

I 17

Sombroek

KE 1978.14

Kenya Soil Survey
S543/FO/RFW - 10/10/78
Internal Communication No. 17

Field Guidelines for the annotation of the
SOIL PROFILE DESCRIPTION FORM
("green form")

dat.:	30-10-78
No.	0574 gez: GG
naar:	WS .gez:
naar:	doss:
beh.:	gez:

INTERNAL COMMUNICATION NO. 17, 1978

by Kenya Soil Survey Staff
edited by R.F. van de Neg

supercedes stencils: S 202/JK/RFW of 9-1-74 and S 215/JK/RFW of 20-2-74

This stencil is a field guideline intended to assist the soil surveyor in filling in the "green forms", i.e. the Soil Profile Description Form. It is a summary of the "Guidelines for Soil Profile Description", published by FAO.

The FAO Guidelines are mainly based on the documentation as given in the USDA "Soil Survey Manual" of which copies are available for reference in the Kenya Soil Survey Library.

Ref. Guidelines for soil profile description (second edition)
Soil Resources Development and Conservation Service,
Land and Water Development Division,
Food and Agriculture Organisation of the U.N. Rome, 1977.

Ref. Soil Survey Manual,
Soil Survey Staff, U.S. Dept. of Agriculture
Handbook 18, 1962
U.S. Government Printer

The summary follows the sequence of the "green forms" and gives also the abbreviations and code to be used on these forms. For full details the surveyor is referred to the above references.

The soil profile description is divided into three parts:

1. General information, location etc.
2. Regional and site information and general information on the soil
3. Description of individual soil horizons

Note: > larger than
 < smaller than

1. General information:

Date/season: self explanatory; add actual weather conditions e.g. after rains, overcast, cloudy, sunny etc.

Survey area/district: name of survey area and administrative district

Type of survey: detailed, site evaluation etc.

Sheet-Observation no: 136/4-3, etc., according to topographic map (1:50.000 or 1:100.000)

Type of observation: augering, profile pit, roadcut etc.

Location: position of observation, mention nearest distance to population centre and/or school e.g. 200m west of Kitanga village along main road to Kikiru.

Coordinates: to be taken from topographical map:East;North

Elevation: in m or ft. above sea level, in general to be taken from topographical maps

Climate: ecological zone indication

Author(s): names of person(s) carrying out the observation

Photoscale: to be taken from aerial photograph

Photoyear: -do-

Flight/sequence No. run number and photo number

Photointerpretation unit: indicate symbol of unit distinguished

Soil mapping unit: indicate symbol of unit distinguished

Provisional soil name: e.g. "black cotton", "red basement soil" etc.

Soil Classification: indicate classification according to FAO legend or Soil Taxonomy

2. Regional and site information and general information on the soil:

Geological formation:

Overall geology of the area, with name and symbol of formation. For information refer to the geological map of the survey area (enclosed in the geological reports).

Local petrography:

Parent material and/or parent rock of the soil, where possible indicate the dominant minerals.

See also: Internal Communication no. 13. part I: Guidelines for subdivision of geology (based mainly on lithology) in relation to soil mapping and map legend construction.

Physiography/land unit: see Internal Communication no. 13. part II:
Definitions of land forms in relation to soil mapping and map legend construction.

Macrorelief:

Considerable differences in topography over large distances

	% slope	code
flat-very gently undulating.....	0-2	A
gently undulating.....	2-5	B
undulating.....	5-8	C
rolling.....	8-16	D
hilly.....	16-30	E
mountainous.....	>30	F

<u>Slope</u>	length.....in m.
	shape.....concave, convex, linear, etc.
	pattern.....regular, irregular, single, complex, etc.

Mesorelief and microrelief:

Meso: medium-sized differences in topography over rather short distances. Take into account the surface features occurring within the general macrorelief. Mostly related with sedimentation processes and minor erosion processes such as: wind deposits, river levees/back swamps etc.

Micro: characterized by relief irregularities and undulations found within less than 100m distance and due to neither active erosion by wind nor water; e.g. gilgai, termite mounds etc.

short description followed by class estimate:

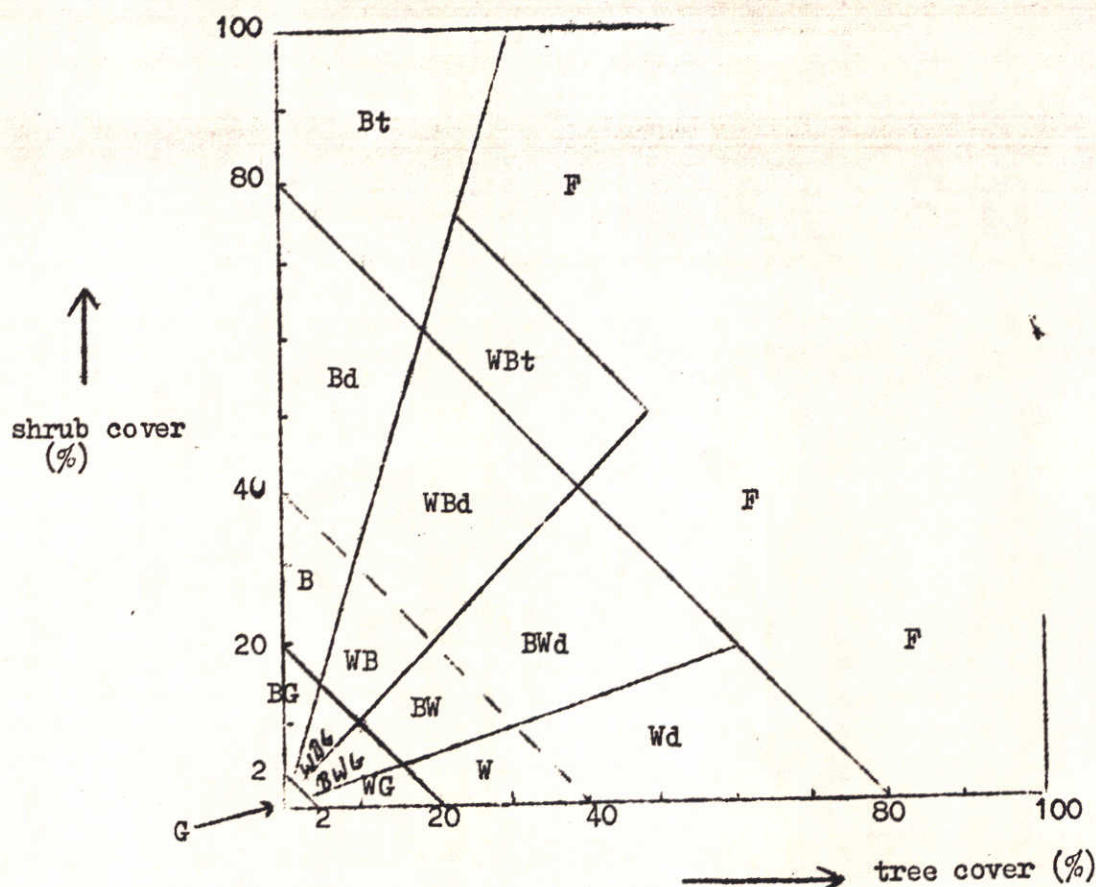
	density	height	code
none to very slight.....		0-15cm	1
slight.....	sparse (2-10%)	15-30cm	2
moderate.....	mod. dense (10-40%)	30-60cm	3
strong.....	dense (>40%)	>60cm	4

Regional Vegetation

(estimate cover and composition in an area of approximately one ha (=100x100m))

% Cover of trees and shrubs: Estimate the proportion of the ground surface which is covered by the crowns of trees and shrubs. Determine the physiognomic vegetation type, using the diagram below (which is based on the types described in the atlas of Kenya and Journal of Appl. Ecol., 3, p 369-382).

trees = woody vegetation higher than 6m irrespective of growth form
shrub = woody vegetation lower than 6m



Vegetation type: G= Grassland, W= Woodland, d= dense,
B= Bushland, t= thicket, F= Forest

(if shrubs are smaller than 1m. then the types BG and B get the prefix d)

Note: The Alpine Moorland (A), Marshland (M), Swamp-land (S), and Barren land (BL) do not appear in the above diagram, they are determined by:

- (A) a special species composition
- (M) species composition and temporary inundation
- (S) species composition and permanent inundation
- (BL) the absence of vegetation

Cover of herbs (he), grasses (gr) and bare ground (b.g.): Estimate the proportion of the soil surface which is covered by the foliage of grasses and herbs at 5 cm above ground level. Note: $he+gr+b.g.=100\%$

Dominant species: List the species which have the highest cover in the tree layer, shrub layer, herb layer and grass layer.

Note: Mention other species which might have "indicator value"; if the land is cultivated; write C, mention the crop or crops.

Land use (in the immediate vicinity of the observation):

Type of land use: e.g. shifting, rotation or permanent cultivation of annual crops; perennial crop cultivation; horticulture; irrigation cultivation (furrow, basin or sprinkler); improved or unimproved grassland; nomadic, sedentary pastoral or ranching rangeland; rangeland thickets; production or protection forest; national parks or wildlife sanctuary; recreational area; lake or swamp; urban; unproductive land (see S 457/OKHW/18/8/1977).

Crop or crop combination if interplanted

Size of plots: small (>1 ha), medium (1-5ha), large (>5ha)

Example: rotation cultivation of annual crops; maize/millet; small plots

Erosion (water): shallow rill =<10 cm deep; rill =< 25 cm deep; deep gully =>100cm deep.

Indicate: active or fossil

Indicate Type: splash, sheet, rill, gully

code

very slight.....at most shallow rills (more than 50m apart).....	1
slight.....sheet erosion, shallow rills (20-50m apart).....	2
moderate.....shallow rills (<20m apart).....	3
mod. deep gullies (20-50m apart)	
severe.....very dense rills/mod. deep gullies (<20m apart).....	4
deep gullies (20-50m apart)	
excessive.....land destroyed by gully erosion.....	5

Erosion (wind)

very slight..... <10% of area affected.....	1
slight.....part of A horizon removed/few (10-40% of area).....	2
very shallow (0-5cm) hollows/blow outs	
moderate.....A-horizon removed/common (40-75% of area).....	3
shallow (5-15 cm) hollows/blow outs	
severe.....many, (>75% of area), moderate deep (>15cm).....	4
hollows/blow outs	

Rock outcrops (rockiness)

concerned with the presence of rock outcrops on or near the soil surface that may limit the use of mechanized agricultural implements.

	exposure	distance	code
no rocks or very few rocks.....	0-2%	> 100m apart	0
fairly rocky.....	2-10%	35-100m apart	1
rocky	10-25%	10-35m "	2
very rocky	25-50%	3.5-10m "	3
extremely rocky	50-90%	< 3.5m "	4
rock outcrop	> 90%	5

Surface stoniness (stoniness)

stones: 7.5 to 25cm diameter
boulders: more than 25cm diameter

refers to the relative proportion of large fragments over 7.5cm in diameter on or near the soil surface.

		% surface covered	code
no stones - very few stones		< 0.01%	0
fairly stony.....	10-30m apart	0.01-0.1%	1
stony	1.5-10m "	0.1-3.0%	2
very stony	0.75-1.5m "	3.0-15%	3
exceedingly stony	<0.75m "	15-90%	4
(rubble land	> 90%	5)

In the case of fragments larger than 25cm, add boulders between brackets e.g. very stony (boulders).

Overwash/Overblow:

Overwash: (deposition of water erosion products)

		code
very slight	<10% of area affected	1
slight	10-40% of area affected	2
moderate	40-75% " " "	3
severe	>75% " " "	4

Overblow: (deposition of wind erosion products)

very slight	<10% of area affected	1
slight	10-40% of area affected	2
moderate	40-75% " " "	3
severe	>75% " " "	4

Surface runoff: (External soil drainage) refers to the relative rate at which water is removed by flow over the surface of the soil. This includes rain as well as water flowing out of the soil from the surrounding land. Classes are determined by characteristics of the soil profile, soil slope, climate and cover. (Soil Survey Manual, p. 166)

...../7

Ponded	0
Very slow	commonly level to nearly level/very porous and open soil	1
Slow	nearly level-very gently undulating/absorbing precipitation very rapidly; normally no erosion hazard	2
Medium	commonly gently sloping/large part of water absorbed; slight and moderate erosion hazard	3
Rapid	usually moderate steep to steep/low infiltration capacity; commonly moderate to high erosion hazard	4
Very rapid	usually steep to very steep/low infiltration capacity; high to very high erosion hazard	5

Flooding : Indicate: if in growing season etc: frequency, depth etc.
and Ponding : Indicate: water quality and depth of submergence.

Note:

Flooding hazards apply to lands where a risk of temporary submersion by running waters exists. This may cause damage such as crop destruction, flood channels, deposition, destruction of existing infrastructure etc.

Ponding: is a submersion of the soil surface by still waters which do not cause damage to the lands. It might be due to a temporary rise of the groundwater table or due to low infiltration of rain water, level or concave topography, seepage from adjacent lands, very slow runoff and lack of outlet for surface waters.

General groundwater level:

Both the depth at the time of description and the approximate average annual fluctuation in depth of the level of the groundwater surface should be recorded.

<i>Absent or taken</i>		code
Always deep	> 200 cm	0
Always deep	> 120 cm	1
Temp. mod. deep	60-120cm	2
Always mod. deep.....	60-120cm	3
Temp. shallow	< 60cm	4
Always shallow	< 60cm	5

Plant growth at location: (approx. 10 sq. m. around pit)

Indicate: Dominant species in rank order of dominance,
Estimate cover of grasses and shrubs.

Slope gradient: (refers specifically to the slope of the land immediately surrounding the pit. Indicate also %)

	code
Flat/almost flat <2%	0
Gently sloping 2-6%	1
Sloping 6-8%	2
Strongly sloping 8-13%	3
Moderately steep 13-25%	4
Steep 25-55%	5
Very steep >55%	6

Position on slope: upper slope, lower slope etc.
add slope aspect: the direction toward which a slope faces with respect to the compass e.g. N W, S E etc.

Presence of salt/alkali: Descriptive: Presence on surface, showing on vegetation, plant growth;
Indicator vegetation species.

	EC. mmhos	E.S.P. %	code
Free..... no inhibition/evidence of injury from excess salts	0-4	< 6	0
Slightly affected sensitive crops show injury	4-8	<15	1
Mod. affected no crop does well	8-15	<30	2
Strongly affected only few plants survive	above 15	<50	3
Excessively affected ... bare land	above 30	>50	4

Human influences: - presence of artefacts, bricks, pottery, charcoal etc.
- evidence of disturbance, digging, irrigation, terracing etc;
- information on fertilizing, past land use etc.

Surface sealing/crusting/cracking:

Surface sealing: Indicate degree and thickness of surface capping: e.g. weak < 5 mm thick; - - - - -

Crusting: Indicate degree, induration, thickness, etc.

Cracking: Indicate width and depth of cracks, spacing of cracks, etc.

Soil fauna: any evidence of past and present biological activity (e.g. krotovinas, termite burrows, worm casts, insect nests etc) should be recorded.

Root distribution: General comment on root distribution, drawing attention to any abnormalities observed,
Indicate: depth, size, abundance

<u>Size</u>	<u>diameter</u>	<u>quantity (abundance)</u>
Very fine roots.....	<1mm	Very few >100 mm apart
Fine	1-2mm	Few 50-100 mm "
Medium	2-5mm	Common 20-50mm "
Coarse	> 5 mm	Frequent 10-20mm "
		Very frequent 5-10mm "
		Abundant <5mm "

Effective soil depth: i.e. depth to which roots can easily penetrate throughout the year, and where there is significant moisture storage.

	<u>depth</u>	<u>code</u>
Rock/extremely shallow	<10 cm	0
Very shallow	10-25 cm.....	1
Shallow	25-50 cm.....	2
Moderately deep	50-80 cm.....	3
Deep	80-120cm.....	4
Very deep	>120 cm.....	5
Extremely deep	>180 cm.....	6

Internal drainage class: (this refers to the soil drainage class)

<u>class</u>	<u>indications</u>	<u>code</u>
Very poorly drained.....	Soil peaty or very humic/gley horizon underneath/flooding or ponding for most of the year	0
Poorly drained.....	Mottles as from surface, gley as from 30-40 cm. (temp. flooded)	1
Somewhat poorly drained (Imperfectly drained)	Mottles as from 30 cm	2
Moderately well drained	Mottles as from 60 cm	3
Well drained.....	No mottles, or below 120 cm	4
Somewhat excessively drained..	No mottles, very rapid percolation.....	5
Excessively drained	No mottles, very rapid percolation.....	6

For full description of classes see "Soil Survey manual" and "FAO guidelines".

Infiltration During the survey only a general remark on these aspects can be given.

9 — Vert. permeability
Hor. permeability

If infiltration measurements are carried out, add information afterwards on soil profile description form.

Classification of ring infiltration and rainfall simulation measurements

mm/h	← ring infiltration	rainfall simulation mm/h
< 1	very slow	< 1
1-5	slow	1-3
5-20	moderately slow	3-10
20-60	moderate	10-20
60-125	moderately rapid	20-40
125-250	rapid	40-80
> 250	very rapid	> 80

Perched groundwater table: Add information if it is available.

Remarks: self-explanatory
 e.g. ease of augering etc.
 also add: moisture condition of the soil at the time of sampling/
 description.

3. Description of Individual Soil Horizons

No. Sample e.g. 17a, 17b etc.

Horizon: Designation: A, B, R, etc. see "FAO Guidelines", p. 18

from-to in cm

Boundary: Width of boundary (thickness of transition zone)

			code
abrupt:	boundary	<2cm wide	a
clear :	"	2-5cm "	c
gradual:	"	5-12cm "	g
diffuse:	"	> 12cm "	d

Topography of boundary

smooth (boundary nearly a plane surface)..... s
 wavy (pockets are wider than their depths) w
 irregular (pockets are deeper than their widths)... i
 broken (boundary not continuous) b

Colour: Dry and moist: refers to soil matrix colour: Munsell colour notation and abbreviated name(e.g. d.gr. brown) see: Munsell soil colour charts. If relevant add also: rubbed (crushed) ped colour.

Mottling: (the word: "mottled" means marked with spots of colour)

Colour : refers to colour of mottles. In most cases only the standard colour name should be given. The additional details provided by the use of Munsell notations is usually unnecessary.

<u>Abundance (A)</u>		<u>Size (S)</u>		<u>Contrast (C)</u>
<2%	fewf	< 5 mm	fine1	faintf
2-20	common ..c	5-15	medium ...2	distinct.....d
> 20	manym	> 15	coarse ...3	prominentp

Structure

Form (type) and size (class) of structure:

Form (type)	size in mm				
	very fine (1)	fine (2)	medium (3)	coarse(4)	very coarse(5)
platy (pl)	<1	1-2	2-10	5-10	> 10
prismatic (pr)	<10	10-20	20-50	50-100	>100
columnar (cpr)	<10	10-20	20-50	50-100	>100
angular blocky (abk)	<5	5-10	10-20	20-50	>50
subangular blocky (sbk)	<5	5-10	10-20	20-50	>50
granular (gr)	<1	1-2	2-5	5-10	>10
crumb (cr)	<1	1-2	2-5	-	-

Grade (development)

structurelessspecify:

massive (coherent)m
porous massivepm
add: weakly coherent
moderately coherent
strongly coherent
single grain (non-coherent).....sg

weakw
moderatem
strongs
falling apart to: →
e.g. pr 4 → ab 2

Cutans: ped coatings; — pressure faces; — slickensides etc.
Type: Quantity: Grade: (thickness)
clay skins A patchy (few) f thin 1
slickensides S broken(common) c moderately thick 2
metallic oxides M continuous a thick 3
pressure faces P (abundant)
humus coatings H

Detection of cutans by naked eye or by hand lens(10x magnification)
absence of detectable cutans may be significant in relation to soil genesis
and classification and should be noted (e.g. "no cutans") in the description
of B-horizons.

Pores:

Quantity:

1-50 per sq. dm.....fewf
 51-200 per sq. dm.....common.....c
 > 200 " "manym

sq. dm. = 10 x 10 cm

Size:

macropores: < 200 micron (0.2mm)m
 biopores : > 200 micron (0.2mm)b

The porosity of soil material may be tested in the field by taking a clumb of soil and observe the rate in which water sprinkled from the water bottle disappears; pores are extending through if the bottom of the ped is moistened.

Texture: Abbreviation of American triangle:

and

Stoniness

May be preceded by:

very fine(vf)
 fine(f)
 coarse(co)

clay	c
silt	si
sand	s
loam	l

To indicate that significant properties of coarse, fine or very fine sand are present in sand fraction.

v. coarse medium

Mineral particles larger than 2 mm within the soil

% of large particles	0.2-7.5 cm ø gravel	7.5-25 cm ø stones	> 25 cm ø boulders
2-15%	slightly gravelly (sl. gr)	slightly stony (sl. st.)	bouldery (bl.)
15-50%	gravelly (gr.)	stony (st.)	bouldery (bl.)
50-90%	very gravelly (v.gr.)	very stony (v.st.)	very bould. (v.bl.)
> 90%	gravel	stones	boulders

may be followed by: rounded (r), angular (a), platy (p)

Consistence:

-14-

When dry:

loosedl
 softs
 slightly hardsh
 hardh
 very hardvh
 extr. hardeh

When moist:

loose.....ml
 very friablevfr
 friablefr
 firm*fi
 very firmvfi
 extr. firmefi

When wet:

non stickyns
 slightly sticky....ss
 stickys
 very stickyvs
 non plasticnp
 slightly plastic....sp
 plasticp
 very plasticvp

* Note: the term "compact" should be only used to denote a combination of firm moist consistence and close packing of particles. It can be qualified by use of "very" or "extremely".

Cementation:

Mention under "other features".

refers to a brittle hard consistence caused by some cementing substance, such as CaCO_3 , Silica, oxides of Fe and Mn, etc. Cementation is altered little if any by moistening.

Weakly cemented: can be broken by hand; strongly cemented: easily broken by hammer; indurated: sharp blow with hammer needed.

Reaction HCl (10%): no visible free carbonates in matrix:

no effervescence		0
slight effervescence	(ear only)	1
strong effervescence	(bubbles)	2
violent effervescence	(foamy)	3

pH: indicate at top of column, type of indicator solution used or if pH-meter is used, indicate soil-water ratio.

	pH		pH
Extremely acid.....below	4.5	neutral.....	6.6-7.3
Very strongly acid.....	4.5-5.0	mildly alkaline	7.4-7.8
Strongly acid.....	5.1-5.5	mod. alkaline	7.9-8.4
Medium acid.....	5.6-6.0	strongly alkaline	8.5-9.0
Slightly acid.....	6.1-6.5	very strongly	
		alkaline	9.1 and higher

Concretions: (and secondary minerals)

<u>Type</u>	<u>Quantity</u>	<u>Size</u> in mm Ø
ironir	very few <5% by volume	
carbonatesca	few 5-15% " "	
gypsumgy	frequent 15-40% " "	
manganesema	very frequent 40-80% by volume	
silicasi	dominant > 80% " "	
etc.		

add indication on hardness and shape:

hardness: soft; nodule can be broken between fore finger and thumb nail
hard; nodule cannot be broken in the fingers
shape: self-explanatory descriptions such as spherical, irregular (or knobbly), angular etc.

Salts: descriptive; or if conductivity meter is used: EC values.

Primary minerals: (non weathered rock particles)

<u>Type</u>		<u>Quantity</u>	in volume %
ferromagnesian	D		
micas	M	<u>Size</u>	in mm Ø
feldspars	F		
quartz	Q		
etc.			

Other features: descriptive
a.o. occurrence of pans