefore better characterizes the mapping unit.

8. I-V (1377 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as high-gradient mountains and hills, and flat to gently undulating plains developed on igneous rocks and pyroclastic materials.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	-	I, V	-	a(/b/c)	m/f
1:1M	I	-	Lc, Zo, Rc, Xk, Hh, Je	a/b/c	m

The slope class distributions of the two datasets are comparable, as is the proportion of shallow soils (Lithosols). According to KENSOTER, the associated Vertisols as indicated on the SMW do not occur and need to be replaced by an association of medium textured soil units, each with a limited areal extent.

9. I-c (1788 km2)

This mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains and high-gradient hills developed on igneous rocks and pyroclastic materials.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	I	-	-	c	m
1:1M	-	I, Re(li)	Be, Od, Sk, Xk, Rc, So	b	m

According to KENSOTER the largest part of the unit is less steep than indicated on the SMW and the soil association includes a considerable proportion of deeper soils in addition to the Lithosols.

10. Jc6-2a (2159 km2)

This mapping unit consists of alluvial deposits according the SMW. KENSOTER characterizes the physiography and lithology of this unit as flat alluvial plains and adjacent dissected plains developed on sedimentary rock, with dunes occurring in 15% of the unit.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Jc	Zo	Oe, Re	a	m
1:1M	-	-	I, Xe, Qc, Jc, Be, Z, Re, So, Lc, Xh	a1	variable

The two datasets are comparable from a physiographic point of view. However, according to KENSOTER, the composition of the soil association is far more complex than suggested by the SMW unit description and consists of a wide variety of soils, each with a limited areal extent. This is at least partly due to the poor representation of the this elongated, winding unit on the low resolution raster image of the SMW, and the somewhat exaggerated representation of this unit on the SMW.

11. Lf18-2a (1349 km2)

This SMW mapping unit comprises soils developed on Precambrian gneiss and schist. KENSOTER characterizes the physiography and lithology of this unit as plains and high-gradient hills with a mixed lithology. Alluvial deposits cover approximately 25% of the unit.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Lf li	Re		a	m
1:1M	-	Qc so, I	Je, So, Lc, Jc, Zo, Bk	a	c/m

The slope class distributions of the two datasets are comparable. However, KENSOTER indicates that soils are coarser textured, and generally less well developed than suggested on the SMW and that shallow Ferric Luvisols do not occur in this unit. Instead the soil association is dominated by sodic Cambic Arenosols and Lithosols.

Remark: Only a minor part this unit is within Kenyan territory.

12. Ne12-2c (4032 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as plains developed on igneous rocks, with ridges formed in basic rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Ne	Be	I, Vp	c/b	m
1:1M	Nh	Hl	Bc, Fr, Ne	a2	f

KENSOTER indicates that a large part of the unit is less steep than indicated on the SMW. Very deep Nitosols dominate the soil associations at both map scales. However, according to the 1:1M dataset topsoils are generally humic and well developed (mollic and umbric A horizons) and the occurrence of weakly developed soils (Cambisols) is more limited.

13. Qc19-1c (311 km2)

This SMW mapping unit comprises soils developed on Cretaceous limestone, marl and sandstones. KENSOTER characterizes the physiography and lithology of this unit as plains and medium-gradient hills developed on sandstone.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Qb li		Qa, Re	c	c
1:1M	Bk	I	Qc	a/b	m

According to KENSOTER, a large part of the unit is less steep than indicated on the SMW and the occurrence of coarse textured soils (Cambic Arenosol) is limited. Instead Calcic Cambisols are the dominant soil unit, with Lithosols subordinately.

Remarks: Only a minor part of this unit is within Kenyan territory

14. Qc8-1a (8613 km2)

This mapping unit comprises soils developed on Cretaceous limestone, marl and sandstones. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on sandstone and gneiss.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Qc	Ge		a	c
1:1M	Bk	Qc	I	a	m

According to KENSOTER, the occurrence of coarse textured soils is limited in this unit, and Cambic Arenosols are subordinate to Calcic Cambisols.

15. Qc9-1b (477 km2)

This SMW mapping unit comprises soils developed on Jurassic limestone, marl and gypsum. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on sandstone.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Qc	Ge, I		b	c
1:1M	Bk	I	Qc	a	m

According to KENSOTER, the major part of the unit is less steep than indicated on the SMW. The occurrence of coarse textured soils is limited and Cambic Arenosols have a very limited occurrence, instead the major part of this unit consists of Calcic Cambisols. The proportion of very shallow soils (Lithosols) is correctly represented on the SMW.

Remarks: Only a minor part of this unit is within Kenyan territory

16. Rc2-3c (1221 km2)

This mapping unit comprises soils developed on Jurassic limestone, marl and gypsum. KENSOTER characterizes the physiography and lithology of this unit as medium-gradient hills and flat plains developed on limestone and marl.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Rc li	I	Jc, Xh	c	f/m
1:1M	I	Xy	Bk	b	f/m

According to KENSOTER, the major part of the unit is less steep than indicated on the SMW. The general soil characterization of the unit is in accordance with the 1:1M dataset. The proportion of very shallow soils (Lithosols) and shallow soils (lithic phase) is underrepresented on the SMW.

Remarks: Only a minor part of this unit is within Kenyan territory.

18. Rc22-2b (22989 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. Kensoter characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on basalt, with pyroclastic materials in places.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Rc li	I, Jc	Je, Qc, Zo	a/b	m

1:1M	Xk st	Xh st	Sk, Bc, Rc, So, Be	a	m

KENSOTER indicates that in general the soils of the unit are deeper and better developed than suggested by the SMW unit description, with a large proportion of stony Xerosols instead of lithic Eutric Regosols and Lithosols. The proportion of recent alluvial soils (Fluvisols) is overestimated on the SMW.

19. Re59-2c (5733 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as hills, mountains and plains developed on metamorphic and igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Re li		I, Je	c	m
1:1M		Be, ?	Re, Lf, Hl, I	a/c/b	m

The available KENSOTER data suggests that the soils of the unit are generally deeper and better developed than suggested by the SMW unit description, with Eutric Cambisols instead of lithic Eutric Regosols.

Remarks: This mapping unit includes an undefined KENSOTER unit (17% of mapping unit).

20. Re59-a (16788 km2)

This mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat to undulating plains developed on basalt and other igneous rocks, with lavaflows in places.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Re li		I, Je	a	m
1:1M		Bc, Rock	Xk, Vp, Rc, Hl, So	a	m/f

KENSOTER shows a larger percentage of deeper and better developed soils in this mapping unit, such as Chromic Cambisols. The alluvial soils are predominantly Solonetz instead of Fluvisols.

21. Re63-2c (15561 km2)

This mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat to undulating plains mainly developed on pyroclastic materials and basalt.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Re li		I, Je	c	m
1:1M		Re li, Rc li	Xk, I, Sk, Jc, So, rock	a/b	m/f

KENSOTER indicates that the largest part of the land in this unit is considerably flatter than indicated on the SMW. The general soil characterizations of both datasets are comparable, with soil associations dominated by shallow Regosols.

22. Vc34-3a (5063 km2)

This mapping unit includes alluvial deposits of the White Nile drainage system. KENSOTER similarly characterizes the physiography of this unit as flat alluvial plains.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Vc	Ge	Lf, Re	a	f/m
1:1M	-	Jc so, Je,Qc so	I	a1	m

KENSOTER indicates that the soils of this mapping unit are predominantly medium textured, sodic, and better drained than suggested in the SMW mapping unit description. With sodic Calcaric Fluvisols, Eutric Fluvisols and sodic Cambic Arenosols co-dominant in the soil association, instead of Chromic Vertisols and Eutric Gleysols as indicated on the SMW.

Remarks: Only a limited part of this mapping unit is on Kenyan territory.

24. Xk19-2a (6701 km2)

This SMW mapping unit comprises soils developed on basalt, pyroclastics and Quaternary alluvial and lacustrine deposits. KENSOTER characterizes the physiography of this unit as alluvial plains.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Xk	-	Zo	a	m
1:1M	Qc so		Rc, Xe, I, So, Xh, Ql, Bk, Xl, Zo	a1	c

On the SMW this unit is almost completely classified as Calcic Xerosol. KENSOTER indicates that the soils of this mapping unit are predominantly coarse textured and noncalcic and comprise sodic Cambic Arenosols and a wide range of other soil units, each with a limited proportional occurrence.

25. Yh17-2c (1371 km2)

This SMW mapping unit comprises soils developed on Precambrium gneiss, schist and quartzite as well as volcanic rocks. KENSOTER characterizes the physiography and lithology of this unit as flat to undulating plains developed on limestone, basalt and pyroclastic materials.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Yh li	I	Je, Vc	c	m
1:1M	Xk st	Xh	Sk, Re	a1	c

KENSOTER shows that the slope class distribution as indicated on the SMW is not representative for the Kenyan part of this unit. The general soil characterizations of both datasets are comparable. However, soils are deeper than indicated on the SMW. Note that in KENSOTER the Yermosols are included in the Xerosols.

Remark: The largest part of this mapping unit is located outside Kenya.

26. Yh19-2a (53459 km2)

This SMW mapping unit comprises soils developed on Jurassic limestones, shales, sandstones, siltstone and gypsiferous beds and quaternary alluvial, lacustrine and lagoonal deposits. KENSOTER characterizes the physiography and lithology of this unit as flat plains developed on sandstone and granodiorite, and alluvial plains.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Yh	Zo	I, Re	a	m
1:1M	So	Qf, Ws	Xl	a1	c

According to KENSOTER, a large proportion of this unit consists of sodic soils with coarse textured topsoils overlying medium-fine textured subsoils. And Orthic Solonetz and Solodic Planosols replace the Haplic Yermosols/Xerosols and Orthic Solonchaks as described on the SMW.

27. Yh20-2b (35554 km2)

This SMW mapping unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of the largest part of this unit as flat plains developed on gneiss.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Yh	Xl	Jc, Re	b	m
1:1M	Xl		So, Qf, Xk, rock, Sm, Be, Re, Vp	a1	m

KENSOTER indicates that the largest part of the land is characterized by slopes of less than 8%, and not by rolling and hilly land as on the SMW. The general soil characterization on the SMW corresponds well with the 1:1M dataset.

28. Yh2-3a (18412 km2)

This SMW mapping unit comprises soils developed on Jurassic limestones, shales, sandstones, siltstone and gypsiferous rocks. KENSOTER characterizes the physiography and lithology of this unit as flat plains developed on limestone and metamorphic rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Yk pc	I	Vc	a	f
1:1M	Xl pc		Qb, Xh, Xy, So, I, Qf, Vp, Lc	a1	f/m

The general soil characterization and slope class distribution of the SMW corresponds well to the 1:1M dataset. Xerosols/Yermosols over petrocalcic material are the dominant soils in the soil associations according to both datasets.

29. Zo9-3a (37292 km2)

On the SMW, this unit represents recent alluvial deposits and the corresponding KENSOTER units similarly characterize the physiography of this unit as flat to gently sloping alluvial plains and floodplains.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Zo so	So	Jc, X, Zg	a	f/m
1:1M	So		Ge, Be, Xk, Qf, rock, Jc, Je, Vp	a1	m/f

The slope class distribution of the SMW corresponds well with the 1:1M dataset. According to the 1:1M dataset the occurrence of saline soils is limited and Orthic Solonetz form the major component of the soil association, rather than sodic Orthic Solonchaks.

30. Qc20-1a (1526 km2)

This SMW mapping unit comprises soils developed on alluvial and aeolian deposits (shifting sands). KENSOTER characterizes the physiography of this mapping unit as flat plains developed on sedimentary rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Dunes	Qc	Re	a	c
1:1M	Zt		So, U, Qc, Xk, Rc	a1	f

The slope class distribution on the SMW corresponds well with KENSOTER. However, the soil characterization is very different. The SMW indicates dunes and sandy soils, KENSOTER shows the occurrence of excessively saline clay soils (Takyric Solonchaks).

31. Af32-1/2a (579 km2)

This SMW mapping unit comprises soils developed on Basement System rocks (e.g. orthogneiss, granite, magmatite). KENSOTER characterizes the physiography and lithology of the largest part of this unit as gently undulating plains developed on granite.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Af partly li	Ap	Gp, I, Vp	a	m/c
1:1M	Ap	Hl	Gh, Ws, Ag, Vc	a2	m

The slope class distribution of the SMW corresponds well with KENSOTER. The soil characterizations according to the two datasets are comparable, with deeply weathered Acrisols and poorly drained alluvial soils. However, the shallow Acrisols, which dominate the SMW soil association, do not occur according to KENSOTER.

Remarks: Minor unit in kenya, occurs predominantly in Tanzania.

32. Bc14-2bc (10313 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics and Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as medium-gradient hills and gently undulating plains developed mainly on acid metamorphic rock, and basaltic ridges.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Bc partly stony	I, Rd	Ap	b/c	m
1:1M	Nh		Fr, Hl, Vp, We, Be, Ao, U	a	f

According to KENSOTER, the land is less steep than indicated on the SMW and the soil association is characterized by deeply weathered soils, such as, Humic Nitosols and Rhodic Ferralsols instead of lesser developed (stony) Chromic Cambisols, Dystric Regosols and Lithosols as indicated on the SMW.

33. Bc15-2ab (1714 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on basalt.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Bc partly pc	Be	I	b	m
1:1M	Bk		Hl, Lc, Lo	a1	m

According to KENSOTER, the land is less steep than indicated on the SMW. The soil characterizations of the two datasets are comparable, although KENSOTER indicates inclusions of well developed, deep Luvisols and Phaeozems rather than very shallow Lithosols and weakly developed Eutric Cambisols.

The larger part of this unit is located in Tanzania.

34. Bh14-3c (737 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as escarpments, hills and ridges developed igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Bh	Ne	I, Je, O	c/b	f/m
1:1M	Hl		Nh, rock, Bh, Th, Be, Nd	b	f

According to KENSOTER, the land is slightly less steep than indicated on the SMW and the soil characterizations of both datasets are comparable, but KENSOTER indicates that most soils have argillic horizons, and consequently Luvic Phaeozems replace the Humic Cambisols.

35. Bk25-2a (6960 km2)

This SMW mapping unit comprises soils developed on Quaternary alluvial and lacustrine deposits and Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat to gently undulating plains developed on igneous and metamorphic rock, and alluvial deposits.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Bk	Be	Vp, We	a	m
1:1M	Hl	Ws	Jc, Tm, Vp, U	a1	f/m

The slope class distributions of the two datasets are comparable. The soil characterizations of the two datasets differ. According to KENSOTER, Luvic Phaeozems and Solodic Planosols are the most common soils in this mapping unit, instead of Calcic and Eutric Cambisols as indicated on the SMW.

Remarks: A considerable part of this unit is located in Tanzania.

36. Bk31-2a (2232 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat plateaus developed on intermediate igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Bk	Be	Vp	a	m
1:1M	Vc	Hl	Jc, Nh	a1	f

The slope class distributions of the two datasets are comparable. The soil characterizations are different. According to KENSOTER, the soils are fine textured and Chromic Vertisols are the dominant soil unit. Medium textured Calcic Cambisols do not occur.

37. Fo34-3a (3940 km2)

This SMW mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of the larger part of this mapping unit as flat to gently undulating plateaus developed on intermediate and basic igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo pe	Vc	Re	a	f
1:1M	Hl		Vc	a1	f

The slope class distributions of the two datasets are comparable. The soil characterizations are different. According to KENSOTER, Luvic Phaeozems are the dominant soil unit in the association, instead of highly weathered, petric Orthic Ferralsols and Chromic Vertisols.

38. Fo42-2b (117 km2)

This SMW mapping unit comprises soils developed on granite. KENSOTER characterizes the physiography and lithology of this unit as high-gradient hills developed on acid metamorphic rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo	Af, N	I, Je, O	b	m
1:1M	Be, partly li	Bh	Hh, Re	c	m

According to KENSOTER, this unit is considerably steeper than indicated on the SMW and consists predominantly of weakly developed, and in places shallow, soils instead of deeply weathered Orthic Ferralsols, Ferric Acrisols and Nitosols as indicated on the SMW.

39. Fo43-2b (3326 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains with high-gradient hills and ridges developed on acid metamorphic rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo	Af, Fx	I, Je, O	b/a	m
1:1M	Bh		Be, Fr, Fh, Ao, Hl, Gm, Lf	a/b	m/f

According to KENSOTER, this unit has a higher proportion of level land than indicated on the SMW. However, the proportion of deeply weathered soils (Orthic and Xanthic Ferralsols and Ferric Acrisols) is lower than indicated with Humic and Eutric Cambisols covering large parts of the steeper slopes.

40. Fo47-2ab (3564 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss, volcanics, and clayey and sandy sediments. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains with a mixed lithology, and alluvial deposits.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo	Ap, Fx	Gp	a	m
1:1M	Ap	Ao	Fh, Ge, Fr, Bd	a1	m/f

The general soil characterization of the mapping unit on the SMW is in accordance with KENSOTER, with deeply weathered soils (Acrisols, Ferralsols) in the higher positions and Gleysols on the poorly drained alluvial deposits. However, the proportional distributions of the soil units in the two datasets differ.

41. Fo49-2a (3564 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss, volcanics, and clayey and sandy sediments. KENSOTER characterizes the physiography and lithology of this unit as gently undulating to undulating plains developed on acid and intermediate igneous and metamorphic rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo	Fp	Gp	a	m
1:1M	Ao		Fr, Ap, Lf, Bh, Vp	a2	m/f

The slope class distributions of the two datasets are comparable. According to KENSOTER, Orthic Acrisols are dominant in this mapping unit, and the occurrence of Ferralsols is limited.

42. Fo50-2a (169 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss, and volcanics. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains, valleys and depressions developed on intermediate igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fo	Ap	Vp	a	m
1:1M		Lv, Vp, Bv	Je	a	f

The slope class distributions of the two datasets are comparable. According to KENSOTER, the soils are predominantly clayey and vertic. Vertic Luvisols and Cambisols occur on the higher positions. Pellic Vertisols and Eutric Gleysols are found in the depressions.

43. Fp10-2a (285 km2)

This mapping unit comprises soils developed on Quaternary alluvial deposits. KENSOTER characterizes the physiography and lithology of this unit as lacustrine and alluvial deposits, and the adjacent parts of the flat to gently undulating plains developed on intermediate igneous rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fp	So, Vp	Gp	a	m
1:1M	Bd pf		Lo, Vc, Je, Bv, We, Ws	a1	m/f

The slope class distributions and the general soil characterizations of the datasets are roughly comparable. However, Dystric Cambisols over petroferric material (petro-plinthite) replace Plinthic Ferralsols as the dominant soil in this mapping unit.

Remarks: Minor unit in Kenya

44. Fr7-2a (5609 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology as gently undulating plains developed on acid metamorphic rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fr	Fo	Vp	a	m
1:1M	Fr	Lc, Ao	Je, Vp, Lo, Hh, Lf	a2	f

The slope class distributions and the general soil characterizations of both datasets are comparable, but the proportion of highly weathered soils (Ferralsols) is less than indicated on the SMW, with Chromic Luvisols and Orthic Acrisols as associated soils.

45. Fr9-2a (4749 km2)

This mapping unit comprises soils developed on Precambrian acid and basic volcanics, and sandy and clayey sediments. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains with medium level hills and ridges developed on igneous rocks of variable composition.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Fr	Fo	Gp, Vp	a	m
1:1M	Hl		We, Ap, Ws, Nd, Nh, Bh, Hh, Ah, Be, Wd	a2	f

The slope class distributions of the two datasets are comparable. According to KENSOTER, a wide range of soils occurs in this mapping unit, partly with mollic or umbric A horizons and/or argillic B horizons. Ferralsols do not occur.

46. G7-2a (148 km2)

According to the SMW, this unit comprises soils developed on recent alluvial deposits. KENSOTER describes the physiography as gently undulating plains developed on gneiss, with alluvial deposits.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	G	Jd	Z	a	m
1:1M	Fh	Gm		a2	f

The slope class distributions of the two datasets are comparable. The soil association of the SMW unit consists mainly of poorly drained Gleysols. According to KENSOTER, this mapping unit is characterized by well drained, very deep Humic Ferralsols, with Mollic Gleysols occurring subordinately.

Remarks: Minor isolated unit.

47. I-A-R-bc (834 km2)

This SMW mapping unit comprises soils developed on Tertiary volcanics. KENSOTER characterizes the physiography and lithology of this unit as plateaus and plains developed on pyroclastic materials, and a basaltic escarpment (SE Rift Valley).

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M		I, A, rock		b	m
1:1M	Re st	Lc, rock	I, Rc, Hl, Be	a2/b	m

The slope class distributions and the general soil characterizations of both datasets are comparable. According to KENSOTER, the proportion of very shallow soils (Lithosols) is less than indicated on the SMW and stony Eutric Regosols replace a large part of the Lithosols in the soil association as indicated on the SMW.

48. I-Bk-R-bc (4454 km2)

This unit comprises soils developed on Tertiary volcanics. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plateaus developed on pyroclastic materials, and plains with a mixed lithology.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M		I, Bk, rock		b	m
1:1M	Re st	Lc, Be	Hl, rock	a2	m/f

KENSOTER indicates that the unit is considerably flatter than indicated on the SMW and that soils are generally deeper and noncalcic. Stony Eutric Regosols, Chromic Luvisols and Eutric Cambisols replace Lithosols, Calcic Cambisols and rock as associated soils.

49. I-R (7360 km2)

This unit comprises soils developed on basalt and other basic rocks. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plateaus with high-gradient hills and mountains developed on pyroclastic material and intermediate and basic igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M		I st, rock		b/c	m
1:1M	I		Re, Lc, So, Nh	a/b/c	m/f

According to KENSOTER, the proportions of sloping and steep land are less than indicated on the SMW. The soil characterizations of the two datasets are comparable, but the proportion of bare rock is very limited, and the unit includes deep, well developed soils, such as Chromic Luvisols and Humic Nitosols.

50. I-Re-T-c (219 km2)

This unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as plateaus and plains developed on pyroclastic material and a basaltic escarpment zone (SW Rift Valley).

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M		I st, Re, T		b/c	m
1:1M	Be	Re, rock	Zg, Lc	a2	f/m

KENSOTER indicates that the proportions of sloping and steep land are less than suggested by the SMW, and that Andosols do not occur in this unit. Otherwise the soil characterizations of the two datasets are comparable.

Remarks: Minor unit

51. I-U-c (1917 km2)

This unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as mountains and hills developed on pyroclastic materials (upper slopes of Mount Kenya and Mount Elgon).

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M		I, U		c	m
1:1M	Od li	Th partly li	We, Be, Bh, Ah, Tm, Nh	b	m/f

KENSOTER indicates that the proportions of sloping and steep land are less than suggested by the SMW. According to KENSOTER, the predominant soil units are lithic Dystric Histosols (Mount Elgon only) and Humic Andosols (partly lithic), instead of Lithosols and Rankers.

52. I-V-b (4515 km2)

This unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains developed on basalt and gneiss, with hills formed in pyroclastic materials (Chyulu range) and adjacent lava flows.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M		I, V		a/b	m/f
1:1M	Lc, partly stony	Lava	Hl, Bk, Tm, Vp, Fr, Hh, Lf	a	m/f

KENSOTER indicates that the proportions of sloping and steep land are less than suggested by the SMW. According KENSOTER, the soils are generally deeper and better developed than indicated on the SMW with Chromic Luvisols as the dominant soils. Vertisols do occur in places, but are not as prominent as indicated on the SMW.

53. Lf17-2ab (93338 km2)

This unit comprises soils developed on Tertiary to recent volcanics, and Neogene and Quaternary alluvial, coastal and marine deposits. KENSOTER characterizes the physiography and lithology of this unit as flat plains developed on gneiss and sedimentary rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Lf		I, Zo	a/b	m
1:1M		Fr, So sa	Ws, Lf, Lg, Vp	a1	f/m

KENSOTER indicates that the proportions of sloping and steep land are less than suggested by the SMW. According to KENSOTER, the mapping unit comprises nearly equal proportions of highly weathered Rhodic Ferralsols on gneiss and saline Orthic Solonetz on the sedimentary rock. Ferric Luvisols do occur, but only as inclusions in the soil association.

54. Lf86-2a (16871 km2)

This unit comprises soils developed on sedimentary rocks (Karroo). KENSOTER characterizes the physiography and lithology of the larger part this unit as flat plains developed sedimentary rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Lf	Vp		a	m
1:1M	So, partly sa	Ws	Lc, Lo, Vp, I, Fr	a1	m/c/f

The slope class distribution on the SMW corresponds with KENSOTER. KENSOTER further indicates the occurrence of a large proportion of sodic soils (Orthic Solonetz and Solodic Planosols). Luvisols do occur, but in a considerably smaller proportion than indicated on the SMW.

55. Nd37-2/3ab (306 km2)

This unit comprises soils developed on Precambrian schist and gneiss, and acid and basic volcanics. KENSOTER characterizes the physiography and lithology of this unit as undulating to gently undulating plains developed on granite and intermediate igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Nd	Fo, Lf	I	b/a	m/f
1:1M	Ah	Bh	Mg, Mo	a2	f

According to KENSOTER sloping land does not occur in this mapping unit, and the soils are fine textured and generally have umbric or mollic A horizons. The dominant soil unit is the Humic Acrisols instead of the Dystric Nitosol.

Remarks: Largest part of mapping unit is located in Tanzania

57. Ne29-2bc (2423 km2)

This unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as ridges, plains and plateaus of pyroclastic material and igneous rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Ne		We	b/c	m
1:1M	Tm	Nh, Be	Th, Hl, I, Rc, Nd	a2/b	m/f

According to KENSOTER, steep land does not occur in this mapping unit and the proportion of level land is larger than indicated on the SMW. Soils generally have humic topsoils and the predominant soil units on pyroclastic parent materials are Mollic and Humic Andosols. Humic Nitosols occur on the plateaus on igneous rock.

58. Ne30-2ab (3525 km2)

This unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as medium-gradient hills and gently undulating plains developed on intermediate igneous rocks and gneiss.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Ne	Fo	Ap, Gp	a/b	m
1:1M	Fr		Af, Vp, Qf, Fo, Nh	a2	f

The slope class distribution on the SMW corresponds reasonably well with the KENSOTER dataset. The proportion of Ferralsols in both datasets is comparable. However, according to KENSOTER, the proportion of Nitosols in the soil association is much smaller.

59. Ne31-2ab (7133 km2)

This unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains developed on gneiss with medium-gradient hills and basalt ridges.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Ne		I, Vp	a/b	m
1:1M	Lc		Fr, Bd, Hh, Lf, Ao, Qf, We, Be, Je, Kh, Nh, Vp	a/b	m/f

The slope class distribution on the SMW corresponds with KENSOTER. The general soil characterizations of both datasets are comparable. However, according to KENSOTER, the deep well developed soils (Luvisols, Nitosols, Phaeozems) cover considerably less of the unit than indicated on the SMW.

60. Ne38-2ab (279 km2)

This unit comprises soils developed on metamorphic and igneous rocks (Basement complex). KENSOTER characterizes the physiography and lithology of this unit as flat plains developed on gneiss and bottom lands along the eastern part of the Tanzanian border.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Ne	Bc	I, Vp	b/a	m/f
1:1M		Fr, Zg so		a1	m/f

The physiography and soils of the two datasets differ considerably. According to KENSOTER, the unit consists completely of level land with Rhodic Ferralsols in the better drained positions and sodic Gleyic Solonchaks in the poorly drained positions.

Remarks: The largest part of this unit is located in Tanzania

63. Nh2-2c (20125 km2)

This unit comprises soils developed on Tertiary to recent volcanics and Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as ridges, medium-gradient hills and gently undulating plains developed on predominantly basic rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Nh	Th	I, O	c	m
1:1M	Nh		Fr, Hl, Ao, Fh, Fo, Tm	a2/b	f

According to KENSOTER, the unit consists of almost equal proportions of level and sloping land instead of steep land. Humic Nitosols are the dominant soil unit in the association. Humic Andosols occur only in places. Instead Ferralsols, Phaeozems and Acrisols are found.

64. Qc30-1/2a (237 km2)

This unit comprises soils developed on Neogene and Quaternary coastal deposits. KENSOTER similarly characterizes the physiography and lithology of this unit as flat marine sediments and dissected rolling plains developed on sandstone.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Qc	Af, Qf	I, Je, Vp	a/b	c/m
1:1M		Fo, Lg so, So sa	Ao, Jc	a	m/c

The slope class distributions of both datasets are comparable. According to KENSOTER, the soils have coarse textured topsoils over medium to fine textured subsoils and are to a large extent sodic and saline. Sandy Orthic Ferralsols, Acrisols and Fluvisols are found in this mapping unit, instead of the Arenosols as indicated on the SMW.

Remarks: Only a very small part of this unit is on Kenyan territory.

65. Qc37-1a (8041 km2)

This unit comprises soils developed on recent coastal deposits. KENSOTER similarly characterizes the physiography and lithology of this unit as predominantly flat coastal plains (lagoonal deposits).

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Qc	Af, Qf	I, Vp	a/b	c/m
1:1M	Lg so		Qf, So, Af, Fr, Hl, Lf, Ws, Be, Fo, Sg, Vp	a	c/m/f

The slope class distributions of the two dataset are comparable. According to KENSOTER, the soils have coarse textured topsoils over medium to fine textured, often sodic, subsoils, and are poorly or imperfectly drained. Sodic Gleyic Luvisols are the dominant soil unit in the mapping unit, instead of Cambic Arenosols.

66. Qf35-1/2bc (6783 km2)

This unit comprises soils developed on Tertiary and Quaternary marls, sand, clay over Jurassic limestone and shale. KENSOTER characterizes the physiography and lithology of the larger part of this unit as flat coastal plains and plateaus developed on various types of sedimentary rock of marine origin.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Qf	Af	Ap, Gp	b	c/m
1:1M			Fx, Lo, Ql, Ws, Be, So, Hl, Sm, Sg	a1	m/c

According to KENSOTER, this mapping unit consists almost entirely of level land. The soils are generally finer textured than indicated on the SMW and Arenosols occur only in places. The mapping unit includes a large number of soil units, each with a limited proportional occurrence, varying from deeply weathered Xanthic Ferralsols to poorly drained Gleyic Solonetz.

67. Tm10-2bc (3812 km2)

This unit comprises soils developed on Tertiary volcanics. KENSOTER characterizes the physiography and lithology of this unit as ridges and gently undulating plains developed on pyroclastic rocks and basalt.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Tm	Ne	Ge	b	m
1:1M	Tm	Be	Hl, I, Rc	b/a	m

The slope class distribution and soil characterization of the SMW are in accordance with the KENSOTER dataset. Mollic Andosols are the dominant unit in the soil association according to both datasets.

68. Tm11-1/2ab (2484 km2)

This unit comprises soils developed on Tertiary volcanics. KENSOTER characterizes the physiography and lithology of this unit as gently undulating plains with ridges and high-gradient hills formed in pyroclastic and basaltic materials (Volcanoes), and lava flows.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Tm	To		b/a	c/m
1:1M	Rc partly st and li		I, Tm, rock, Sg, Hh, So, Bg	a/c/b	c/m

The slope class distribution of the SMW is in accordance with the KENSOTER dataset. KENSOTER shows the occurrence of a large proportion of (very) shallow and stony soils (lithic and stony Calcaric Regosols, Lithosols) in this mapping unit, instead of the Andosols as indicated by the SMW.

69. Tm9-2c (4028 km2)

This unit comprises soils developed on Tertiary volcanics. KENSOTER characterizes the physiography and lithology of this unit as ridges and hills of pyroclastic rocks. This unit includes the slopes of Mount Elgon and Mount Kenya.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Tm	I	Je, O	c	m
1:1M	Th partly Ii	Nh	Nd, Ne, Tm, Od	b	f

The slope class distribution of KENSOTER indicates a large proportion of sloping land rather than steep land. In addition to the Andosols, a considerable proportion of well developed very deep soils (Humic and Dystric Nitosols) occurs in this unit, which is not indicated on the SMW.

70. To7-2/3a (603 km2)

This unit comprises soils developed on Tertiary volcanics. KENSOTER characterizes the physiography and lithology of this unit as flat plains developed on predominantly pyroclastic rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	To	Bc, Tv	I	a/b	m/f
1:1M	So partly pc	Be	Zo, Lc, Lg, Bk, Kh, Re, Vp	a1	m/f

KENSOTER indicates a larger proportion of level land than the SMW. Andosols do not occur, and a large percentage of the soils is sodic or saline. Orthic Solonetz (partly petrocalcic) are predominant in the mapping unit, with Eutric Cambisols in association, and with sodic Orthic Solonchaks as a major inclusion.

Remarks: The largest part of this unit is located in Tanzania

71. Vc39-3a (780 km2)

This unit comprises soils developed on Jurassic limestone, shale and gypsiferous beds. KENSOTER characterizes the physiography and lithology of this unit as gently undulating coastal plains and medium-gradient hills developed on sandstone.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Vc		Vp	a	f
1:1M	Lo		Af, Be, Hl, Ne, Ql	a	c/f

The slope class distributions of both datasets are comparable. According to KENSOTER, the soils in this mapping unit are mainly coarse textured. Consequently Vertisols do not occur and are replaced by Orthic Luvisols as the dominant soil unit.

72. Vp45-2/3a (7699 km2)

This unit comprises soils developed on Quaternary alluvial deposits, and Precambrian schist and gneiss partly overlain with volcanic material. KENSOTER characterizes the physiography and lithology of this unit as flat plains developed on basic and intermediate igneous rock.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Vp	Be, Vc	I	a	f/m
1:1M	Vp partly st		We, Hl, Mo, Be, E, Jc, Lo, Tm	a	f

The slope class distribution and general soil characterization on the SMW are comparable to the KENSOTER dataset. Pellic Vertisols are the dominant soil unit, but the total area of Pellic and Chromic Vertisols is considerably lower than indicated on the SMW, and the mapping unit includes a large area of Eutric Planosols.

73. Vp49-3a (4359 km2)

This SMW mapping unit comprises soils developed on alluvial deposits of the Tana River. KENSOTER shows that the unit includes also parts of the adjacent flat plains developed on sedimentary rocks.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	Vp	Zo	Je	a	f/m
1:1M	So sa		Ws, Je, Lg, Vc, S, Vp, Zo	a	f/c

The slope class distributions of both datasets are comparable. The soil characterization differs significantly. According to KENSOTER, saline Orthic Solonchaks are the dominant soil unit and the soil association includes a considerable area of Solodic Planosols. Pellic Vertisols occur only in places on the alluvial terraces of the Tana river.

74. We4-2a (2229 km2)

This mapping unit comprises soils developed on Tertiary to recent volcanics. KENSOTER characterizes the physiography and lithology of this unit as mainly flat plains developed on basic rocks and pyroclastic materials, and alluvial plains (bottomlands).

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	We	Gp	Fo	a	m
1:1M	We	Vp, Ws	I, Hl, Th, Nh, Tm	a	m/f

The slope class distributions and the soil characterizations of both datasets are comparable, with Eutric Planosols as dominant soil unit according to both datasets.

75. X7-2ab (2229 km2)

This mapping unit comprises soils developed on Precambrian schist and gneiss. KENSOTER characterizes the physiography and lithology of this unit as flat and gently undulating plains developed on gneiss.

	Dominant Soil Unit	Associated Soil Units	Inclusions	(Pre)dominant Slope Class	(Pre)dominant Textural Class
1:5M	X	Re, Y	Jc, Xk, Zo	a/b	m
1:1M	Bk pc	Lc	S, Lf, Bc, So, Be, Re	a	m/c

KENSOTER indicates that this mapping unit is level and does not include steeper land, as described by the SMW. On the SMW, the dominant soils are classified as Xerosols and Yermosols. In KENSOTER the moisture regime was not considered aridic and the soils have been classified accordingly.

3. LAND EVALUATION FOR IRRIGATED CROPS

Considering the marked differences between the SMW and KENSOTER datasets, it is likely that land suitability assessments based on these datasets will differ as well.

In order to assess this, the land suitability for irrigated upland crops and paddy rice in Kenya was determined on basis of the KENSOTER dataset and compared to the existing land suitability information, which was determined on basis of the SMW (Nachtergaele, 1995). The results are presented in this Chapter.

3.1. Land Evaluation Method

The land evaluation method applied to determine the land suitability for paddy rice and gravity irrigated upland crops is similar to the method presented in the FAO Agroecological Zones studies for Africa (1978) and the FAO/UNFPA Land Resources for Populations of the Future study (1980).

The evaluated land use types are both under gravity irrigation and sufficiently high levels of annual inputs are assumed, ensuring adequate amounts of fertilizer, etc. Major land improvements are not considered realistic for these land use types.

This land evaluation results in qualitative assessments of the physical potential of the land, under the assumption that good quality water is available and that the required irrigation infrastructure has been realized.

To evaluate the KENSOTER soil and terrain information of each SMW mapping unit as stored in KENSOIL.DBF (see Section 2.1), the Qbasic programs PADDYSUI.BAS and UPLIRRI.BAS (Nachtergaele, 1995) were rewritten in the Dbase application language.

3.1.1. Land Use Requirements (FAO/UNFPA, 1980)

The land use requirements are defined on basis of the following characteristics available from the SMW: topography, drainage, texture, surface stoniness, subsurface stoniness, depth, calcium carbonate level, gypsum status, and salinity and alkalinity conditions.

<u>Topography</u>

The slope gradient is the dominant topographic factor that influences the suitability for irrigation. The slope requirements for irrigated upland crops and rice are:

Optimum:	0 - 2%
Marginal:	2 - 8%
Prohibitive:	> 8%

Drainage

Irrigation of upland crops in optimal conditions requires well drained soils to ensure good aeration and to avoid secondary salinization. The drainage requirements for upland crops are:

Optimum:	Well drained
Marginal:	Moderately well drained, imperfectly drained
Prohibitive:	(Somewhat) excessively drained

Paddy rice requires an impermeable substratum and flooded conditions, which are best realized on poorly drained soils. The drainage requirements are:

Optimum:	Poorly drained
Marginal:	Very poorly drained, imperfectly drained, moderately well drained
Prohibitive:	(Somewhat) excessively drained

Texture

Irrigated upland crops require, for optimal conditions, soil textures imparting a high waterholding capacity and good permeability of the profile. The requirements are as follows:

Optimum :	Loam to silty clay loam
Marginal:	Sandy loams and clays (structured)
Prohibitive:	(Loamy) sands, massive clays

Paddy rice requires textures imparting low permeability and maintenance of flood conditions. The requirements are as follows:

Optimum :	Clay loam to massive clays
Marginal:	Sandy loams to clay loams
Prohibitive:	(Loamy) sands

Soil Depth

The soil depth requirements for irrigated upland crops are as follows:

Optimum :	> 100 cm
Marginal:	50 -100 cm
Prohibitive:	< 50 cm

The soil depth requirements for paddy rice are less stringent:

Optimum :	> 50 cm
Marginal:	20 - 50 cm
Prohibitive:	< 20 cm

Surface Stoniness

Surface stoniness influences the workability of the land and severely limits the suitability for irrigation. Consequently soils with a stony (rudic) phase are considered not suitable for both land use types.

Subsurface Stoniness

Subsurface stoniness reduces the water holding capacity and favours the infiltration rate and has an adverse effect on the irrigability of the soil. The occurrence of more than 40% coarse fragments in some layer within 100cm of the surface (petric or skeletic phase) is considered marginal for both land use types.

Calcium Carbonate

The presence of free lime in the soil influences the moisture regime of the profile, through its effect on soil structure, and the nutrient supply for plant growth. Irrigated upland crops have a variable tolerance for lime. The requirements are given under the assumption that the choice of the crop(s) is made according to the calcium carbonate content of the soil. In other words that crops with a higher tolerance for calcium carbonate are grown on the more calcareous soils.

Optimum :	0 - 30%
Marginal:	30- 60%
Prohibitive:	> 60%

The calcium carbonate requirements for paddy rice are:

Optimum:	0 - 15%
Marginal:	15 - 30%
Prohibitive:	>30%

Gypsum

Gypsum is a source of calcium for plant nutrition but is does interfere with water intake and availability. As a result of the solubility of gypsum, dissolution depressions can be created when irrigation water is applied to highly gypsiferous soils. For this reason soils with a high gypsum content are considered unsuitable for irrigation.

Salinity

Soil salinity has an important influence on crop production. The tolerance for salinity is crop dependent and for the requirements of irrigated upland crops it is assumed that salt tolerant crops are selected for the more saline soils:

Optimum:	0 - 8 mS/cm
Marginal:	8 - 16 mS/cm
Prohibitive:	> 16% mS/cm

The requirements for paddy rice are:

Optimum:	0 - 2% ms/cm
Marginal:	2 - 4% mS/cm
Prohibitive:	> 4% mS/cm

Alkalinity

The exchangeable sodium percentage (ESP) strongly influence soil structure and water availability in irrigated lands.

The requirements for irrigated upland crops are:

Optimum:	0 - 15%
Marginal:	15 - 30%
Prohibitive:	> 30%

The requirements for paddy rice are:

Optimum:	0 - 20%
Marginal:	20 - 40%
Prohibitive:	> 40%

3.1.2. The Land Evaluation Procedure (FAO/UNFPA, 1980)

The land evaluation procedure involves a suitability assessment of the soil unit, and subsequent corrections made on basis of slope, texture and phase.

The land suitability classification uses the maximum limitation method, according to which the final suitability class is determined by the rating of the most limiting land characteristic(s). The results are expressed in three classes:

Very Suitable (S1). All land characteristics considered in the evaluation are optimal.

Marginally Suitable (S2). One or more of the land characteristics considered in the evaluation are marginal.

Not Suitable (N). One or more of the land characteristics considered in the evaluation are severely limiting or prohibitive. In this study all not suitable land is regarded as permanently not suitable (N2), as major land improvements are not considered under these land use types.

Suitability Assessment of Soil Units

All FAO (1974) soil units have been rated for both land use types, by matching the soil characteristics with the land use requirements. The FAO/UNFPA ratings for paddy rice and irrigated upland crops are given in Tables 7 and 8. The following guidelines have been employed:

Fluvisols are considered 25% well and moderately well drained, 25% imperfectly drained and 50% poorly and very poorly drained. This results in a rating of 0.25 S1 - 0.25 S2 - 0.5 N for irrigated upland crops and 0.5 S1 - 0.25 S2 - 0.25 N for paddy rice.

Gleyic Cambisols have moderate drainage and are considered marginal for both land use types.

All other ***gleyic*** soil units are considered imperfectly drained after reclamation. They have been rated S2/N2 for irrigated upland crops and S1/S2 for paddy rice.

Planosols have been rated S2/N2 for irrigated upland crops and S1/S2 for paddy rice on basis of variation in drainage conditions. Solodic Planosols are further decreased by one class.

Arenosols and ***Vitric Andosols*** are considered excessively drained and rated not suitable for both land use types.

Rendzinas, having a high calcium carbonate content are considered not suitable.

Calcaric soil units have been rated S2/N2 for paddy rice and S1/S2 for irrigated upland crops, on the basis of a possible too high calcium carbonate content.

At least part of the ***Vertisols*** is considered to be well structured. These Vertisols have been rated marginally suitable for irrigated upland crops, on basis of limitations due to low permeability and poor workability. The non-structured Vertisols are considered unsuitable. For the Vertisols as a whole this results in a S2/N2 rating for irrigated upland crops. Because of a limited workability Vertisols have been rated S2 for paddy rice.

Table 7. Suitability Ratings of FAO Soil Units for Paddy Rice

Rating	Soil Units
S1	Re, Rd, Bd, Bg, Bv, Lv, Lp
S1 / S2	We, Wd, Wh, Ap, Wm, Fp
S1 / N2	Gc, Ge, Gd, Gm, Gh, Gp, Hg, Lg, Mg, Dg, Ag
0.5 S1 / 0.25 S2 / 0.25 N2	J
S2	Be, Bh, Bf, Bc, Lo, Lf, La, Lc, Ao, Ah, Af, N, To, Tm, Th, Fo, Fx, Fr, Fh, Ch, Cl, Cg, Hh, Hc, Hl, Kh, Kl, Vc, Vp, Dd, De, Mo
S2 / N2	Zo, Zm, Rc, Yk, Xk, S, Kk, Ck, Bk, Lk, Ws
0.25 S2 / 0.75 N2	O
N2	Gx, Wx, Bx, Tv, Rx, I, E, U, Zt, Zg, Yt, P, Yh, Yl, Yy, Fa, Xl, Xh, Xy

The evaluation of ***Solonchaks*** and ***Solonetz*** is guided by the possibility of leaching excess salts and the possible improvement of the alkalinity level.

Acrisols, ***Nitosols*** and ***Ferralsols*** have a very low available water content due to their specific clay mineralogy. for this reason they have been rated one class lower than they would have been if their clay mineralogy was the same as the Luvisols respectively Cambisols.

Table 8. Suitability Ratings of FAO Soil Units for Gravity Irrigated Upland Crops

Rating	Soil Units
S1	Re, Rd, To, Tm, Yh, Yl, Xh, Xl, Kh, Kl, Ch, Cl, Cg, Hh, Hl, Mo, Bd, Be, Bc, Bh, Lo, Lc, De, Dd
S1 / S2	Rc, Yk, Xk, Ck, Hc, Bk, Lk
0.25 S1 / 0.25 S2 / 0.5 N2	Je, Jc, Jd
S2	Th, Af, Bf, Bg, Mg, Lf, La, Lp, Ao, Ah, Ap, Fo, Fx, Fr, Fh, Fp, Ne, Nd, Nh
S2 / N2	Zo, Zm, Lg, Dg, Hg, Ge, Gc, Gd, Gm, Gh, Gp, We, Wd, Wm, Wh, Vc, Vp
N2	Gx, Ws, Wx, Bx, Tv, Rx, E, I, U, Zt, Zg, Yt, P, O, S , Q, Xy, Yy, Jt, Fa, Ag

Phase Modifications

A ***stony*** phase of any soil unit is considered not suitable (N2) for both land use types.

The ratings of soils with a ***petric*** phase are one-half decreased by one class and one-half downgraded to N2, for both irrigation types.

The ratings of soils with ***lithic*** and ***petrogypsic*** phases are downgraded to not suitable (N2).

The ratings of soils with ***petrocalcic***, ***petroferric***, ***duripan*** and ***fragipan*** phases are all one-half decreased by one class and one-half downgraded to N2 for irrigated upland crops, and decreased by one class for paddy rice.

The ratings of soils with a ***saline*** phase are decreased by one class for both land use types.

The ratings of soils with a ***sodic*** phase are decreased by one class for the irrigation of upland crops. The ratings for paddy rice remains unchanged.

Slope Modifications

The land evaluation procedure as presented in FAO/UNFPA (1980) uses the following rules:

> Slopes of more than 8% (slope classes b and c) are not suitable (N2).
>
> The ratings for soils with slope gradients of less than 2% remain unchanged.
>
> The ratings of soils with slope gradients between 2-8% are one-half decreased by one class and one-half are downgraded to N2 for both land use types.

The slope classification of the Legend to the Soil Map of the World does not distinguish between 0 -2 % and 2 - 8% slopes and for land evaluation purposes slope classes of the soil units have been reclassified in a number of subclasses on basis of their original slope classification on the SMW and expert knowledge on their most likely positions in the landscape.

The modified slope classification into the relevant slope classes for the evaluation of gravity irrigated crops (class 'a1' 0-2%; class 'a2' 2-8%) as used by the SMW evaluation programs (Nachtergaele, 1995) is given in Table 9.

Table 9. Revised Slope Classification on Basis of Soil Units for Level Land (Slope gradient 0 - 8%)

Soil Group	Subclass	Proportion of Original Class as on the SMW	
		'a' (0-8%)	'b' (8-30%)
G V S W	0 - 2% 2 - 8%	75% 20%	10%
R I E U T B A N	0 - 2% 2 - 8%	10% 80%	10%
Z	0 - 2% 2 - 8%	60% 30%	10%
Y X K C H M L D F Q	0 - 2% 2 - 8%	30% 60%	10%
O	0 - 2% 2 - 8%	90% 10%	10%
J	0 - 2% 2 - 8%	80% 20%	10%

The total proportions of slope classes 'a1' and 'a2' in Kenya are given in Table 10 and compared to the original slope class distribution of the SMW and the slope class distribution according to KENSOTER. Note that the reclassification resulted in a slightly lower total area with slope class 'a'. The general observations made in Section 2.2 are still valid and the total area of land with 0-8% slope is still considerably lower than indicated by the 1:1M KENSOTER dataset. However, the Table shows that the major difference between the two datasets is in the estimation of the proportion of level land with a slope of less than 2%.

Table 10. Slope Class Distribution of the SMW, Reclassified Slope Class Distribution of the SMW, and the Slope Class Distribution of KENSOTER

Slope Class		1:5 SMW	1:5M SMW reclassified	KENSOTER
a1	0 - 2%	53%	24%	60%
a2	2 - 8%		28%	25%

Texture Modifications

All ratings of soils with a coarse texture (class 1) are rated 75% not suitable and 25% marginally suitable for both land use types.

All ratings of soils with a medium texture (class 2) remain unchanged for both land use types.

All ratings of soils with a fine texture (class 3) are downgraded one class except for Vertisols and Vertic units where the texture has been considered in the rating of the soil units, for both land use types.

3.2. Results

The areal distributions of very suitable land, marginally suitable land and non suitable land in Kenya according to both datasets are given in Table 11. From this Table it can be concluded that the evaluation on basis of the SMW results in an overestimation of the area of potentially suitable land for upland crops and underestimates the area of potentially suitable land paddy rice.

Taking into account the considerable differences in soil distribution, slope class distribution and textural class distribution (see Chapter 2), the evaluations on basis of 1:5M SMW and the 1:1M KENSOTER dataset arrive at remarkably similar proportions of very suitable, marginally suitable and non suitable land in Kenya. However, because of the relatively small proportions of S1 and S2 land, the areal differences per suitability class can still be considerable. For instance the total area of S1 land for paddy rice determined on basis of the KENSOTER dataset is only 40% of the total area of S1 according to the SMW.

The evaluation results per SMW mapping unit show that the geographic distribution of S1, S2 and N2 land within Kenya on basis of the KENSOTER dataset deviates considerably from the evaluation results on basis of the SMW, following the differences in soil distribution, slope class and textural class distribution as described in the previous Chapter.

Table 11. Areal Distribution of S1, S2 and N2 Land in Kenya for Paddy Rice and Irrigated Upland Crops, Calculated on basis of the SMW and KENSOTER.[3]

Land Suitability class	Paddy Rice				Upland Crops			
	1:5M		1:1M		1:5M		1:1M	
	km2	%	km2	%	km2	%	km2	%
S1 Very Suitable	15000	3	6000	1	17500	3	12500	2
S2 Marginally Suitable	70500	12	88500	15	69000	12	58000	10
N2 Non Suitable	493500	85	479000	84	491000	85	503000	88

The evaluation results per SMW mapping unit are listed in Tables 13 and 14. Comparing the evaluation results on basis of the SMW and the KENSOTER dataset at mapping unit level results in the following observations:

The evaluation on basis of the SMW does not result in a systematically overestimation or underestimation of the land potential.

For approximately 20% to 30% of the SMW units the estimated potential for respectively paddy rice and irrigated upland crops at scale 1:5M is in line with 1:1M information. Although, often based on different sets of soil and physiographic limitations.

The remaining SMW units show considerable differences in land suitability between the datasets. Mapping units with large deviations are listed in Table 12. The most extreme differences are found in mapping units:

LF17-2ab. The SMW evaluation results in an underestimation of suitable land for paddy rice of 19000 km2, or 1.9 M hectares, due to a severe underestimation of the proportional occurrence of level land.

Zo9-3c. The SMW evaluation results in an overestimation of suitable land for paddy rice of 6600 km2, due to a very different soil unit composition and consequently a severe underestimation of soil constraints.

Yh19-2a. The SMW evaluation results in an overestimation of total suitable land for irrigated upland crops of 19000 km2, again due to a very different soil unit composition, and an underestimation of the occurrence of soil constraints (mainly related to the occurrence of Orthic Solonetz and Ferralic Arenosols).

The general conclusion that can be drawn on basis of the results presented here is that the evaluation results for irrigation on basis of the SMW are unreliable at mapping unit level. The results cannot be improved by systematic corrections, but require updating of the soil and physiographic information.

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[3] The slight discrepancy in the sum of total areas of S1, S2 and N of the 1:5M and 1:1M datasets is due to undefined soil components in KENSOTER units

Table 12. Mapping Units with a Large Discrepancy Between the 1:5M and 1:1M Suitability Classification

Paddy Rice			**Irrigated Upland crops**		
	SMW Mapping unit	**Difference (km2)**		**SMW Mapping unit**	**Difference (km2)**
S1	Gh7-2a	+1314	S1	Rc22-2b	+1379
	Rc22-2b	+2747		Yh19-2a	6414
	Yh20-2b	+1386		Yh20-2b	-3555
S2	Vc34-3a	+1387		Lf17-2ab	-1167
	Xk19-2a	+1025		X7-2ab	+1876
	Yh19-2a	-1892	S2	Gh7-2a	+1049
	Zo9-3a	+6647		Vc34-3a	+1183
	Bc14-2bc	-1027		Xk19-2a	+1715
	Bk25-2a	-1754		Yh19-2a	+12355
	Bk31-2a	-1594		Yh20-2b	-1707
	Fo34-3a	-2191		Yk2-3a	-1528
	Fr2-2a	+1290		Fo34-3a	-2686
	Lf17-2ab	-19077		Lf17-2ab	-3250
	Nh2-2c	-1374		Lf86-2a	-3211
	Qf35-1/2bc	-1445		Qf35-1/2bc	-1095
	Vp45-2/3a	+1783			
	Vp49-3a	+2170			

Table 13. Land Suitability for Irrigated Upland crops (in % of Mapping unit)

Mapping unit	S1		S2		N	
	1:5M	1:1M	1:5M	1:1M	1:5M	1:1M
Be49-3c	0	0	4	56	96	44
Fo48-2ab	0	1	21	8	79	91
Gh7-2a	2	4	25	6	73	89
Gm15-2a	4	0	27	10	69	90
I-R	0	0	3	3	97	97
I-R-bc	0	0	3	4	97	95
I-Re-3a	0	0	3	0	97	100
I-V	0	3	19	3	81	95
I-c	0	0	0	6	100	68
Jc6-2a	10	0	21	11	69	84
Lf18-2a	0	0	2	4	98	96
Ne12-2c	0	0	5	12	95	88
Qc19-1c	0	0	1	14	99	86
Qc8-1a	0	0	11	13	89	87
Qc9-1b	0	0	8	12	92	88
Rc2-3c	4	0	4	0	92	100
RC22-2b	6	0	10	7	84	93
Re59-2c	2	0	2	6	96	78
Re59-a	2	0	2	4	96	96
Re63-2c	2	1	2	3	96	94
Vc34-3a	0	0	32	9	68	92
Xk19-2a	14	0	30	4	57	92
Yh17-2c	2	0	6	3	92	97
Yh19-2a	15	3	25	1	61	95
Yh20-2b	7	17	11	15	83	65
Yk2-3a	0	3	4	12	96	85
Zo9-3a	4	1	4	6	93	94
Qc20-1a	0	0	1	0	99	100

Mapping unit	S1		S2		N	
	1:5M	1:1M	1:5M	1:1M	1:5M	1:1M
Af32-1/2a	0	0	11	14	90	87
Bc14-2bc	0	1	2	2	98	95
BC15-2ab	0	35	3	41	97	24
Bh14-3c	2	0	2	0	96	100
Bk25-2a	3	1	22	21	76	78
Bk31-2a	3	0	20	48	77	52
Fo34-3a	0	0	12	80	88	20
Fo42-2b	2	0	2	0	96	100
Fo43-2b	2	1	2	1	96	97
Fo47-2ab	0	3	13	4	87	94
Fo49-2a	0	1	31	3	69	88
Fo50-2a	0	0	29	10	71	47
Fp10-2a	0	3	26	35	74	63
Fr7-2a	0	0	26	11	74	90
Fr9-2a	0	2	27	11	73	85
G7-2a	6	0	32	10	62	90
I-A-R-bc	0	0	2	12	98	88
I-Bk-R-bc	0	0	2	24	98	76
I-R	0	2	3	5	97	93
I-Re-T-c	0	0	2	13	98	87
I-U-c	0	0	0	2	100	98
I-V-b	0	4	19	14	81	83
Lf17-2ab	0	1	15	18	85	79
Lf86-2a	0	0	32	13	68	87
Nd37-2/3ab	0	0	7	6	93	94
Ne29-2bc	0	0	4	10	96	90
Ne30-2ab	0	0	12	0	88	98
Ne31-2ab	0	0	8	12	92	88
Ne38-2ab	0	0	7	50	93	50

Mapping unit	S1		S2		N	
	1:5M	1:1M	1:5M	1:1M	1:5M	1:1M
Nh2-2c	0	1	0	3	100	96
Qc30-1/2a	2	0	6	0	92	100
Qc37-1a	0	1	4	10	96	90
Qf35-1/2bc	0	0	5	21	95	79
Tm10-2bc	0	0	5	15	95	85
Tm11-1/2ab	2	4	11	3	87	94
Tm9-2c	2	0	2	1	96	99
To7-2/3a	3	19	18	4	80	78
Vc39-3a	0	0	38	12	63	89
Vp45-2/3a	0	2	27	15	73	76
Vp49-3a	2	0	11	1	54	99
We4-2a	0	0	35	18	65	83
X7-2ab	10	0	17	12	73	88

Table 14. Land suitability for Paddy Rice (in % of Mapping Unit)

Mapping unit	S1		S2		N	
	1:5M	1:1M	1:5M	1:1M	1:5M	1:1M
Be49-3c	0	0	8	52	93	48
Fo48-2ab	5	3	27	37	69	60
Gh7-2a	27	2	9	12	65	85
Gm15-2a	28	19	17	11	57	70
I-R	0	2	3	6	98	92
I-R-bc	0	0	3	6	98	93
I-Re-3a	0	0	3	1	98	99
I-V	0	1	38	4	63	95
I-c	0	0	0	3	100	70
Jc6-2a	20	3	23	6	57	87
Lf18-2a	0	0	2	3	99	97
Ne12-2c	0	1	8	11	93	88
Qc19-1c	0	0	1	0	99	100
Qc8-1a	11	0	0	0	89	100
Qc9-1b	8	0	0	0	93	100
Rc2-3c	4	0	2	0	94	100
RC22-2b	12	0	10	11	78	89
Re59-2c	4	0	2	6	94	97
Re59-a	4	1	2	4	94	95
Re63-2c	4	1	2	5	94	91
Vc34-3a	11	11	40	12	49	77
Xk19-2a	0	0	17	1	84	96
Yh17-2c	4	0	10	6	86	94
Yh19-2a	0	1	10	13	91	86
Yh20-2b	4	0	3	4	93	92
Yk2-3a	0	0	8	4	93	96
Zo9-3a	4	2	26	8	71	90
Qc20-1a	0	0	1	0	99	100

Mapping unit	S1		S2		N	
	1:5M	1:1M	1:5M	1:1M	1:5M	1:1M
Af32-1/2a	5	5	15	18	80	77
Bc14-2bc	1	1	4	13	96	84
BC15-2ab	0	0	0	43	100	58
Bh14-3c	4	0	5	0	92	100
Bk25-2a	4	4	14	39	82	56
Bk31-2a	0	0	11	82	90	18
Fo34-3a	0	0	23	79	77	22
Fo42-2b	4	0	5	0	92	100
Fo43-2b	4	3	5	14	92	83
Fo47-2ab	5	3	13	21	83	76
Fo49-2a	8	2	27	9	65	80
Fo50-2a	1	2	34	19	66	36
Fp10-2a	11	20	38	63	51	17
Fr7-2a	0	1	30	8	70	92
Fr9-2a	4	2	27	12	69	83
G7-2a	35	10	10	0	56	90
I-A-R-bc	0	0	2	7	98	93
I-Bk-R-bc	0	1	2	17	98	82
I-R	0	1	3	8	97	90
I-Re-T-c	0	0	2	5	98	95
I-U-c	0	5	0	6	100	89
I-V-b	0	0	38	18	63	82
Lf17-2ab	0	0	15	35	85	63
Lf86-2a	0	0	44	20	57	80
Nd37-2/3ab	0	0	9	0	92	100
Ne17-2/3c	0	0	0	0	100	0
Ne29-2bc	4	0	4	7	92	93
Ne30-2ab	4	0	10	11	86	88
Ne31-2ab	0	1	12	12	89	87
Ne38-2ab	0	0	10	50	90	50

Mapping unit	S1		S2		N	
	1:5M	1:1M	1:5M	1:1M	1:5M	1:1M
Nh2-2c	0	2	2	9	98	90
Qc30-1/2a	4	0	10	4	86	96
Qc37-1a	0	2	8	18	93	80
Qf35-1/2bc	4	0	3	24	93	77
Tm10-2bc	4	1	0	4	96	95
Tm11-1/2ab	0	2	2	9	98	89
Tm9-2c	4	0	5	0	92	100
To7-2/3a	0	0	5	32	95	68
Vc39-3a	0	0	75	13	25	87
Vp45-2/3a	0	6	53	29	48	58
Vp49-3a	4	0	56	6	40	94
We4-2a	34	13	27	45	40	43
X7-2ab	4	0	7	12	89	88

CHAPTER 4. REVISED 1:5M SOIL DATABASE OF KENYA

4.1. Map Construction and Database Compilation

A 1:5M soil database was constructed on basis of the available soil information at scale 1:1M, as provided by the KENSOTER database (Kenya Soil Survey, 1995) and the Exploratory Soil Map of Kenya (Sombroek, Braun and Van Der Pouw, 1980). The database includes a 1:5M soil map and the corresponding attribute data.

The soil pattern of Kenya is characterized by striking differences in elevation, landform, geology and climate. This is reflected in the legend of the ESMK, which uses major landforms at the highest level of generalization (Sombroek, Braun and Van Der Pouw, 1980). Physiography was therefore used as a first criterion to generalize the 1:1M mapping unit information to scale 1:5M.

In this process, the major landform classification of the ESMK proved to be more practical to use than the SOTER classification. The 'pragmatic' ESMK classification, which distinguishes major landforms on basis of their geomorphological characteristics as well as their origin (e.g. volcanic plains, dissected erosional plains), grouped the 1:1M mapping units into large physiographic units with distinct soil patterns. A classification on basis of KENSOTER using major landform, elevation, and lithology resulted in a pattern of often smaller, scattered units.

Major soil characteristics were used to further subdivide or combine these physiographic units into the 1:5M mapping units. This resulted in a total of 62 mapping units. The units are described in the Section 4.3. The composition of the soil associations of the mapping units is given in Table 15. Appendix 2 gives a comprehensive list of soil units, their proportional area, textural and slope classification, per mapping unit.

It must be emphasized again that the KENSOTER database is still in development, and that soil component definitions have not yet been completed for all KENSOTER units. The spatial delineation of the KENSOTER units follows the ESMK mapping unit boundaries closely, and, where necessary, data gaps in the KENSOTER database were filled on basis of the information of the corresponding ESMK mapping unit. Reference is made to Chapter 1 for details on the KENSOTER database structure, data availability, data quality and source of information.

Attribute Data

The available soil and terrain information of the mapping units is organized in two datafiles:

KEN5SOIL.DBF	Soil and terrain information for each KENSOTER soil component ordered per mapping unit. The data structure and attributes are listed in Table 16.
KEN5UNIT.DBF	Aggregated information for each soil unit - phase - textural class - slope class combination per mapping unit. The information in this file is listed in Appendix 2.

Table 15. Abridged Mapping Unit Compositions of the Revised 1:5M Soil Map of Kenya

Unit Code	Mapping Unit	Proportional Occurrence of Soil Unit in Mapping Unit		
		> 50 %	20 - 50 %	< 20 %
21	ACp1-2a			ACp, ACh, PHl, GLe, ALh, PLe, NTr, LXh, FRr, CMo
20	ALh1-2a		ALh	LXh, LVx, CMx, FLe, LVv, ACu, CMe
7	ANm1-2b	ANm	NTu	CMe
1	ANu1-3b		ANu, ANu li, HSs li	NTr
57	ARb1-1a		ARb so	CMc, CLh st, FLc so, SCk so, SNh st, ARh ye
44	ARo1-1a	ARo	ARh	LVk pc, SCh
49	ARo2-1a	ARo	RGc so	SNg
56	ARo3-1a		ARo, LVf	FRr, ARa, LPq, FRh, FLt so, SCg, CMo li
6	CLh1-3a	CLh		CMe, CLh st
8	CLh2-2a	CLh st	RGc st	SHk so
73	CLh3-2a	CLh		LPq, LPe, LPq st
39	CLl1-2a		CLl st, SNk	CLh st, LPe, CMC st
34	CLp1-2a	CLp		LVx, SNk, LVx st
40	CLp2-3a	CLp		LPe, ARh, LPq st, SCk ta, FRr pf
2	CMe1-2c		CMe, LPq	CMx st, CMe li, Lpe, CMu, PHl, CMx, LXh
3	CMu1-3c		CMu li, LVx, LPq	LPe
14	CMx-RGd-2b	CMx st	RGd li	
64	FLe1-3a		FLe	VRe so, Flc so, LXh, CLh so, SNk sa, GLm
41	FRh1-3a		FRh, FRr	FRu, Glm, GLe, CMu
18	FRr1-3a		FRr	ACh, LVx, VRe
26	FRr2-2a	FRr		LVx
43	FRr3-3a	FRr li	CMx li	VRe so, FRr
63	GLe1-3a	GLe sa	SNH sa	FLc, FLe, VRe sa
4	LPe-LPq-2bc	LPe		LPq
22	LPq1-2b		LPq, RGc st	CLh sa, SCk st, SNk, CLl st, RGc so
72	LPq2-3b		LPq st, GYk sa, GYk st	LPe, LPq, LPu
55	LVg1-2a	LVg		PLu, FRr, SNh sa, LVg so, SNg sa, FLt so, ARh, SCh
23	LVh1-1a			LVh, ARl, FRx, CMe li, SNh, PHl so, FRh, ACf, LPe, SNg sa
27	LVh2-2a			LVh, LVx pf, SNk, LPq, VRe so, LVx, LVh so, LPm, PHl so
19	LVx1-2a	LVx pf	FRh	FRr, VRe
31	LVx2-1a		LVx, CMx	LXh, LPe, CLh sa, SCk st, CHk so

Unit Code	Mapping Unit	Soil Unit Composition of Mapping Unit		
		> 50 %	20 - 50 %	< 20 %
46	LVx3-2a		LVx, LVh sa	ARo, LXh, LPe, LVv so, FLc so
75	LVx4-1/2a		LVx	LVx st, LXh, PHl st, FLe, VRe, LPe, PLe, CMd li, LVf
47	LXf1-3a	LXf		PLe, LVk pc, LVx
11	LXh1-3a		LXh	CMe ye, SCk st, CLh sa, SNh ye, ARl ye, LPe
12	LXh2-2a		LXh ye	ARb so, FLe, ARb, RGc so, LVx, LXh, Rock
10	NTu1-3a	NTu		PHl, CMc
60	PHh1-2a	PHh	CMg fr	SNk
33	PHl1-2a	PHl	PHl li	LPu, LPq
36	PHl2-3a	PHl		VRe so
29	PLe1-3a		PLe so	PLe, PHl, VRe sa, LPu, VRe so, CMu, PHl li, PHl so, CHh
48	PLe2-1a		PLe so	SNg, SNh sa, SNk sa
54	PLe3-1a	PLe so		PHg, PHl, VRe so
5	RGc1-2a		RGc st, LVx	CMe, Rock, FLe, SNh
77	RGc2-2b			RGc, LPq, PHl, ANh, CMe li, LPe
78	RGc3-2a		RGc st, RGc so	LPq, LPe, ARb so, LXh ye, CLl st, SNk, SNh st
65	RO1	Rock		SCh st, SNh sa, FLc
71	RO2		Rock	RGc, FLe, LPe, SNh st, FLc sa
74	RO3		Rock, SNh st	FLc sa, LXh, ALh, ARb sa, LVx, FLe
76	RO4	Rock	ANm	ANm st, ANm so, CHh st, CLh st
61	SCg1-3a		SCg so	SNh, SNh pc, CLl sa, VRe, LVg sa, CLh li, VRe sa, VRe so, CLh sa
30	SCh1-3a		SCh st, VRe so	PHl sa, SCh so, SNh sa, FLc, LXh
58	SCh2-3a		SCh ta, CLh st	LPu, SCk so, SNh st
52	SNg1-1a	SNg		ARo, SNh sa, VRe so, PLe so, RGc so
28	SNh1-3a	SNh sa		SNk sa, FLc so, LVx, SNh st
51	SNh2-3a	SNh sa	VRe sa	SNg
62	SNh3-3a		SNh sa	SCn, VRe sa, VRe so, LVk pc, PLe sa, CLh
70	SNh4-2a		SNh st, ARb so	FLc sa, FLc so, FLe, SNh sa, RGc st
37	VRd1-3a		VRd, PHl	FLe st, PHl sa
38	VRe1-3a		VRe st	VRe, FLe st, PLe, VRe so, CMx li, Lpm, VRe sa, CMx
59	VRe2-3a			VRe so, FLe, PLe so, ACp, CMd pf, CMd, CMv so, VRe, GLd, LVh
35	VRe-3a	VRe sa		

KEN5SOIL.DBF includes all KENSOTER soil component and terrain component information that was required to construct the 1:5M map. The information is organized per 1:5M mapping unit. KEN5SOIL.DBF can be linked to the KENSOTER database through keyfield SUID. This link provides a means to access soil and terrain information which is not physically included in this database, and facilitates updating of KEN5SOIL.DBF with new KENSOTER information.

Table 16. Structure of KEN5SOIL.DBF

Field Name	Type	Width	Dec	Description
POLY_ID	num	4	0	KENSOTER polygon number 0,,3260.
AREA	num	5	0	Polygon area in km2
SUID	num	3	0	Soter unit identifier 0,,401
SOIL	char	16		ESMK mapping unit code
UNIT5M	num	2	0	1:5M mapping unit number
UNITCODE	char	12	0	1:5M mapping unit code
CLAF	char	3		Soil classification (FAO, 1990)
PHAS	char	2		Soil phase (FAO, 1990)
POSI	char	1		Position of soil component in terrain component
RDEP	char	1		Rootable depth class
DRAI	char	1		Drainage class
SLGR	num	3		Dominant slope gradient in %
SLCL	char	2		Dominant slope class
TEXT	char	1		Textural class
LNDF	char	2		Landform
RSLO	char	2		Regional slope
LITH	char	4		Lithology

Landform, regional slope, position, lithology, rootable depth, drainage are classified according to the SOTER Procedures Manual (Van Engelen & Wen (eds), 1995).

The textural classification is according to the Revised Legend to the Soil Map of the World FAO, 1990), and refers to the upper 30cm of the soil:

1 Coarse textured: sands, loamy sands and sandy loams with less than 15% clay, and more than 70% sand.

2 Medium textured: sandy loams, loams, sandy clay loams, silt loams, silt, silty clay loams, and clay loams with less than 35% clay and less than 70% sand; the sand fraction may be as high as 85% if a minimum of 15% clay is present.

3 Fine textured: clays, silty clays, sandy clays, clay loams and silty clay loams

with more than 35% clay.

The dominant slope gradient classification of the Revised Legend to the Soil Map of the World FAO, 1990) was refined and the following classes are distinguished:

a1	dominant slope	0 - 2%
a2	dominant slope	2 - 8%
b1	dominant slope	8 - 16%
b2	dominant slope	16 - 30%
c	dominant slope	> 30%

Digital Map Production

The mapping units of the revised 1:5M Soil Map of Kenya were generated by the aggregation of the SOTER map polygons, by means of a reclassification process. The reclassification was carried out on a rasterized version of the KENSOTER polygon map with a resolution of 1.4 km. For cartographic purposes the mapping unit boundaries were subsequently generalized. All files required for the map production process are included on the diskette. Information on the image and values files is found in the associated documentation files.

4.2. Mapping Unit Descriptions

This Section includes brief descriptions of the major geomorphological, lithological and soil characteristics of each mapping unit. The information on landforms and lithology is derived from the ESMK (Sombroek, Braun, and De Pouw, 1980), unless stated otherwise. The proportional distribution of the FAO (1990) soil units in Kenya is given in Table 17.

ACp1-2a (16171 km^2)

Undulating plains, with hills and ridges (uplands, various levels). Mixed lithology with acid to basic igneous rocks (granites, rhyolites, andesites, basalts), sedimentary rocks (mudstones, sandstones), metamorphic rocks (gneisses), and alluvial deposits.

Dominant soil units: Plinthic Acrisol, medium textured, slope 2-8%, on granites and alluvium
Haplic Acrisol, fine textured, slope less than 16%, on gneiss and sandstone

Inclusions: Luvic Phaeozem, fine to medium textured, slope 2-8%, on rhyolites and basalt
Eutric Gleysol, coarse textured, slope 0-2%, on alluvium in lower poorly drained positions (bottomlands)
Haplic Alisol, fine textured, slope 2-8%, on quartzite and granite
Eutric Planosol, partly sodic, fine textured, slope 2-8%, on basalt and other undifferentiated igneous rocks
Rhodic Nitisol, medium textured, slope 2-8%, on basalts
Haplic Lixisol, medium textured, slope 2-8%, on granite

Rhodic Ferralsol, partly petroferric, fine textured, slope 0-2%, on mudstone
Ferralic Cambisol, fine textured, slope 2-8%, on andesite

Table 17. Proportional distribution of FAO (1990) Soil Units in Kenya According to KENSOTER

Soil Unit	Area %	Soil Unit	Area %	Soil Unit	Area %
ACf	0.1	FLc	2.4	LXf	2
ACh	1.0	FLe	1.8	LXh	2.3
ACp	0.4	FLt	0.1	NTh	0.1
ACu	0.1	FRh	0.6	NTr	0.4
ALh	0.5	FRr	6.1	NTu	3
ANh	0.1	FRu	0.3	PHh	0.2
ANm	1.1	FRx	0.2	PHl	3.3
ANu	0.6	GLd	0.1	PLd	0.1
ARb	1.7	GLe	1.4	PLe	5.4
ARh	1.0	GLm	0.1	PLu	0.1
ARl	0.3	GRh	0.1	RGc	4.7
ARo	2.9	GYk	0.3	RGd	0.1
CHh	0.1	HSs	0.2	SCg	0.2
CHk	0.1	KSh	0.1	SCh	1.2
CLh	4.4	LPd	0.1	SCk	0.7
CLl	1.2	LPe	2.7	SCn	0.3
CLp	2.9	LPm	0.2	SN	1.8
CMc	0.5	LPq	3.5	SNg	4.7
CMd	0.2	LPu	0.3	SNh	6.2
CMe	2.5	LVf	0.2	SNk	2.3
CMg	0.1	LVg	1.0	SNm	0.7
CMo	0.1	LVh	1.5	VRd	0.3
CMu	0.8	LVk	0.4	VRe	3.6
CMv	0.1	LVv	0.2		
CMx	2.1	LVx	5.3	Rock	2.0

ALh1-2a (2665 km^2)

Plains (uplands), footslopes and ridges. Predominantly Basement System rocks(gneisses).

Dominant soil unit:	Haplic Alisol, medium textured, slope 2-8%
Associated soil unit:	Haplic Lixisol, fine textured, slope 2-16%, mainly on ridges
Inclusions:	Chromic Luvisol, fine textured, slope 8-16%
	Chromic Cambisol, medium textured, slope 8-16%
	Eutric Fluvisol, coarse textured, slope 0-2%, on recent alluvium
	Vertic Luvisol, fine textured, slope 16-30%, on ridges
	Humic Acrisol, medium textured, slope 8-16%, on gneiss rich in ferro-magnesian minerals
	Eutric Cambisol, medium textured, slope 8-16%, mainly on ridges

ANm1-2b (7203 km2)

Plateaus. Mainly pyroclastic materials of recent volcanoes.

Dominant soil unit:	Mollic Andosol, medium textured, slope 8-16%
Associated soil unit:	Humic Nitisol, fine textured, slope 2-8%, on igneous rock
Inclusions:	Eutric Cambisol, medium textured, slope 8-16%

ANu1-3b (4268 km2)

Middle and upper slopes of older, major volcanoes. Predominantly pyroclastic materials.

Dominant soil unit:	Humic Andosol, partly lithic, fine textured, slope 16-30%
Associated soil unit:	Terric Histosol, lithic, medium textured, slope 16-30%
Inclusions:	Rhodic Nitisol, medium textured, slope 16-30%

ARb1-1a (6869 km^2)

Flat lacustrine plains with dunes (Lake Turkana), and floodplains.

Dominant soil unit:	Cambic Arenosol, sodic, coarse textured, slope 8-16%, lacustrine plain - dunes complex
Associated soil units:	Calcaric Cambisol, coarse textured, slope 0-2%, lacustrine plain - dunes complex
Inclusions:	Haplic Calcisol, stony, medium textured, slope 0-2%, on lacustrine deposits
	Calcaric Fluvisol, partly sodic, partly saline, coarse textured, slope 0-2%, on recent alluvium
	Haplic Arenosol, yermic, coarse textured, slope 0-2%, on lacustrine deposits
	Calcic Solonchak, sodic, fine textured, slope 2-8%, on basalts
	Haplic Solonetz, stony, medium textured, slope 0-2%

ARo1-1a (12292 km^2)

Flat sedimentary plains. Sheetwash and aeolian deposits from Basement System rocks.

Dominant soil unit:	Ferralic Arenosol, coarse textured, slope 0-2%
Associated soil unit:	Haplic Arenosol, coarse textured, slope 0-2%
Inclusions:	Calcic Luvisol, petrocalcic, medium textured, slope 0-2%, on limestones and gypsiferous beds
	Haplic Solonchak, fine textured, slope 0-2%

ARo2-1a (3625 km^2)

Flat sedimentary plains. Sediments derived from various sources.

Dominant soil units:	Ferralic Arenosol, coarse textured, slope 0-2%, on sheetwash and aeolian deposits from Basement System rocks
Associated soil unit:	Calcaric Regosol, sodic, medium textured, slope 0-2%
Inclusions:	Gleyic Solonetz, coarse textured, slope 0-2%, on bay sediments

ARo3-1a (1601 km^2)

Flat coastal plains with lagoonal deposits, beach ridges, and mangrove swamps.

Dominant soil unit:	Ferralic Arenosol, coarse textured, slope 0-2%, on lagoonal deposits
Associated soil unit:	Ferric Luvisol, medium textured, slope 0-2%, on lagoonal deposits
Inclusions:	Rhodic Ferralsol, fine textured, slope 0-2%, on coral reef limestones
	Albic Arenosol, coarse textured, slope 0-2%, on lagoonal deposits
	Lithic Leptosol, medium textured, slope 0-2%, on coral reef limestones
	Haplic Ferralsol, medium textured, slope 0-2%, on reworked lagoonal deposits
	Thionic Fluvisol, sodic, coarse textured, slope 0-2%, mangrove swamps
	Gleyic Solonchak, fine textured, slope 0-2%, mangrove swamps
	Ferralic Cambisol, lithic, medium textured, slope 0-2%, on coral reef limestones

CLh1-3a (4082 km2)

Step-faulted floor of the Rift valley. Mainly volcanic rocks, with alluvium in places.

Dominant soil unit:	Haplic Calcisol, fine textured, slope 2-8%
Inclusion:	Eutric Cambisol, fine textured, slope 0-2%, in lower positions

CLh2-2a (13496 km2)

Lower slopes of major, older volcanoes. Pyroclastic materials and basalts.

Dominant soil unit:	Haplic Calcisol, stony, medium textured, slope 2-8%
Associated soil unit:	Calcaric Regosol, stony, medium textured, slope 2-8%
Inclusion:	Calcic Solonchak, sodic, fine textured, slope 2-8%

CLh3-2a (5825 km^2)

Footslopes and hills. Fine sandstones, siltstones and sandy limestones.

Dominant soil unit:	Haplic Calcisol, medium textured, slope 2-8%, on colluvium
Inclusions:	Lithic Leptosol, medium textured, slope 8-16%
	Eutric Leptosol, medium textured, slope 0-2%

CLl1-2a (13351 km^2)

Flat plateaus developed on limestones, with step-faulted scarps, and badlands developed on lacustrine deposits of Lake Turkana.

Dominant soil units:	Luvic Calcisols, stony, medium textured, slope 0-2%, on limestones
	Calcic Solonetz, medium textured, slope 0-2%, on limestone
Associated soil unit:	Haplic Calcisol, stony, medium textured, slope 2-8%, on lacustrine and volcanic deposits
Inclusions:	Eutric Leptosol, medium textured, slope 8-16%, on scarps
	Calcaric Cambisol, stony, medium textured, slope 2-8%, on basic igneous rocks

CLp1-2a (14821 km^2)

Gently undulating erosional plains. Predominantly Basement system rocks.

Dominant soil unit:	Petric Calcisol, medium textured, slope 0-2%,
Inclusions:	Chromic Luvisol, coarse and medium textured, slope 0-8%
	Calcic Solonetz, medium textured, slope 0-2%, on alluvium and basalt

CLp2-3a (10100 km^2)

Flat plateaus developed on limestones.

Dominant soil unit:	Petric Calcisol, fine textured, slope 0-2%
Inclusions:	Eutric Leptosol, medium textured, slope 0-2%
	Haplic Arenosol, coarse textured, slope 0-2%, on sandy deposits
	Lithic Leptosol, stony, medium textured, slope 0-2%
	Calcic Solonchak, takyric, medium textured, slope 0-2%, on alluvium and colluvium
	Rhodic Ferralsol, petroferric, fine textured, slope 0-2%, on claystones

CMe1-2c (19821 km2)

Mountains and hills. Predominantly acid metamorphic rocks.

Dominant soil unit:	Eutric Cambisol, partly lithic, medium textured, slope over 30%
Associated soil unit:	Lithic Leptosol, medium textured, slope over 16%, on pyroclastic materials
Inclusions:	Chromic Cambisol, partly stony, medium textured, slope 2-8%

Eutric Leptosol, medium textured, slope 8-16%
Humic Cambisol, medium textured, slope over 30%
Luvic Phaeozem, fine textured, slope 8-16%, on igneous rock
Haplic Lixisol, fine textured, slope 2-8%

CMu1-3c (1499 km2)

Mountains and hills. Predominantly gneisses, granites and andesites.

Dominant soil unit:	Humic Cambisol, lithic, fine textured, slope over 30%, on gneiss Chromic Luvisol, fine textured, slope over 30%, on gneiss
Associated soil unit:	Lithic Leptosol, fine to medium textured, slope over 16%, on gneiss and andesite
Inclusions:	Eutric Leptosol, medium textured, slope 8-16%, on granite

CMx-RGd-2b (3059 km^2)

Dissected erosional plains. Predominantly Basement System rocks (mainly gneiss).

Dominant soil unit:	Chromic Cambisol, stony, medium textured, slope 8-16%
Associated soil unit:	Dystric Regosol, lithic, medium textured, slope 8-16%

FLe1-3a (5150 km^2)

Floodplains.

Dominant soil unit:	Eutric Fluvisol, coarse textured, slope 0-2%
Inclusions:	Eutric Vertisol, sodic, fine textured, slope 0-2% Calcaric Fluvisol, sodic, coarse textured, slope 0-2% Haplic Lixisol, fine textured, slope 2-8%, on colluvium from Basement System rocks Haplic Calcisol, sodic, fine textured, slope 2-8%, on Basement System rocks Calcic Solonetz, saline, fine textured, slope 0-2% Mollic Gleysol, fine textured, slope 0-2%

FRh1-3a (6191 km^2)

Undulating plains and plateaus. Acid and intermediate igneous and metamorphic rocks.

Dominant soil unit:	Haplic Ferralsol, fine textured, slope 0-2%, on intermediate igneous rocks
Associated soil units:	Rhodic Ferralsol, fine textured, slope 2-8%, on granites and gneisses Humic Ferralsol , fine textured, slope 2-8%, on Basement System rocks
Inclusions:	Mollic Gleysol, fine textured, slope 0-2%, in poorly drained positions on basement system rock Eutric Gleysol, fine textured, slope 0-2%, in low positions on alluvium and colluvium (bottomlands) Humic Cambisol, fine textured, slope 8-16%, on gneiss

FRr1-3a (14755 km^2)

Plains and footslopes. Basement System rocks (mainly gneisses).

Dominant soil unit:	Rhodic Ferralsol, fine textured, slope 2-8%
Associated soil unit:	Haplic Acrisol, fine textured, slope 0-2%
Inclusions:	Chromic Luvisol, coarse textured, slope 2-8%
	Eutric Vertisol, fine textured, slope 2-8%, on gneiss rich in ferro-magnesian minerals

FRr2-2a (29568 km^2)

Erosional, non-dissected plains. Basement System rocks and colluvium derived from Basement System rocks.

Dominant soil unit:	Rhodic Ferralsol, medium and fine textured, slope 0-2%
Inclusion:	Chromic Luvisol, medium textured, slope 2-30%

FRr3-3a (998 km^2)

Flat plateau (Athi). Basic igneous rocks.

Dominant soil unit:	Rhodic Ferralsol, lithic, fine textured, slope 0-2%
Associated soil unit:	Chromic Cambisol, lithic, fine textured, slope 0-2%
Inclusion:	Eutric Vertisol, sodic, fine textured, slope 0-2%

GLe1-3a (11300 km^2)

Floodplains.

Dominant soil unit:	Eutric Gleysol, saline, fine textured, slope 0-2%
Associated soil unit:	Haplic Solonetz, saline, fine textured, slope 0-2%
Inclusions:	Calcaric Fluvisol, fine textured, slope 0-2%
	Eutric Fluvisol, coarse textured, slope 0-2%
	Eutric Vertisol, saline, fine textured, slope 0-2%

LPe-LPq-2bc (3909 km2)

Step-faulted scarps of the Rift Valley. Undifferentiated volcanic rocks.

Dominant soil unit:	Eutric Leptosol, medium textured, slope 16-30%
Inclusion:	Lithic Leptosol, medium textured, slope over 30%

LPq1-2b (15338 km^2)

Hills and undulating plains (uplands). Volcanic rocks (mainly basalts) and Basement System rocks(mainly gneisses).

Dominant soil unit:	Lithic Leptosol, medium textured, slope 16-30%, on basalt, rhyolite and andesite
Associated soil unit:	Calcaric Regosol, stony, coarse textured, slope 2-8%, on basalt and gneiss
Inclusions:	Haplic Calcisol, saline, medium textured, slope 2-8%, on gneiss
	Calcic Solonchak, stony, medium textured, slope 0-2%, on gneiss
	Calcic Solonetz, medium textured, slope 0-2%, on basalt
	Luvic Calcisol, stony, medium textured, slope 0-2%, on basalt

LPq2-3b (3675 km^2)

Flat plateau remnants and undulating dissected plains. Predominantly limestones.

Dominant soil unit:	Lithic Leptosol, stony, fine textured, slope 8-16%, on limestones and calcaric mudstones
Associated soil units:	Calcic Gypsisol, saline, medium textured, slope 0-2%, on marls
	Calcic Gypsisol, stony, medium textured, slope 0-2%, on marly limestones, gypsiferous shales and sandy limestones
Inclusions:	Eutric Leptosol, medium textured, slope 0-2%, on limestones
	Humic Leptosol, medium textured, slope 0-2%, on lacustrine deposits derived from limestones

LVg1-2a (8805 km^2)

Flat coastal plains developed on lagoonal deposits, with beach ridges, dunes and mangrove swamps.

Dominant soil unit:	Gleyic Luvisol, coarse textured, slope 0-2%
Inclusions:	Umbric Planosol, medium textured, slope 0-2%
	Rhodic Ferralsol, medium textured, slope 0-2%, on beach ridges
	Haplic Solonetz, saline, medium textured, slope 0-2%
	Gleyic Solonetz, saline, coarse textured, slope 0-2%
	Thionic Fluvisol, sodic, coarse textured, slope 0-2%, mangrove swamps
	Gleyic Solonchak, fine textured, slope 0-2%, mangrove swamps
	Ferralic Cambisol, lithic, medium textured, slope 0-2%, on coral reef limestones
	Haplic Arenosol, coarse textured, slope 2-8%, on dunes

LVh1-1a (8138 km^2)

Coastal plains. Sedimentary rocks (mainly sandstones) and unconsolidated sediments.

Dominant soil unit:	Haplic Luvisol, coarse textured, slope 0-2%, on sandstones and siltstones
Inclusions:	Luvic Arenosol, coarse textured, slope 0-2%, on sandy deposits, sandstones and grits
	Xanthic Ferralsol, medium textured, slope 0-2%, on sandstones
	Eutric Cambisol, lithic, medium textured, slope 2-8%, on shales, sandstones and siltstones
	Haplic Solonetz, fine textured, slope 0-2%, on bay sediments
	Luvic Phaeozem, sodic, fine textured, slope 8-16%, on bay and lagoonal deposits, and shales
	Haplic Ferralsol, medium textured, slope 2-8%, on coarse sandstones and grits
	Ferric Acrisol, fine textured, slope 2-8%, on coarse sandstones and grits
	Eutric Leptosol, fine textured, slope 8-16%, on shales and sandstones
	Gleyic Solonetz, saline, coarse textured, slope 0-2%, on lagoonal deposits

LVh2-2a (8422 km^2)

Plains, mainly erosional and non-dissected. Sedimentary rocks.

Dominant soil unit:	Haplic Luvisol, partly sodic, medium textured, slope 0-8%, mainly on sandstone
Inclusions:	Chromic Luvisol, partly petroferric, medium and fine textured, slope 0-2%
	Calcic Solonetz, medium textured, slope 0-2%, on alluvium and bay sediments
	Eutric Vertisol, sodic, fine textured, slope 0-2%, on shales
	Lithic Leptosol, medium textured, slope 2-8%, on siltstones and shales
	Mollic Leptosol, fine textured, slope 16-30%, on limestone ridge
	Luvic Phaeozem, sodic, fine textured, slope 0-2%, on shales

LVx1-2a (4163 km^2)

Plains (uplands). Basement System rocks (predominantly gneisses).

Dominant soil unit:	Chromic Luvisol, petroferric, medium textured, slope 2-8%
Associated soil unit:	Haplic Ferralsol, fine textured, slope 2-8%
Inclusions:	Rhodic Ferralsol, fine textured, slope 0-2%
	Eutric Vertisol, fine textured, slope 2-8%, on gneiss rich in ferro-magnesian minerals

LVx2-1a (13734 km^2)

Non-dissected plains, with isolated hills. Predominantly Basement System rocks.

Dominant soil unit:	Chromic Luvisol, coarse textured, slope 2-8%
Associated soil unit:	Chromic Cambisol, fine textured, slope 0-2%, on basic igneous rocks
Inclusions:	Haplic Lixisol, fine textured, slope 2-8%
	Eutric Leptosol, medium textured, slope 8-16%
	Calcic Solonchak, stony, medium textured, slope 2-8%
	Haplic Calcisol, saline, medium textured, slope 2-8%
	Calcic Chernozem, sodic, fine textured, slope 0-2%, in bottomlands on alluvium and colluvium of volcanic ashes

LVx3-2a (16124 km^2)

Flat sedimentary plains developed on sheetwash and aeolian deposits from Basement System rocks, erosional plains developed on Basement system rocks, and isolated hills (limestones, gneisses).

Dominant soil unit:	Chromic Luvisol, medium textured, slope 0-2%, on sheetwash from Basement System rocks
Associated soil unit:	Haplic Luvisol, saline, medium textured, slope 0-2%, on Basement System rocks
Inclusions:	Ferralic Arenosol, coarse textured, slope 0-2%, on aeolian deposits and sheetwash from Basement System rocks
	Haplic Lixisol, fine textured, slope 2-8%, on colluvium from basement system rocks(footslopes)
	Eutric Leptosol, medium textured, slope 8-16%, Basement System rocks(hills)
	Vertic Luvisol, sodic, fine textured, slope 16-30%, on colluvium from limestones (footslopes)
	Calcaric Fluvisol, sodic, coarse textured, slope 0-2%, on recent alluvium

LVx4-1/2a (10873 km^2)

Undulating plain, with isolated hills. Basement Systems rocks, basic igneous rocks and limestones

Dominant soil unit:	Chromic Luvisol, coarse and medium texture, slope 2-16%
Inclusions:	Haplic Lixisol, fine textured, slope 0-8%, on crystalline limestones
	Haplic Phaeozem, stony, fine textured, slope 0-2%, on basic igneous rocks
	Eutric Fluvisol, coarse textured, slope 0-2%, on recent alluvium
	Eutric Vertisol, fine textured, slope 0-2%, on alluvium
	Eutric Leptosol, medium textured, slope 8-16%, on Basement System rocks
	Eutric Planosol, medium textured, slope 2-8%, on Basement System rocks
	Dystric Cambisol, lithic, fine textured, slope 8-16%, on Basement System rocks
	Ferric Luvisol, medium textured, slope 0-2%, on crystalline limestones

LXf1-3a (11115 km^2)

Flat sedimentary plains. Mainly bay sediments and sheetwash derived from bay sediments.

Dominant soil unit:	Ferric Lixisol, fine textured, slope 0-2%
Inclusions:	Eutric Planosol, sodic, coarse textured, slope 0-2%
	Calcic Luvisol, petrocalcic, medium textured, slope 0-2%, on alluvial terraces
	Chromic Luvisol, coarse textured, slope 0-2%, on sheetwash derived from sandstones

LXh1-3a (1997 km^2)

Footslopes, sedimentary plains and hills. Basement system rocks, and alluvium and colluvium derived from basement system rocks.

Dominant soil unit:	Haplic Lixisol, medium textured, slope 2-8%, on gneiss and colluvium
Inclusions:	Eutric Cambisol, yermic, coarse textured, slope 0-2%, on sandy alluvium and colluvium
	Haplic Calcisol, saline, medium textured, slope 2-8%, on basement system rock
	Calcic Solonchak, stony, medium textured, slope 2-8%, on basement system rocks
	Haplic Solonetz, yermic, coarse textured, slope 0-2%, on sandy alluvium and colluvium
	Luvic Arenosol, yermic, coarse textured, slope 0-2%, on sandy alluvium and colluvium
	Eutric Leptosol, medium textured, slope 8-16%. on hills.

LXh2-2a (7770 km^2)

Piedmont plains developed on Basement system rocks (predominantly gneiss) and adjacent sedimentary plains, and alluvium and colluvium derived from Basement system rocks.

Dominant soil unit:	Haplic Lixisol, yermic, medium textured, slope 0-2%, on alluvial and colluvial deposits
Associated soil unit:	Cambic Arenosol, partly sodic, coarse textured, slope 0-2%, on alluvial deposits and basement system rock
Inclusions:	Eutric Fluvisol, coarse textured, slope 0-2%, on recent alluvium
	Calcaric Regosol, sodic, medium textured, slope 2-8%, on Basement system rock
	Chromic Luvisol, medium textured, slope 2-8%, on gneiss and alluvial deposits
	Rock (lava flow)

NTu1-3a (23845 km2)

Lower slopes of major, older volcanoes. Predominantly igneous rocks.

Dominant soil unit:	Humic Nitisol, fine textured, slope 2-16%
Associated soil unit:	Luvic Phaeozem, fine textured, slope 2-16%
Inclusions:	Calcaric Cambisol, medium textured, slope 0-2% , on basalt

PHh1-2a (793 km^2)

Flat lacustrine plains. Sediments derived from volcanic ashes.

Dominant soil unit:	Haplic Phaeozem, medium textured, slope 0-2%
Associated soil units:	Gleyic Cambisol, fragipan, fine textured, slope 0-2%
	Calcic Solonetz, medium textured, slope 0-2%

PHl1-2a (4135 km^2)

Partly dissected plateau, with isolated hills. Predominantly volcanic rocks.

Dominant soil unit:	Luvic Phaeozem, partly lithic, fine textured, slope 0-16%, on volcanic ashes and other pyroclastic materials
Inclusions:	Humic Leptosol, medium textured, slope 8-16%, on quartzitic hills
	Lithic Leptosols, medium textured, slope, 8-16%, on quartzitic hills

PHl2-3a (3472 km^2)

Flat to almost flat plateaus. Predominantly basic igneous rocks.

Dominant soil unit:	Luvic Phaeozem, fine textured, slope 0-2%
Inclusion:	Eutric Vertisol, sodic, fine textured, slope 0-2%

PLe1-3a (8943 km^2)

Non-dissected plains and plateaus, with isolated hills. Parent materials derived from igneous and metamorphic rocks, often with an admixture of volcanic ashes.

Dominant soil unit:	Eutric Planosol, partly sodic, medium textured, slope 0-8%, on basalts, granites and gneisses with admixture of volcanic ashes.
Inclusions:	Luvic Phaeozem, partly sodic and partly lithic, coarse textured, slope less than 30% on colluvium of pyroclastic materials, quartzites, gneisses
	Eutric Vertisol, saline and partly sodic, fine textured, slope 0-8%, on basalts and gneisses with admixture of volcanic ashes.
	Humic Leptosol, medium textured, slope 8-16%, on quartzites
	Humic Cambisol, fine textured, slope 2-8%, on basic igneous rocks
	Haplic Chernozem, medium textured, slope 0-2%, on granites with admixture of volcanic ashes

PLe2-1a (49201 km^2)

Flat sedimentary plains. Mainly bay sediments and sheetwash derived from bay sediments.

Dominant soil unit: Eutric Planosol, sodic, coarse textured, slope 0-2%
Associated soil unit: Gleyic Solonetz, coarse textured, slope 0-2%
Inclusions: Haplic Solonetz, saline, medium textured, slope 0-2%
Calcic Solonetz, saline, medium textured, slope 0-2%

PLe3-1a (3721 km^2)

Flat coastal plains. Lagoonal deposits.

Dominant soil unit: Eutric Planosol, coarse textured, slope 0-2%
Inclusion: Gleyic Phaeozem, fine textured, slope 0-2%, in lower positions (bottomlands)
Luvic Phaeozem, fine textured, slope 0-2%, in lower positions (bottomlands)
Eutric Vertisol, sodic, fine textured, slope 0-2%, in lower positions (bottomlands)

RGc1-2a (9626 km2)

Step-faulted floor of the Rift valley. Volcanic rocks and alluvium derived from volcanic materials.

Dominant soil unit: Calcaric Regosol, stony, medium textured, slope 2-8%
Associated soil units: Chromic Luvisol, fine textured, slope 2-8%
Eutric Cambisol, fine textured, slope 0-2%, on andesite
Inclusions: Rock (lava flows)
Eutric Fluvisol, fine textured, slope 0-2%, alluvium
Haplic Solonetz, stony, medium, textured, slope 0-2%, alluvium

RGc2-2b (7177 km^2)

Gently undulating floor of the Rift Valley with recent volcanoes

Dominant soil unit: Calcaric Regosol, variable texture, slope over 2%
Associated soil units: Lithic Leptosol, medium textured, slope 16-30%
Inclusions: Haplic Andosol, fine textured, slope 0-2%
Eutric Planosol, medium textured, slope 0-2%
Eutric Cambisol, lithic, medium textured, slope 16-30%
Eutric Vertisol,fine textured, slope 0-2%
Mollic Andosol, medium textured, slope 16-30%
Luvic Phaeozem, fine textured, slope 0-2%

RGc3-2a (14359 km^2)

Gently undulating plains and hills. Volcanic rocks and Basement System rocks.

Dominant soil units:	Calcaric Regosol, stony, coarse textured, slope 2-8% Calcaric Regosol, sodic, medium textured, slope 2-8%
Inclusions:	Lithic Leptosol, medium textured, slope 16-30% Eutric Leptosol, medium textured, slope 8-30%, on Basement System rocks Haplic Lixisol, medium textured, slope 0-2%, on alluvium derived from Basement System rocks Cambic Arenosol, sodic, coarse textured, slope 0-2%, on alluvium derived from Basement System rocks Luvic Calcisol, stony, medium textured, slope 0-2%, on basalts Calcic Solonetz, medium textured, slope 0-2%, on basalts Haplic Solonetz, stony, medium textured, slope 0-2%, on alluvium derived from volcanic rocks

RO1 (7015 km^2)

Predominantly lava flows.

Dominant soil unit:	Rock (lava flows)
Inclusions:	Haplic Solonchak, stony, fine textured, slope 0-2% Haplic Solonetz, saline, fine textured, slope 0-2% Calcaric Fluvisol, fine textured, slope 0-2%

RO2 (4641 km^2)

Association of lavaflows, recent volcanoes, and alluvium (Rift Valley floor).

Dominant soil unit:	Rock (lava flows)
Associated soil units:	Calcaric Regosol, medium textured, slope over 30%, on ashes and other pyroclastics of recent volcanoes Eutric Fluvisol, medium textured, slope 0-2%, on recent alluvium
Inclusions:	Eutric Leptosol, medium textured, slope over 30%, on ashes and other pyroclastics of recent volcanoes Haplic Solonetz, stony, medium textured, slope 0-2%, on alluvium Gleyic Solonchak, sodic, fine textured, slope 0-2%, swamps Haplic Acrisol, medium textured, slope 2-8%, on Basement System rock Ferralic Cambisol, fine textured, slope 2-8%, on Basement System rock Calcaric Fluvisol, saline, medium textured, slope 0-2%, on recent alluvium

RO3 (3375 km^2)

Lavaflows and associated alluvial deposits.

Dominant soil unit:	Rock (lavaflows)
Associated soil unit:	Haplic Solonetz, stony, medium textured, slope 0-2%, on alluvium
Inclusions:	Calcaric Fluvisol, saline, medium textured, slope 0-2%, on recent alluvium
	Haplic Lixisol, fine textured, slope 8-16%, on granites
	Haplic Alisol, medium textured, slope 8-16%, on granites
	Eutric Fluvisol, medium textured, slope 0-2%, on recent alluvium
	Cambic Arenosol, sodic, coarse textured, slope 0-2%

RO4 (2041 km^2)

Recent volcanoes, footslopes and lavaflows.

Dominant soil unit:	Rock (lavaflows)
Associated soil units:	Mollic Andosol, medium textured, slope over 30%, on ashes and pyroclastics of recent volcanoes
	Mollic Andosol, stony, medium textured, slope 0-2%, on footslopes
Inclusions:	Haplic Calcisol, stony, medium textured, slope 0-8%, on footslopes
	Haplic Chernozem, stony, medium textured, slope 0-2%

SCg1-3a (888 km^2)

Flat lacustrine plains of Lake Amboseli, floodplains and swamps. lacustrine sediments derived from volcanic ashes.

Dominant soil units:	Gleyic Solonchak, sodic, fine textured, slope 0-2%, on lacustrine sediments
	Haplic Solonetz, partly petrocalcic, medium textured, slope 0-2%, on lacustrine sediments
Associated soil unit:	Eutric Vertisol, partly saline, partly sodic, fine textured, slope 0-2%, on alluvium
Inclusions:	Luvic Calcisol, saline, medium textured, slope 0-2%, on alluvium
	Gleyic Luvisol, saline, fine textured, slope 0-2%, on alluvium
	Haplic Calcisol, partly lithic, partly saline, medium textured, slope 0-2%, on basic igneous rocks

SCh1-3a (7757 km^2)

Non-dissected plains. Basic igneous rocks, pyroclastics, and parent materials derived from Basement System rocks, with an admixture of volcanic ashes.

Dominant soil unit:	Haplic Solonchak, stony and partly sodic, fine textured, slope 0-2%, on olivine basalts
Associated soil unit:	Eutric Vertisol, partly sodic, partly saline, fine textured, slope 0-8%, on gneisses and basalts with an admixture of volcanic ashes

Inclusions:	Luvic Phaeozem, saline, fine textured, slope 0-2%, on Basement System rocks with an admixture of volcanic ashes Haplic Solonetz, saline, fine textured, slope 0-2%, on lacustrine deposits Calcaric Fluvisol, fine textured, slope 0-2%, on recent alluvium Haplic Lixisol, fine textured, slope 2-8%, on Basement System rocks

SCh2-3a (3731 km^2)

Flat lacustrine plains (Chalbi), with adjacent footslopes.

Dominant soil unit:	Haplic Solonchak, takyric, fine textured, slope 0-2%
Associated soil unit:	Haplic Calcisol, stony, medium textured, slope 0-2%, on sediments from basic igneous rocks
Inclusions:	Humic Leptosol, medium textured, slope 0-2%, on sediments derived from limestones Calcic Solonchak, sodic, fine textured, slope 0-2%, on basalts (footslopes) Haplic Solonetz, stony, coarse textured, slope 0-2%

SNg1-1a (23424 km^2)

Flat sedimentary plains. Bay sediments, in places reworked; sheetwash and aeolian deposits from Basement System rocks.

Dominant soil unit:	Gleyic Solonetz, coarse textured, slope 0-2%, on bay sediments
Associated soil unit:	Ferralic Arenosol, coarse textured, slope 0-2%, on sheetwash and aeolian deposits from Basement system rocks
Inclusions:	Haplic Solonetz, saline, fine textured, slope 0-2%, on bay sediments Eutric Vertisol, sodic, fine textured, slope 0-2%, on bay sediments Eutric Planosol, sodic, coarse textured, slope 0-2%, on sheetwash from bay sediments Calcaric Regosol, sodic, medium textured, slope 0-2%

SNh1-3a (12849 km^2)

Flat erosional and sedimentary plains. Basement System rocks and deposits.

Dominant soil unit:	Haplic Solonetz, saline, fine textured, slope 0-2%
Associated soil units:	Calcic Solonetz, saline, medium textured, slope 0-2%, on Basement System sediments with an admixture of basaltic and lacustrine materials
Inclusions:	Calcaric Fluvisol, sodic, coarse textured, slope 0-2%, on recent alluvium Chromic Luvisol, medium textured, slope 0-2%

SNh2-3a (14266 km^2)

Flat sedimentary plains. Bay sediments.

Dominant soil unit:	Haplic Solonetz, saline, fine textured, slope 0-2%
Associated soil unit:	Eutric Vertisol, saline, fine textured, slope 0-2%
Inclusion:	Gleyic Solonetz, coarse textured, slope 0-2%

SNh3-3a (9415 km^2)

Flat to almost flat sedimentary plains (alluvial fan deposits). Mainly reworked bay sediments.

Dominant soil unit:	Haplic Solonetz, saline, variable texture, slope 0-2%
Associated soil unit:	Eutric Vertisol, partly saline, partly sodic, fine textured, slope 0-2%
Inclusions:	Sodic Solonchak, fine textured, slope 0-2%
	Calcic Luvisol, petrocalcic, medium textured, slope 0-2%, on alluvial terraces
	Eutric Planosol, saline, coarse textured, slope 0-2%
	Calcaric Fluvisol, fine textured, slope 0-2%, on recent alluvium
	Haplic Calcisol, saline, fine textured, slope 0-2%

SNh4-2a (23537 km^2)

Almost flat alluvial and sedimentary plains. Deposits mainly derived from volcanic rocks and ashes.

Dominant soil unit:	Haplic Solonetz, stony, medium textured, slope 0-2%
Associated soil units:	Calcaric Fluvisol, partly saline, partly sodic, medium textured, slope 0-2%
	Cambic Arenosol, sodic, coarse textured, slope 0-2%
Inclusions:	Eutric Fluvisol, coarse textured, slope 0-2%
	Calcaric Regosol, stony, coarse textured, slope 2-8%, on volcanic rocks (mainly basalts)

VRd1-3a (3792 km^2)

Flat plateaus. Predominantly basic igneous rocks.

Dominant soil unit:	Dystric Vertisol, fine textured, slope 0-2%
Associated soil unit:	Luvic Phaeozem, fine textured, slope 0-2%
Inclusions:	Eutric Fluvisol,stony, fine textured, slope 0-2%, recent alluvium

VRe1-3a (4350 km^2)

Flat plateaus. Predominantly basic igneous rocks.

Dominant soil unit:	Eutric Vertisol, partly stony, fine textured, slope 0-2%
Inclusions:	Eutric Fluvisol, stony, fine textured, slope 0-2%, recent alluvium
	Eutric Planosol, fine textured, slope 0-2%, on gneisses
	Chromic Cambisol, partly lithic, fine textured, slope 0-2%
	Mollic Leptosol, fine textured, slope 0-2%

VRe2-3a (1914 km^2)

Flat lacustrine plains of Lake Victoria, and floodplains.

Dominant soil unit:	Eutric Vertisol, partly sodic, fine textured, slope 0-2%, on lacustrine mudstones
Inclusions:	Eutric Fluvisol, medium textured, slope 0-2%, on recent alluvium Eutric Planosol, sodic, fine textured, slope 2-8%, on alluvium derived from Basement System rocks Plinthic Acrisol, medium textured, slope 2-8%, on granite Dystric Cambisol, partly petroferric, medium textured, slope 0-8%, on alluvium derived from Basement System rocks Vertic Cambisol, sodic, fine textured, slope 0-2%, on lacustrine deposits Dystric Gleysol, coarse textured, slope 0-2%, swamps Haplic Luvisol, fine and medium textured, slope 0-2%

VRe-3a (1406 km^2)

Flat alluvial plain. Alluvium derived from volcanic rocks (mainly basalts).

Dominant soil unit: Eutric Vertisol, saline and sodic, fine textured, slope 0-2%

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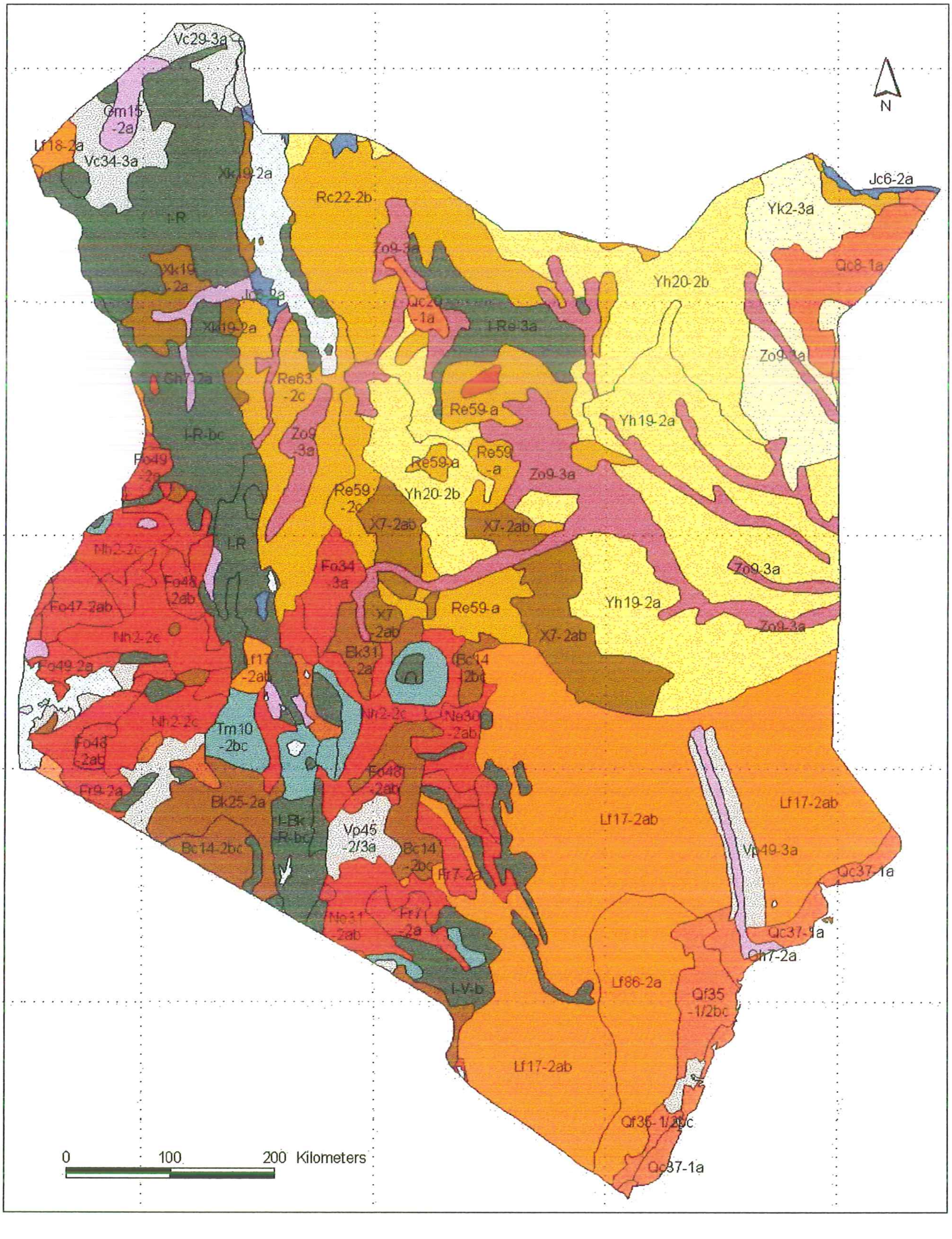
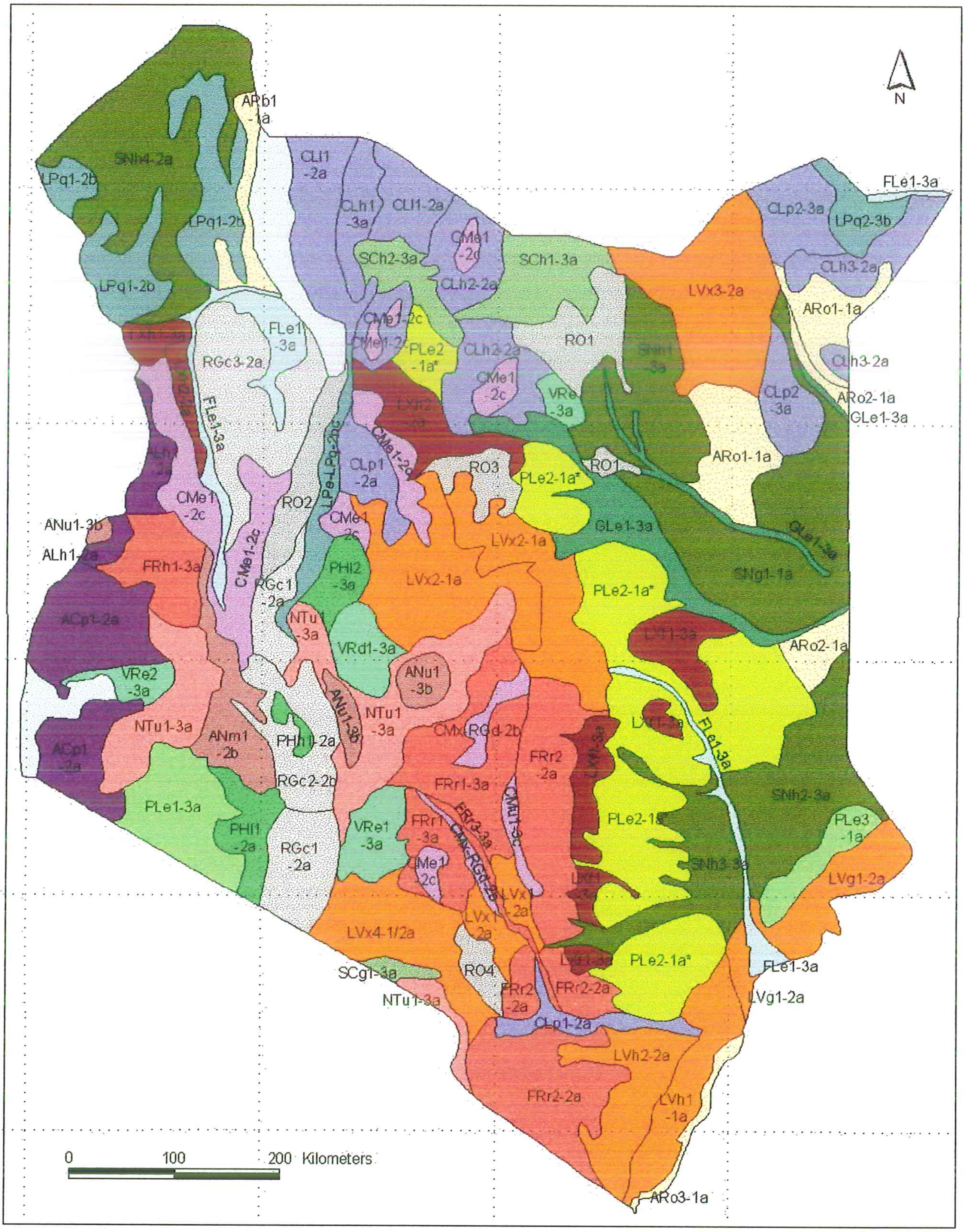
FAO SOIL MAP - SCALE 1:5,000,000



SOIL MAP OF KENYA (draft) - SCALE 1:5,000,000



APPENDIX 1. KENSOTER SOIL COMPONENT ATTRIBUTES.

This Appendix contains the following attributes per SOTER soil component:

- Area (km2)
- Revised FAO classification (1990)
- FAO 1974 classification
- Landform
- Regional slope
- Position
- Depth
- Drainage
- Dominant slope gradient (%)
- Lithology

Landform, regional slope, position, depth, drainage and lithology are coded according to the Soter Procedures Manual (Van Engelen & Wen, 1995).

This information is also stored in digital format in file UNIT1M.DBF

Appendix 1 - 2

Soter unit	Area km2	FAO 90 unit	phase	FA0 74 unit	phase	land form	reg slope	posi	depth	drai	slope	lith
1	878	CMU		BH		SP	S				23	II
2	689	ALH		AO		LP	U	M	M	W	8	II
3	175	LVV	PF	LV	PF	LP	G	M	M	W	4	II
3	155	CMV	PF	BV	PF	LP	G	M	M	M	4	II
4	182	CMO		BF		LP	G	H	M	W	3	I
4	121	ACP		AP		LP	G	H	M	W	3	I
4	182	ACH		AO		LP	G	H	D	W	3	I
4	121	NTR		ND		LP	G	H	X	W	3	I
5	161	VRE		VP		LD	F	D	D	I	2	UF
5	28	FLM		JE		LD	F	D	X	I	2	UF
6	473	NTR		ND		SH	S	H	X	W	16	IB2
7	20	ACF		AF		LP	G	H	M		5	IB
7	31	LXP		LP		LP	G	H	M	W	5	IB
8	2222	ACP		AP		LP	G	M	M	M	5	IA1
9	2248	CLH	ST	XK	ST	LP	U	M	S	W	7	SO1
10	271	GLD		GD		LP	W	D	M	P	0	UE
11	713	CME		BE		LF	U	M	M	W	6	II
12	176	CME		BE		SE	S	M	M	W	18	IB2
12	702	RO		RO		SE	S				18	IB2
13	66	LVH		LO		LP	S	M	M	W	1	II
13	44	PLE		WE		LP	S	L	D	P	2	II
14	219	LVH		LO		LP	S	M	M	W	2	II
15	158	VRE		VP		LP	W	L	D	I	0	UF
16	175	FLE		JE		LP	F	L	D	W	2	UF
16	150	CMV	SO	BV	SO	LP	F	L	D	P	2	UF
16	175	VRE	SO	VC	SO	LP	F	L	D	P	0	UF
17	170	ACP		AP		LP	G	M	D	W	3	UF
17	426	GLE		GE		LP	G	L	D	P	2	UF
17	255	GLE		GE		LP	G	M	X	P	5	UF
18	230	CMD		BD		LP	F	M	M	M	1	SC2
18	276	FRR		FR		LP	F	M	M	W	1	SC2
18	92	GLD		GD		LP	F	L	D	P	3	SC2
18	322	ACH		AO		LP	F	M	D	W	1	SC2
19	78	GLE		GE		LP	G	L	X	P	5	I
19	156	NTR		ND		LP	G	M	D	W	3	I
19	313	ACH		AO		LP	G	M	X	W	3	I
19	235	CMO		BF		LP	G	M	M	W	3	I
20	175	NTR		ND		LP	G	M	X	W	4	SC
20	48	GLD		GD		LP	G	L	D	P	3	SC
20	96	GLD		GD		LP	G	L	D	P	4	SC

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21	509	FRU		FH		LP	G	M	D	W	4	MA
21	763	ACH		AO		LP	G	M	D	W	4	MA
22	57	NTR		ND		LP	G	M	X	W	4	SC
22	136	ACH		AO		LP	G	M	D	W	4	SC
22	34	GLD		GD		LP	G	L	D	P	3	SC
23	207	LXH		LF		LP	G	M	X	W	4	MA
23	207	NTU		NH		LP	G	M	D	W	4	MA
23	207	FRG		FR		LP	G	M	D	W	4	MA
23	69	ACH		AO		LP	G				3	MA
24	36	GLD		GD		LP	G	M	X		0	IA1
24	168	CMD		BD		LP	G	M	X	W	4	IA1
24	36	LVH		LO		LP	G	M	D	M	4	IA1
25	706	ARO		QF		SH	S	M	X	W	15	MA2
26	134	VRE	SO	VP	SO	LP	F	L	X	I	1	SC3
27	147	FLE		JE		LP	W	D	M	P	0	UF
28	244	PLE	SO	WS		LP	G	L	D	P	3	UF
29	617	NTU		HL		SH	R				9	I
30	255	FLE		JE		SH	R	L	X	I	1	IA1
30	255	ALH		AO		SH	R	M	X	W	9	IA1
30	574	LXH		LF		SH	R	M	X	W	9	IA1
30	191	PHL		HL		SH	R	M	X	W	9	IA1
31	398	PHL		HL		SE	IN	H	M	W	10	II1
32	93	ACH		AO		SE	WE	M	X	W	15	IA1
33	192	ACH		AO		SH	R			W	10	IA
34	30	CMD	LI	BD	LI	LP	F	M	S	W	2	II1
34	169	CMD	PF	BD	PF	LP	F				2	II1
35	127	FRR		FR		LL	U	M	D		6	II1
36	51	NTH		ND		LL	U				5	IB2
37	95	LPD		RD		SH	S	H	S		16	IA1
37	32	RO		RO		SH	S				16	IA1
38	41	SC		Z		LP	W				1	UL
39	274	ACH		AO		SE	R				15	MB3
40	110	NTU		NH		SR	R	M	X	W	15	I
40	442	PHL		HL		SR	R	M	X	W	15	I
41	456	NTU		NH		SR	R	M	X	W	11	II1
42	26	RGD		RD		SR	S	H	M	E	20	UP
42	145	PHL		HL		SR	S	M	X	M	20	UP
43	70	PLD		WD		LP	W	D	D	P	1	UF
43	12	HSS		OE		LP	W	D	D	E	1	UF
44	635	NTU		NH		SR	U	M	X	W	9	IB2
44	212	PHL		HL		SR	U	M	S	W	2	IB2

45	603	PHL		HL		SE	S	M	X	W	20	IB2
46	89	NTU		NH		SH	R	M	X	W	8	IB3
47	93	PLE		WE		LP	F	L	X	P	1	UP
48	38	ALH		AO		SH	R	M	D	W	12	III1
48	8	LPQ		I		SH	R	H	V	P	16	III1
48	30	LXG		LG		SH	R	M	X	I	12	III1
49	334	PLE	SO	WS		LP	G	M	D	I	3	I
49	84	PHH	PF	HH	PF	LP	G				6	I
50	126	ACU		AH		LP	U	M	D	W	5	IA1
50	32	CMU		BH		LP	U	M	M	M	5	IA1
51	27	ACU		AH		LP	G	M	M	M	3	IA1
52	176	PHL		HL		SH	U	M	D	W	8	IA4
52	176	PLD		WD		SH	U	D	D	P	7	IA4
52	527	PHL		HL		SH	U	M	D	W	8	IA4
53	67	VRE		VP		LP	G	L	D	P	2	I
53	156	PLD		WD		LP	G	D	D	P	2	I
54	31	PHL		HL		LP	U	M	D	W	5	III1
54	10	PHG		HG		LP	U	L	M	M	5	III1
54	10	PLD		WD		LP	U	D		P	4	III1
55	34	ACG		AG		LP	G				4	IA
55	192	PHL		HL		LP	G	M	S	W	4	IA
56	6454	LPE		RE	LI	SM	S				16	IA1
57	80	GRG		MG		LP	G	M	D	P	3	III1
57	40	GRG		MO		LP	G				3	III1
57	281	CMU		BH		LP	G	M	M	W	3	III1
58	393	GRH	SO	MO	SO	LP	G	M	D	I	2	IA1
58	262	CHH		CH		LP	G	M	M	W	2	IA1
59	72	ACG		AG		LP	G				4	IA1
59	288	PHL		HL		LP	G	M	S	W	4	IA1
60	102	PLE		WE		LP	G	M	S	W	5	III1
60	152	PHH	PF	HH	PF	LP	G	M	M	W	5	III1
61	134	GLU		GH		LP	W				1	UF
62	185	VRE	SO	VC	SO	LP	W				1	UF
63	295	PLE		WE		LP	G	M	D	I	4	IB2
64	216	ACU		AH		LP	U				6	IA1
65	151	CMO		BF		LP	G				5	II
66	7	RGD	LI	QF	LI	LP	G				5	SC
66	10	CMO	ST	BF	ST	LP	G				5	SC
67	3594	SNM	SA	SM	SA	LP	F				1	UF
68	93	SNH		SO		LP	F				2	IA1
69	1903	FRH		FO		LP	F	M	X	M	1	II

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70	158	PHL		HL		LP	G				3	IB2
71	355	CMU		BH		SR	R	M	X	W	14	IA1
71	118	PHL		HL		SR	R	M	X	W	14	IA1
72	269	GLM		GM		LP	G	D	D	P	0	MA2
72	1075	FRU		FH		LP	G	M	X	W	5	MA2
73	432	CME		BE		SR	R	M	M	W	9	MB3
74	96	ACU		AH		SR	R	M	X	W	15	MB3
75	98	LVV		LV		SR	R				30	MA
75	183	LXH		LF		SR	R	M	D	W	16	MA
76	1248	ALH		AO		LP	G	M	D	W	3	IA
77	6570	LXH		LF		LP	U	M	D	W	5	MA2
78	319	LXH		LF		LP	G	M	X	W	4	MB3
79	7134	FLE		JE		LP	F	L	X	W	0	SC2
80	3824	CME		BE		TH	T				40	MA
80	2682	CME	LI	BE	LI	TH	T				40	MA
81	652	CMX		BC		TH	T	H	D	W	45	MB3
82	393	PHH		HH		TH	T	H	X	W	35	MA
82	1180	CMU		BH		TH	T	H	D	W	35	MA
83	651	CME		BE		SR	S	M	D	I	16	MA
84	117	GLD		GD		LP	W	L	X	P	0	UF
85	542	FRR		FR		LP	G	M	D	W	5	MB3
86	69	NTU		NH		SE	S	M	D	W	15	MB3
87	216	GLM		GM		LP	F	D	D	P	0	UF
88	573	FRR		FR		LP	G	M	D	W	4	MB3
89	151	NTR		NE		LP	F	M	D	W	2	UP
90	219	VRE		VP		LP	F	D	X	P	1	UF
91	200	NTR		NE		SU	S	H	M	W	26	UP
91	599	NTR		NE		SU	S	H	D	W	26	UP
92	1907	ANU		TH		SH	T				20	UP
92	1272	ANU	LI	TH	LI	SH	T				20	UP
93	226	PHL		HL		SR	R				8	I
94	960	HSS	LI	OD	LI	TM	T				30	UP
95	477	GLE		GE		LP	W	D	X	V	1	II1
96	110	CMU		BH		SR	R	M	D	W	9	MA2
97	388	FRR		FR		LP	F				1	II1
98	89	NTU		NH		LP	F				1	II1
99	600	NTU		NH		SE	S	M	X	W	30	MB3
100	1214	NTU		NH		LL	G	M	X	W	4	I
101	50	PHL		HL		SE	S	M	X	W	3	IA4
101	22	LPU		U		SE	S	M	S	W	2	IA4
102	206	CMX		BC		LP	F				3	IB2

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102	51	CMX	LI	BC	LI	LP	F				3	IB2
103	271	NTU		NH		SP	R	M	X	W	9	IB2
104	8702	SNH	ST	SO	ST	LP	F	M	D		2	UF
104	3730	FLC	SA	JC	SA	LP	F	M	X	M	2	UF
105	2203	LVX		LC		LL	G	M	D	W	3	UP
105	3304	RGC	ST	RE	ST	LL	G	M	D	W	3	UP
106	1943	CME		BE		LP	F	D	D	M	1	II1
107	356	FLE		JC		LP	F				1	UF
107	237	FLE	SO	JC	SO	LP	F				1	UF
108	32	PLE		WE		LP	G	D	D	P	3	U
108	14	PHH	PF	HH	PF	LP	G				3	U
109	168	SNH	PC	SO	PC	LP	F				2	UP
109	168	SNH		SO		LP	F				2	UP
110	2935	LPQ		I		TM	T	H	S	W	40	UP
111	11730	LPQ		I		TH	T				30	II1
112	816	FLE		JE		LP	W	L	X	W	1	UF
113	263	ANU		TH		SR	S	M	X	W	16	UP
113	2368	NTU		NH		SR	S	M	X	W	16	UP
114	1567	RGC		RC		TM	T				40	UP
114	1045	LPE		RC	LI	TM	T				40	UP
115	6507	CLL	ST	XK	ST	LP	F	M	M	W	1	IB2
115	6507	SNK		SK		LP	F	M	D	M	1	IB2
116	2418	CLH	ST	XK	ST	LP	F	M	S	W	2	IB2
117	5385	LPE		RE	LI	LP	S	H	S	E	20	UP
118	723	PHL		HL		SM	T	H	D	W	30	I
119	2292	SCK	SO	ZO	SO	LP	G	M	D	W	3	I
119	982	CLH	ST	XK	ST	LP	G	M	M	W	3	I
120	233	RO		RO		SM	T	M	D		30	I
120	100	CMU	ST	BH	ST	SM	T	H	M	W	30	I
121	3950	RGC	ST	RC	ST	LP	G	M	S	W	3	I
121	9218	CLH	ST	XK	ST	LP	G				3	I
122	2683	CMX	ST	BC	ST	LF	U	M	M	W	5	I
123	2588	SNK	SA	SO	SA	LP	F	M	D	M	1	SC
124	551	ARB	SO	QC	SO	SP	DU	A	X	E	12	UE
125	904	SCH	TA	ZT		LP	F	A	D	P	1	SC
126	497	SCH	TA	ZT		LP	F			P	1	SC
127	1182	LXH	YR	XL		LP	F	A	D	W	2	SC
128	604	SNK	SA	SO	SA	LP	F	A	X	M	1	SC
128	403	SNK	SA	SO	SA	LP	F	A	X	I	1	SC
129	396	SNK	SA	SO	SA	LP	F	A	X	M	1	SC
129	70	ARB	SO	QC	SO	LP	F	A	X	E	12	SC

130	10081	RO		RO		LP	G				4	IB2
131	3156	LXH	YR	XL		LP	F	A	D	W	1	UE
131	3156	ARB	SO	QC	SO	LP	F	A	D	E	1	UE
132	118	ALH		AO		LP	F	A	D	W	1	SC2
132	29	ARL		QL		LP	F				1	SC2
133	2594	FLC		JC		LP	T	D	D	M	1	UF
134	226	VRE	ST	VC	ST	LP	G	M	M	I	1	I
135	926	LVX		XL		LP	G	M	D	W	5	MA2
136	9650	RGC	ST	RC	ST	LP	G	M	S	W	5	IB2
137	339	LVX		LC		LP	U	M	S	W	7	I
138	6542	SNH	SA	SO	SA	LP	F	A	D	I	1	SC2
139	5373	RGC	SO	RC	SO	LP	G	M	X	W	5	SC2
140	648	FLC	SO	JC	SO	LP	F	L	D	M	1	SC2
141	2593	PHL		HL		LL	F	M	M	W	2	II1
142	1170	PHL		HL		LL	G	M		W	1	IB2
143	2997	SCH	ST	ZO	ST	LP	F	A	D	M	1	IB2
144	55	LVX		LC		LP	U	M	D	W	4	MA2
145	1458	SCK	ST	ZO	ST	LP	G	A	D	W	3	MA2
145	1458	CLH	SA	BK	SA	LP	G	A	D	W	3	MA2
146	342	ARL	YR	QL		LP	F	M	D	S	2	UE
146	342	SNH	YR	SO		LP	F	M	D	M	2	UE
146	456	CME	YR	XH		LP	F	M	D	W	2	UE
147	199	CME	YR	XH		LP	DU	M	D	W	2	UE
147	199	ARB	SO	QC	SO	LP	DU	A	X	E	2	UE
148	3481	ARB	SO	QC	SO	LP	F	A	X	E	1	SC2
149	3304	FLC	SO	JC	SO	LP	F				2	UF
150	260	SC	SO	Z	SO	LP	F				1	UE
150	347	CMC		XE		LP	F	A	D	S	1	UE
150	260	ARH	YR	QC		LP	F	A	D	S	1	UE
151	1017	CMC		XE		SP	DU	A	D	S	1	UE
151	1017	ARB	SO	QC	SO	SP	DU	A	X	E	12	UE
152	477	LVX		LC		SH	R	A	D	W	9	MA2
152	477	CMX		BC		SH	R	M	D	W	9	MA2
153	453	PHL		HL		LL	F	M	D	W	2	II1
153	113	VRD		VC		LL	F	M	D	M	2	II1
154	1712	VRD		VC		LL	F			M	2	II1
155	521	VRE	SO	VP		LD	F	A	D	I	1	II1
156	3313	NTU		NH		SR	R	A	X	W	8	IB
157	1032	PHL		HL		LF	U				6	I
158	442	LXF		ND		LF	G				5	I
159	1510	VRE	SO	VP	SO	LP	F				1	IB2

160	1000	SCH	SO	ZO	SO	LP	F				1	IB2
161	1906	VRE	SA	VP	SA	LP	F				1	IB2
162	4469	NTU		NH		SR	U	M	X	W	6	IB2
163	3439	CLH		XH		LP	G				3	UP
164	48	PLD		WD		LP	F	M	D	M	2	UP
165	3513	FLC	SO	JC	SO	LP	F	L	X	W	2	UF
166	1063	VRE		VP		LP	F	A	X	I	1	UF
167	2984	CMX		BC	ST	LP	F	A	S	W	2	IB2
168	490	SCG	SO	ZG	SO	LP	W				1	UE
169	837	FLE	ST	JC	ST	LP	F				1	UE
170	623	CMC	ST	XH	ST	LP	U				6	IB2
171	596	LPU		U		LP	F	A	V	I	1	UP
172	1035	ARB		QC		LP	F				2	SC2
173	17596	PLE	SO	WS		LP	F				1	SC2
175	209	CMX	LI	BC	LI	LP	F	A	S		2	I
176	7078	LVX		LC		LP	G	M	X	W	5	MA2
177	288	CLH	SO	BK	SO	LP	G				5	UF
178	398	CME		BE		LP	G				4	UF
179	6145	GLE	SA	GE	SA	LP	F				2	UF
180	14162	SNH	SA	SO	SA	LP	F				1	SC2
181	8622	CLP		BK	PC	LP	G	A	M	W	2	MA2
182	655					LL	F				1	III1
183	607	NTU		NH		LL	U	M	X	W	8	IB
184	182	NTU		NH		SR	R				10	IB2
185	134	FRR		FR		SR	R				12	IA4
186	24	FRU		FH		LL	G				2	MA1
187	460	PLE		WE		LP	F	M	D	I	2	IB2
188	91	PLE		WE		LP	F				2	IB2
188	91	PHL		HL		LP	F				2	IB2
189	301	CMU	LI	BH	LI	SR	R				12	I
189	560	NTU		NH		SR	R				12	I
190	235	CMU	LI	BH	LI	SR	R				12	I
190	437	NTU		NH		SR	R				12	I
191	3011	CMX				SH	S				16	II
192	813	ANM		TM		LP	G	M	D	W	3	UP
193	144	PHL		HL		SR	R				10	III1
194	137	PLU		WH		LP	F				2	I
195	271	ANM		TM		LP	G				3	UP
196	2050	ANM		TM		SR	R	M	D	W	11	UP
196	879	CME		BE		SR	R				11	UP
197	213	SNK		SO		LP	G	A	D	M	2	UE

198	830	ANH		TH		LP	F	M	D	W	1	UO
199	436	PHH		HH		LP	F	M	D	W	1	UP
199	291	CMG	FR	BG	FR	LP	F				1	UP
200	366	ANM		TM		SR	S				16	UP
200	366	CME	LI	BE	LI	SR	S				16	UP
201	93	CME	LI	BE	LI	SR	S				16	UP
202	89	ANM		TM		LL	G				4	UP
203	796	RGC		RC		LP	G				3	UP
204	127	SNG	SA	SG	SA	LP	G				2	UP
205	813	ANM		TM		LP	G	M	X	W	4	UP
206	319	ANM		TM		LF	U	M	D	W	6	IB2
207	137	PHL		HL		LP	G	M	D	W	3	UP
208	456	PLE		WE		LP	F	M	D	I	1	UP
209	264	ANM		TM		LP	F				2	UP
210	144	ACU		AH		LP	G				5	IB2
211	134	LXH		LF		SR	R				10	IB2
211	58	LVG		LG		SR	R				10	IB2
212	388	NTH		NE		LF	G				5	IB2
212	291	CMX		BC		LF	G				5	IB2
212	291	PHL		HL		LF	G	M	X	W	5	IB2
213	751	PHL		HL		LP	U				6	I
214	168	PHL		HL		LP	U				6	SC
215	1144	PHL	SA	HL	SA	LP	F				1	MA2
216	333	FRR		FR		LP	F				2	IB2
217	422	CHK	SO	CK	SO	LP	F				1	I
218	4194	SN		S		LP	F				2	UL
219	137	CMX		BC		LP	F	M	M	W	1	UP
219	319	VRE		VC		LP	F	A	D	V	1	UP
220	1937	VRE	ST	VP	ST	LP	F				1	II1
221	245	VRE		VP		LP	F				1	II1
221	245	LPM		E		LP	F				1	II1
222	118	PHL		HL		LP	F				1	UP
222	29	PLE		WE		LP	F				1	UP
223	141	VRE		VP		LP	F				1	MA1
223	141	VRE	SA	VP	SA	LP	F				1	MA1
223	281	PLE		WE		LP	F				1	MA1
224	1008	LVX		LC		SR	R				9	IB2
224	432	CMD	LI	BD	LI	SR	R				9	IB2
225	296	LVH		LO		LP	G				6	MA2
225	74	ARL		QL		LP	G				6	MA2
226	760	LVX		LC		SH	R				10	MA2

226	760	KSH		KH		SH	R				10	MA2
227	48	VRE	SA	VP	SA	LV	F				1	UF
227	113	CLL	SA	LK	SA	LV	F				1	UF
228	388	PLE		WE		LP	G				3	MA2
228	582	LVX		LC		LP	G				3	MA2
229	95	PHL		HL		LP	G				4	UP
229	38	PHL	LI	HL	LI	LP	G				4	UP
229	57	VRE		VC		LP	G				4	UP
230	584	AC		A		SH	R				12	MA2
231	1061	LPM		E	LI	SR	S				26	SC3
232	748	VRE		VP		LP	U	M	D	P	5	MB3
233	573	FRR		FR		LP	G	M	D	W	3	II1
234	2085	LVX		LC		LP	G	M	D	W	3	MA
235	2409	ACH		AO		LP	G	M	D	W	3	MA2
235	4473	FRR		FR		LP	G	M	D	W	3	MA2
236	127	ARO		QF		LP	U	M	D	W	7	MA2
237	137	ARO		QF		SH	S			W	3	MA2
237	319	RGD	LI	QF	LI	SH	S	H	S	W	3	MA2
238	689	FRR		FR		LP	G	M	X	W	0	MA2
238	230	FRH		FO		LP	G	M	X	W	0	MA2
239	268	NTU		NH		LP	G	M	D	W	3	IB2
239	178	CMU	ST	BH	ST	LP	G	H	M	W	3	IB2
241	93	ACH		AF		LP	G	M	D	W	3	MB3
242	9567	FRR		FR		LP	F	M	X	W	1	MA2
243	69	VRE	SA	VC	SA	LP	F				1	MA2
244	626	LVX		LC		LP	F				20	MA2
244	626	ARO		QF		LP	F				20	MA2
244	835	FRR		FR		LP	F				20	MA2
246	634	FRR	LI	FR	LI	LP	F	A	D	W	2	II1
246	422	CMX	LI	BC	LI	LP	F				2	II1
247	65	VRE	SO	VP	SO	LP	W	A	D	P	1	II1
248	242	ACH	ST	AO	ST	SE	S				20	MA2
248	61	FRR		FR		SE	S	M	M	W	20	MA2
248	101	LVX		LC		SE	S				20	MA2
249	273	LPQ		I		TM	T				34	MA2
249	546	CMU	LI	BH	LI	TM	T				34	MA2
249	546	LVX		LC		TM	T				34	MA2
250	173	LVX		LC		LP	F				6	MA2
250	259	FRR		FR		LP	F	M	M	W	6	MA2
251	13475	FRR		FR		LP	F	A	X	W	1	MA2
252	2461	LVX	PF	LC	PF	LP	G	M	D	W	3	MA2

252	1055	FRH		FO		LP	G				3	MA2
253	575	CLP		BK	PC	LP	F				1	I
254	213	NTR		NE		LP	F	A	X	W	1	IB2
255	559	VRE	SO	VP	SO	LP	F			P	5	UF
255	2238	VRE	SO	VP	SO	LP	F	A	X	P	5	UF
256	332	LXH		LC		LP	F	A	D	W	2	MA2
257	55	LPE		WE		LP	F				2	II1
258	2321					SH	U				8	MA2
259	1289	LVK	PC	LK	PC	LP	F	A	D	W	0	UF
260	69	CME	LI	BE	LI	SH	S				16	II
260	34	LPE	LI	RE	LI	SH	S				16	II
260	34	LPQ		I		SH	S				16	II
261	79	CMX	LI	BC	LI	SH	S				20	II
261	20	RO		RO		SH	S				20	II
262	437	LPD	LI	RD	LI	SH	S				20	II
262	219	CMU	LI	BH	LI	SH	S				20	II
262	219	RO		RO		SH	S				20	II
263	18	NTU		NH		SH	S				17	IB2
263	102	FRR		FR		SH	S				17	IB2
264	21	CME		BE		LP	G				4	MA2
265	137	CMX	SO	BC	SO	LP	G	H	D	M	4	IB2
265	319	NTU		NH		LP	G	M	X	W	4	IB2
266	55	LPU		U		SH	S	A	S	W	20	MA
268	10685	LXF		LF		LP	F	A	D	W	1	MA2
269	34	CLH	SA	BK	SA	LP	F				1	UE
270	195	ANM	SO	TM	SO			A	D	W	0	
271	565	FLE		JE		LP	F			W	0	UF
272	151	SCG	SO	ZO	SO	LP	W	A	X	P	2	UL
273	69	LVG	SA	LG	SA	LP	F	A	D	I	2	UF
274	178	CLH	LI	BK	LI	LP	G				3	IB2
275	211	ANM	ST	TM	ST	LP	F				2	UP
275	211	CHH	ST	CH	ST	LP	F				2	UP
276	232	ANM		TM		TV	T	A	M	W	55	UP
276	232	ANM		TM		TV	T	A	M	W	35	UP
277	581	LVX	ST	LC	ST	LP	G				3	IB
277	581	PHL	ST	HL	ST	LP	G				2	IB
278	230	LVH		LO		LP	F	A	D	M	1	MA2
279	247	PHL	SA	HL	SA	LP	F				1	MA2
280	52	LVV		LV		LP	F				1	UF
280	52	VRE		VC		LP	F				1	UF
281	291	LVF		LF		LP	F	A	D	W	1	MA2

282	414	LVF		LF		LP	F	A	X	W	1	MB3
283	127	CME		BE		LP	F	A	D	W	1	I
284	1147	CMC		BK		LP	F	A	D	W	1	IB2
285	21	CMX		BC		LF	F	A	X	W	4	IB2
286	438	LVX		LC		LP	F	A	X	W	1	MB3
287	120	LVX	ST	LC	ST	LP	F				2	IB2
288	260	LXH	SO	LF	SO	LF	G	A	X	W	3	SO1
289	298	LVX		LC				A	D	W	1	
290	555	CMX		BC		LP	F				1	SO1
291	82	VRE	SO	VP	SO	LP	F				1	MA2
292	500	SNK	SA	SO	SA	LD	W	A	M	P	0	UF
293	857	PLE	SO	WS		LP	F	M	D		1	UM
293	857	SNH	SO	SO	SA	LP	F				1	UM
294	68	LVX		LC		LP	F	A	M	W	1	MA2
295	336	LVX		LC		LP	F	A	D	W	1	UM
296	25820	SNG		SO		LP	F	A	X	P	0	UF
297	827	LVX	ST	LC	ST	LP	F	M	S	W	2	SC2
297	276	CLP		BK	PC	LP	F				2	SC2
298	79	ARL		QL		LF	G				4	MA2
298	20	LVX		LC		LF	G	M	D	W	4	MA2
299	157	LPE		RE	LI	SH	R				10	X
300	1287	LVH		LO		LP	F	A	M	W	2	SC2
301	1729	SNK		SO		LP	F	A	M	I	0	SC2
302	312	ARH		QB		SU	G				4	SC2
303	99	LPM		E		SH	R				12	SC2
304	227	CME		BE		SH	R				10	SC2
304	227	LPE		BE	LI	SH	R				10	SC2
304	454	PHL	SO	HL	SO	SH	R				10	SC2
305	284	FRR		FR		LP	F				1	SO1
306	355	LVF		LF		LP	F	M	M	W	0	SO1
306	152	ARA		QA		LP	F				0	SO1
307	350	FLT	SO	JT	SO	LP	F	A	D	V	1	UM
307	350	SCG		ZG		LP	F	A	D	V	1	UM
308	96	LPQ		I		LP	F				0	SO1
308	41	CMO	LI	BF	LI	LP	F				0	SO1
309	339	SNH	SA	SO	SA	LP	F				1	UM
309	339	LVG	SO	LG	SO	LP	F	A	D	I	1	UM
310	452	FRH		FO		SP	R	A	X	W	8	SC2
311	130	ALH		AO		LP	G	A	D	W	3	SC1
312	400	VRE	SO	VP	SO	LP	F	A	D	I	0	SC3
313	753	LPQ		I		LP	G	A	V	W	3	SC3

314	1389	LVH		LO		LP	G	A	M	W	4	SC3
315	459	ARO		QF		LP	F	A	X	E	1	UM
316	87	ARA		QA		LP	G	A	X	W	3	SC2
316	87	PLE		WE		LP	G	A	D	M	3	SC2
317	79	NTR		NE		LP	G	A	X	W	5	II2
318	1110	FRX		FX		LP	F	A	X	W	2	SC2
319	448	CME	LI	BE	LI	LP	G	A	S	W	4	SC2
319	192	LVH		LO		LP	G				4	SC2
320	70	PLE		WE		LP	G	M	M	I	4	SC2
320	163	CME	LI	BE	LI	LP	G			W	4	SC2
321	198	ARL		QL		LP	G	M	X	W	5	SC2
321	462	ACF		AF		LP	G	H	D	W	5	SC2
322	418	PHL	SO	HL	SO	LP	G	A	M	I	1	SC3
323	291	VRE	SO	VP	SO	LP	F	A	D	I	1	SC4
324	110	NTR		NE		LL	F	A	X	W	2	SO1
325	1089	ARL		QL		LL	F	A	X	E	2	SC2
326	66	PLE	SO	WS		LL	F				1	UF
326	133	PHH		HH		LL	F	M	M	W	1	UF
326	133	ALH	SO	AO	SO	LL	F				1	UF
327	253	PHL	SA	HL	SA	LP	F				1	UM
327	590	SNG	SA	SG	SA	LP	F				1	UM
328	158	PLE	SO	WS		LP	F				1	UM
329	113	FLT	SA	JT	SA	LP	F				1	UF
330	187	PHG		HG		LP	F				1	IU
330	94	PHL		HL		LP	F				1	IU
330	94	VRE	SO	VP	SO	LP	F				1	IU
331	5444	LVG		LG	SO	LP	F				1	IU
332	72	FRH		FO		LP	F				1	IU
333	3356	PLE	SO	WS		LP	F				2	UM
334	638	FRR		FR		LP	F				1	UM
335	164	GLM		GM		LP	F				1	UF
336	566	PLU		WH		LP	F				1	UM
337	48	SNK	SA	SO	SA	LV	F	A	M	P	1	UF
338	1243	LVX	PF	LC	PF	LP	F	A	M	W	1	SC2
339	2918	VRE	SA	VP	SA	LV	F				1	SC2
340	6325	SN	SA	SO	SA	LP	F				1	SC2
341	130	LPE		BK	PC	LP	F				2	SC1
342	641	CME		XH		LP	F				1	SC2
343	1049	LVK	PC	LK	PC	LP	F	A	M	W	1	SO1
344	13126	ARO		QF		LP	F	M	M	W	1	MA2
345	6706	LVX		LC		LP	F				1	MA2

345	1676	ARO		QF		LP	F				1	MA2
346	127	SNG		SO		LP	F			P	1	UF
346	127	LXF	SO	LF	SO	LP	F			W	1	UF
347	463	SNM		SM		LP	F				1	SC2
347	116	PHL		HL		LP	F				1	SC2
348	27	LVX		LC		LP	F				1	SC2
348	7	PHL	SO	HL	SO	LP	F				1	SC2
349	1658	PLE	SO	WS		LP	F			I	1	SC2
350	1008	SNH	SA	SO	SA	LP	F				0	MA2
351	1633	SNH	SA	SO	SA	LP	F				1	UF
351	681	PLE	SA	WS	SA	LP	F				1	UF
351	408	VRE	SA	VC	SA	LP	F				2	UF
352	1475	SNH	SA	SO	SA	LP	F				1	UE
352	1475	SCN		ZO	SO	LP	F				1	UE
353	254	CLH	SA	XK	SA	LP	F				1	UF
354	819	VRE	SA	VC	SA	LP	F				1	UF
355	1821	VRE	SO	VP	SO	LP	F				1	SC2
356	710	GLE	SO	GC	SO	LP	F				1	SC2
357	442	LVH	SO	LO	SO	LP	F				1	SC2
358	4748	ARH		QB		LP	F				1	MA2
359	4356	LVH	SA	LO	SA	LP	F				1	MA2
360	4588	CLH		BK		LF	G				3	SC2
361	1161	LPQ		I		SH	R				10	SC2
362	103	SCG	SO	ZG	SO	LP	F				2	UF
362	103	FLC		JC		LP	F				2	UF
363	466	SCK	TA	ZT		LV	F				1	SO1
364	1601	LPQ	ST	I	ST	SH	R				10	SO1
365	414	FRR	PF	FR	PF	LL	F				1	SC3
366	6668	CLP		LK	PC	LL	F				1	SO1
367	1941	LPE		BK	LI	LL	F				1	SO2
368	682	LPQ	ST	I	ST	LL	F				1	MA1
369	164	ARH		QB		LP	F				1	MA2
369	41	CLH		XK		LP	F				1	MA2
370	712	GYK	ST	XY	ST	LP	F				1	SO1
371	2149	RGC	SO	XH	SO	LP	F	A	X	E	1	SO1
372	614	SCH		ZO		LP	F				1	SO2
373	945	GYK	SA	XY	SA	LP	F				1	SO2
374	236	CLH		BK		SR	S				20	IB2
375	675	LVV	SO	LV	SO	SH	S				20	SO2
376	38	PHL		HL		SH	R	A	X	W	10	IB2
377	1382	PLE	SO	WS		LP	F				1	UP

378	1835	PHL		HL		LP	F				2	UP
379	867	PHL	LI	HL	LI	LP	G				3	SC2
380	737	VRE	SA	VP	SA	LP	F				2	IB2
382	158	GRH		MO		LP	F				1	IU3
383	247	PHL	SO	HL	SO	LP	F				1	MA2
384	377	VRE	SO	VP	SO	LP	G				3	MA2
384	879	PLE		WE		LP	G				3	MA2
385	754	PHL		HL		SH	R				10	MA1
386	967	LPU		U		SH	R				10	MA1
386	415	LPQ		I		SH	R				10	MA1
387	1070	PLE	SO	WS		LP	G				0	MA2
388	302	PHL	LI	HL	LI	LP	F				2	MA2
389	182	PLE		WE		LP	F				2	IA1
390	195	PHL		HL		LP	F				2	MA2
391	202	PLE	SO	WS		LP	F				2	IA1
392	384	ANM		TM		SR	R				11	UP
393	130	LPQ	ST	I	ST	LP	F				1	SC2
394	405	FRR	PF	FR	PF	LP	F				2	MA2
395	247	CLP		LK	PC	LP	F	A	M	W	1	MA2
396	123	CMO		BF		SH	S				16	MA2
397	134	LPE		WE		LP	F				1	MA2

APPENDIX 2. MAPPING UNIT COMPOSITION OF THE REVISED 1:5M SOIL MAP OF KENYA

This information is also stored in digital format in file KEN5UNIT.DBF

Digital soil and terrain information of the KENSOTER soil components in each mapping unit is stored in file KEN5SOI1.DBF

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Mapping Unit		Soil Unit Area		Soil Unit	Phase	Textural Class	Slope Class
Code	km2	km2	%				
ACp1-2a	16171	1980	12	ACp		2	a2
ACp1-2a	16171	998	6	ACh		3	a2
ACp1-2a	16171	866	5	PHl		3	a2
ACp1-2a	16171	680	4	ALh		3	a2
ACp1-2a	16171	481	3	FRu		2	a2
ACp1-2a	16171	467	3	CMu			b2
ACp1-2a	16171	467	3	PHl		2	a2
ACp1-2a	16171	437	3	GLe		1	a1
ACp1-2a	16171	397	2	FRr	pf	3	a1
ACp1-2a	16171	371	2	NTr		3	b1
ACp1-2a	16171	342	2	PLe	so	2	a2
ACp1-2a	16171	339	2	NTr		3	a2
ACp1-2a	16171	338	2	FRr		3	a1
ACp1-2a	16171	331	2	LXh		3	b1
ACp1-2a	16171	318	2	ACh		3	a1
ACp1-2a	16171	298	2	GLe		2	a2
ACp1-2a	16171	293	2	PLe		3	a2
ACp1-2a	16171	293	2	CMe		3	a2
ACp1-2a	16171	275	2	ACh		3	b1
ACp1-2a	16171	274	2	ACh		2	b1
ACp1-2a	16171	264	2	GLd		2	a2
ACp1-2a	16171	234	1	NTu		3	a2
ACp1-2a	16171	229	1	CMd		2	a1
ACp1-2a	16171	225	1	ACu		3	a2
ACp1-2a	16171	214	1	ACp		3	a2
ACp1-2a	16171	208	1	VRe		3	a1
ACp1-2a	16171	208	1	FRg		3	a2
ACp1-2a	16171	208	1	LXh		3	a2
ACp1-2a	16171	206	1	VRe	so	3	a1
ACp1-2a	16171	192	1	GLd		1	a1
ACp1-2a	16171	179	1	PLd		2	a2
ACp1-2a	16171	177	1	LVv	pf	3	a2
ACp1-2a	16171	174	1	FLe		2	a1
ACp1-2a	16171	170	1	CMo		3	a2
ACp1-2a	16171	160	1	PLd		2	a1

ACp1-2a	16171	157	1	CMv	pf	3	a2
ACp1-2a	16171	148	1	LVh		3	a1
ACp1-2a	16171	147	1	ALh		2	b1
ACp1-2a	16171	145	1	RO			b2
ACp1-2a	16171	145	1	PHh	pf	2	a2
ACp1-2a	16171	143	1	PHl		3	b1
ACp1-2a	16171	141	1	CMo		2	a2
ACp1-2a	16171	127	1	ACu		2	a2
ACp1-2a	16171	106	1	ARo		1	b1
ACp1-2a	16171	104	1	FRr		3	a2
ACp1-2a	16171	103	1	ACg		3	a2
ACp1-2a	16171	100	1	CMu		2	b1
ACp1-2a	16171	99	1	PHh	pf	3	a2
ACp1-2a	16171	96	1	PLe		1	a2
ACp1-2a	16171	90	1	SNh		3	a1
ACp1-2a	16171	90	1				b1
ALh1-2a	2665	1237	46	ALh		2	a2
ALh1-2a	2665	292	11	LVx		3	b1
ALh1-2a	2665	292	11	CMx		2	b1
ALh1-2a	2665	243	9	LXh		3	a2
ALh1-2a	2665	189	7	LXh		3	b1
ALh1-2a	2665	108	4	FLe		1	a1
ALh1-2a	2665	102	4	LVv		3	b2
ALh1-2a	2665	95	4	ACu		2	b1
ALh1-2a	2665	91	3	CMe		2	b1
ALh1-2a	2665	16	1	LPe		2	b1
ANm1-2b	7203	2416	34	ANm		2	b1
ANm1-2b	7203	1174	16	NTu		3	a2
ANm1-2b	7203	1072	15	ANm		2	a2
ANm1-2b	7203	872	12	CMe		2	b1
ANm1-2b	7203	732	10	ANm		3	a2
ANm1-2b	7203	270	4	NTu		3	b1
ANm1-2b	7203	252	3	ANm		2	a1
ANm1-2b	7203	159	2	NTu		3	b2
ANm1-2b	7203	136	2	NTr		2	b2
ANm1-2b	7203	86	1	PLu		2	a1

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ANu1-3b	4268	1806	42	ANu		3	b2
ANu1-3b	4268	1203	28	ANu	li	3	b2
ANu1-3b	4268	958	22	HSs	li	2	b2
ANu1-3b	4268	301	7	NTr		2	b2
ARb1-1a	6869	1405	20	ARb	so	1	b1
ARb1-1a	6869	1320	19	CMc		1	a1
ARb1-1a	6869	897	13	CLh	st	2	a1
ARb1-1a	6869	624	9	FLc	so	1	a1
ARb1-1a	6869	425	6	SNh	st	2	a1
ARb1-1a	6869	335	5	FLc	so	2	a1
ARb1-1a	6869	300	4	SCk	so	3	a2
ARb1-1a	6869	299	4	ARb	so	1	a1
ARb1-1a	6869	257	4	ARh	yr	1	a1
ARb1-1a	6869	257	4	SC	so	2	a1
ARb1-1a	6869	183	3	FLc	sa	2	a1
ARb1-1a	6869	158	2	CMe	yr	1	a1
ARb1-1a	6869	151	2	LXh	yr	2	a1
ARb1-1a	6869	129	2	CLh	st	2	a2
ARb1-1a	6869	48	1	FLc		3	a1
ARo1-1a	12292	6399	52	ARo		1	a1
ARo1-1a	12292	3685	30	ARh		1	a1
ARo1-1a	12292	997	8	LVk	pc	2	a1
ARo1-1a	12292	574	5	SCh		3	a1
ARo1-1a	12292	231	2	CLh		2	a2
ARo1-1a	12292	179	1	SNg		1	a1
ARo1-1a	12292	97	1	LPq		2	b1
ARo1-1a	12292	87	1	LPe		2	a1
ARo2-1a	3625	2237	62	ARo		1	a1
ARo2-1a	3625	1007	28	RGc	so	2	a1
ARo2-1a	3625	366	10	SNg		1	a1
ARo3-1a	1601	443	28	ARo		1	a1
ARo3-1a	1601	347	22	LVf		2	a1
ARo3-1a	1601	279	17	FRr		3	a1
ARo3-1a	1601	150	9	ARa		1	a1
ARo3-1a	1601	121	8	LPq		2	a1

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ARo3-1a	1601	76	5	FRh		2	a1
ARo3-1a	1601	61	4	FLt	so	1	a1
ARo3-1a	1601	61	4	SCg		3	a1
ARo3-1a	1601	52	3	CMo	li	2	a1
ARo3-1a	1601	11	1	FRh		2	a2
CLh1-3a	4082	3399	83	CLh		3	a2
CLh1-3a	4082	495	12	CMe		3	a1
CLh1-3a	4082	161	4	CLh	st	2	a1
CLh1-3a	4082	27	1	FLc		3	a1
CLh2-2a	13496	9039	67	CLh	st	2	a2
CLh2-2a	13496	3793	28	RGc	st	2	a2
CLh2-2a	13496	441	3	SCk	so	3	a2
CLh3-2a	5825	4334	74	CLh		2	a2
CLh3-2a	5825	797	14	LPq		2	b1
CLh3-2a	5825	343	6	LPe		2	a1
CLh3-2a	5825	172	3	LPq	st	3	b1
CLh3-2a	5825	118	2	APh		1	a1
CLl1-2a	13351	4403	33	SNk		2	a1
CLl1-2a	13351	4403	33	CLl	st	2	a1
CLl1-2a	13351	2065	15	CLh	st	2	a2
CLl1-2a	13351	919	7	LPe		2	b2
CLl1-2a	13351	615	5	CMc	st	2	a2
CLl1-2a	13351	277	2	LPq		2	b2
CLl1-2a	13351	275	2	FLc		3	a1
CLl1-2a	13351	142	1	CLh	st	2	a1
CLl1-2a	13351	80	1	RGc		2	c
CLl1-2a	13351	76	1	SCk	so	3	a2
CLp1-2a	14821	10160	69	CLp		2	a1
CLp1-2a	14821	1942	13	LVx		1	a2
CLp1-2a	14821	540	4	LVx	st	2	a1
CLp1-2a	14821	419	3	SN		2	a1
CLp1-2a	14821	252	2	SNk		2	a1
CLp1-2a	14821	233	2	CLl	st	2	a1
CLp1-2a	14821	163	1	ACh		3	a2
CLp1-2a	14821	122	1	CMo		3	a2

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CLp1-2a	14821	105	1	GLe	sa	3	a1
CLp1-2a	14821	92	1	FLc	so	1	a1
CLp1-2a	14821	92	1	LXh		3	a2
CLp1-2a	14821	82	1	NTr		3	a2
CLp2-3a	10100	6459	64	CLp		3	a1
CLp2-3a	10100	1324	13	LPe		2	a1
CLp2-3a	10100	813	8	ARh		1	a1
CLp2-3a	10100	616	6	LPq	st	2	a1
CLp2-3a	10100	481	5	SCk	ta	2	a1
CLp2-3a	10100	407	4	FRr	pf	3	a1
CMe1-2c	19821	3272	17	CMe		2	c
CMe1-2c	19821	2643	13	CMx	st	2	a2
CMe1-2c	19821	2367	12	LPq		2	c
CMe1-2c	19821	2181	11	CMe	li	2	c
CMe1-2c	19821	1982	10	LPq		2	b2
CMe1-2c	19821	1555	8	LPe		2	b1
CMe1-2c	19821	937	5	CMu		2	c
CMe1-2c	19821	726	4	PHl		3	b2
CMe1-2c	19821	631	3	CMe		2	b1
CMe1-2c	19821	621	3	CMx		2	c
CMe1-2c	19821	573	3	LXh		3	a2
CMe1-2c	19821	333	2	LPe		2	b2
CMe1-2c	19821	313	2	PHh		2	c
CMe1-2c	19821	202	1	CMx		3	a2
CMe1-2c	19821	190	1	AC		2	b1
CMe1-2c	19821	168	1	NTu		3	a2
CMe1-2c	19821	153	1	SNk		2	a1
CMe1-2c	19821	153	1	CLl	st	2	a1
CMe1-2c	19821	136	1	RO			b2
CMe1-2c	19821	115	1	CMe		3	a2
CMu1-3c	1499	536	36	LVx		3	c
CMu1-3c	1499	536	36	CMu	li	3	c
CMu1-3c	1499	268	18	LFq		3	c
CMu1-3c	1499	103	7	LPe		2	b1
CMu1-3c	1499	56	4	LPq		2	b2
CMx-RGd-2b	3059	2857	60	CMx	st	2	b1

CMx-RGd-2b	3059	68	2	FLc	so	1	a1
CMx-RGd-2b	3059	51	2	LPd	li	2	b2
CMx-RGd-2b	3059	25	1	CMu	li	2	b2
CMx-RGd-2b	3059	25	1	RO			b2
CMx-RGd-2b	3059	23	23	RGd	li	2	a2
FLe1-3a	5150	2138	42	FLe		1	a1
FLe1-3a	5150	779	15	VRe	so	3	a2
FLe1-3a	5150	476	9	FLc	so	1	a1
FLe1-3a	5150	395	8	LXh		3	a2
FLe1-3a	5150	240	5	CLh	so	3	a2
FLe1-3a	5150	198	4	SNk	sa	3	a1
FLe1-3a	5150	161	3	GLm		3	a1
FLe1-3a	5150	117	2	SN		2	a1
FLe1-3a	5150	108	2	FLt	sa	3	a1
FLe1-3a	5150	107	2	SCg	so	2	a1
FLe1-3a	5150	107	2	FLc		2	a1
FLe1-3a	5150	57	1	RGc	so	2	a2
FLe1-3a	5150	47	1	ARb	so	1	a1
FLe1-3a	5150	47	1	LXh	yr	2	a1
FLe1-3a	5150	40	1	ARh		1	a1
FLe1-3a	5150	31	1	ARh		1	a2
FRh1-3a	6191	1803	29	FRh		3	a1
FRh1-3a	6191	1111	18	FRr		2	a2
FRh1-3a	6191	1036	17	FRu		3	a2
FRh1-3a	6191	465	8	GLm		3	a1
FRh1-3a	6191	428	7	GLe		3	a1
FRh1-3a	6191	347	6	CMu		3	b1
FRh1-3a	6191	309	5	FRr		3	a1
FRh1-3a	6191	116	2	PHl		3	b1
FRh1-3a	6191	86	1	CMe		2	b1
FRh1-3a	6191	78	1	CMe	li	2	b1
FRh1-3a	6191	77	1	CMu			b2
FRh1-3a	6191	66	1	NTu		2	b1
FRh1-3a	6191	63	1	VKe		2	a1
FRh1-3a	6191	60	1	GLd		3	a1
FRh1-3a	6191	42	1	ACh		3	a2

FRh1-3a	6191	38	1	LPe	li	2	b1
FRh1-3a	6191	38	1	LPq		2	b1
FRr1-3a	14755	4950	34	FRr		3	a2
FRr1-3a	14755	2469	17	ACh		3	a2
FRr1-3a	14755	2057	14	LVx		1	a2
FRr1-3a	14755	1036	7	FRr		3	a1
FRr1-3a	14755	547	4	VRe		3	a2
FRr1-3a	14755	401	3	NTu		3	a2
FRr1-3a	14755	341	2	ARo		1	b1
FRr1-3a	14755	310	2	LPd	li	2	b2
FRr1-3a	14755	306	2	RGd	li	2	a2
FRr1-3a	14755	267	2	ARo		1	a2
FRr1-3a	14755	260	2	VRe	st	3	a1
FRr1-3a	14755	245	2	AC		2	b1
FRr1-3a	14755	227	2	FRh		3	a1
FRr1-3a	14755	216	1	LPe		2	b1
FRr1-3a	14755	177	1	CMu	st	2	a2
FRr1-3a	14755	162	1	LXh		3	a2
FRr1-3a	14755	156	1	CMu	li	2	b2
FRr1-3a	14755	156	1	RO			b2
FRr1-3a	14755	107	1	ACh	st	2	b2
FRr2-2a	29569	13174	45	FRr		2	a1
FRr2-2a	29569	9028	31	FRr		3	a1
FRr2-2a	29569	780	3	FRr		2	b2
FRr2-2a	29569	572	2	ARo		1	b2
FRr2-2a	29569	572	2	LVx		2	b2
FRr2-2a	29569	460	2	LPe		2	b1
FRr2-2a	29569	420	1	LXf		3	a1
FRr2-2a	29569	415	1	CLp		2	a1
FRr2-2a	29569	329	1	FLc	so	1	a1
FRr2-2a	29569	315	1	LVf		2	a1
FRr2-2a	29569	290	1	KSh		2	b1
FRr2-2a	29569	290	1	LVx		2	b1
FRr2-2a	29569	279	1	LVx		3	a1
FRr2-2a	29569	256	1	LXh	so	3	a2
FRr2-2a	29569	229	1	FRr		2	a2

FRr2-2a	29569	227	1	CMu		2	c
FRr2-2a	29569	212	1	LPm		3	b2
FRr2-2a	29569	190	1	CMx		3	a1
FRr2-2a	29569	177	1	VRe	so	3	a2
FRr2-2a	29569	152	1	LVx		2	a2
FRr3-3a	998	534	54	FRr	li	3	a1
FRr3-3a	998	355	36	CMx	li	3	a1
FRr3-3a	998	64	6	VRe	so	3	a1
FRr3-3a	998	27	3	FRr		2	a2
FRr3-3a	998	18	2	LVx		2	a2
GLe1-3a	11300	5674	50	GLe	sa	3	a1
GLe1-3a	11300	1999	17	SNh	sa	3	a1
GLe1-3a	11300	1281	11	FLc		3	a1
GLe1-3a	11300	452	4	FLe		1	a1
GLe1-3a	11300	309	3	VRe	sa	3	a1
GLe1-3a	11300	270	2	SCk	so	3	a2
GLe1-3a	11300	223	2	VRe	st	3	a1
GLe1-3a	11300	212	2	SNh	st	2	a1
GLe1-3a	11300	196	2	RO			a2
GLe1-3a	11300	179	2	FLc	so	1	a1
GLe1-3a	11300	178	2	SNm	sa	3	a1
GLe1-3a	11300	115	1	CLh	st	2	a2
GLe1-3a	11300	91	1	FLc	sa	2	a1
GLe1-3a	11300	79	1	ARb		1	a1
LPe-LPq-2bc	3909	3516	90	LPe		2	b2
LPe-LPq-2bc	3909	300	8	LPq		2	c
LPe-LPq-2bc	3909	41	1	LPq		2	b2
LPe-LPq-2bc	3909	26	1	SNk		2	a1
LPe-LPq-2bc	3909	26	1	CL1	st	2	a1
LPq1-2b	15338	6076	40	LPq		2	b2
LPq1-2b	15338	5327	35	RGc	st	1	a2
LPq1-2b	15338	580	4	SCk	st	2	a2
LPq1-2b	15338	580	4	CLh	sa	2	a2
LPq1-2b	15338	508	3	SNk		2	a1
LPq1-2b	15338	508	3	CL1	st	2	a1
LPq1-2b	15338	490	3	RGc	so	2	a2

LPq1-2b	15338	348	2	LVx		3	a2
LPq1-2b	15338	201	1	LPq		2	c
LPq1-2b	15338	183	1	FLe		1	a1
LPq1-2b	15338	179	1	SCk	so	3	a2
LPq1-2b	15338	173	1	LPe		2	b1
LPq1-2b	15338	77	1	CLh	st	2	a2
LPq2-3b	3675	1417	39	LPq	st	3	b1
LPq2-3b	3675	914	25	GYk	sa	2	a1
LPq2-3b	3675	726	20	GYk	st	2	a1
LPq2-3b	3675	272	7	LPq		2	b1
LPq2-3b	3675	249	7	LPe		2	a1
LPq2-3b	3675	97	3	LPu		2	a1
LVg1-2a	8805	5384	61	LVg		1	a1
LVg1-2a	8805	578	7	PLu		2	a1
LVg1-2a	8805	456	5	FRr		2	a1
LVg1-2a	8805	336	4	LVg	so	1	a1
LVg1-2a	8805	336	4	SNh	sa	2	a1
LVg1-2a	8805	324	4	SNg	sa	1	a1
LVg1-2a	8805	241	3	SCg		3	a1
LVg1-2a	8805	241	3	FLt	so	1	a1
LVg1-2a	8805	222	3	ARh		1	a2
LVg1-2a	8805	212	2	PLe	so	1	a1
LVg1-2a	8805	138	2	PHl	sa	1	a1
LVg1-2a	8805	111	1	PHh		2	a1
LVg1-2a	8805	111	1	ALh	so		a1
LVg1-2a	8805	83	1	SN		2	a1
LVh1-1a	8138	1269	16	LVh		1	a1
LVh1-1a	8138	1091	13	FRx		2	a1
LVh1-1a	8138	849	10	ARl		1	a1
LVh1-1a	8138	607	7	CMe	li	2	a2
LVh1-1a	8138	479	6	SNm		3	a1
LVh1-1a	8138	474	6	ACf		3	a2
LVh1-1a	8138	452	6	FRh		2	a2
LVh1-1a	8138	451	6	PHl	so	3	b1
LVh1-1a	8138	274	3	SNg	sa	1	a1
LVh1-1a	8138	231	3	ARi		1	a2

LVh1-1a	8138	225	3	LPe		3	b1
LVh1-1a	8138	225	3	CMe		3	b1
LVh1-1a	8138	190	2	LVh		2	a2
LVh1-1a	8138	158	2	FLc	so	1	a1
LVh1-1a	8138	126	2	ALh		1	a2
LVh1-1a	8138	119	1	PHl		3	a1
LVh1-1a	8138	117	1	PHl	sa	1	a1
LVh1-1a	8138	105	1	NTr		3	a1
LVh1-1a	8138	99	1	LPe		2	b1
LVh1-1a	8138	96	1	LPm		3	b1
LVh1-1a	8138	88	1	ARa		1	a2
LVh1-1a	8138	88	1	PLe		1	a2
LVh1-1a	8138	81	1	NTr		3	a2
LVh1-1a	8138	70	1	PLe		2	a2
LVh1-1a	8138	68	1	SN		2	a1
LVh1-1a	8138	44	1	VRe	so	3	a2
LVh2-2a	8422	1377	16	LVh		2	a2
LVh2-2a	8422	1208	14	LVx	pf	2	a1
LVh2-2a	8422	968	11	SNk		2	a1
LVh2-2a	8422	717	9	LPq		2	a2
LVh2-2a	8422	697	8	VRe	so	3	a1
LVh2-2a	8422	447	5	LVx		3	a1
LVh2-2a	8422	416	5	LVh	so	2	a1
LVh2-2a	8422	397	5	PHl	so	3	a1
LVh2-2a	8422	349	4	LPm		3	b2
LVh2-2a	8422	290	3	LVx	st	2	a1
LVh2-2a	8422	264	3	SNk	sa	3	a1
LVh2-2a	8422	245	3	CLp		2	a1
LVh2-2a	8422	211	3	FRr		2	a1
LVh2-2a	8422	161	2	LVx		2	b1
LVh2-2a	8422	161	2	KSh		2	b1
LVh2-2a	8422	136	2	FLe		1	a1
LVh2-2a	8422	79	1	FLc	so	1	a1
LVh2-2a	8422	74	1	PLe	so	1	a1
LVh2-2a	8422	55	1	SNh	sa	3	a1
LVh2-2a	8422	43	1	LVx		2	a1

LVx1-2a	4163	2403	58	LVx	pf	2	a2
LVx1-2a	4163	1030	25	FRh		3	a2
LVx1-2a	4163	390	9	FRr		3	a1
LVx1-2a	4163	185	4	VRe		3	a2
LVx1-2a	4163	50	1	CLp		2	a1
LVx1-2a	4163	22	1	FRr		2	b2
LVx2-1a	13734	4059	30	LVx		1	a2
LVx2-1a	13734	3300	24	CMx		3	a1
LVx2-1a	13734	2000	15	LXh		3	a2
LVx2-1a	13734	1375	10	LPe		2	b1
LVx2-1a	13734	564	4	CLh	sa	2	a2
LVx2-1a	13734	564	4	SCk	st	2	a2
LVx2-1a	13734	396	3	CHk	so	3	a1
LVx2-1a	13734	284	2	PHl		3	a1
LVx2-1a	13734	215	2				a2
LVx2-1a	13734	179	1	LVx		3	b1
LVx2-1a	13734	179	1	CMx		2	b1
LVx2-1a	13734	165	1	VRe	so	3	a1
LVx2-1a	13734	146	1	LVx		2	a2
LVx2-1a	13734	98	1	FLc		3	a1
LVx2-1a	13734	73	1	RO			a2
LVx3-2a	16124	6194	38	LVx		2	a1
LVx3-2a	16124	4264	26	LVh	sa	2	a1
LVx3-2a	16124	1548	10	ARo		1	a1
LVx3-2a	16124	1365	8	LXh		3	a2
LVx3-2a	16124	707	4	LPe		2	b1
LVx3-2a	16124	661	4	LVv	so	3	b2
LVx3-2a	16124	406	3	FLc	so	1	a1
LVx3-2a	16124	311	2	LPm		3	b2
LVx3-2a	16124	234	1	CLh		3	b2
LVx3-2a	16124	177	1	ARh		1	a1
LVx3-2a	16124	140	1	CLp		3	a1
LVx4-1/2a	10873	1352	12	LVx		1	a2
LVx4-1/2a	10873	1006	9	LVx		3	b1
LVx4-1/2a	10873	568	5	LVx	st	2	a2
LVx4-1/2a	10873	568	5	PHl	st	3	a1

LVx4-1/2a	10873	562	5	LVx		2	a2
LVx4-1/2a	10873	540	5	FLe		1	a1
LVx4-1/2a	10873	508	5	VRe		3	a1
LVx4-1/2a	10873	431	4	CMd	li	3	b1
LVx4-1/2a	10873	384	4	LPe		2	b1
LVx4-1/2a	10873	376	3	PLe		2	a2
LVx4-1/2a	10873	370	3	LVf		2	a1
LVx4-1/2a	10873	327	3	LXh		3	a2
LVx4-1/2a	10873	324	3	LXh		3	a1
LVx4-1/2a	10873	301	3	LVh		2	a2
LVx4-1/2a	10873	294	3	KSh		2	b1
LVx4-1/2a	10873	294	3	LVx		2	b1
LVx4-1/2a	10873	291	3	VRe	so	3	a2
LVx4-1/2a	10873	282	3	NTu		3	a2
LVx4-1/2a	10873	238	2	LPm		3	b2
LVx4-1/2a	10873	198	2	NTr		3	a1
LVx4-1/2a	10873	157	1	LVh		3	a1
LVx4-1/2a	10873	149	1	AC		2	b1
LVx4-1/2a	10873	139	1	ARo		1	b1
LVx4-1/2a	10873	122	1	CMx	so	3	a2
LVx4-1/2a	10873	120	1	FLc	so	1	a1
LVx4-1/2a	10873	102	1	PHl	sa	3	a1
LVx4-1/2a	10873	90	1	LVx	st	3	a1
LVx4-1/2a	10873	89	1	CLp		2	a1
LVx4-1/2a	10873	85	1	ANm	so	2	a1
LVx4-1/2a	10873	75	1	ARl		1	a2
LVx4-1/2a	10873	73	1	CMe		2	c
LVx4-1/2a	10873	68	1	RGc		1	a2
LXf1-3a	11115	9293	84	LXf		3	a1
LXf1-3a	11115	575	5	PLe	so	1	a1
LXf1-3a	11115	336	3	LVk	pc	2	a1
LXf1-3a	11115	284	3	LVx		1	a1
LXf1-3a	11115	150	1	CMe		3	a2
LXf1-3a	11115	150	1	FLc	so	1	a1
LXf1-3a	11115	111	1	SNg		1	a1
LXf1-3a	11115	94	1	LXf	so	3	a1

LXh1-3a	1997	604	30	LXh		3	a2
LXh1-3a	1997	242	12	CMe	yr	1	a1
LXh1-3a	1997	233	12	SCk	st	2	a2
LXh1-3a	1997	233	12	CLh	sa	2	a2
LXh1-3a	1997	182	9	SNh	yr	1	a1
LXh1-3a	1997	182	9	ARl	yr	1	a1
LXh1-3a	1997	178	9	LPe		2	b1
LXh1-3a	1997	46	2	RGc	so	2	a2
LXh1-3a	1997	29	1	ARo		1	b1
LXh1-3a	1997	16	1	FRr		2	b2
LXh1-3a	1997	13	1	ARo		1	b2
LXh1-3a	1997	13	1	LVx		2	b2
LXh2-2a	7770	2232	29	LXh	yr	2	a1
LXh2-2a	7770	1048	13	ARb	so	1	a1
LXh2-2a	7770	937	12	FLe		1	a1
LXh2-2a	7770	929	12	ARb		1	a1
LXh2-2a	7770	764	10	RGc	so	2	a2
LXh2-2a	7770	673	9	LVx		2	a2
LXh2-2a	7770	338	4	LXh		3	a2
LXh2-2a	7770	234	3	RO			a2
LXh2-2a	7770	162	2	LPe		2	b1
LXh2-2a	7770	133	2	CLh	st	2	a1
LXh2-2a	7770	102	1	CLl	st	2	a1
LXh2-2a	7770	102	1	SNk		2	a1
LXh2-2a	7770	71	1	SNh	st	2	a1
NTu1-3a	23845	8038	34	NTu		3	a2
NTu1-3a	23845	5235	22	NTu		3	b1
NTu1-3a	23845	2167	9	PHl		3	a2
NTu1-3a	23845	1120	5	CMc		2	a1
NTu1-3a	23845	784	3	PHl		3	b1
NTu1-3a	23845	531	2	CMu	li	3	b1
NTu1-3a	23845	440	2	NTu		3	b2
NTu1-3a	23845	422	2	LXf		3	a2
NTu1-3a	23845	353	1	NTr		2	b2
NTu1-3a	23845	306	1	ANm		3	a2
NTu1-3a	23845	303	1	CLh	st	2	a2

NTu1-3a	23845	260	1	CMu			b2
NTu1-3a	23845	258	1	ANu		2	b1
NTu1-3a	23845	254	1	NTh		3	a2
NTu1-3a	23845	203	1	PHl		2	a1
NTu1-3a	23845	192	1	PHl		2	a2
NTu1-3a	23845	191	1	CMx		3	a2
NTu1-3a	23845	163	1	RO		1	b2
NTu1-3a	23845	149	1	PHl		2	b2
NTu1-3a	23845	148	1	NTr		2	a1
NTu1-3a	23845	142	1	PHl		2	b1
NTu1-3a	23845	130	1	RGc	st	2	a2
NTu1-3a	23845	125	1	CMo		2	b1
NTu1-3a	23845	124	1	FRr		3	b1
NTu1-3a	23845	122	1	CMe		2	a1
PHh1-2a	793	415	52	PHh		2	a1
PHh1-2a	793	277	35	CMg	fr	3	a1
PHh1-2a	793	101	13	SNk		2	a1
PHl1-2a	4135	1460	35	PHl		3	a1
PHl1-2a	4135	856	21	PHl	li	2	a2
PHl1-2a	4135	706	17	PHl		3	b1
PHl1-2a	4135	457	11	LPu		2	b1
PHl1-2a	4135	196	5	LPq		2	b1
PHl1-2a	4135	176	4	PHl		2	a1
PHl1-2a	4135	91	2	PHl		3	b2
PHl1-2a	4135	85	2	PLe	so	2	a1
PHl1-2a	4135	62	1	LXh		3	a2
PHl1-2a	4135	37	1	RO			b2
PHl2-3a	3472	3135	90	PHl		3	a1
PHl2-3a	3472	101	3	VRe	so	3	a1
PHl2-3a	3472	83	2	LXh		3	a2
PHl2-3a	3472	66	2				a2
PHl2-3a	3472	44	1	SCg	so	3	a1
PHl2-3a	3472	38	1	VRd		3	a1
PLe1-3a	8943	2539	28	PLe	so	2	a1
PLe1-3a	8943	852	10	PLe		2	a2
PLe1-3a	8943	717	8	VRe	sa	3	a1

PLe1-3a	8943	644	7	PLe		2	a1
PLe1-3a	8943	497	6	LPu		2	b1
PLe1-3a	8943	448	5	PHl		3	b2
PLe1-3a	8943	395	4	GRh	so	3	a1
PLe1-3a	8943	366	4	VRe	so	3	a2
PLe1-3a	8943	309	3	PHl	li	3	a1
PLe1-3a	8943	272	3	CMu		3	a2
PLe1-3a	8943	263	3	CHh		2	a1
PLe1-3a	8943	247	3	PHl	so	3	a1
PLe1-3a	8943	241	3	PHl		3	a2
PLe1-3a	8943	216	2	LPq		2	b1
PLe1-3a	8943	162	2	PLe		3	a1
PLe1-3a	8943	150	2	GRh		2	a1
PLe1-3a	8943	133	1	LPe		2	a1
PLe1-3a	8943	107	1	LPe		2	b1
PLe1-3a	8943	78	1	GRg		2	a2
PLe1-3a	8943	77	1	PHl		3	a1
PLe1-3a	8943	68	1	GLu		3	a1
PLe1-3a	8943	67	1	LPq	st	2	a1
PLe2-1a	49201	16652	34	PLe	so	1	a1
PLe2-1a	49201	11646	24	SNg		1	a1
PLe2-1a	49201	4808	10	SN	sa	2	a1
PLe2-1a	49201	3461	7	SN		2	a1
PLe2-1a	49201	1768	4	SNh	sa	3	a1
PLe2-1a	49201	1369	3	SNk	sa	2	a1
PLe2-1a	49201	941	2	LXf		3	a1
PLe2-1a	49201	806	2	SNh	so	1	a1
PLe2-1a	49201	806	2	PLe	so	2	a1
PLe2-1a	49201	787	2	CMe		2	c
PLe2-1a	49201	724	1	SNk		2	a1
PLe2-1a	49201	587	1	FLe		1	a1
PLe2-1a	49201	524	1	CMe	li	2	c
PLe2-1a	49201	523	1	VRe	so	3	a2
PLe2-1a	49201	414	1	FLc	so	1	a1
PLe2-1a	49201	393	1	SNk	sa	1	a1
PLe2-1a	49201	380	1	GLe	so	3	a1
PLe2-1a	49201	368	1	SNh	st	2	a1

PLe2-1a	49201	269	1	ARo		1	a1
PLe2-1a	49201	250	1	ARl		1	a1
PLe3-1a	3721	3308	89	PLe	so	1	a1
PLe3-1a	3721	193	5	PHg		3	a1
PLe3-1a	3721	96	3	PHl		3	a1
PLe3-1a	3721	96	3	VRe	so	3	a1
PLe3-1a	3721	28	1	FRr		2	a1
RGc1-2a	9626	3240	34	RGc	st	2	a2
RGc1-2a	9626	2161	22	LVx		3	a2
RGc1-2a	9626	1450	15	CMe		3	a1
RGc1-2a	9626	350	4	FLe		3	a1
RGc1-2a	9626	337	4	RO			b2
RGc1-2a	9626	315	3	CMe		3	a2
RGc1-2a	9626	288	3	SNh	st	2	a1
RGc1-2a	9626	233	2	FLe	so	3	a1
RGc1-2a	9626	174	2	LPq		2	b2
RGc1-2a	9626	140	1	LXh		3	b1
RGc1-2a	9626	132	1	LPe		2	b2
RGc1-2a	9626	123	1	FLc	sa	2	a1
RGc1-2a	9626	108	1	SCg	so	3	a1
RGc1-2a	9626	97	1	FLc		3	a1
RGc1-2a	9626	87	1	FLc	so	2	a1
RGc1-2a	9626	85	1	CMe		1	b2
RGc1-2a	9626	74	1	LVh		3	a1
RGc1-2a	9626	60	1	LVg		3	b1
RGc2-2b	7177	1214	17	LPq		2	b2
RGc2-2b	7177	823	11	ANh		3	a1
RGc2-2b	7177	733	10	RGc		1	a2
RGc2-2b	7177	481	7	RGc		2	c
RGc2-2b	7177	462	6	PLe		2	a1
RGc2-2b	7177	451	6	RGc	st	1	a2
RGc2-2b	7177	447	6	CMe	li	2	b1
RGc2-2b	7177	438	6	VRe		3	a1
RGc2-2b	7177	355	5	ANm		2	b1
RGc2-2b	7177	343	5	PHl		3	a1
RGc2-2b	7177	321	4	LPe		2	c

RGc2-2b	7177	140	2	ACu		3	a2
RGc2-2b	7177	134	2	NTh		3	a2
RGc2-2b	7177	132	2	SNg	sa	2	a1
RGc2-2b	7177	101	1	CMx		3	a2
RGc2-2b	7177	101	1	PHl		3	a2
RGc2-2b	7177	95	1	ANm		2	a2
RGc2-2b	7177	88	1	RO			a2
RGc2-2b	7177	81	1	ANm		3	a2
RGc2-2b	7177	80	1	SNk		2	a1
RGc2-2b	7177	70	1	SCg	so	3	a1
RGc2-2b	7177	49	1	NTr		3	b1
RGc2-2b	7177	38	1	PHl		2	a2
RGc3-2a	14359	3983	28	RGc	so	2	a2
RGc3-2a	14359	2935	20	RGc	st	1	a2
RGc3-2a	14359	1430	10	LPq		2	b2
RGc3-2a	14359	1108	8	LXh	yr	2	a1
RGc3-2a	14359	1108	8	ARb	so	1	a1
RGc3-2a	14359	901	6	LPe		2	b1
RGc3-2a	14359	633	4	SNk		2	a1
RGc3-2a	14359	633	4	CLl	st	2	a1
RGc3-2a	14359	472	3	SNh	st	2	a1
RGc3-2a	14359	449	3	LPe		2	b2
RGc3-2a	14359	202	1	FLc	sa	2	a1
RGc3-2a	14359	161	1	SCk	so	3	a2
RGc3-2a	14359	77	1	CMe	yr	1	a1
RO1	7015	5812	83	RO			a2
RO1	7015	371	5	SCh	st	3	a1
RO1	7015	325	5	SNh	sa	3	a1
RO1	7015	205	3	FLc		3	a1
RO1	7015	93	1	RGc		2	c
RO1	7015	72	1	SCh	so	3	a1
RO1	7015	62	1	LPe		2	c
RO2	4614	1039	23	RO			a2
RO2	4614	852	18	RGc		2	c
RO2	4614	801	17	FLe		2	a1
RO2	4614	568	12	LPe		2	c

RO2	4614	407	9	SNh	st	2	a1
RO2	4614	175	4	FLc	sa	2	a1
RO2	4614	142	3	SCg	so	3	a1
RO2	4614	122	3	ACh		2	a2
RO2	4614	122	3	CMo		3	a2
RO2	4614	81	2	ACp		3	a2
RO2	4614	81	2	NTr		3	a2
RO2	4614	75	2	CLh	st	2	a2
RO2	4614	64	1	CLl	st	2	a1
RO2	4614	64	1	SNk		2	a1
RO3	3375	1532	45	RO			a2
RO3	3375	755	22	SNh	st	2	a1
RO3	3375	323	10	FLc	sa	2	a1
RO3	3375	201	6	LXh		3	b1
RO3	3375	100	3	LXh	yr	2	a1
RO3	3375	100	3	ARb	so	1	a1
RO3	3375	89	3	ALh		2	b1
RO3	3375	89	3	LVx		2	a2
RO3	3375	89	3	FLe		2	a1
RO3	3375	67	2	PHl		3	b1
RO3	3375	30	1	LPe		2	b1
RO4	2041	1033	51	RO			a2
RO4	2041	454	22	ANm		2	c
RO4	2041	184	9	ANm	st	2	a1
RO4	2041	184	9	CHh	st	2	a1
RO4	2041	102	5	ANm	so	2	a1
RO4	2041	67	3	CLh	st	2	a2
RO4	2041	17	1	FRr		3	a1
SCg1-3a	888	178	20	SCg	so	3	a1
SCg1-3a	888	119	13	SNh		2	a1
SCg1-3a	888	119	13	SNh	pc	2	a1
SCg1-3a	888	107	12	VRe		3	a1
SCg1-3a	888	106	12	CLl	sa	2	a1
SCg1-3a	888	67	8	LVg	sa	3	a1
SCg1-3a	888	65	7	CLh	li	2	a2
SCg1-3a	888	45	5	VRe	sa	3	a1

SCg1-3a	888	45	5	VRe	so	3	a2
SCg1-3a	888	37	4	CLh	sa	2	a1
SCh1-3a	7757	2601	34	SCh	st	3	a1
SCh1-3a	7757	1524	20	VRe	so	3	a1
SCh1-3a	7757	1133	15	PHl	sa	3	a1
SCh1-3a	7757	908	12	SCh	so	3	a1
SCh1-3a	7757	424	5	SNm	sa	3	a1
SCh1-3a	7757	362	5	FLc		3	a1
SCh1-3a	7757	351	5	LXh		3	a2
SCh1-3a	7757	127	2	SNk		2	a1
SCh1-3a	7757	127	2	CLl	st	2	a1
SCh1-3a	7757	114	1	LVx		2	a1
SCh2-3a	3731	1401	38	SCh	ta	3	a1
SCh2-3a	3731	1074	29	CLh	st	2	a1
SCh2-3a	3731	489	13	LPu		2	a1
SCh2-3a	3731	322	9	SCk	so	3	a2
SCh2-3a	3731	138	4	CLh	st	2	a2
SCh2-3a	3731	127	3	SNh	st	2	a1
SCh2-3a	3731	63	2	CLl	st	2	a1
SCh2-3a	3731	63	2	SNk		2	a1
SCh2-3a	3731	54	1	FLc	sa	2	a1
SNg1-1a	23424	12041	51	SNg		1	a1
SNg1-1a	23424	4171	18	ARo		1	a1
SNg1-1a	23424	2187	9	SNh	sa	3	a1
SNg1-1a	23424	1816	8	VRe	so	3	a1
SNg1-1a	23424	1665	7	PLe	so	1	a1
SNg1-1a	23424	1098	5	RGc	so	2	a1
SNg1-1a	23424	328	1	GLe	so	3	a1
SNh1-3a	12849	8387	65	SNh	sa	3	a1
SNh1-3a	12849	2179	17	SNk	sa	2	a1
SNh1-3a	12849	928	7	FLc	so	1	a1
SNh1-3a	12849	394	3	LVx		2	a1
SNh1-3a	12849	359	3	SNh	st	2	a1
SNh1-3a	12849	154	1	FLc	sa	2	a1
SNh1-3a	12849	142	1	VRe	sa	3	a1
SNh1-3a	12849	97	1	ARo		1	a1

SNh1-3a	12849	71	1	LXh		3	a2
SNh2-3a	14266	7810	55	SNh	sa	3	a1
SNh2-3a	14266	2930	21	VRe	sa	3	a1
SNh2-3a	14266	1476	10	SN	sa	2	a1
SNh2-3a	14266	1229	9	SNg		1	a1
SNh2-3a	14266	648	5	CMe		2	a1
SNh2-3a	14266	128	1	FRr		2	a1
SNh3-3a	9415	2434	26	SNh	sa	3	a1
SNh3-3a	9415	1559	17	SNh	sa	1	a1
SNh3-3a	9415	1451	15	SCn		3	a1
SNh3-3a	9415	1230	13	VRe	sa	3	a1
SNh3-3a	9415	853	9	VRe	so	3	a2
SNh3-3a	9415	762	8	LVk	pc	2	a1
SNh3-3a	9415	651	7	PLe	sa	1	a1
SNh3-3a	9415	258	3	CLh	sa	3	a1
SNh3-3a	9415	100	1	PLe	so	1	a1
SNh3-3a	9415	92	1	CLp		2	a1
SNh4-2a	23537	7478	32	SNh	st	2	a1
SNh4-2a	23537	4749	20	ARb	so	1	a1
SNh4-2a	23537	2916	12	FLc	sa	2	a1
SNh4-2a	23537	2853	12	FLc	so	2	a1
SNh4-2a	23537	2537	11	FLe		1	a1
SNh4-2a	23537	765	3	RGc	st	1	a2
SNh4-2a	23537	671	3	SNm	sa	3	a1
SNh4-2a	23537	580	2	LXh	yr	2	a1
SNh4-2a	23537	414	2	SCk	so	3	a2
SNh4-2a	23537	276	1	LPq		2	b2
SNh4-2a	23537	178	1	CLh	st	2	a2
SNh4-2a	23537	167	1	SNk		2	a1
SNh4-2a	23537	167	1	CLl	st	2	a1
SNh4-2a	23537	167	1	CMe	yr	1	a1
VRd1-3a	3792	1713	45	VRd		3	a1
VRd1-3a	3792	743	20	PHl		3	a1
VRd1-3a	3792	575	15				a1
VRd1-3a	3792	457	12	FLe	st	3	a1
VRd1-3a	3792	135	4	PHl	sa	3	a1

VRd1-3a	3792	81	2	CLh	sa	2	a2
VRd1-3a	3792	81	2	SCk	st	2	a2
VRe-3a	1406	1406	100	VRe	sa	3	a1
VRe1-3a	4350	1601	37	VRe	st	3	a1
VRe1-3a	4350	635	15	VRe		3	a1
VRe1-3a	4350	363	8	FLe	st	3	a1
VRe1-3a	4350	284	7	VRe	so	3	a1
VRe1-3a	4350	272	6	PLe		3	a1
VRe1-3a	4350	238	5	LPm		3	a1
VRe1-3a	4350	207	5	CMx	li	3	a1
VRe1-3a	4350	149	3				a1
VRe1-3a	4350	142	3	VRe	sa	3	a1
VRe1-3a	4350	113	3	CMx		3	a1
VRe1-3a	4350	100	2	PHl		3	a1
VRe1-3a	4350	70	2	LPq		2	b2
VRe1-3a	4350	42	1	LPe		2	b1
VRe1-3a	4350	33	1	FLe		1	a1
VRe1-3a	4350	25	1	PLe		2	a1
VRe1-3a	4350	25	1	LXh		3	a2
VRe2-3a	1914	286	15	VRe	so	3	a1
VRe2-3a	1914	214	11	PLe	so	3	a2
VRe2-3a	1914	192	10	ACp		2	a2
VRe2-3a	1914	175	9	CMd	pf	2	a1
VRe2-3a	1914	152	8	CMd		2	a2
VRe2-3a	1914	150	8	FLe		2	a1
VRe2-3a	1914	129	7	CMv	so	3	a1
VRe2-3a	1914	108	6	FLe		1	a1
VRe2-3a	1914	97	5	GLd		1	a1
VRe2-3a	1914	97	5	VRe		3	a1
VRe2-3a	1914	47	2	PHl		3	b1
VRe2-3a	1914	40	2	LVh		3	a1
VRe2-3a	1914	33	2	LVh		2	a2
VRe2-3a	1914	33	2	GLd		3	a1
VRe2-3a	1914	32	2	CMd	li	2	a1
VRe2-3a	1914	27	1	ARo		1	b1
VRe2-3a	1914	27	1	PLe		2	a1

VRe2-3a	1914	24	1	CMe		2	a2
VRe2-3a	1914	24	1	CMu			b2
VRe2-3a	1914	11	1	FLm		3	a1

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A COMPARISON OF SOIL INVENTORIES OF KENYA AT SCALES 1:5M (FAO SOIL MAP OF THE WORLD) AND 1:1M (KENSOTER)

LAND SUITABILITY FOR GRAVITY IRRIGATION OF PADDY RICE AND UPLAND CROPS IN KENYA

SOIL MAP OF KENYA AT A SCALE OF 1:5M

ANNEX: MAPPING UNIT COMPOSITION TABLES

DRAFT, JUNE 1995

Land and Water Development Division
Food and Agriculture Organization of the United Nations